

Water Sharing Institutions in Complex Coastal Commons: A Study of Cochin Estuary, Kerala, India

M.A George and K.T. Thomson

Abstract:

Management of multiple commons continues to be a challenge for policy makers due to diversity of ecosystem functions and social groups. However, common property theorists broadly agree that traditional communities were elegantly managing these issues through the interplay of water and wetland institutions. In the case of Cochin estuary of Kerala, the communities had designed a variety of institutions that enabled water sharing for multiple uses. A substantial shift in the uses of brackish water for commercial aquaculture and the decline of agriculture and capture fisheries has degenerated some of these water sharing institutions. Social conflicts emerged despite government interventions and policies. The collapse of these management systems escalated management complexities and exerted high pressure on sustainability and livelihoods. Despite these vulnerabilities, communities have been adapting to the crisis in many ways. The paper will analyse the past and present water sharing arrangements among multiple users in the study area and details changes occurred due to the entry of modern enterprises. It also tries to analyse the emerging self restructuring patterns of the system.

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Introduction

Majority of the poor communities in South Asian countries depend on estuaries for their livelihoods even today. The Multifunctionality of estuarine commons, no doubt has contributed both to food security and leisure (Chen and Facon, 2005). Estuarine commons raised multiple uses for various communities with strict institutional set up. These waters provide various services like drinking water, irrigation, hydro electric projects, transportation of goods; industrial purposes, recreation, and it support livelihoods of major portion of the poor peoples in the country. The water resource as a common property is always a conflicting one because of the endless use of these resource and large number of stakeholder's involvement have make these systems highly complex. . The study shows that there was a strong traditional institutional set up which facilitated various multiple function to the coastal communities. With these arrangements each resource group were able exclude each others from the direct use of their resources and able to minimise the resource conflict. But the modern developmental activities had resulted in the dilution of these traditional institutions and there by the degradation of the ecosystem services. So it is necessary to have a strong institution to tackle these highly complex issues.

2. Canal ecosystems and water sharing technologies in Vypin Island

The study is conducted in the Vypin island of Cochin estuary, which is one of the largest brackish water bodies in the south-western coastal zone of the Indian peninsula The Island lies at the north west of Ernakulam district and has a length of 25 kms and a width of 4 km¹. Two panchayaths lying at the extreme north end of the estuary (Pallipuram and Kuzhppilly Panchayats) are selected for intensive examination. There are 14 major canals that run across Vypin island connecting its wetlands to veeram puzha (northern part of Cochin estuary) and these canals are connected with single large canal called poyil canal which run across these

¹ It is believed that Vypin Island was formed after the great floods in fourteenth century (C.Achutha Menon, 1911) As the name indicates vypu means newly formed and this has been remained unhabited wetland for a quite long time. Later on the rulers of that period found it is profitable to give these lands for "pattam" (leasing for long tenure) and also increase agricultural productivity.in the 18th century there was conflict between cochin state and Madras presidency on the rights over these islands as it located between the administrative boundaries of these states.

canals. The poyil canal runs to the total length of the Vypin Island with one end opening to the cochin estuary bar mouth and other end to the munambam bar mouth. Apart from the poyil canal there are numerous feeder canals which inter-link main canals making a web of water channel across the Island. (See map1 and table 1 for details).

Encircled by brackish water and estuarine ecological processes, Vypin Island's economy relied heavily on fishing, prawn filtrations, wetland agriculture (pokkali), coir products and recently developed tourism industry. The brackish water around the Island is the most crucial resource that sustains the livelihoods of local population. The canal systems in the Vypin island experiences two rounds of routine tidal currents (*Veliyettam* and *Veliyirakkam*) within a period of 24 hours. During high tide, water enters from the estuary to the wetlands of the island through the eight major canal systems two distinct openings which opens to Cochin bar mouth and other to the Munambam bar mouth respectively ([see map](#)) and carries with it a diverse flow of fisheries wealth

LOCATION MAP

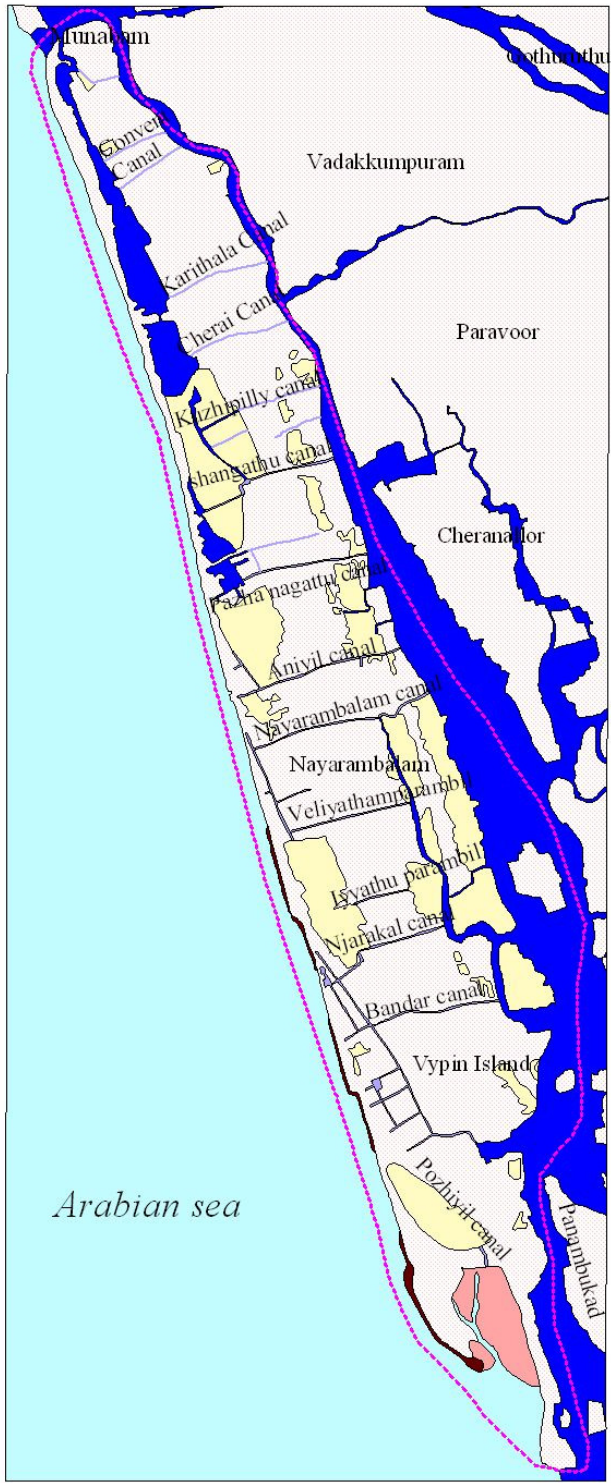


1 0 1 2 Kilometers

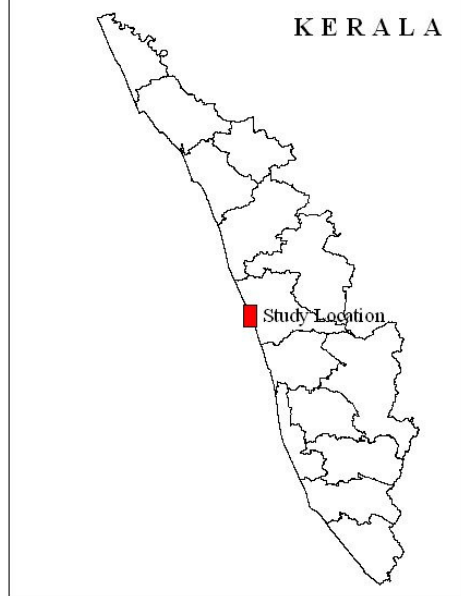


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- Study location
- Wet land
- Mud flat
- Sand
- Sea
- Waterbody
- Canal
- Vegetation with Settlement



KERALA



INDIA



The coastal canals act as the main artery of thickly populated vypin island as it is the most densely populated island in the whole of the world. Most of these canals flowing parallel to the coastal belt very close to the sea shore so it connect the sea shore with the back waters and during the mansoon season these canals act as drainage for sea water which entered to shore due to rough sea or cyclone to the back waters. This will protect the coastal are contamination with salt water and protect local agricultural activities. During the period of 2004 Indian ocean tsunami, eventhough four deaths have been reported from the island there wasn't much impact because these webs of canals across the island had absorbed the water and drained it in to the cochin estuary otherwise it could have cause catatrophic impact on the island population and other natural resources. Earlier these canals where used for transportation and to take the materials from main land to this coastal belt . The water from the canal also used for house hold purposes for the local communities. These waters also home for variety of fish species and supported varous fishing activities like gill netting, cast nats, pole line, traditional trap fishing, etc. How ever these canal systems are used for multiple functions there lack the coordination among various stake holders resulting in the degradion of system in certain points.

Multiple uses of canal systems

If you consider the multiple uses of these canal systems there are three major groups who draws direct diarect benefit from the ecosystem The first group is the fishing community who receaves sustantial amount of fish catch from these wetlands as the 14 major canals draws large amount of fishes and juveniles from the cochin estuary. The second major benefitiar

The major canal systems of the vypin island includes 14 major canals which runs to a total length of 53.4 Km and various sub canals which interlinks these canals forms a web of networking canals in these island. The major canal in this island is pozhiyil canal which runs the entire length of the vypeen island in the north south direction where as all other canals are flowing in the east west directionby cutting the major canal. but the developmetal activities and reclamation had blocked direct moovement of water through the canals eventhough it has connected with small feeder canals. The details of the canals syatems are given below

Sl No	Name of the Canal	Location/ Village it running through	Length of the canal in KM
1	Pozhiyil Canal	Entire Vypeen island	22.00
2	Bandar Canal	Puthu Vypu	3.00
3	Appangadu canal	Elamkunnathu puzha	3.50
4	Njrakkal Canal	Njarakkal	3.70
5	Iyyathu parambu Canal	Njarakkal	4.00
6	Veliyathu parambu canal	Nayarambalam	4.00
7	Nayarambalma Canal	Nayarambalam	4.20

8	Aniyil Canal	Edavanakkadu	4.50
9	Payathu Canal	Edavanakkadu	4.50
10	Chathangattu Canal	Edavanakkadu	4.20
11	Kuzhuppilly canal	Kuzhuppilly	4.50
12	Rama Varma Canal	Pallipuram	4.10
13	Cherai canal	Pallipuram	3.80
14	Convent Canal	Pallipuram	3.20
Total			53.40

Food production systems

Fishery is one of the major ecosystem service provided by these wetlands and the deeper parts of the low lying wetlands of vypeen and the eight major canals and their sub canals of the islands are exclusively used for fishing. This part of the wetland is known as "Poyil" which is derived from a malayalam word called "Pozhi" which mens opening to the sea. The poyil has two other feeder canals that open to cochin estuary. The major fishery of poyil is the shrimp while fish catches are comparatively lower. The main species caught from the poyil include *Penaeus Indicus* (White shrimp), *Metapenaeus monoceros* (Brown shrimp), *Metapenaeus dobsoni* (Flower tail shrimp), *Eetroplus suratensis* (Pearl spot) and *Mugil cephalus*(Mulletts) In addition to these, *Scatophagus argus* (scat), *Goboides*, silver bellies and *Ambassis* species are lesser constituents of the catch. Most of the fishing activities in these water bodies are controlled by the local gramapanchayath by issuing a licensing system with strong formal institutional set up. The important fishing communities of the island includes gill netters, cast netting, stake net, seine nets, chinese nets, hook and line and hand picking. Fishing is a year round activity in the village. However, the best fishing season of Vypeen Island is from December to March and the number of average fishing days during these months varied between 20 to 25. The lean fishing season was during June and July while all other months fishing days varied within 13 - 20 day

Agri-aqua culture systems is another important service provided by the estuarine ecosystem. Farmers cultivate paddy (pokkali) in their fields as the first crop and convert it for prawn culture immediately after the harvest. Prawn farming is an economic activity is done the low depth areas of the wet lands of the island. Traditionally agricultural farmers directly organizing prawn farming activities but later when modern aqua culture practices came they started to lease out the pond for others for commercial prawn culture. During the rainy season lots of fresh water is accumulated in the feeder canals of this island and the salinity reduces and the people in island use these waters for their house hold activities source of water for house hold activities .The another important function of these canal systems is the function of flood controll as the state of Kerala is receiving

both the south west and north east monsoons and during this season huge amount of downpour of rain water occurs in the island of vypeen. These waters are soon collected in to these web of canals and drain it out to the cochin estuary and eventually to the arabian sea with out cuasing any flooding in this region. The island was isolated from the main land before past few decades and only means of transportation was through the estuaries and The vypeen island is full of coconut plantation and each plantation has connected with webs of canal systems for the easy transport of coconuts and other coir products from the island. The low lying ares of the island where using for pokkali(rice variety which grows in the saline water) rice cultivation and these canals where the only means of access to the paddy fiels for the tranportation of goods.

In addition to agriculture, fishing and aquaculture, people of Vypeen island undertake a variety of small-scale industrial activities, which directly or indirectly use brackish water system. The most popular activities are the clam and lime shell collection, this activity provides livelihood to a number of fishing families and majority of the clam fishers are women. The sand mining is mainly done to raise the lands of coconut plantations as it provides higher yield, traditional ferry service is another activity in the island, and it thrived before the coming of roads and bridges to the island. Coir related activities were, once upon a time, one of the important occupations of the people of Vypeen, which provided large-scale employment to both men and women. The recent developing industry in vypeen island is tourism as the island is blessed with scenic beauty of backwaters, canal systems and sandy beaches. The island community is welcomming the development of the tourism industry as it provides alternative source income to them.

It is evident that t traditional communities were making use of the best possible use of estuarine resources through multiple uses and services subject to their needs. In addition to fishing and agriculture, eco systems were also used for industrial activities at a smaller scale without seriously harming the environment in any significant ways. The question now is whether there existed any informal institutions and organisations that enabled the communities to organise their multiple activities. We have found many such informal organisational arrangements in the local village, which are still relevant for the sharing of resources and environmental governance

Evolution of multiple use activities

The crop of the island was coconut as the eastern part of the island where sandy belts, coconut plantations where very well thrived there but the western part of the island where damp marsh wetland with shallow and deeper areas and during the cyclonic period sea often entered to this water body. During the period of Cochin State decision was taken increase the agricultural productivity of the state for that under the leadership of son of the former District judge T. A. Ettan, initiation was taken to convert waste marsh wetland in the wester part of the island to highly productive ecosystem. First they reinforced the coastal belt with pitting sacks filled with sands to protect the sea entering in the wetland and

deepening and reinforcing the various water channels to canals which connects the wetland with the estuary. It is also taken decision to use the deeper portion for the fishing and shallow region for the purpose of a special variety of rice called pokkali. As this water body has no bund separating deep and shallow portions, the salinity of the water in pokkali fields was not controlled. In order to protect the pokkali land and to make use of the marsh a bund was constructed between the Pallippuram and Kuzhippilly panchayats separating the deep and shallow portions. Later the deep portion, which was exclusively used for fishing, came to be known as the poyil and the shallow areas mainly used for pokkali cultivation were known as Puthanpadom. This state intervention has completely changed the economic activities and livelihoods in this area in a big way. People around the poyil began to involve in fishing and people around the shallow marsh engaged themselves in *Pokkali* cultivation and prawn filtration. In addition, the state has also reinforced a number of canals during this period for irrigating the pokkali cultivation.

Technologies for Multi-functionality

The multi-functionality of the system where engineered by the management of movement of water using construction of bunds and sluices to regulate the flow of water according to the season and cropping pattern of the island. The canals which directly enter to agri-aqua culture fields are closed during the period of paddy cultivation to prevent the entry of salt water from the estuary where as the major poyil canal which run across the pay field will be used to discharge the excess water accumulated during the rain. It is important to let the pail canal open as it connects the deeper portions of the wetland to estuary and provide free movement of fishes to these deeper areas of wetlands and avoiding conflict with agrarian communities' fisher groups for blocking the other canals. The networks of feeder canals across coconut plantations also provide equitable sharing of ecosystem services as it collects huge amount of rain water and drains it in to the pokkali fields and helps to minimise salinity of the ponds and makes it suitable for rice cultivation. These feeder canals also act as nursery for juvenile fishes and prawn of the wetlands and its rich nutrients and primary production it substantially contribute to the fishery of the region.

Water sharing institutions for multiple uses

Since lagoon supported multiple uses, a variety of interactive institutions evolved locally for the development of various economic activities. These institutions are broadly classified as fishery institutions and agri-aqua culture institutions.

Estuarine brackishwater and its habitats were considered as common property and a variety of norms and customs governed access to fishing grounds and fishing technologies. Some of these informal and formal institutions are listed below.

- Fishing gears should not be used in a way that causes obstruction to water transport.
- Not allowed do the aqua culture in the pozhi

- a) Not allowed to charge a fee more than Rs 3.50 per month from the cast net fishermen of kappu
- b) Not allowed to charge a fee more than 3.50 per month from Thappidutham (hand picking) fishermen. And will not charge more than 1/8th share or Rs.0.70 for full day fishing (24hrs)
- c) Not allowed to charge a fee more than 1/8th share of catch from the scare fishing such as *valli thelichil vala*.
- d) Auctioneer is allowed fish only from the stake nets situated near the sluice and the distance between the stakes will be 16 meter, and fixing the stake should be with a gap of 5 meter from the bund for the easy transportation.
- e) It is only with the information of the Panchayath that the auctioneer fish with stake net when the bund is braking for irrigation purpose.
- f) The current orders of the government regarding fishing have to be obeyed.
- g) Without the permission of panchayath it is not allowed to change the location of existing Chinese nets and those who are changing ownership of Chinese net will have to inform officially to panchayath and the auctioneer of particular year.
- h) According to the government order on 17.10.73 in G.O.(M.S)141/73 number, the fee for fishing from Government Department must be paid by the auctioneer.
- i) The profit share which has to be paid at Fishermen welfare fund should paid by the auctioneer and the receipt will be submit to the panchayath within the auction period other wise the particular amount will be deducted from the security bond or prosecution steps will be taken.
- j) The auctioneer have no right to ask for any compensation for his loss due to the blockage of canal for the construction of bridges or any other developmental activities may comes.
- k) For the construction of roads or any other developmental purposes panchayath is having full right to reclaim some parts of the poyil and any loss due to this activity to the auctioneer will not be compensated by the panchayath
- l) It is not allowed use Koori vala (Trammel Net) other than the months of Edavam, Midhunam and Karkkidakam (monsoon season)
- m) If the construction of any bund or road by the government for the purpose of transportation from pallipuram poyil to the beach may cause financial loss to the auctioneer and he is eligible to get compensation only according to the Panchayathi Raj Act.
- n) A display board, which shows the details of fees of different fishing methods, will be placed in a notable place and the auctioneer has to fish only from stake net or sluice net.
- o) Fishing with loop net, Koori Vala, Chemeen Vala.is not allowed

- p) The auctioneer has to do necessary arrangements for the inspection of canals and poyil by the officials of Fisheries Department and should follow the instructions by them.
- q) If the poyil sluice has to be opened and closed for the purposes of irrigation or when required, the auctioneer is not entitled for any compensation.

Agri-aqua culture institutions

The management institution of agriculture in the Vypeen Island consists of “Kadal vypu puthen padam ikya samajam” which consist of 20 different blocks and the institutional setup each block varies with nature of the environment. Each individual blocks consists of individual land owners and the size and number of farmers varies within each blocks. Where “Puthen Padam” is the farmer organization and the “Ikya Samajam” is the apex body.

Management structures of institutions

Kadal Vypu Puthen Padam Ikya Samajam	
Name of the block	Area
Kadal Vypu Puthenpadam krishi samajam	1873.860
Kadal Vypu Thundi puram krishi samajam	1500
Kadal Vypu thollayiram krishi samajam	695.750
Konaery Block	465
Kanjirakkadu Block	363
Kuruppathody Block	311
665/4 micha bhoomi koottukrishi samajam	252.875
Puthen padam micha bhoomi	198.500
Appy raghavan block	80
Vanayappilly Micha bhoomi karshaka sangam	60
Sayuvintae odi grace land	170.625
Fours block	60
Illickal block	120
Pathiyara krishnapilla block	30
Kaithavalappil block	40
T.A. Abu Block	37.500
Selvin Francies block	126.890
Maharaja block	64.250
T.A. Abdul Salam Block	23.375
K.K. Mohanan Block	11
Total	6488.625

Pokkali cultivation in fact is a highly labour oriented activity and large numbers of local people were employed at various stages of cultivation. Both the landlords and tenants draw their labour mainly from the local areas mostly belonging to the socially backward classes. The traditional Institutional arrangement for the

management of rotational cropping of agricultural and prawn culture in the shallow regions of the wetland called puthen padam as follows.

Crop calendar

Month	Days	activity	agency
April 15-30	15	pumping out the water and reinforcing of outer dikes	Puthen padam Ilya samajam
April 30- May 10	10	drying the wetland(until the cracks comes off from bottom)	Individual Padasekharams
May 10- may 31	21	reinforcing inner dikes, deepening feeder canals and plowing	Individual Padsekharams
June first week	7-14	Seed maturing (keeping the seed in the water for 12 hours)_ preparation of sawing bed and sawing (If the monsoon is not started it will be delayed)-	Individual farmers
June 14- 21	7	Removing the weeds	Individual farmers
June 28 –July 5	7	Replanting	Individual farmers
July 5- October 1	87	Pokkali cultivation	Individual farmers
October 1 _ 15	15	Reaping	Individual farmers
October 15 _ 30	15	Mowing, Grains drying	Individual farmers
November 10 _15	5	Preparation of the pond for prawn culture	Aquaculture farmers
November 15_ April 14	150	Prawn cultivation	Aquaculture farmers

Collective action to sustain Multifunctionality

Although, cultivation of paddy and shrimp filtration were undertaken by individual landowners in their respective fields, leasing the land to leasers for shrimp filtration and taking it back at the time of rice cultivation after six months was a difficult proposition for them, especially the marginal farmers. This led to the evolution of a co-operative moment among indigenous rice farmers and resulted in the formation of farmer's collectives called "*Padashekarams*" (Farmer organizations) (Thomson et al. 2002). These forms of collective action/farming are popular not only in India, but its presence has been reported in many Asian countries including Vietnam, Cambodia and Philippines. *Padasekharam* is a

neighborhood association of farmers - a voluntary coalition that provides securities to individual members in their bargains with leasers.

The collective actions of the farmers under these traditional institutions and informal organisations have performed their functions well in the past. They not only intervened in the day-to-day provisioning of resources within the village but had also effectively redressed the conflicts among the farmers and other rural stakeholders. These age-old institutions of the traditional farmers, however, have undergone several changes recently mainly due to the introduction of various agrarian policies relating to land and aquaculture development. With the implementation of land reforms, many such institutional arrangements have disintegrated and a few of them became dormant. The development of tourism industry in the island created higher demand for the wetland to construct hotels and resorts had resulted in the reclamation of major canal systems and blocking the traditional water sharing systems in the island. The network sub feeder canals once used for transporting goods and provided irrigation to the coconut plantations have been eroded due to reclamation of land for real estate and this has resulted in the blockage natural tidal flow providing breeding ground for mosquitoes and other microbes. There was outbreak of viral disease called Chicken guinea in the island spread by mosquitoes which is a clear example how the degradation of the ecosystem can affect the human system. However, the "Puthenpadam Padasekharam" of the Vypeen Island is still runs in spite of constrains and struggle and with the assistance of government institutions like Krishibhavan and Pokkali Land Development Agency.

SUMMARY AND CONCLUSIONS

Various studies in the recent past shows that there is considerable change in the ecosystems due to the degradation of the traditional institutional set up and it is also evident in this study that the considerable change traditional institutions have eroded the eco-system and sustainable livelihoods of the coastal communities. Multiple uses of coastal wetlands plays major role in the coastal economic generation and minimising resource conflict among various groups. The prospects of the coastal communities where addressed by the equitable sharing of ecosystem services provided by the traditional institutions and management structures. This study shows the importance of these estuarine water sharing systems of coastal wetlands in the livelihood provisioning of rural communities. The paper clearly narrates the strong institutional arrangement where prevailed in both the fishing and agrarian coastal communities of Cochin estuary which provided provision for exclusion one resource group from each other and fair distribution of the resources. The various levels of wetland systems in the island where occupied by each group with minimum levels of conflict and encourage fairness in the allocation of benefits from the common- pool resources. From this study it is evident that well defined boundaries and recognition of each resource group rights results in the fair distribution of ecosystem services of coastal water to the local communities.

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