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The Relevance of Indigenous Knowledge System in Mitigating Vulnerability to Disaster - A Case of Fishermen Community of Kerala State

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Abstract
This paper examines the contribution of indigenous knowledge of fishermen community towards disaster risk reduction activities in Kerala State. Usually the indigenous knowledge adopted by local community is viewed as unscientific and outdated. In this study, the indigenous knowledge of fisherfolk that enable them to effectively respond and tackle the adverse situation is highlighted. Using their vernacular expertise at sea, the fisherfolk had rescued about 65,000 marooned people during floods that affected Kerala State in August 2018. Just with the ease with which they catch fish, they were able to rescue the victims of flood. Alappad Panchayat of Karunagapally taluk of Kollam District, which was severely affected by Tsunami 2004 and even today susceptible to sea erosion and sand mining is chosen for Case study. About eleven Karayogams in Alappad panchayat had actively participated in the search and rescue operations that followed 2018 Kerala floods at Thiruvalla Municipality of Pathanamthitta District and at Kuttanad taluk and Chengannur Municipality of Alappuzha District.
Reconnaissance survey, Key informant interviews and researcher observation were used to collect data for the study. One of the major finding was that the local fishermen community understands even minute changes in weather pattern as well as behavior of certain animal species that get alarmed and hence they respond quickly thereby reducing the vulnerability to hazard. This paper concludes with the suggestion to include indigenous knowledge system along with the disaster risk reduction strategies of modern times. Then it would help policy makers and practitioners to plan effectively for the reduction of vulnerability of fisher community to coastal hazards.

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I. INTRODUCTION

Natural hazards are often tackled by the indigenous community using their local wisdom which is also known as indigenous knowledge. Fishermen community is found to be more vulnerable to hazards even at the global level. In their continuous struggle to recover from hazards like tsunami, coastal flooding, sea erosion, cyclones etc, they relied on their indigenous knowledge and practical experience. According to UNISDR (2015), the Sendai Framework for Disaster Risk Reduction 2015-2030, adopted by the 3rd UN World Conference, necessitate to employ a people centric approach by use of indigenous knowledge and practices to complement scientific knowledge in Disaster Risk Assessment.

Recent studies reveal that Disaster Risk Reduction is possible by proper understanding of indigenous knowledge. That would depend upon the initiative of elder generation to promote their indigenous knowledge and the attitude of younger generation to accept the same. If the indigenous knowledge is included in existing policies and integrated with modern scientific knowledge then it would lead to

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empowerment of affected community and thereby reduce vulnerability.

The aim of the study is to explore the role of indigenous knowledge in reduction of vulnerability of fishermen community to coastal hazards. The main objectives are to identify the variables of indigenous knowledge through literature review and to find out the current role of Indigenous knowledge in Disaster Risk Reduction of selected study area. The study concludes with suitable recommendations for the promotion of indigenous knowledge inorder to empower fishermen community for vulnerability reduction.

Two research methods that are employed are Literature Review and Empirical study. Semi structured interview was used to collect qualitative data. Descriptive as well as Exploratory research is used for understanding the role of indigenous knowledge and its use in Disaster Risk Reduction.

In Kerala state, in addition to the Coastal hazards; marginalization is another phenomenon that is increasing the vulnerability of fishermen community. They are under serious threat of eviction due to development projects along coastal stretch. Many of the human intervention in the coastal area had adversely affected the life and means of livelihood of fisherfolk.

The study area selected is Alappad Panchayat of Karunagapally taluk of Kollam District (Ref.Fig.1).

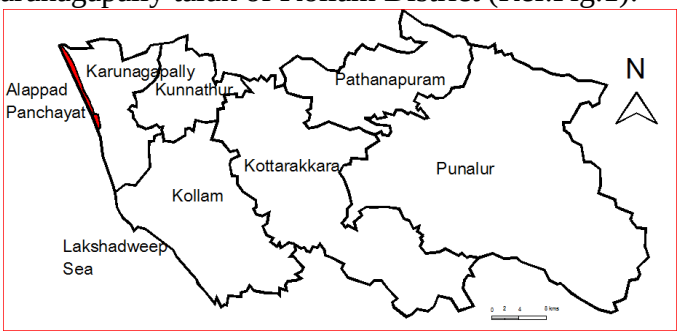

Fig.1.Location map of Alappad panchayat in Taluk map of Kollam District (Source: Kollam District Disaster Management Plan)

The fishermen community in Alappad panchayat is currently facing issues related to mining, housing and rehabilitation issue, infrastructure issue, socio-economic issue and environmental issue.

II. Secondary Study

A. Indigenous Knowledge (IK) and Indigenous Knowledge Systems

Indigenous knowledge is described as an all-inclusive knowledge that covers technologies and practices that have been and still are being used by indigenous and local people for their existence, survival and adaptation in a variety of environment. [10] People living in a particular locality or region determine their own indigenous knowledge that is unique and conducive to their continued existence and survival in their particular community.

According to De Guchteneire et al.(2004), the main characteristics of IK are the following: IK is generated within communities, it is oral in nature, it is not systematically documented, it is location and culture specific, it forms basis for decision-making on survival strategies, it concerns critical issues of human and animal life, it is dynamic and based on innovation, adaptation and experimentation.

The main limitation for Indigenous Knowledge is that, not all indigenous ways of living had proved to be sustainable.

The challenges of Indigenous Knowledge are as follows:

(i) Marginalization- exclusion caused by perception that IK is primitive and has no value.

(ii) Informal mode of knowledge transfer- since it is handed down orally from generation to generation, it is not captured and stored in systematic way.

(iii)Disappearance- IK faces threat of extinction due to failure to record it or problem associated with preservation and protection of IK

(iv)Management of IK –includes methods to identify and access it, media or format to preserve

(v) Other challenges-Human and financial constraints, institutional capacity, political will.

Indigenous Knowledge Systems are collections of societal systems represented by totality of products, skills, technologies, processes and systems developed and adapted by cohesive indigenous societies and produced, applied, practiced and preserved over generations to ensure their long-term existence, sanctify progress within their natural, social and economic environment. (Odora Hoppers,2001)

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B. Vulnerability of Indigenous Community

Vulnerability describes susceptibility of a group such as indigenous community to impact of hazards. (UNISDR,2004).

Factors imparting vulnerability are:

Social factors, Cultural factors, Environmental factors, economic factors, political factors, physical circumstances, state of physical and mental health, other factors like age, gender, linguistic ability, ethnicity, race etc.

Mc Entire (2005) had suggested five measures to reduce and manage vulnerability:

1) Establish a Knowledge base by regular assessment of liabilities and capabilities in both physical and social environment.
2) Educating policy makers and citizens on disasters and strengthening disaster prevention and preparedness.
3) Harnessing technology for protection of environment and reducing poverty.
4) Vulnerability management by promoting individual and community empowerment and responsibility
5) Integration of activities by proper coordination and collaboration between the public, private and non-profit partnerships to reduce liabilities and raise capabilities.

C. Use of Indigenous Knowledge to reduce DRR

Indigenous Knowledge can be used in different sectors like Housing, Health, food security, education, and disaster risk reduction. Indigenous Knowledge is part of health care system. About 80 % of world population uses vernacular health care services (Eyong, 2007). IK is used in water conservation like taboos of not washing in and around fresh water streams. IK is also used in landuse management, protection of flora and fauna, agriculture, fishing, biodiversity, mountain ecosystem and forests.

Indigenous knowledge of storm surges and wind pattern helps people to design their disaster management plan in advance- by constructing shelters, wind-break structures, homestead fence etc. appropriately. Migratory pattern of birds, change in bird's cries during mating period etc. indicates seasonal changes. Height of bird's nest near river predicts flood.

III. BACKGROUND STUDY

An overview of disasters that affected fisherfolk in Kerala State clearly indicates that an increase in vulnerability happened after the Tsunami that had occurred in 26th December 2004. It had caused substantial loss of life and property of 219 coastal villages that were housed in three districts of Kerala State- Kollam, Alappuzha and Ernakulam Districts. About 2.4 lakh people were rehabilitated in 269 relief camps and the death toll was 238.

Several Fishermen Rehabilitation projects were initiated by Government under various schemes. Tsunami Rehabilitation project was carried out by Government of Kerala in association with voluntary agencies and Kerala State Housing Board. Mainly there were three types of projects based on the funding agency and funding pattern: Tsunami Emergency Assistance Project (TEAP) funded by Asian Development Bank, Tsunami Rehabilitation Programme (TRP) General package funded by Central Government and Tsunami Rehabilitation Programme (TRP) Special Package funded by Central Government in which assistance was given under Rajiv Gandhi Rehabilitation Project (RGRP). The main initiatives under these schemes were: Restoration and recovery of livelihood, Re-establishment of transportation network like roads, bridges etc., Restoration of local infrastructure like water supply, sanitation and Capacity Building and Awareness generation programme. [9]

After the Ockhi cyclone that mainly affected Ernakulam District in 29th November 2017, rehabilitation of fishermen community was done mainly by the Fisheries department and voluntary agencies.

For the floods that affected Kerala State in August 2018, rehabilitation was done under Rebuild Kerala Initiative through Kerala State Cooperative Department. Now the houses are being constructed through Pradhan Mantri Awas Yojana (PMAY) under Life Mission.

In addition to that, as part of Punargeham project initiated by Government of Kerala in 6th March 2020, Rs.2450 crores is allotted to Fisheries department to rehabilitate 18,685 fisher households who are residing within 50m from the coastline inorder to strictly adhere to the revised CRZ notification 2019.

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IV. PRIMARY STUDY

A. *Criteria for selection of study area*

As the density increases, vulnerability to hazard also would increase. The Table-1 shows that coastal stretch along Kollam district in Kerala is densely populated. This clearly indicates that Kollam district is more vulnerable to coastal hazards like tsunami, coastal flooding, cyclone, sea erosion etc.

Table 1. District wise Coastal length, population and density of Marine fisherfolk

District	Coastal length (km)	No: of Marine fishing villages	Marine fisher folk population (in thousands)	Fisherfolk population per km length
1)Thiruvananthapuram	78	42	168.701	2162.8
2)Kollam	37	27	93.022	2514
3)Alappuzha	82	30	128.497	1567
4)Ernakulam	46	21	72.526	1576.7
5)Thrissur	54	18	59.971	1110.5
6)Malappuram	70	23	89.869	1283,8
7)Kozhikode	71	34	98.540	1387.9
8)Kannur	82	11	37.840	461.5
9)Kasargod	70	16	43.358	619.4
Total	590	222	788.324	1336.14

Source:Kerala Fishermen Welfare Board, Directorate of Economics and statistics, Matsyafed Information Guide,2018

Along the coastal belt of Kollam district 176 people had lost their life and about 1600 were injured.84,773 people were evacuated and accommodated in 142 relief camps. About 6280 houses were destroyed and 11,175 houses were damaged. Alappad Panchayat of Kollam District was the worst hit panchayat by Tsunami in 26th December 2004 with a death toll of 143 out of 238 in Kerala state.

B. *Criteria for Sampling*

Fishermen community at Alappad grama panchayat is well known for the indigenous knowledge that they possess. There are 5000 households residing in 17km stretch of Alappad panchayat.

Out of the 16 wards in Alappad panchayat, ward 4 had been identified for study as it was the most affected area by Tsunami 2004.In addition to susceptibility to natural hazards, the fishermen are under threat of eviction due to mining activities and desertification. About 400 houses were destroyed in Azheekal (ward 4).

A reconnaissance survey of twenty households was conducted. Elderly population is more aware of Indigenous Knowledge. Purposive sampling technique and Snow ball sampling technique were adopted.

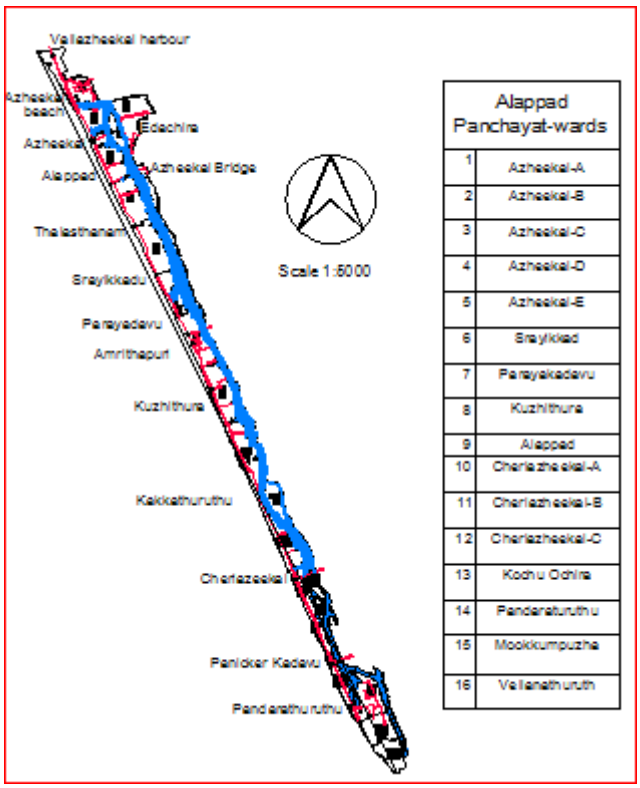

Fig.2.Ward map of Alappad Panchayat, 2020
Source:Author generated from Cadastral Map,2020 & Toposheet, KSLUB

V. EMPIRICAL FINDINGS

Alappad panchayat has been selected as study area as it is vulnerable to both natural hazards as well as manmade hazards. Alappad is surrounded by water bodies on all side. Kayamkulam Kayal on the northern side, Lakshadweep sea on the western side, Vattakayal on southern side and T.S.Canal on eastern side. The neighboring panchayats of Alappad are Arattupuzha panchayat of Alappuzha district in the north, Clappana, Kulashekharapuram and Karunagapally in the east Panmana and Chavara in the south.

A. *Vulnerability of Alappad Panchayat*

1) ***Demography*** - When we compare the population density of Alappad panchayat as per the census report of 2001 and 2011, we see a sharp decline, from 3366p/sq.km to 2967 p/sq.km.[2] But from the reconnaissance survey it was found that many of the

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relocated households had returned back to their original habitation to pursue their means of livelihood that is predominantly fishing.

Average Household size of sample population is 4, which comprised of 48% male and 52% female population. With respect to age group 24% belong to age group (61-90), 29% belong to age group (41-60), 25% to age group (21-40), 15% to age group (11-20) and 7% to age group (1-10).Literacy rate had increased and number of school drop outs has been reduced in recent years. But the younger generations are not interested in fishing and they prefer white collar jobs. The sample population selected belongs to Araya community of Hindu religion.

2) ***Social Aspect*** – According to census 2011, there are 361 people in SC category and 18 in ST category. Marginalization is an important phenomenon that is affecting fishermen community. One of the reasons for returning back to their original habitation was that the society is marginalizing the fishermen community by calling them names like *tsunami colony karan* and even mistreating their children as *tsunami kuttikal*. Housing rehabilitation schemes had not considered livelihood recovery. Eventhough 850 families were relocated in neighbouring panchayats in the main land, about 500 people had returned back. Amrita houses constructed by Amritanandamayi Matt are mainly found in ward 4.

Fig.3.Amrita house at Azheekal (Source: Reconnaissance survey,2020)

3) ***Economic aspect*** –In the sample population chosen, 35% are unemployed, 32% are students, 17% are fishermen, 7% are retired fishermen and 9% have government jobs like clerks, KSRTC bus conductor ,KSFE ,polytechnic college etc. This shows that percentage of dependent group in more (74%) as compared to the working group (26%).Also 40% of households belong to BPL category.

30% of female population is involved in Kudumbashree activities. 57% of ladies spent their life indoors as housewives. Only 13% of ladies are employed. There were three women headed households.

Azheekal fishing harbor contributes a large share for their food system. For essential goods and services Alappad depends on neighbouring towns of Ochira, Karunagapally, and Kayamkulam.

Amritanandamayi Matt established at Parayakadavu ward in 1980s promotes health tourism. In addition to that some of the temples had become spiritual tourist destinations.

4) ***Environmental aspect*** – Initially there was mud bank formation known as '*Chakara*' at Alappad panchayat which enriched fish farming (Gopinathan, 1974).But now due to the laying of *Pulimuttu* no such formation occur and it had adversely affected the fish stock. Unscientific construction of sea wall and groins, which were meant for shoreline protection, posed negative impact. Major crop is coconut plantation. With regard to analysis of existing and previous landuse plan it was found that 11.97 hectare land area was eroded by coastal erosion, mining and dredging activities.

There is drastic change in landuse pattern. Built up area along coastal stretch is found to be increasing. The present landuse pattern has 12.06% Built up area, 14.23% coconut plantation, 27.71% Mixed crop, 28.04% water body, 10.11% sandy area, 1.67% water logged area, 0.71% mangrove forest, 4.36% fallow land and 1.11% marshy area. Continuous beach wash had stopped the process of beach formation. This had increased the vulnerability to sea erosion and coastal hazards.

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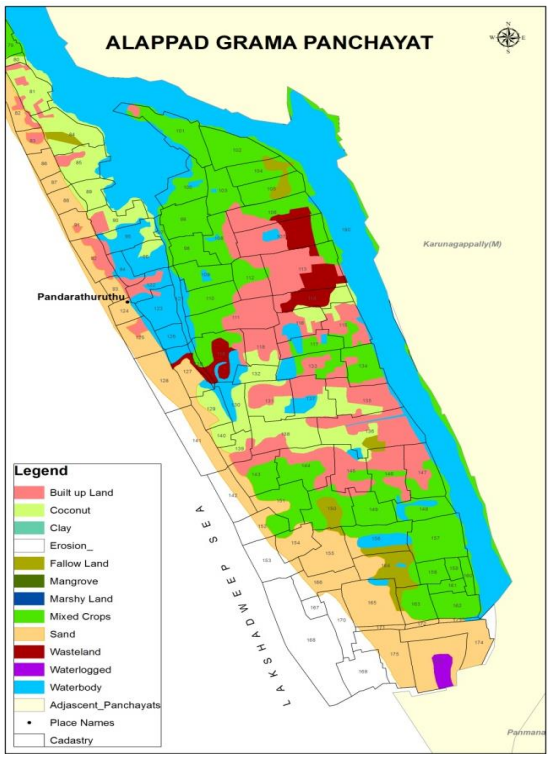

Fig.4.Sea erosion at the southern tip of Alappad Panchayat

(source: Author generated by overlaying cadastral map with landuse map, 2020)

5) ***Infrastructure aspect***- Alappad is facing acute water shortage, even though it is surrounded by water bodies. After tsunami 2004, as part of Ochira Water Supply scheme, water is pumped from the Pampa River and treated at Ochira and via Karunagapally it is distributed to Alappad. Now only intermittent supply is got and that too, once in a week.

Accessibility to dwelling units is yet another issue. There is a well developed road (3 -5m width) leading to Valiyazheekal Fishing harbor constructed under the Central Government- PMGSY scheme. But the pedestrian pathway had not yet been constructed. There are three bridges connecting Alappad with main land – Panikkarkadavu bridge, Cheiyazhikkal bridge and a pedestrian bridge at Parayakkadavu. In addition to that, a fourth bridge is being constructed at Valiyazheekal which is connecting Alappuzha district as part of Sagarmala project.

B. Indigenous Knowledge Systems at Alappad

Inorder to find out what can be done to reduce the vulnerability of fishermen community using indigenous knowledge system; key informant interviews were conducted especially with the aged group of sample population surveyed. They had given a detailed description about the historical background of Alappad, beliefs and customs that had then existed and the indigenous fishing techniques and accurate prediction based on weather conditions. All these were possible due to the indigenous knowledge and practical experience of indigenous fisher folk. The younger generation fishermen are not following these practices thinking that they are outdated. That is of real concern to the retired fishermen.

1) Views on Disaster

According to the belief of indigenous fishermen community the land area of Alappad was formed as a result of land reclamation and leveling of Sahyadri hills which were also called *Kadaladikodan mala.* Alappad was famous for its sand dunes. Before IREL(India Rare Earths Ltd.) started its mining activities in1965, the land area was more. Even though fishermen relied on vernacular methods of fishing, there was abundant supply of fish. After the mining activities started at Vellanathuruth ward, beach shrinkage occurred (Ref.Fig.4). This affected supply of fish stock. Then trawling activities took place. Usage of engine driven boats consumes more petroleum products. So the profit obtained by sale of fish is given to pumps. Thus it is found that the fishermen are facing financial crisis. Moreover, it is not according to the time predicted based on indigenous knowledge, that the fishing activities are taking place. This results in over exploitation of marine resources ultimately leading to its shortage.

Fishermen community had joined hands for save Alappad Campaign, as their land is getting depleted and they are under threat of eviction. They argue that if their land which is acting as a barrier to prevent salt water intrusion into other areas of Kerala state is depleted then Kuttanad taluk and Onattukara region in Alappuzha panchayat which are below m.s.l. will be affected. This would in turn affect paddy cultivation of that area, which would ultimately affect even food security of Kerala state.

Fishermen fears eviction threats due to human intervention. Coastal Development projects such as Sagarmala Project and Coastal Highway Project are not addressing the issues of the poor marginalized fishermen community

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2) Views on Indigenous Knowledge of Fisherfolk

Indigenous fishermen were enthusiastic in sharing the past glory of Alappad panchayat. In olden times, the inhabitants of Alappad were nature worshippers. They used to have sun Pongola and moon Pongola. It was directly related to their means of livelihood, as they had relied on the solar path and lunar path to engage in fishing activities.

They used to light lamp under every banyan tree. Later temples were constructed near such banyan trees. Their religious belief had ensured better health and hygiene. They used to take bath in fresh water lake in early morning and then walk to the temple. Now there are about 24 temples at Alappad and they mainly go there for festivals.

Due to the abundant supply of paddy, in early days there were social customs like conducting marriages on top of rice heaps. The feudal landlord would arrive on elephant back and get married on top of the rice heap. This symbolizes prosperity in married life. Now as the paddy fields are leveled, Alappad has lost its prosperity.

All these incidents are heard by younger generation as a grandmother's tale and no suitable measures are taken for the conservation of the rich heritage of Alappad.

3) Importance of Indigenous knowledge in fishing

Indigenous fishermen used to do fishing as per the indigenous knowledge that they obtained from their forefathers. They involve in fishing activity based on the movement of sun, moon, stars, clouds, wind and even birds. When the southern winds blow, clouds are blocked by the Western Ghats and there is possibility of heavy rainfall. When wind blows from northwest to southeast then the clouds are not completely blocked by Western Ghats and the sea is calm and there is less rainfall. So this is found to be favorable weather condition to go for fishing.

Fishermen go for fishing based on the lunar path. When the moon moves towards the west there is a possibility of fish stock also to move towards west. If the fishermen trace out that path, then they would get a good catch. By the transfer of indigenous knowledge orally by their forefathers, fishermen used to look at the stars and move. Their ancestors had informed them that, when they cover the distance till particular number of stars on their waterway, then their boat would have reached that much fathometer depth in the sea. This had been found to be correct.

From the movement of birds also, a fisherman finds out the presence of fish stock. When certain variety of seabird suddenly moves to the water body and dips it beak, then that act denotes availability of fish stock there.

Chakara or mud bank was an important phenomenon at the seashore. Below the mud bank, it is very cool and lot of planktons grows there. So there the plant eater fish like *Mathi* thrives abundantly. To feed on them larger fish like *Ayala* also flourish there. Thus a natural ecosystem was created there. But due to the construction of sea wall and laying of *Pulimuttu*, this *Chakara* is absent now. The aged fishermen of Alappad still believe that if the *Pulimuttu* along the coastal region is removed, then *Chakara* formation would take place again.

Before there were four types of fishing techniques- by using *Kambavala vallam, Kattamaram, Cheru vallam, Thangu vallam*. Silk thread net was first experimentally used at Alappad and presently used in every fisher village. Later Lamborghini engine of Government of India was used for fishing, inorder to reduce labour. During the gap between tidal waves, fishing was done. Now due to the shrinkage of beach indigenous fishing activities is not taking place.

4) Use of Indigenous Knowledge for Food security

In the earlier days, dryfish was produced in large quantities at Alappad. Large drying yard is needed for that and its smell should not reach neighbourhood premises. After it is dried and stored near seashore, people come and purchase it by bargaining. Then they sell it in markets. Nowadays there is no space for drying fish and storing it. So they had abandoned that activity.

There were two paddy fields at Alappad, which were the chief source of food for Mid-Travancore area- *Mookkumpuzha padam* and *Panakkada padam* which had irrigation canals as well. This had catered to the food and water supply demand of the Panchayat. When the population density along the coastal stretch increased, these paddy fields got levelled up and people constructed their houses there.

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Ultimately the paddy cultivation in panchayat perished.

Now only small scale vegetable gardens of tomato, chilly, brinjal etc. are grown at household level. Cattle rearing are practiced by 40 households in panchayat.

Retired fishermen expressed their concern that, if fishing activities are stopped at Alappad due to human intervention, then it would seriously affect food security of urban areas like Ochira town, Karunagapally town and Kayamkulam town and in the long run entire Kerala State would be affected.

5) ***Use of Indigenous Knowledge as means of livelihood for women in fisher households***- The ladies who were mainly housewives also had tried to earn income by the production of coir and coir products. They used to wake up at 3:00am and immerse the coconut husk in small inland water bodies. Then they would take it and make coir and coir products. To increase their earning by increasing the weight of coir, they usually added some black sand to it. Alappad coir products got famous even at global level, which had led the Germans to come and find out the source of black sand. Knowingly or unknowingly this had paved way to the current dredging and mining practice at Alappad by Govt.of India Company-IREL(India Rare Earths Ltd.) and Govt.of Kerala company-KMML(Kerala Minerals & Metals Ltd.). Now coir or coir products are not made at Alappad.

There are about 20 to 25 Kudumbashree units in each of the sixteen wards of Alappad panchayat. They are mainly engaged in tailoring and catering service.

6) ***Use of Indigenous Knowledge in Social connectivity-*** In the past, when *Kambavala vallam* arrives after fishing, the fishermen would sit on the beach to divide their share. First they would give some coins to the kids who assemble there. Then they would separate out a share to the differently abled people in their community. Only after that they would take their share. There were intricate social linkages among fisherfolk. Even if any of the fishermen couldnot go to sea due to some personal problem, the others would give him their share in fishing. That was the social system that had prevailed at Alappad and it was lost when the joint family got disintegrated into nuclear families.

7) *The Role of Indigenous Knowledge in Disaster Risk Reduction of fishermen community*

In the days of old, creeping varieties of mangroves, *poochamullu, kallimullu, chakkaramullu, kaitha etc*.were used for shoreline protection.

For individual dwelling units, they erected sand banks. During high tides, they would increase the height of sand banks and divert the water course in such a way, so as to prevent entry of water into their home.

After tsunami 2004, casuarinas were grown along the shore for protection of beach. Currently, they are also facing extinction due to lack of proper maintenance.

There is no proper warning mechanism for fishermen. Warning dissemination is only done through their mobile phones. Under some circumstances, the weather prediction delivered to them had proved to be incorrect.

The indigenous fishermen find it difficult to wear the life jacket, as they are worried whether accidents might occur while moving around the propeller shaft or belt of the engine. They still rely on their indigenous knowledge and their practical experience to keep themselves safe.

The retired fishermen at Alappad had expressed their serious concern about the sustenance of their future generations in terms of Disaster Risk reduction and food security.

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VI. RECOMMENDATION

1) The shoreline protection should be done based on indigenous knowledge systems like planting creeping varieties of mangroves and not by unscientific protective measures like *pulimuttu* and seawall.
2) Indigenous fishermen communities have to be protected from eviction threats. Area specific revision has to be made in CRZ regulation.
3) Desalinization policy needs to be initiated and implemented inorder to alleviate the water shortage faced by the panchayat.
4) Dredging and Refilling activities need to be monitored properly by representatives selected from among fisherfolk
5) Karayogams could be entrusted with Community development initiatives and projects.
6) Participatory approach need to be adopted for development projects
7) Indigenous knowledge should be integrated with scientific knowledge for effective Disaster Risk Reduction.

CONCLUSION

This study has analyzed and documented the vulnerability of fishermen community at Alappad panchayat to Coastal hazards. It also conveys the role of indigenous knowledge towards prediction of natural hazards. Indigenous methods employed to avoid the loss of life and assets and also to ensure availability of potable water, and food security have been discussed.

When we consider the local context of Alappad panchayat, vulnerability and availability of resources and services, it is evident that such indigenous practices are thoughtful responses to mitigate the coastal hazards. This necessitates the effective promotion of indigenous knowledge system for the efficient Disaster Risk Reduction by bringing such knowledge to the scientific realm.

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