

Coping with Climate Change

The case of Fisherfolk along the Coromandel Coast of Tamil Nadu

R.S. Bhalla¹

¹Foundation for Ecological Research, Advocacy and Learning (FERAL)

INTERNATIONAL CONFERENCE ON CLIMATE CHANGE RESILIENCE
October 4th to 7th 2015, Pondicherry



- 1 Overview
- 2 Hazards Faced and Vulnerabilities of Coastal Communities
- 3 Our Findings
- 4 Conclusions

Coastal communities remain among the most vulnerable to impacts of climate change. Their vulnerability is a result of:

- Physical proximity to natural hazards.
 - Cyclones and squalls.
 - Shoreline change.
 - Sea level rise.
 - Extreme rain events leading to floods.
 - Social vulnerability
 - Distinct artisanal caste group.
 - Poor political representation.
 - Economic vulnerability
- Livelihoods based largely on fishing and allied occupations.
 - Environmental and ecological vulnerability
 - Downstream of drainage systems over which they have no control:
 - Pollution
 - Alteration of natural flows
 - Ecological vulnerability
 - Degraded habitats, reduced ecosystem goods and services
 - Overexploited resource base

The Study

We present results of a study spanning 62 villages along the Coromandel coast of Tamil Nadu.

The goal of the study was to understand the nature of vulnerability of coastal and backwater fisherfolk to large scale environmental and ecological processes. Our specific objectives were to:

- determine the level of dependence on fishing and allied activities of traditional marine fishers and backwater fishers respectively.
- identify perceived threats, pressure points and coping strategies adopted.
- determine the role of formal institutions in supporting livelihoods of these communities.
- build a perspective on the long term strategies for livelihood diversification within the community.



Some of the coastal habitats present in the study site. Photo credits: Gopinath S, FERAL.

Methods

A modification of the Sustainable Livelihoods framework [1] to deal specifically with the requirements of fishing communities was used.

Semi structured interviews, group discussions and structured household surveys were used in combination with direct observations.

- Historical mapping in 62 settlements.
- Stake holder analysis in 23 settlements.
- Transects for use of craft in 62 villages^a.

^aFor a broad idea of craft use.



- 1 Overview
- 2 Hazards Faced and Vulnerabilities of Coastal Communities**
- 3 Our Findings
- 4 Conclusions



Some Definitions

Relating hazards and vulnerabilities[2]

Hazards: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

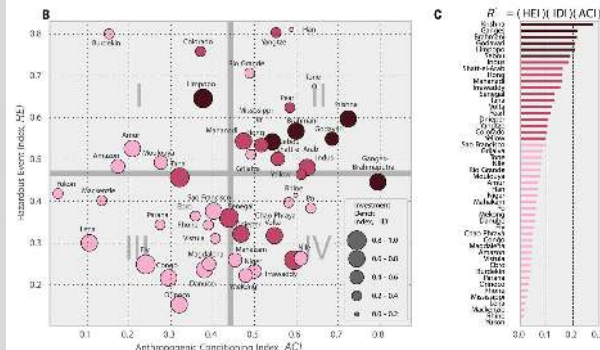
Vulnerability: The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

Risk assessment: A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

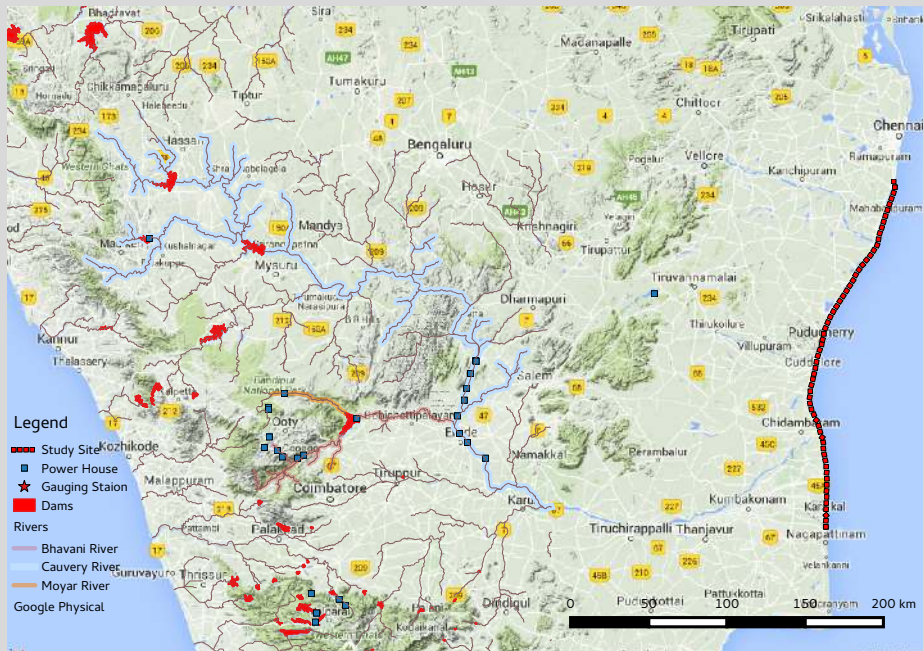


(a) Hard structures take their toll on coastal erosion. (b) Chinna Mudliyar Chavady. Photo credit: Aurofilio.

Anthropological activities have exacerbated coastal hazards in many parts of the world. Human activities fundamentally alter and affect coastal processes such as sediment transport by longshore drift resulting in shoreline change which damages property and exposes settlements to wave action and sea level rise.



Coastal communities in south and south-east Asia are extremely poor and their coastal densities are amongst the highest in the world leaving them very vulnerable. [3]Z. D. Tessler et al. Science 2015;349:638-643.



Altered flow regimes in the Cauvery have led to nutrient, sediment and fresh water deficit and degradation of backwater habitats. Access to the sea has been hampered by sand-bar formation.

Natural defences are being lost



Mangroves cleared out for aquaculture farms – they are among the most endangered ecosystems in the world.
Photo credit: Gopinath S.



Sand dunes, probably the only natural defence which was able to withstand the devastation of the 2004 Tsunami are falling prey to real estate developers and vanishing across the Coromandel coast. Photo credit: Gopinath S.

Combine this with sea level rise, increased frequency of cyclones and squalls.



Coastal protection is one of the most important ecosystem services offered by coastal habitats.

Perhaps more importantly...

Ecosystem services	Ecosystem processes and functions	Important controlling components	Ecosystem service value examples	Human drivers of ecosystem change
Raw materials	generates biological productivity and diversity	reef size and depth, coral type, habitat quality	estimates unavailable	climate change, blast or cyanide fishing, lime mining, eutrophication, sedimentation, coastal development, dredging, pollution, biological invasion
Coastal protection	attenuates and/or dissipates waves, sediment retention	wave height and length, water depth above reef crest, reef length and distance from shore, coral species, wind climate	US\$174·ha ⁻¹ ·yr ⁻¹ for Indian Ocean based on impacts from 1998 bleaching event on property values (Wilkinson et al. 1999)	
Maintenance of fisheries	provides suitable reproductive habitat and nursery grounds, sheltered living space	coral species and density, habitat quality, food sources, hydrodynamic conditions	US\$15–45 000·km ⁻² ·yr ⁻¹ in sustainable fishing for local consumption and \$5–10 000·km ⁻² ·yr ⁻¹ for live-fish export, the Philippines (White et al. 2000)	
Nutrient cycling	provides biogeochemical activity, sedimentation, biological productivity	coral species and density, sediment deposition, subsidence, coastal geomorphology	estimates unavailable	
Tourism, recreation, education, and research	provides unique and aesthetic reefscape, suitable habitat for diverse fauna and flora	lagoon size, beach area, wave height, habitat quality, coral species and density, diversity	US\$88 000 total consumer surplus for 40 000 tourists to marine parks, Seychelles (Mathieu et al. 2003) and meta-analysis of recreational values (Brander et al. 2007)	

Coastal habitats sustain a range of goods and services on which coastal communities depend [4].



- 1 Overview
- 2 Hazards Faced and Vulnerabilities of Coastal Communities
- 3 Our Findings**
- 4 Conclusions



Stakeholder Analysis

Stakeholders and their strategies

- Major stakeholders are craft owners, crew and fish vendors.
- Issues identified during microplanning sessions:
 - resource over-exploitation
 - dwindling markets
 - lack of infrastructure
 - environmental degradation.
- Livelihood strategies remain largely within the fishing sector:
 - joining ring seine operations
 - join mechanised boats as crew (men)
 - increasing the catchment for purchase of fish for vending (women).

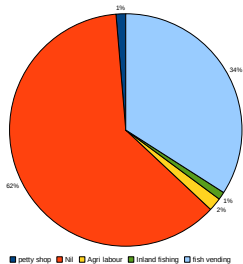
Resource Dependence

Artisanal fishing communities are heavily reliant on fishing alone

- Nearly 94% of working (non household work) women are primarily involved in fishing related activities, less than 1% pursue other work.
- 90% of working men are primarily involved in fishing, less than 3% pursue any other work.
- Neither women nor men pursue any “secondary” occupations.
- Backwater fishers rely on fishing and agricultural labour equally. However they compete with marine fishers during poor weather.

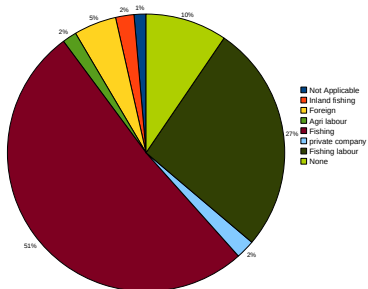
Primary occupation of women

Aggregated where number >1%



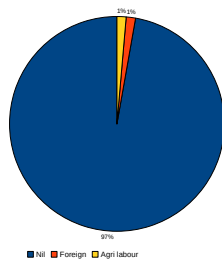
Primary occupation of men

Aggregated where occupation >1%

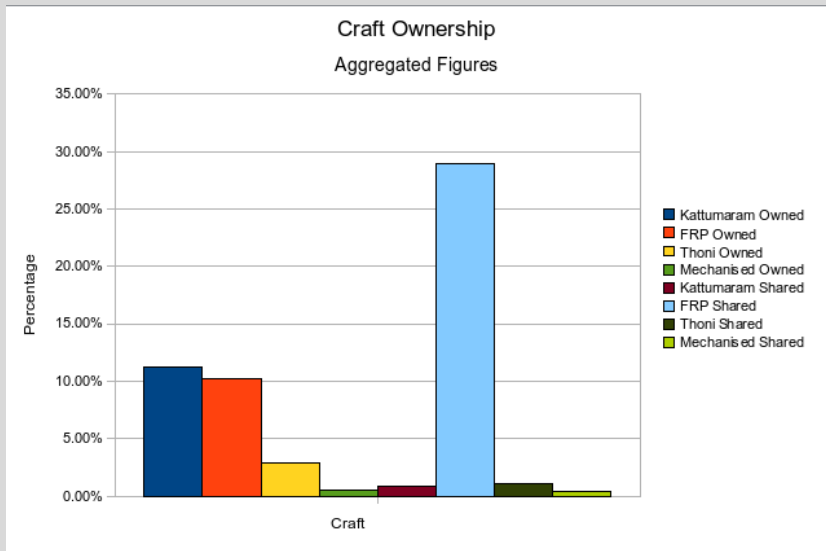


Secondary occupation of men

Aggregated where number > 1%



Over Investment



Over half of the households have exclusive or shared ownership of fishing craft. Yet, less than half the craft are operated on any given day.

Resource Depletion

There are and have been sufficient signs of over fishing. Are we headed towards a collapse?

- Many of the important species are being harvested at pre-adult stages.
- 22 species of fish are thought to have become rare or have disappeared.
- There is a clear downward shift in the trophic index - species lower in the food chain are increasingly dominant.
- Habitat destruction and pollution are serious issues not only in backwaters but also in industrialised parts of the coast.
- Coastal habitats as a whole are under severe pressure from modifications to upstream areas and flows.
 - Backwaters are both depleted and polluted due to reduced fresh water inflows as well as pollutants from industrial areas.
 - Sand bars regularly form during the dry season, preventing fishing craft from leaving jetties and harbours such as Mudusal Odai.
- There are compelling reasons to represent interests of fishing communities in proposed amendments to coastal management laws.

“Back to the wall” strategies.

- Illegal mesh sizes in virtually all craft.
- Trawler operations have shifted nearshore to tap the “only fertile ground” and compete directly with artisanal craft.
- Ring seining has become the most attractive investment.



Back to the wall strategies being pursued (left) a ring seine being cleaned, (right) near shore trawling.

Lack of institutional support

Government support to the sector is primarily in the form of subsidies on fuel and dole during the ban period. Yet:

- There is no formal credit system available - fisherfolk depend heavily on informal credit which is tied to marketing and elbows out traditional vendors in favour of food processing, inter state and international export.
- The insurance sector is virtually missing from this high risk job.
- There is no monitoring or enforcement of existing MFRA regulations.
- Processing, storage and transport remain firmly in the hands of private markets - cooperatives are ineffective in most areas.

- Govt. action has been limited to demarcation of high tide lines in some villages. Mostly without any formal communication or effort to inform coastal dwellers.
- Zonation under the new CRZ act are considered by many as un-just to fisherfolk. Infact a large protest resulted in the re-working of the original notification finally published in 2011 [5, 6, 7].
- Published estimates of shoreline change are not reliable. The original report listed the Pondicherry coastline as stable [8] - facts show otherwise.
- Post tsunami, many villages have been set-back from the coast, particularly in the Cauvery delta, however many have returned to their formal dwellings and remain vulnerable.
- On the positive side - early warning systems and evacuation systems appear to be in place and have been demonstrated to be effective in the recent cyclones in AP.



- 1 Overview
- 2 Hazards Faced and Vulnerabilities of Coastal Communities
- 3 Our Findings
- 4 **Conclusions**



Living With Hazards!

- Fishing communities continue to be exposed to coastal hazards - these have not been adequately estimated and existing projections have not been shared with coastal communities.
- Longer term issues of habitat degradation are probably more important but are difficult to tackle:
 - Environmental flows are still considered “waste of water flowing to the sea”.
 - Land use change in coastal areas is unabated as dunes and beaches are being cleared and mangroves converted to aquaculture.
 - Sustainable management of fisheries is a challenge that concerned departments are ill-equipped to handle.
- Co-management efforts led by the FAO have tried to address some of the constraints, however marine fisheries remains largely neglected.

Investment in research

- Climate change predictions and their impacts on coastal hazards are not being studied in sufficient details and available information is not being shared with the stakeholders. We need down-scaled models which:
 - Give probabilities of hazards in different time periods.
 - Likely effect of sea level rise.
 - Shoreline change estimates.
 - Likely impact of these events on productivity in the Bay of Bengal.
- There must be an effort to restore existing habitats. Research shows that even smaller patches of natural habitat play a role in disaster mitigation [9].
- The ecological research community in India needs to engage with the issues of environmental flows and measurement of ecosystem services if we are to build a case for their conservation.

Thank you for your attention



If there are any additional questions or issues you'd like to discuss, we would be happy to do so.

This work was supported by the FAO - UNTRS, DST (SEED division) and the Ruffords Foundation.

Bibliography



I. Scoones, E. Institute of Development Studies (Brighton, Sustainable rural livelihoods: a framework for analysis, Institute of Development Studies Brighton, 1998.



Anonymous, **Terminology - UNISDR** (2009).

URL <http://www.unisdr.org/we/inform/terminology>



Z. D. Tessler, C. J. Vörösmarty, M. Grossberg, I. Gladkova, H. Aizenman, J. P. M. Syvitski, E. Foufoula-Georgiou, **Profiling risk and sustainability in coastal deltas of the world**, *Science* 349 (6248) (2015) 638–643.
doi:10.1126/science.aab3574.

URL <http://www.sciencemag.org/content/349/6248/638>



E. B. Barbier, S. D. Hacker, C. Kennedy, E. W. Koch, A. C. Stier, B. R. Silliman, **The value of estuarine and coastal ecosystem services**, *Ecological Monographs* 81 (2) (2010) 169–193.

doi:10.1890/10-1510.1.

URL <http://www.esajournals.org/doi/abs/10.1890/10-1510.1>



M.S.Swaminathan, Report of the Committee to Review the Coastal Regulation Zone Notification 1991, Tech. rep. (Feb. 2005).



A. Sridhar, M. Menon, S. Rodriguez, S. Shenoy, Coastal Management Zone Notification '08 - the last nail in the coffin, Tech. rep., ATREE, Bangalore (2008).



Ministry of Environment and Forest, **Coastal Management Zone Notification, 2011**. (Jan. 2011).

URL http://www.ionemis.nic.in/pdf_documents/CRZ-Notification-2011.pdf



R. Ramesh, R. Purvaja, A. Senthil Vel, **National Assessment of Shoreline Change: Puducherry Coast**, Tech. Rep. NCSCM/MoEF Report 2011-01, National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment and Forests, Government of India (2011).

URL <http://www.ncscm.org/reports.php>



E. B. Barbier, E. W. Koch, B. R. Silliman, S. D. Hacker, E. Wolanski, J. Primavera, E. F. Granek, S. Polasky, S. Aswani, L. A. Cramer, D. M. Stoms, C. J. Kennedy, D. Bael, C. V. Kappel, G. M. E. Perillo, D. J. Reed, **Coastal Ecosystem-Based Management with Nonlinear Ecological Functions and Values**, *Science* 319 (5861) (2008) 321–323.

doi:10.1126/science.1150349.

URL <http://www.sciencemag.org/content/319/5861/321>