



India has 7,500 km of sea coast, with a 12 nautical-mile territorial sea and an exclusive economic zone of 200 nautical miles. The country is the seventh largest fishing nation in the world. Its coastlines support almost 30 per cent of its population, besides playing a vital role by virtue of the resources, productive habitats and rich biodiversity that they hold.

The Indian coast is doubly vulnerable today – on one hand, it is facing unprecedented pressures because of industrial and urban development; on the other hand, it is threatened by climate change-related devastation – from growing intensities of cyclonic storms to sea surges and eventual sea level rise. The rate of sea level rise is projected to accelerate two-five-fold over the next 100 years. In India, 26 per cent of the population lives within 50 km from the shoreline, making it vulnerable to these natural disasters.

Fishing communities who inhabit the coastal areas are also threatened – ironically, from conservation on one hand and development on the other.

Future policies for coastal area management must reverse these trends and find approaches to conserve and protect vulnerable ecosystems as well as secure the livelihoods and habitats of its people. That is the challenge.

What does sea-level rise lead to

- Shoreline erosion and threat to coastal communities by flooding
- Damage to coastal wetlands (mangroves and marshes)
- Devastation of coral reefs
- Stress on marine fisheries
- Loss of habitat land and local biodiversity
- Salt water intrusion leading to groundwater and soil contamination
- Changes in salinity and temperature regimes
- Loss of critically endangered native species due to loss of habitat, overcrowding, competition and lack of food sources
- Disturbance to the food cycle and redistribution of energy, thus costing economic loss to coastal zones

The regulations

The effort to protect the Indian coast began in the early 1980s, at the initiative of the then prime minister Indira Gandhi. In 1981, Ms Gandhi sent an advisory to coastal state governments to take adequate precautions while promoting development in the coastal areas. Subsequently, guidelines issued for the protection of beaches were found ineffective without statutory backing. In February 1991, the Ministry of Environment and Forests (MoEF) issued the Coastal Regulation Zone (CRZ) Notification under the Environment Protection Act, 1986 to regulate all developmental activities in coastal areas.

The CRZ Notification, 1991 prohibits and regulates certain activities within 500 metres from the High Tide Line (HTL) on the landward side and within 100 to 150 metres from the HTL on the landward side along water bodies influenced by tidal activities – such as creeks, estuaries and rivers. The land use is regulated by classifying the 500-metre regulated zone into four categories: CRZ-I (ecologically sensitive and inter-tidal areas), CRZ-II (urban or developed areas), CRZ-III (rural areas) and CRZ-IV (Andaman & Nicobar and Lakshadweep Islands).



In the last several years, the Ministry has amended the CRZ Notification 25 times. The issues concerning the implementation of CRZ have also been deliberated and decided upon by various courts of the country.

Based on the directions of the Supreme Court on April 16, 1996, the Ministry set up 13 national and state-level Coastal Zone Management Authorities. These State/Union Territory Authorities, set up under the Environment (Protection) Act, 1986 (EP Act, 1986) are institutions mandated to enforce and monitor implementation of the CRZ Notification, 1991. But in this period, violations continued, as did the demands for review of the different provisions of the original Notification.

It was increasingly evident that the implementation of the CRZ Notification was not as successful as anticipated. It was in this context that the Ministry set up, in 2004, an Expert Committee under the Chairmanship of Prof M S Swaminathan to review the existing CRZ Notification and to suggest the agenda for coastal zones. In February 2005, the Committee submitted its Report to the MoEF. The Report contained specific recommendations designed to protect and safeguard the livelihoods of coastal communities and promote conservation.

In May 2008, the Ministry issued the draft CMZ Notification, accompanied by an amendment providing for inclusion of green field airports in CMZ areas. However, the Swaminathan committee had recommended that the proposed law on CMZ be allowed to lapse, and suggested the CRZ notification of 1991 be strengthened instead. Any proposed legislation should take into account the problem of climate change-induced sea level rise and growing pressure on coastal resources, the committee said. Fishing communities have been protesting the notification from the very outset saying any development work along the coast will cut off their access to the sea.

What the laws say

COASTAL REGULATION ZONE NOTIFICATION, to be published in the Gazette of India, Extraordinary, Part-II, Section 3, Sub-section (ii), dated January 6, 2011

The following areas are declared as CRZ:

- (i) The land area from High Tide Line (HTL) to 500 mts on the landward side along the sea front.
- (ii) CRZ shall apply to the land area between HTL to 100 mts or width of the creek whichever is less on the landward side along the tidal-influenced water bodies that are connected to the sea; the distance up to which development along such water bodies is to be regulated shall be governed by the distance up to which the tidal effects are experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plans (hereinafter referred to as the CZMPs).
- (iii) The land area falling between the hazard line and 500 mts from HTL on the landward side, in case of seafront and between the hazard line and 100 mts line in case of tidal influenced water body the word 'hazard line' denotes the line demarcated by the MoEF through the Survey of India taking into account tides, waves, sea level rise and shoreline changes.
- (iv) Land area between HTL and Low Tide Line (LTL) which will be termed as the intertidal zone.
- (v) The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.

Prohibited activities within CRZ:

- (i) Setting up of new industries and expansion of existing industries except (a) those directly related to waterfront or directly needing foreshore facilities; means activities which require waterfront for their operations such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations and the like, projects of Department of Atomic Energy, facilities for generating power by non-conventional energy sources and setting up of desalination plants in the areas not classified as CRZ-I(i) based on an impact assessment study including social impacts, development of green field Airport already



permitted only at Navi Mumbai, reconstruction, repair works of dwelling units of local communities including fishers in accordance with local town and country planning regulations.

- (ii) Manufacture or handling oil storage or disposal of hazardous substance
- (iii) Setting up and expansion of fish processing units including warehousing except hatchery and natural fish drying in permitted areas:
- (iv) Land reclamation, bunding or disturbing the natural course of seawater with exceptions
- (v) Setting up and expansion of units or mechanism for disposal of wastes and effluents except facilities required as notified.
- (vi) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements. The concerned authorities shall implement schemes for phasing out existing discharge of this nature, if any, within a time period not exceeding two years from the date of issue of this notification.
- (vii) Dumping of city or town wastes including construction debris, industrial solid wastes, flyash for the purpose of land filling
- (viii) Port and harbour projects in high eroding stretches of the coast, except those projects classified as strategic and defence related in terms of EIA notification, 2006 identified by MoEF based on scientific studies and in consultation with the State Government or the Union territory Administration.
- (ix) Reclamation for commercial purposes such as shopping and housing complexes, hotels and entertainment activities.
- (x) Mining of sand, rocks and other sub-strata materials except as in the notification.
- (xi) Drawl of groundwater and construction related thereto, within 200mts of HTL with exceptions.
- (xi) Construction activities in CRZ-I except those specified in para 8 of this notification.
- (xiii) Dressing or altering the sand dunes, hills, natural features including landscape changes for beautification, recreation and other such purpose.
- (xiv) Facilities required for patrolling and vigilance activities of marine/coastal police stations.

Regulation of permissible activities in CRZ area:

- (i)(a) Clearance shall be given for any activity within the CRZ only if it requires waterfront and foreshore facilities;
- (b) For those projects which are listed under this notification and also attract EIA notification, 2006
- (c) Housing schemes in CRZ as specified in paragraph 8 of this notification;
- (d) Construction involving more than 20,000sq mts built-up area in CRZ-II shall be considered in accordance with EIA notification, 2006 and in case of projects less than 20,000sq mts built-up area shall be approved by the concerned State or Union territory Planning authorities in accordance with this notification after obtaining recommendations from the concerned CZMA and prior recommendations of the concern
- (e) MoEF may under a specific or general order specify projects which require prior public hearing of project affected people.
- (f) Construction and operation for ports and harbours, jetties, wharves, quays, slipways, ship construction yards, breakwaters, groynes, erosion control measures



Nuclear chimera

Going by the Kudankulam example, India's nuclear power generation target is a pie in the sky

Promoters of nuclear plants need patience and deep pockets. That's the lesson being reinforced for India—from a showpiece project in its backyard and another in Finland, where French company Areva's flagship project, is running into time and cost overruns.

Both have implications for India's programme of taking nuclear generation capacity to 470,000 MWe by 2050 as Prime Minister Manmohan Singh announced in September last year. It is an absurdly optimistic target, say nuclear analysts, because the current capacity is 4,560 MWe. The first of the warning signals comes from the Kudankulam project in Tamil Nadu's Tirunelveli district where the Russians are setting up two reactors of 1,000 MWe each.

Kudankulam, launched in 2002, is three years behind schedule, but is entering the final lap, according to the state-owned Nuclear Power Corporation of India (NPCIL), which is partnering the Russian Atomstroyexport in building the two reactors. NPCIL is the only entity authorised to construct and operate nuclear power plants in the country.

There was a frisson of excitement towards April end when dummy fuel assemblies were uploaded into the core of one of the reactors. This is done to assess the reactor's performance before the actual uranium fuel is used, and marks a milestone in construction. But the celebratory mood in Kudankulam was tinged with concern since the first reactor might be commissioned only in December this year—if the remaining work is completed according to schedule.

"We are trying to commission unit I of Kudankulam in the third quarter of 2010-11 and unit II about six to eight months later," said Sudhinder Thakur, NPCIL'S executive director. He explained the delay was caused by Russia's failure to provide components in time. "Towards the end, only small value equipment, but critical for completion, was delayed. Imports for unit I are near-complete and all activities are now in our domain." Chairman and managing director of NPCIL, added that the project had given them valuable experience in setting up large reactors.

Thakur did not disclose how much the delay has added to the cost of the Rs 13,171-crore Kudankulam project. Experts say price escalation is unlikely to be of the magnitude that Areva is experiencing with its Olkiluoto 3 project, using the European pressurised reactor (EPR), in Finland. Olkiluoto 3, three years behind schedule, has seen additional cost of €2.7 billion (Rs 16,343 crore) against an initial cost of €3.2 billion (Rs 19,370 crore). This has plunged state-owned Areva into the red.

Not a good augury for India, which sees Areva as the next partner to push the country's nuclear power agenda. Official sources say NPCIL is working on a business model with Areva to build two 1,650 MWe EPRS in Maharashtra. Although they claim it will be similar to the deal with Russia, this is next to impossible. The Kudankulam deal was signed in the Soviet Union era when India was an ally, and most of the tabs are being picked up by the Russian Federation now. India has paid 15 per cent of the cost and the rest is reportedly to be repaid in 12-14 instalments after commercial operations start. Besides, the Russians have assured Kudankulam fuel for its life cycle.

Areva's mess in Finland is bound to cast a shadow over cooperation with NPCIL, although some experts point out that the industry is used to delays. "Construction of nuclear reactors has always taken much longer than, say, natural gas-based power plants," said M V Ramana, physicist and research scholar at Princeton University. "The time period increased significantly after the mid-1980s following the Three Mile Island and Chernobyl accidents. As per the International Atomic Energy Agency's data the average construction time is close to nine years. In most cases, the anticipated construction time was about five years," he said.

Even if delays are a given, other issues such as who bears the liability make the Areva project and those by Americans shaky. The issue is not just the amount of compensation to be paid in the event of an accident but as to who will be landed with bill, the operators or the suppliers, and to what extent. Private Indian players who wish to set up nuclear power projects in the country want to pass on part of the liability to the suppliers and are thus stalling the passage of the nuclear liability bill. Among the companies that have expressed interest in entering the field are Reliance Industries and Tata Power.

The Russian advantage

Kudankulam enjoys other advantages that the new entrants do not; it has been sanitised as far local opposition is concerned. This is not the case with Jaitapur project in Maharashtra and Mithi Vardi and Jasapur in Gujarat. Communities that face displacement are on the warpath and in both cases the environmental impact assessment reports and pre-feasibility reports of NPCIL have been found to be faulty, sparking fresh trouble for the project promoters.

All the same the country's sole nuclear power producer is banking on larger environmental concerns related to climate change fears to push its agenda. Although coal and gas-power plants are far cheaper



and faster to set than nuclear, sections of the green lobby have been championing nuclear power because of its low-emission plants.

While that debate rages on, NPCIL has learned that ambitious targets on adding new capacity could bite the dust for various reasons. Its most immediate problem, however, is the shortage of fuel that has brought its plant load factor (PLF), or the level at which each project is operating, to low levels. Part of the problem was taken care of with fuel imported from the Russian Federation and Kazakhstan last year.

Barring Tarapur units I and II in Maharashtra, NPCIL runs its stable of indigenously developed boiling water reactors on natural uranium, and a shortage of yellow cake, as the processed uranium is called, has curtailed operations. "The PLF is about the same level as last year, around 60 per cent. However, the capacity in operation now is 640 MWe more than last year thanks to imported fuel," said Thakur. "In all, 1,400 MW was operated at full power using imported fuel, while rest worked at 50-70 per cent PLF because of non-availability of domestic natural uranium."

Where does this leave India, with its target of ramping up capacity to 470,000 MWe? Not even at the take-off point. Take just the target for the XIth Plan which has been scaled down significantly. Thakur is confident that NPCIL can nudge it to 7,280 MWe. In this case the arithmetic is straightforward: 220MWe from Kaiga-4 in Karnataka, Kudankulam I & II 2,000 MWe and the fast breeder reactor (FBR) at Kalpakkam 500 Mwe. That is, a total of 2,720MWe.

M V Ramana, the author of a forthcoming book *Nuclear Power in India*, says this figure matches his calculation, although he is not so sanguine about the FBR. "There simply is no possibility of any more power by 2012."

After that, the prediction is inherently more uncertain because it is dependent on political factors. Ramana's guess is that India will see one set of twin reactors from the big players, France, Russia and the US, at each of the sites allotted to these countries although the US gets two sites because of the civilian nuclear agreement it pushed with India. "It is plausible that the 20,000 MWe by 2020 might materialise, but I doubt if one can have the targeted 40,000 MWe by 2020," predicted Ramana. As for Manmohan Singh's target, that is clearly a pie in the sky.

– Down To Earth, August 1-15, 2010