

## **1. The Cauvery Delta Vulnerability: Emerging Threats and Challenges**

*S. Janakarajan Professor MIDS (retd)*

*President, South Asia Consortium for Interdisciplinary Water Resources Studies*

The coastal ecosystem is very complex, critical and provides a delicate equilibrium among various inter-dependent elements such as estuaries, brackish water lakes, backwater canals, coral reefs, mangroves, deltas etc. If the equilibrium is distorted among these elements, it will have very serious implications on coastal ecosystem as a whole. In particular livelihoods of millions of those who depend upon this ecosystem will be very seriously affected. Deltas are very much a part of coastal ecosystem and at the moment they are very heavily damaged / weakened all across the world. Cauvery delta is no exception. Cauvery delta is under very serious threat due to several socio-economic, political, agronomic, hydro-geological factors. Climate variability, changing monsoon conditions and coastal extreme events only add to the already stressed Cauvery delta. Key physical systems that are in danger are freshwater and brackish water resources, coastal freshwater aquifers, land and soils, rivers and streams, mangroves and human settlements. Groundwater use as an alternate source of irrigation in the delta districts is becoming more and scarcer due to severe seawater ingress. Most critical factors of vulnerability in the Cauvery delta are, increasing density of population, pressure on land, climate variability and erratic monsoon conditions, coastal erosion, sea-level rise, coastal flooding, cyclonic storms etc. Most precarious however is delta subsidence: Since the delta is located in the low elevation coastal zone, this land mass is already sinking due to various hydro-geological and climatological factors. Hydro-carbon exploration will only aggravate the danger of delta subsidence. Therefore, the key concerns in front of us are how to save delta, people's livelihoods and the food security of the state.

## **2. Mangrove Ecosystems for the prosperity of coastal community**

*Dr. S. Ramasubramanian, MSSRF*

Mangrove ecosystems are the most important and highly productive natural ecosystems on earth. Mangrove ecosystem consists of inter-tidal flora and fauna found along the tropical and subtropical regions of the world. Mangrove plants thrive in the saline water through unique adaptations such as stilt roots, viviparous seeds, salt glands, salt-excluding mechanism, leathery leaves with thick cuticle and pneumatophores. Mangroves play both protective and productive roles for the coastal community. Mangroves along the coastline reduce the impacts of waves and storm surges during cyclones. India with a long coastline of about 7516 km had a mangrove cover of about 6,749 km<sup>2</sup>, the fourth largest mangrove area in the world. However, the recent assessment showed that the cover is only 4,900 km<sup>2</sup> which is 0.14% of the country's total geographic area. Indian mangroves contribute merely 3% of the global mangrove area and about 8% of Asian mangroves. In the Indian coast East coast contributes about 60% west coast contributes 27% and the remaining 13% is in the Andaman and Nicobar Islands.

### **Reducing the impacts of disasters**

The tropical cyclones particularly the frequency and intensity of cyclones along the East Coast is very high. The mangrove forest acts as a Bioshield (first line defence) to these disasters. The assessment of cyclones between 1877 and 2005 along the East and West coasts of India revealed that only 35 cyclones occurred in the West coast and the remaining 248 cyclones occurred along the East coast. The super cyclone with wind speed of about 258 km / h that struck the Odisha coast on 29th October 1999 caused extensive damage to life and properties. The loss of life and property was less where the mangroves were dense revealing that the mangroves reduce the wind and storm surge appreciably. This was again proved during the Indian Ocean Tsunami in 2004 in Andaman and in Pichavaram in Tamil Nadu. Mangroves prevent soil erosion and stabilize the coastline and also help in land building process by trapping sediments and suspended solids.

## **Fishery Resource enhancement**

Mangrove wetlands also serve as spawning and nursery grounds for many economically important finfish and shellfish. Mangrove wetland contributes nearly 23% of India' s total fish catch, roughly translating to Rs 68 billion and each hectare contributes 1.86 tonnes / annum. Crustaceans like prawns and crabs constitute a higher percentage of fish catch near mangroves (about 25% more) than in non-mangrove areas, where they account between 9 and 15 %. Mangrove forests harbour many endangered fauna including salt water crocodile, tiger and many resident and migratory birds.

## **Climate Change and sea level rise**

Mangrove forests are one of the important carbon sink. The below ground carbon content of mangroves is 4 to 18 times higher than the carbon content of tropical rainforest. The global carbon burials of mangroves are approximately 18.4 Terra grams of carbon per year. The mangrove wetland also accretes sediments and the increase in the height of the mangrove substratum is almost equal to predicted annual increase in sea level.

## **Degradation of Mangroves**

In spite of all the above benefits, mangrove wetlands are being highly exploited. It is estimated that about 1% of the mangroves are degraded every year and almost 67% of the global mangroves were lost. This paper provides different ecosystem services it provides to the coastal community and the ways to improve the mangrove cover to mitigate the impacts coastal disasters.

### **3. Marine Fisheries (Regulation and Management) Bill 2019**

*Mr Maridasan*

The Union Government is expected to pass the Marine Fisheries (Regulation and Management) Bill 2019 for regulating fishing related activities. Fish and fish product exports emerged as the largest group in agricultural exports in 2018-19. India is the second largest fish producer in the world. This presentation deals with the merits and demerits of the proposed bill. The bill, if enacted as an Act would bring in irreparable damage to the life and livelihood of traditional fisher people. The bill divides the sea into three zones, one up to 12 nautical miles, the next from 12 to 200 nautical miles called as Exclusive Economic Zone, and the 3rd as the high seas. Though fisheries in territorial waters are a state subject, the activity in all the zones now comes under the purview of the Union Government. Those vessels, including country boats, without licences would be banned as per the planned central legislation. Those boats, heading to the sea without the permit, would be seized and a fine would be slapped on the owner. It says that “ Only those vessels registered as per the Merchant Shipping Act 1958, would be given the licence. The licence would be suspended or cancelled if norms are not followed. Official would inspect the vessels at any time and obstructing the officials’ duty can lead to slapping of fines or even imprisonment. Power corrupts, absolute power corrupts absolutely. As per this bill, the coast guard is given enormous powers which may lead to absolute corruption.

#### **4.Small-scale fisheries and livelihoods: an overview:**

*Rahul Muralidharan*

Small-scale or artisanal fishers include people who fish in near-shore waters using low technology, less capital-intensive techniques, taking catch for household consumption and sale in domestic markets. Small-scale fisheries provide employment, livelihoods and is an important source of food security for millions of people. Fishing is narrowly characterised as a male dominated occupation; however, women play an equally crucial role in small-scale fisheries engaging in the post-harvest sector. Despite their important contribution, small-scale fishing communities remain marginalised across the world. The aim of this brief talk is to offer a glimpse of the current status and discuss what portends the future of small-scale fisheries. Historically, small-scale fishing communities in India have been impacted due to state-aided fisheries development efforts and intensification of marine conservation. This has not only led to the decline of fish catch but also loss of customary fishing rights and living spaces. I will draw upon examples from Tamil Nadu to contextualise some of the concerns I aim to discuss.

## **5. Technology, Conflict and Gender: The Fisher Movement in Mumbai**

*Gayatri Nair, PhD, Assistant Professor, Sociology, Department of Social Sciences and Humanities, Indraprastha Institute of Information Technology (IIIT Delhi)*

The fisheries much like agriculture saw a skewed technological intervention introduced by the state. Work was seen as occurring only in the act of fishing itself, and thus women's work in the fisheries has seen only limited technological change over the last few decades. In the city of Mumbai where fishers have organised, fisherwomen are now demanding access to new technology which they feel will secure their position in the changed context of the fisheries in the state. But the kind of technological interventions they have demanded and the manner in which the early phase of the movement developed, indicates that for Koli fisherwomen it remains vital to define work in the fisheries around the identity of Kolis. This has brought Koli fishers in confrontation with migrants, both men and women, who seek work in the fisheries. The presentation will focus on why migrant entry has been a vital issue for fisherwomen and possibilities and paths lie ahead to address issues of all fishworkers.

## **6. Coastal Area Industrial Development:**

### **Necessity, Challenges and Way Out**

*P.K.Rajan*

Industrial Development wherever happen put pressure on the environment of the respective area. Not only that. Some of the implications transcends the immediate vicinity and affect the environment and the livelihood of people in much larger area. No one can be oblivious to the happenings in areas 'Other' than their own domicile and no one can be exclusively concerned only about their back yard.

Naturally people living in the immediate vicinity will be much more alarmed than people who think they are living at a 'Safe Distance'. But in a practical sense there is no 'Safe Distance'. However people who perceive immediate and near danger may resort to the typical 'Not in My Backyard' syndrome. But a people's science movement like TNSF or for that matter, AIPSN cannot adopt or accept a state of autarchy. We in TNSF feel a lot can be mitigated and the development can be made sustainable and it is possible to approach both Growth-Development and Environmental protection on a balanced way.

We in Tamil Nadu Science forum approach the problems of the coastal areas too within this broad frame work. Coastal areas have myriad issues due to Industrial development. But on account of paucity of time and personal expertise, this paper restricts the discussion to three sectors namely, Electrical Power, Oil & Gas and Desalination. In addition the references will be restricted to Tamil Nadu but which are similar to any state with long coast like Tamil Nadu.

## **7. Agriculture on the coasts**

*Raghunath.T.P.*

*Pondicherry Science Forum / Sri Aurobindo Society*

India has a total coastline of 7516.6 km, out of which mainland coastline consists of 6100 km and islands' coastline consists of 1197 km. India's mainland coastline is divided into two parts- Eastern coastline and Western coastline. Large parts of the coastal plains of India are covered by fertile soils on which different crops are grown. The coastal eco-systems had always played an important role in food production in various ways and mean of which agriculture on the coasts was an important livelihood. Agriculture on the coasts play an important role in not only giving livelihoods and food security but an even more important role of maintaiting the freshwater ecosystem, sustainable use of rain-water, harvesting, recharging and securing the fresh-water coastal aquifer system intact against salt water intrusion arising out over-extraction of groundwater. Changes in land use on the coastal plains have created havoc on the groundwater-surface water balance and have put the coastal populations on a do-or-die situation creating social, ecological and economic problems which are still not fully understood or addressed to by both state as well as civil-society



## **8. To Break The Frack (Cauvery Delta.... Hydrocarbon Issues)**

### ***V. Sethuraman, Tamil Nadu Science Forum***

India is basically an agrarian country. Most of the people depend on agriculture and its related work. Our Prime Minister announced that the budgets submitted by his Government were pro-agrarian budget. But it is not so. The policies of the government are against farmers and agricultural lands. For example, in our State, Cauvery Delta region is the most precious agriculture based area. Even though there is a big dispute on Cauvery Water sharing, farmers produced food crops especially paddy production by using the ground water and natural resources. The total production in the Cauvery Delta area in 17 Lacs acre which contributes 7% of the National Paddy production and more than 60% of Tamilnadu paddy production. The Cauvery delta area is thickly populated. Majority of them are engaged in agriculture.

The Cauvery delta areas are identified for natural fossil fuels in various forms. In the Cauvery basin, Oil and Natural Gas resources had been identified and to tap the resources, ONGC had carried out so many exploratory works from 1970 and identified the oil field. Since 1985 onwards, the production of oil is going on. According to ONGC, 700 wells were dug in the Cauvery delta. More over, 200 wells are now in progress. They are linked through pipe line from production well to EPS centres. Farmers are agitated due to oil seepage in the agriculture land. ONGC is facing the resistance from Farmers and fringe groups.

In Mannargudi area, 23,000 million tonnes of lignite base with one trillion cubic feet of Coal Bed Methane are also identified. In 2010, according to CBM IV round, extraction coal bed Methane in Mannargudi Lignite base area awarded to M/s GEECL, an Indian based MNC. The extraction of Methane is done through extraction of water in which the Methane is immersed. If the water is extracted from Coal Bed, Methane gas will be coming out with high pressure. In Mannargudi area CBM bed level is between 450 feet and 1200 feet. Since the water is extracted from 450 feet, the present ground water level which is required for Drinking and agricultural purposes are depleted. The extracted water content of so many hard materials and minerals may affect the fertility of soil. This issue was first raised by Tamilnadu Science Forum and brought to the notice of the Govt of Tamilnadu and to the public. As a result of this a permanent ban was imposed by the then Chief minister of Tamil Nadu J Jayalalitha based on a recommendation by an expert committee.

India is in the third place of largest Petroleum consumption countries after US and China and India has to depend 80-85% of it on imports alone. For the purpose of augmenting indigenous production of fossil fuel, the country is trying the unconventional method which involves eco unfriendly and dangerous methods that includes Hydraulic fracking method to extract Shale gas and oil in sedimentary basins.

In the year 2016 central Govt introduced a new permit system called HELP (Hydrocarbon Exploration and Licensing policy) replacing the previous system NELP (New Exploration Licensing Policy), that has now been made possible to explore any type of energy (by using Conventional and Unconventional method ) from permitted areas.

NELP system was modified with a still more liberal Single Licensing model called HELP and now it is further liberalized to bring Open Acreage Licensing Policy - OALP. The government has started the process to award these identified areas on revenue sharing basis to interested parties from July 2017. By this action, the existing methodology of identifying and auctioning which are hitherto in the domain of Directorate of Hydrocarbon has been scrapped. As per this policy, getting separate licenses for exploration of Hydrocarbon, methane, shale oil and shale gas has been modified. Under the new HELP-OALP licensing, a single license is given for all categories of explorations.

We cannot find fault with utilization of energy resources for country's sake. But it is also equally important from where the resources are tapped. It would be utterly reckless to disturb places like Cauvery basin for the purpose of extracting Hydrocarbon as this has been a place where agriculture is taking place for more than 200 years.

In toto, the production and conservation of energy should not be done at the cost of providing the dailybread to the citizens...

**Earth provides enough to satisfy every man's need, but not every man's greed....Mahatma Gandhi**

## **9. Mangroves- The Defender & Promoter of livelihood in India,**

### **A Study from Muthupet :**

*Dr.B.Ram Manohar, Thanjavur*

Mangroves of group of Trees, shrubs, grow in the Intertidal and subtropical coastal Zone. salt tolerant, breathing roots, stilt roots, Aerial roots are special characteristic features of Mangrove plants. River dominated Mangroves are present at Pichaikaran, Muthupet at Tamilnadu.

Muthupet mangroves are situated at Thiruvarur District, Tamilnadu with the area 11,885.91 hectares. It spreads also in adjacent Districts of Nagapattinam, Thanjavur. This forest is present at south corner of Cauvery River Delta. Here Vennar, Pamanii, Karaiyar, Kilaithangiyar, valavanaru water entered into the sea via Lagoon which is called Mullipallam.

Mangrove plant species found in Muthupet are *Accidents marina*, *Aegiceros carniculatum*, *Thozhil hora*, *Exocoeaeria agallochaa*, *Acanthus licifolius*, *Luminizera racemosa*, During North East Monsoon, water flow from Rivers entered into this area.

Biodiversity of Muthupet mangroves are unique and more. 61 species of different plants are identified. Specially *Thalassia*, *Hallophytes* with 6 species of Sea grass are also found in this area. More than 73 species of Fishes, 160 species of Aquatic and land Birds are also spotted. Particularly Migratory Birds from different countries are gathering here during the months of October to February . Birds like Flamingoes, Darters, Painted Storks, Ducks, Waders, are also visiting to this coastal area.

Historically Muthupet mangroves is very important. During the regime of King Serfoji (16th century) , This Forest was highly affected seriously for longtime. During 1911 year only this area was declared as protected forest.

Our Tamilnadu Science Forum is conducting National Children Science Congress in our State regularly for the past 26 years. During year 1998 NSS volunteer students of Government Higher Secondary school, Pattukkottai, Thanjavur District worked on the Project of Muthupet Mangroves Birds and the awareness of Village people.

They were awarded " Young Scientists" at that time.They were also continuing the Awareness on the Local Environment conservation. In the year 2006, Students of Panchayat Union middle School students of Kuppathevan village, Thanjavur District near Kattumavadi coastal area have done the NCSC Project on Mangroves and Sepia Breeding. students given suggestions to fishermen to conserve the rear .They were also awarded Young Scientist awards.

Here the awareness of Mangroves should be realised by local people.Cutting of Trees, Cattle grazing may be banned .Training to Teachers , Students of local schools, youth, women, Fishermen, self-help women groups may be organized regularly. Cultural Programmes also may be conducted in the area. Our sincere efforts may be focused to chart out plans only to conserve the Mangroves of Muthupet will be with the Coordination of Local village people.