Fishers turn climate scientists to save beaches

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A community-managed shoreline monitoring project in Tamil Nadu and Puducherry is tracking changes to beaches to safeguard an ecosystem that is vital for the livelihoods of those who depend on fishing

Volunteers taking readings to map the shoreline. (Photo by Vivek Coelho)

Classical musician and Magsaysay award winner T.M. Krishna recently urged the public to save their poromboke, which means community land in Tamil. Now, local communities in Tamil Nadu and Puducherry have come forward to safeguard their poromboke — the beaches. This is a unique initiative because they are using hard-core science and barefoot technology to monitor and map the shoreline they depend upon. And they are doing this without any formal education. The lyrics of Krishna's song — *Poromboke ennaku illai, poromboke unnaku illai…bhoomikku* (Poromboke is not for me, it is not for you; Poromboke is for the city, it is for the earth) —call for engaging communities in protection of the local environment and allowing natural common spaces such as wetlands and beaches to exist. Such ecological spaces are rapidly being taken over or are being altered due to development, concretization, climate change and pollution. This is despite the fact that Coastal Regulations Zone norms restrict construction along the coast up to 500 metres from the high tide line, making beaches part of community land. The project called "A Tide Turns" is a community science initiative by Tata Institute of Social Sciences in partnership with local NGOs Social Need Education and Human Awareness (

SNEHA

) and Legal Aid to Women (LAW) Trust that has helped turn more than 120 people from local fishing communities into climate scientists who now use cheap do-it-yourself equipment and elementary maths to map, document and track changes in the shoreline by generating scientifically accurate data. It can be an effective tool to help in timely decisions to safeguard the ecosystem, livelihoods and to make the coast healthier and more resilient. Using cost-effective materials, volunteers use various scientific methods such as beach profiling, sand grain analysing and photographic evidences to arrive at accurate results. "This is a long-term coastal profiling project which we began a year ago and has helped in generating baseline data which was not available so far. With regular monitoring over the next few years, it will yield information such as what are the impacts on beaches, how the shoreline is changing, its biodiversity, impacts of development projects and constructions and also on actions that need to be taken to stabilize eroding beaches," said Vivek Coelho, fellow from TISS who is the brain behind this project. "It will generate evidence to ensure informed decision-making in order to protect the coasts. And such rigorous monitoring is only possible if we involve local communities." Crucial mapping exercise This is a crucial exercise because, according to Shoreline Change Atlas of India, 45.5% of India's 7,500 km of coastline is under various degrees of erosion and most satellites provide only two dimensional images, which are not useful in making on-ground decision-making. Experts say beaches are highly dynamic and can show drastic changes with just one natural disaster event as seen in 2015 floods in Cuddalore. Hence the current sporadic monitoring being done by the government at just 4-5 locations on the entire shoreline is not enough to give an accurate picture of the whole coastline. Further, the country's extensive coastline is under jurisdiction of different state governments that makes it even more difficult for the authorities to monitor the coast. On the other hand, there is a fishing village located every 2 km along the Indian coastline and roping in these communities is the perfect solution for a successful, intensive, sustained and rigorous beach mapping. In the initial stage, over 120 volunteers have been trained in two districts of Tamil Nadu and Puducherry — Cuddalore and Karaikal — covering 30 km of the coast with monitoring being done every 5 km.

Volunteers making their own equipment out of cost-effective materials (Photo by Vivek Coelho)

Harish, a 22-year-old volunteer in Karaikal district in Pondicherry, has been mapping the beach from the past one year – from the inception of the project. He told indiaclimatedialogue.net that despite initial resistance, local panchayats (village councils) and villagers joined in the initiative which is very helpful in documenting the degradation rate of the beaches. “Indian coast is being eroded due to man-made structures as well. The rate of erosion is very high,” he said. “With beach profiling, we can notice and record the monthly changes, even very small changes and collectively, we can clearly say that the length of the beach is affected.”

Dynamic zones Beaches are dynamic zones which support coastal communities, marine and terrestrial species and are continually influenced by tides. They are also nature’s barriers against disasters and help in nutritional exchanges between land and sea. Their health depends on an uninterrupted tidal regime and natural courses of sand flows that can make or break their form. On one hand, beaches are threatened by the rising sea-level due to climate change which is crunching them. On the other hand, development pressures and rapid constructions of ports and other infrastructure is depleting their sand content, accelerating erosion. Coelho explained that on the eastern coast sand flows in the direction of south to north for a good eight months and north to south for the remaining four months. The sand flows like a river shoreline and if a perpendicular barrier (such as port, industry, energy plant) comes in the way, then it breaks the flow and sand starts falling on one side of the structure and the sand that manages to reach the beach is not adequate enough causing depletion. So with the beach-profiling data, authorities, regulators, project proponents and local population can check if a project is viable. It can also be a yardstick for environmental compliance by the developers and at the same time the data can help in studying impacts of rising sea levels and in deciding if beach stabilizing species like Ipomoea should be used to check erosion. Harish, who hails from a fishing community but who belonging to a new generation has chosen a different career path, believes that the beach profile data will help empower his community and will help them in asserting their rights, “I noticed how in other places people have been affected, how projects have displaced people. This will sure be reflecting in our community too, so this is coming at the right time. Through resources mapping each village has a map of trees, plants, farmhouses, fields and with this proper evidence in hand, people can approach the authorities to safeguard their land.”

Science behind mapping Beach profiling is a simple technique to measure the contour and elevation change of a concerned beach. It involves making topographic profiles of the beach using the Adapted Emery method and sand grain size analysis that strengthens the collected data. The profiling is done using Emery method but in this adapted version developed by Coelho, the standard equipment is replaced by cheap, lightweight and commonly available materials that are affordable to local communities without compromising accuracy. So, PVC poles, hair bands, measuring tape (instead of readymade expensive calibrated poles) etc. are all part of the kit and can be procured from local shops easily. It requires only one time investment of INR 10,000 (USD 155). Once in every month, volunteers go to the beach on a full moon day or a new moon day and conduct beach mapping when the tides are the lowest. The exercise is repeated round the year to generate baseline data. The process uses two basic 2-metre poles and a standard measuring tape. A 5-metre rope is used to maintain distance between the two poles. The difference in elevation between two poles give the topographic change for that segment and various such readings are taken as the pair of poles is shifted constantly for each reading down the beach. The data is plotted into a graph that gives a graphic representation of the contours of the beaches. With such constant gathering of data over the years, comparisons can be made with the baseline data for any change in erosion or contours at the same location. This will also help in planning remedial actions to restore the beaches. To make it more accurate, sand size analysis is also included in the process. It is done by collecting and sifting sand sample through an array of sieves that sift grains into 7 categories based on sizes. Presence of different sized grains narrate different story, which in turn helps in strengthening the accumulated data. For example, sharp and angular particles are often an indicator of eroding beaches.

Challenges remain One of the challenges is to get fishing communities involved during low tide days because that coincides with high fish-catching days, which is the busiest time for them. However, the project managers say that seeing its benefits and the fact that it just needs one hour in the day, communities are more willing to do it. “A Tide Turns” has made the use of science as easy it can be for the traditional communities who are dependent on beaches and who can now approach the relevant authorities with facts and figures. Organizations involved in the project hope that it will be replicated by other fishing communities, which can go a long way to save India’s coastline. First published on

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