



## **Assessment of challenges faced by the coastal women due to the impact of climatic change in selected coastal districts of Tamil Nadu, India**

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### **ABSTRACT**

The present study investigated the challenges faced by women in coastal villages in selected districts of Tamil Nadu due to impact of climatic changes. One hundred coastal women beneficiaries from coastal districts of Tiruvallur, Kancheepuram, Cuddalore and Nagapattinam were selected for the study. Descriptive statistics and SWOT (strengths, weaknesses, opportunities and threats) analysis were used to examine the data. Results of the study revealed that gender, age and community of the respondents had influence over the access to different sets of resources and livelihood assets. Drudgery of women increased after migration of men to urban areas in search of job. It is understood that livelihood patterns of women have changed considerably. Strengths expressed were knowledge, leadership qualities, self confidence and group cohesiveness, while the weaknesses identified were lack of knowledge, lack of technical knowledge, male migration, social taboos and beliefs as well as poor health status. The opportunities were government institutional support as well as research organisation support. The threats identified were unusual rainfall, floods, cyclone and change in water quality. It is understood that women need access to training, credit and skills-development programmes to ensure their full participation in climate change initiatives. Participation of women in negotiations, policy actions and initiatives towards environmental change will help governments and coastal communities to maintain and build adaptive measures towards the effects of climate driven environmental changes in the coastal villages.

Keywords: Climatic effect, Fishers, Livelihood, Strategy, SWOT analysis

### **Introduction**

Climate change has been attracting growing attention for its immediate and potential impacts upon the environment and human populations. Salagrama (2012) opined that marine and coastal ecosystems are extremely vulnerable to climate change processes such as ocean warming and sea-level rise, which have a direct impact upon the lives and livelihoods of coastal fishing communities. In developing countries, impact of climate change has tremendous effects on life of the poor and can aggravate inequalities in health and access to adequate food, water and other resources.

Climate changes affect the livelihoods of coastal populations, but they are unaware of the adaptive measures to be taken towards the effects of environmental change. In particular, women in coastal villages face lot of challenges due to environmental changes. All climatic effects, mitigation measures and adaptation strategies should be analysed with respect to the gendered division of labour (WHO, 2009). According to Hansson (2007), the domestic workload of women can be strongly influenced by climate change and by adaptive measures. Cannon (2002) describes that women and men experience different kinds and degrees of vulnerabilities and cope with natural disasters differently. There are differences in risk perception between women

and men. Women on average are more prone to take future risks seriously and opt for measures to cope up with them (Fothergill, 1996; Anderson, 2000; IMM/ICM, 2003a; FAO, 2008; Leduc, 2008; WHO, 2009; Elinder Erixson, 2012). The aim of this study is to analyse the challenges faced by the coastal women towards the effects of environmental changes in selected coastal districts of Tamil Nadu.

This paper discusses on the following aspects: Socio-economic profile of the coastal women from selected districts of Tamil Nadu; Livelihoods adopted by the coastal women before and after Tsunami, Stress and drudgery faced by coastal women due to impact of environmental changes, Risks faced by coastal people due to environmental changes, Awareness and supportive measures among the coastal women as well as Strengths, weaknesses, opportunities and threats (SWOT) of coastal women due to impact of environmental changes.

### **Materials and methods**

One hundred coastal women beneficiaries belonging to all communities were selected from the coastal districts of Tiruvallur, Kancheepuram, Cuddalore and Nagapattinam in Tamil Nadu, with 25 women beneficiaries in each district. Data related with socio-economic profile, livelihoods adopted before and after tsunami, stress and drudgery details and risks

faced by them were collected from the respondents using pre-tested interview schedules. In addition to descriptive analysis, SWOT analysis as a management technique was carried out to examine the strengths (S), weaknesses (W), opportunities (O) and threats (T) of the women beneficiaries towards the impact of environmental changes. SWOT analysis was also used to study the coastal women's perception of inter-linked activities related to fishing, fish waste utilisation and setting up auxiliary enterprises (Shanthi *et al.*, 2010). Kruskal-Wallis test was used to test the significance of difference among the identified districts.

## Results and discussion

### *Socio-economic profile of the coastal women*

Socio-economic profile of the coastal women such as age, education, religion, monthly income and communities of the respondents is presented in Table 1. Majority of the respondents in Tiruvallur District (10 nos.) and Cuddalore District (11 nos.) were in the age group of 40 to 60 years, followed by the age group of 20 to 40 years in Kancheepuram District (11 nos.) and 60 years and above (10 nos.) in Nagapattinam District.

In Tiruvallur District, majority of the coastal women (15 nos.) were illiterate followed by primary school level education (12 nos.) in Kancheepuram and Cuddalore districts. Majority of the coastal women in Nagapattinam District (13 nos.) were having education up to secondary level. The secondary level education has facilitated the women to easily understand the techniques and take up training and demonstration programmes conducted by the Central and State Government departments and Non-Government Organisations (NGOs)

Most of the beneficiaries belonged to Hindu religion in Tiruvallur (15 nos.), Kancheepuram (16 nos.), Cuddalore (13 nos.) and Nagapattinam (16 nos.) districts followed by other religions. During the survey, it was understood that lot of beneficiaries were converting to other religions.

The monthly income of the respondents in Tiruvallur District (12 nos.) ranged from ₹1001 to 4000/-. This was followed by monthly income of ₹4001 to 10,000/- in Kancheepuram (12 nos.), Cuddalore (15 nos.) and Nagapattinam (13 nos.) districts. It was inferred that the beneficiaries with low income level at Tiruvallur and Cuddalore districts have come forward to adopt alternative

Table 1. Socio-economic status of coastal women in the districts selected for the study in Tamil Nadu (n=100)

Factors	Tiruvallur (n=25)	Kancheepuram (n=25)	Cuddalore (n=25)	Nagapattinam (n=25)
<b>Age</b>				
20 - 40 yrs	7	11	9	9
40 - 60 yrs	10	6	11	6
>60 yrs	8	8	5	10
<b>Education</b>				
Illiterate	12	6	6	5
Primary level	5	12	12	5
Secondary level	5	4	6	13
Higher secondary level	1	2	0	1
Graduates	2	1	1	1
<b>Religion</b>				
Hindu	15	16	13	16
Muslim	5	3	0	3
Christian	5	6	12	6
<b>Monthly income</b>				
₹1001 - 4000	12	7	8	6
₹4001 - 10,000	8	12	15	13
₹10,001 - 15,000	5	5	2	4
₹15,001 above	0	1	0	2
<b>Community</b>				
Schedule tribe (ST)	12	8	11	10
Schedule caste (SC)	11	15	7	13
Most backward community (MBC)	2	2	5	2

livelihood options to improve their standard of living. Majority of the respondents in Tiruvallur (12 nos.) and Cuddalore (11 nos.) districts belonged to scheduled tribe community, whereas, majority of the respondents in Kancheepuram (11 nos.) and Nagapattinam (13 nos.) districts belonged to scheduled caste communities.

#### *Livelihood of the coastal women before tsunami*

Different types of livelihood of the coastal women before tsunami is depicted in Table 2. Among various forms of livelihoods, maximum number of women participated in fresh fish sale, dry fish sale and wild shrimp collection in all the coastal districts. This was followed by other livelihood options like fish vending, clam collection, jelly fish processing, crab fattening (in concrete tanks) and as labourers in shrimp farms and agricultural fields.

#### *Livelihood of coastal women after tsunami*

Among the different types of livelihoods of the coastal women after tsunami (natural disaster), maximum number of coastal women participated in 100 days rural employment under NREGA (National Rural Employment Guarantee Act) in all the selected coastal districts (Table 3). This was followed by other means of livelihood like, mud crab fattening (in pens as well as in tide fed ponds), seabass nursery rearing in hapas (10 nos. each) and fish feed development

(5 nos.) in Tiruvallur, Kancheepuram and Cuddalore districts. New livelihood opportunities like NREGA, crab fattening (in pens and tide-fed ponds), seabass nursery rearing in hapas and fish feed development have been taken up by the coastal women after tsunami. Women Self Help Groups (WSHGs) in which the respondents were members, have also facilitated adoption of these technologies.

#### *Stress and drudgery faced by coastal women due to impact of environmental changes*

Different kinds of stress and drudgery faced by coastal women due to the environmental changes are given in Table 4. Among these, adoption of diversified livelihoods, interrupted power supply, irregular employment and difficulty in drying fish due to lack of space, were given the maximum scores in all the coastal districts. In Nagapattinam District alone, the factor, death of family members due to natural calamities scored the maximum. The respondents' also revealed that maximum death was due to tsunami in Tamil Nadu.

Kruskal-Wallis test was carried out for finding out significant difference if any between different kinds of stress and drudgery factors faced by coastal women due to the environmental changes listed in Table 4. It was found that there was significant difference between the stress and drudgery factors listed in the table (chi-square 64.90

Table 2. Livelihood of coastal women before tsunami (n=100)

Types of livelihoods	Tiruvallur (n=25)	Kancheepuram (n=25)	Cuddalore (n=25)	Nagapattinam (n=25)
Fish sales	25	25	25	25
Fish vending	2	5	3	3
Clam collection	3	5	5	4
Jelly fish processing	5	-	-	-
Dry fish sales	15	12	15	15
Mud crab fattening (in concrete tanks)	-	-	5	-
Wild shrimp collection	10	5	20	10
Labourers in shrimp farms	5	-	-	2
Agriculture labour	4	5	0	0

Multiple scoring

Table 3. Livelihood of the coastal women after tsunami (n=100)

Types of livelihoods	Tiruvallur (n=25)	Kancheepuram (n=25)	Cuddalore (n=25)	Nagapattinam (n=25)
NREGA	25	25	25	25
Mud crab fattening (in pens)	10	20	20	-
Mud crab fattening (in tide fed ponds)	10	-	-	-
Seabass nursery rearing in hapas	10	-	-	-
Fish feed development	5	-	-	-
Mud crab fattening (in cages)	5	5	-	-
Labour in private companies	5	7	3	3
Petty shops	2	3	2	3
Fast food outlets	5	5	6	5

Multiple scoring

Table 4. Stress and drudgery faced by coastal women due to impact of environmental changes (n=100)

Factors	Tiruvallur (n=25) no. and %	Kancheepuram (n=25) no. and %	Cuddalore (n=25) no. and %	Nagapattinam (n=25) no. and %
Fluctuation of market rates	20 (5)	18 (4.5)	15 (3.75)	15 (3.75)
Adoption of diversified livelihoods	25 (6.25)	25 (6.25)	25 (6.25)	25 (6.25)
Migration of men	10 (2.5)	12 (3)	14 (3.5)	13 (3.25)
Long distance of work spot	10 (2.5)	12 (3)	10 (2.5)	11 (2.75)
Interrupted power supply	22 (5.5)	21 (5.25)	22 (5.5)	20 (5)
Participation of women in non-traditional occupation	14 (3.5)	18 (4.5)	18 (4.5)	18 (4.5)
Irregular employment	20 (5)	19 (4.75)	18 (4.5)	20 (5)
Low economic status	18 (4.5)	17 (4.25)	19 (4.75)	14 (3.5)
Need to travel long distance to fetch drinking water	18 (4.75)	12 (3)	11 (2.75)	13 (3.25)
Lack of transport facilities	8 (2)	5 (1.25)	7 (1.75)	8 (2)
Attending to additional family chores	8 (2)	4 (1)	5 (1.25)	4 (1)
Increase of work load	10 (2.5)	12 (3)	14 (3.5)	12 (3)
Care of other family members	11 (2.75)	12 (3)	9 (2.25)	12 (3)
Women headed families	9 (2.25)	8 (2)	7 (1.75)	10 (2.5)
Mortgaging of assets	8 (2)	7 (1.75)	10 (2.5)	15 (3.75)
Poor health status	4 (1)	5 (1.25)	6 (1.5)	10 (2.5)
Death of family members in natural calamities	1 (0.25)	-	2 (0.50)	18 (4.5)
Uncertain supply of products	6 (1.5)	5 (1.25)	5 (1.25)	6 (1.5)
Difficulty in drying fish due to lack of space and unusual rains	20 (5)	19 (4.75)	18 (4.5)	20 (5)

\*Multiple scoring

\*\* Figures in the parenthesis represent percentage

$p < .0001$ ). Among the stress and drudgery factors such as adoption of diversified livelihood, interrupted power supply, irregular employment, difficulty in drying fish due to lack of space, unusual rains and fluctuation of market rates were marked as higher priorities followed by the factors such as uncertain supply of products and attending to additional family chores as the low priorities.

#### *Risks faced by coastal people in the selected coastal districts due to environmental changes*

Risks faced by coastal people in the selected coastal districts due to environmental changes are presented in Table 5. Among the factors expressed, change in regular monsoon, non-availability of seasonal fishes, high rate of fish, land pollution, increasing fishing fleets and fish catch, unusual rains, high salinity in ground water and water pollution were given maximum scores by the coastal women of Tiruvallur, Kancheepuram, Cuddalore and Nagapattinam districts. Certain incidences like seawater invading the dwelling areas, sea erosion and sea level rise were reported only in Kancheepuram District. Factors like ban of fishing in Pulicat Lake during rocket launching at Sriharikota and evacuation of village due to rocket launching and use of very small mesh size fishing nets by trawlers were reported only by the respondents of Tiruvallur District. The data have been analysed using Kruskal-Wallis one way ANOVA to

test difference in the risks among the districts. It was found that there was no significant difference between the districts related to the risk factors (Kruskal-Wallis chi-squared = 1.6628,  $p$ -value = 0.6452).

#### *Strengths, weaknesses, opportunities and threats (SWOT) of coastal women due to impact of environmental changes*

The results of SWOT analyses are presented in Table 6.

**Strengths:** Among the factors expressed, group cohesiveness, community support and good group savings were given the maximum score by the respondents of Tiruvallur, Kancheepuram and Cuddalore districts. The results also revealed that the maximum score in these districts are due to the adoption of diversified livelihoods through brackishwater aquaculture technologies by the coastal WSHGs. The adoption of technologies by WSHGs has enhanced the strengths of the beneficiaries compared to the respondents of Kancheepuram and Nagapattinam districts.

**Weakness:** Among the factors expressed, social taboos and beliefs were given the maximum score by the beneficiaries of Tiruvallur and Cuddalore districts. This is due to fact that maximum respondents were from tribal community. This was followed by factors such as lack of technical knowledge which scored maximum among the respondents of Kancheepuram and Nagapattinam districts.

Table 5. Risks faced by coastal people in the selected coastal districts due to environmental changes (n=100)

Factors	Tiruvallur (n=25)	Kancheepuram (n=25)	Cuddalore (n=25)	Nagapattinam (n=25)
Change in regular monsoon	25	25	25	25
Seawater invading the dwelling areas	12	25	15	18
Sea erosion	12	24	10	20
Non-availability of seasonal fishes	20	21	21	21
Fishing of juvenile fishes by small fishers due to non-availability of fishing	10	12	14	10
Reduced fish catch and subsequent high price of fish	20	21	22	25
Destruction of fishing inputs and infrastructures due to sea erosion	8	20	5	18
Land pollution	24	23	25	25
Increasing fishing fleets and fish catch	25	25	25	25
Unusual rains	20	18	18	22
Shrinking of space due to erosion	10	12	13	15
Lack of space due to real estate values	8	6	6	8
Change in wind patterns	15	15	12	10
Shifting of households	10	8	5	18
Sea level rise	10	22	11	18
High salinity in ground water	21	20	21	23
Fish mortality due to mixing of effluent waste from atomic power plant	18	24	12	10
Pollution of canal water due to effluents of factories and Effluent Treatment Ssystems (ETS)	19	10	15	12
Shrinking of ponds, lakes and rivers	8	5	2	3
Ban of fishing in Pulicat Lake during rocket launching by ISRO	20	-	-	-
Evacuation of village due to rocket launching threats	23	-	-	-
Water pollution	20	21	22	22
Use of very small mesh size in fishing nets by trawlers	25	10	12	11

Multiple scoring

*Opportunities:* Among the factors expressed, Government welfare measures, training and demonstration given by research organisations, NGO support and availing bank loans were given the maximum score by the respondents of Tiruvallur, Kancheepuram and Cuddalore districts. This is due to fact that these respondents have adopted diversified livelihood options through brackishwater aquaculture technologies. Adoption of technologies by WSHGs has given them the above opportunities compared to the respondents of Nagapattinam District.

*Threats:* Among the factors expressed, non-availability of seasonal fish, floods and cyclone as well as irregular employment were given the maximum score by the respondents of Tiruvallur, Kancheepuram, Cuddalore and Nagapattinam districts.

#### *Awareness and supportive measures*

In some districts, it was understood that State Departments, Central Government Research Institutions, NGO's and financial institutions play a major role in creating

awareness and supporting the beneficiaries through transfer of technologies to the coastal women as alternate livelihood options. Various welfare schemes have also supported coastal women to adapt to the environmental changes. The ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA) transferred its brackishwater aquaculture technologies viz., crab fattening (in cages, pens and in tide-fed-ponds), Asian seabass nursery rearing in hapas, farm-made fish feed development, ornamental fish farming, polyculture of seabass and mud crab to the coastal women and WSHGs of coastal villages in Tamil Nadu (who were affected by tsunami) as alternative livelihoods. The beneficiaries adopted these technologies in lagoons, estuaries and creeks available in the coastal areas in their villages. The revenue generation from crab fattening (in pens) was: ₹22,000-30,000 per cycle; crab fattening (in ponds) ₹1,00,000-2,00,000 per cycle; Asian seabass nursery rearing ₹10,000-20,000 per cycle; polyculture of mud crab and Asian seabass ₹1,33,908/- per cycle; The farm-made fish feed development ₹10,000-15,000 per cycle and ornamental fish farming ₹8000-12000 per

Table 6. Strengths, weaknesses, opportunities and threats of coastal women due to impact of environmental changes (n =100)

Factors	Tiruvallur (n=25)	Kancheepuram (n=25)	Cuddalore (n=25)	Nagapattinam (n=25)
<b>Strengths</b>				
Group cohesiveness	22	18	20	12
Self confidence	18	12	20	11
Leadership qualities	18	10	18	15
Community support	20	12	20	15
Technical knowledge	18	12	18	15
Family support	10	12	12	9
Good group savings	20	20	20	6
<b>Weaknesses</b>				
Lack of knowledge	12	15	12	14
Lack of technical knowledge	8	20	5	20
Social taboos and beliefs	15	12	16	15
Male discrimination	10	11	15	10
Low economic status	7	10	13	17
Group disagreements	8	11	13	12
Migration	5	9	10	16
<b>Opportunities</b>				
Government welfare measures	22	23	20	25
Training and demonstration given by research organisations	25	20	25	24
NGO support	23	20	24	24
Bank loans	20	16	22	9
Availability of good saving within the SHG members	12	18	10	10
Availability of credit facilities	9	16	10	6
Being a member of WSHG	17	16	16	15
Free inputs given by Govt. institutions for technology adoption	13	12	15	15
<b>Threats</b>				
Non-availability of seasonal fish	25	25	25	25
Floods and cyclone	22	20	20	20
Poor health status	10	12	10	10
Irregular employment	20	21	20	21
Water pollution	12	11	13	10
Unusual rains	10	11	10	9
Seawater invading the dwelling areas	12	13	13	11
Change in monsoons	11	11	12	13
Need to travel long distance to fetch drinking water	10	12	16	22
Lack of transport facilities	10	11	15	19
Interrupted power supply	9	16	10	6
Uncertain supply of products	13	12	15	15
Difficulty in drying fish due to lack of space and unusual rains	12	12	9	15
Fluctuation of market rates	10	12	12	9

## Multiple scoring

month. Improved nutritional security was also noticed due to average additional home consumption of 1-2 kg seafood in beneficiary households per month. The actual increase in income noticed from the above interventions was 43-80% of their usual income, prior to technology interventions. These brackishwater aquaculture technologies adopted by

fishers were observed to be a viable means of alternative/ supplementary livelihood support, socio-economic improvement and nutritional security. The participation of women in small scale aquafarming significantly contributed to the family income which in turn helped them to fulfill the minimum requirements for their food, health and education.



Women in the coastal communities were found to be undertaking a range of adaptive and mitigation measures, not all of which are successful but some of which have helped to improve their overall condition as well as the climate change processes. The coastal women have been adopting alternate livelihood practices from their traditional occupation due to the environmental changes. There is a need to create awareness among the beneficiaries on climate change effects. There is also need to raise awareness among the nodal agencies dealing with climate change, as well as among fisheries departments and research institutions, about the human and socio-economic dimensions of climate change. Women need to be equally represented on all levels in the public and private bodies where decisions on climate adaptations are made. Women's involvement in the adoption of diversified technologies ensures that they are user-friendly, effective and sustainable. It was also understood that women need access to technical training, credit and skills-development programmes to ensure their full participation in climate change initiatives. The implication of this study is that the existing strategies, mitigation techniques and knowledge should be integrated with new techniques to help the coastal women to sustain their livelihoods during the impact of environmental changes in the present and future scenarios.

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