Beach Profiling for Community Resilience

Women and men in fishing communities in South India work together to generate important beach related data

By **Vivek Coelho** (vivekcoelho@gmail.com), Social and Ecological Stewardship Programme, Tata Institute of Social Sciences, Mumbai, India,
Jesu Rethinam (snehangt@gmail.com), Director, SNEHA and Convener, Coastal Action Network, Tamil Nadu, India,
Gandimathi Alagar (lawtrust1986@gmail.com), Director, LAW Trust, Tamil Nadu, India and
Tara Thomas (tarathomas.bac@gmail.com), Independent writer, Chennai, Tamil Nadu, India

India's 7,500 km coastline is a hotbed of transformation. The 'Territorial Sea', where fishing is allowed, provides an exclusive economic zone in the ocean, 60 per cent the size of its land area. India ranks third in world fish production with a harvest of 6.3 million tonnes. India's seas are also habitat to countless forms of marine and terrestrial life.

Beaches already undergo constant natural changes with the movement of sand by wind, waves, tides, currents and littoral drift. Man-made coastal structures, such as industries and ports, along with natural influences, affect coastlines and beaches. Shoreline ecosystems face a threat as we develop and progress without a basic understanding of shoreline dynamics and processes. The Shoreline Change Atlas of the Indian Coast indicates that 45.5 per cent of the coast is under erosion.

India's four million-strong fishing communities, especially on the coast, have seen their livelihoods go through multiple changes from small-scale artisanal fishing, to trawling and mechanised practices. They are vulnerable communities, steadily losing their homes, resources and space for livelihood activities such as boat parking, fish drying and net mending to the ocean as beaches are eroded.

In the state of Tamil Nadu in India, where the 2004 tsunami wreaked maximum damage, aid flew in and changed lives in many fishing communities. However, self-reliance has not been a result of this aid. Small-scale fishermen see dwindling catch, lose out economically to trawlers, and are also losing the coastal land and beach space around where their homes are located.

SNEHA

Women volunteers recording beach profile, Karaikal, India and this programme has encouraged more women volunteers to get involved

Beaches aren't valuable from the standpoint of aesthetics and real estate alone. They form an essential first line of defence against the ravages of the sea, and soften the impact of lashing waves. Sandy beaches and dunes act as buffers, protecting the hinterland from the sea. Beach sand plays a vital role in restricting saline intrusion into the groundwater of coastal regions.

The National Policy on Marine Fisheries in India, gazetted in May 2017, appears biased towards privatisation of fishing practices, while being silent about constant violations to areas traditionally used by fishing communities, especially Coastal Regulation Zone-1 (CRZ-1) areas. In October 2017, the Ministry of Environment, Forests and Climate Change in India issued an amendment that relaxed guidelines for the mining of atomic minerals like uranium and thorium in CRZ areas. These amendments follow a string of policy changes drafted and passed without prior public consultation.

The proposed Sagarmala project promises to set up five or six mega ports, a host of smaller ports and 14 coastal economic zones. The implications of the Sagarmala project are alarming. Close to 1,500 km inland of the ports are to be claimed for special coastal economic zones. They reinforce how coastal communities most affected by these projects are not considered equal stakeholders in this process. The social, economic and ecological implications of such initiatives that directly affect the shorelines and fishing communities of India need further consideration.

Stewardship of coastal land is the primary challenge for coastal communities. Ground truth verification of land use patterns of coastal communities have not been carried out adequately, or verified with the perspective of access and rights for ownership. Regional resource maps often omit entire beaches and ecological features, to prioritise coastal development.

Sea level rise and the unpredictability of extreme weather events require local communities to play an active role in creating knowledge bases for appropriate action, to reduce disaster risk and recreate a healthy

coastline. Beach profiles can be documented on beaches where there are already specific problems, or a lack of information about the status of the coastline. Examining this data can tell us how individual beaches respond to a variety of ecological phenomena and anthropogenic activities. The Beach Profile Monitoring Programme was envisioned as a way to empower fishing communities with the data, skills and knowledge to observe and understand what is happening to their coastlines, and be stakeholders in the process of building resilience to changes by stewarding their local ecology.

In 2013, Vivek Coelho, of the Social and Ecological Stewardship Programme (SESP), Tata Institute of Social Sciences, India initiated work in Puducherry on a mandate to work with fishing communities and create a citizen science programme. Interacting with advocacy groups and local communities led to ideas on measuring erosion and accretion patterns.

Stewardship of coastal land is the primary challenge for coastal communities

The goal was to document and create locale specific evidence on shoreline dynamics in terms of erosion and accretion patterns of the beach; and to study beach features through sand grain size analysis and photo documentation. Understanding and documenting beach profiles and sand grain sizes provide basic tools for communities to strengthen their relationship as stewards of coastal ecology.

One method to do this, proposed in 1961 by K.O. Emery, is beach profiling, based on readings taken on the days of the lowest tide, with the use of two graduated poles, whose alignment and intersection with the horizon allow for the determination of elevation change along the profile line. The readings are taken along the profile line of a fixed structure on the beach, known as a 'control point' up to the low water mark. These are then calculated and plotted on a graph to document the profile of the beach in question. The graphs represent the length from the control point to the low water mark and elevation change along this profile line—the contour of the beach. Anyone with a basic working knowledge of reading, writing and mathematics can record and calculate readings. Sand grain size analysis reveals information about effects of tidal influences and man-made factors. It also reveals the presence of magnetic and mineral properties in beach sand.

Coastal communities did respond to initial training but with reluctance. Fisherpeople's lives are burdened with daily labour, commitment to their trade, additional jobs if necessary, running households and caring for children. They have little time to spare to take cognizance of the beach around them and engage in citizen science or research. This was felt strongly in the state of Puducherry in India, where community mobilisation was a challenge.Another hurdle was the cost of the equipment used in the Emery method. The calibrated poles are fairly expensive, and impossible for fishing communities to access. Coelho first used wooden poles, two metres in length with one metre steel scales pasted onto them.

The equipment was bulky, and a five metre long thread was used to space the interval between the two poles. Thread and fingers were used as viewfinders to fix readings with reference to the horizon. The equipment proved to be bulky, expensive, and hard to maintain. Expensive equipment would make it challenging to expand the programme and work with more communities.

Finally, Vivek replaced the calibrated poles with PVC-U pipes and measuring tape, with women's hair ties as viewfinders. This method was formulated and termed the 'Adapted Emery Method for Beach Profiling'. It proved low cost, effective, lightweight, transport friendly and easy to maintain. With an annual cost of Rs 10,000 (USD150) to sustain the entire annual data collection process, the equipment is finally accessible to coastal communities. Engaging the interests of these communities, however, is more challenging. In recent years, industrial expansion into coastal areas has altered lives and livelihoods. Coastal communities can observe how changes in littoral drift and sand movement affect erosion and accretion patterns. But community interest needs to grow to address the changes that cause these occurrences.

The support of veterans working with coastal communities who understood ground realities encouraged community involvement in citizen science. The programme was lucky to build a partnership in the year 2014 with two NGOs, SNEHA (Social Need Education and Human Awareness) and LAW (Legal Aid to Women) Trust in the Nagapattinam region in Tamil Nadu, each of which had a long term relationship with the coastal community. Together, the team trained staff and volunteers to understand their ecological and environmental surroundings in the context of disasters. Trainings also included the processes to record monthly beach profile readings, make calculations based on these readings, plot graphs, and archive the data after every session.

Initially, community members and panchayat (village administration) leaders were nonplussed at the initiative. As a voluntary effort that did not offer monetary benefits and used up precious community time, it was deemed an unwise use of resources.

The manual, *A Tide Turns*, was written to make this initiative accessible to all coastal communities at risk from climate change. As training sessions continued, individuals displayed an interest and pride in understanding and mapping local beaches. The activity of beach profiling promoted principles of teamwork and leadership in volunteers and staff. Volunteers understood the correlation between graphs and what they saw on site; they learnt how to operate high-end cameras, manage a group, and more. They also created a database of monthly reports with readings for the locations archived at the community. Volunteers and external parties can now use the manual as a detailed do-it-yourself (DIY) guide to set up their own beach profiling initiatives.

Coastal communities eventually accepted the programme's benefits and showed support by offering temples, halls and other community spaces for volunteers to calculate readings, analyse sand grains, store equipment, have meals and so on. Fisherwomen in these communities were trained to collect data. Currently, there is an active engagement of the youth, both male and female, in the data collection effort, with older women and men playing a supportive role. In fact, the support that women have extended to the beach profiling programme has encouraged more female volunteers to get involved.

As the programme becomes a part of community life, grooms leaders and offers them ownership over their data, the way forward would be to use such locale specific data to create a healthy coastline. Local organisations and governance bodies could use the programme as an entry point to develop the practice of stewardship, the spirit of volunteerism and to initiate efforts that use traditional knowledge systems to address the urgent need for restoration and regeneration of local ecologies. The initiative's preparedness and mitigation action plans could improve community resilience and build ecological integrity.

Beach restoration is more than keeping beaches clean. It is a holistic approach to recognise eroding, vulnerable beaches and regenerate them. Soft solutions include planting sand binding varieties, indigenous coastal vegetation and building sand dunes. Exploring ecologically aligned and sustainable livelihoods can build community resilience, restore ecology and create a cadre of first responders in the context of disasters.

Evaluating ongoing and proposed development activities along the coast with an ecological lens, and ensuring effective coastal planning requires location specific data to inform decision making processes. India's commitment to implement Sustainable Development Goals (SDGs) is a step towards protecting coastlines. SDG 14 prioritises conservation and the sustainable use of the oceans, seas and marine resources. Community-led ecological monitoring and context specific coastal resource stewardship is critical to disaster risk reduction and should be non-negotiable in the implementation of SDG 14. The programme is open to partner and share knowledge with all stakeholders and decision making bodies to ensure scalability along the Indian coast. Our partner organisations and community volunteers have undergone a 'Resource Stewardship Leadership Development Programme'—specially designed by the SESP-TISS team, with support and supervision from Dr. Monica Sharma, a former director of leadership and capacity development with the United Nations.

The extensive length of India's coastline and its administrative jurisdiction under ten states makes it challenging for government agencies to monitor the coast. With a fishing village located almost every two kilometres along the coast, community monitoring of beaches using citizen science can provide the data to understand the changing dynamics of our beaches. More importantly, it provides a platform to usher in coastal resource stewardship.

Community-led ecological monitoring and context specific coastal resource stewardship is critical to disaster risk reduction and should be non-negotiable in the implementation of SDG 14