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# Coastal regulation zone rules in coastal panchayats (villages) of Kerala, India vis-à-vis socio-economic impacts from the recently introduced peoples' participatory program for local self-governance and sustainable development

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## Abstract

Coastal Regulation Zone (CRZ) notification was issued by the Ministry of Environment and Forest of Government of India in February 1991 as a part of the Environmental Protection Act of 1986 to protect the coast from eroding and to preserve its natural resources. The initial notification did not distinguish the variability and diversity of various coastal states before enforcing it on the various states and Union Territories. Impact assessments were not carried out to assess its impact on socio-economic life of the coastal population. For the very same reason, it was unnoticed or rather ignored till 1994 when the Supreme Court of India made a land mark judgment on the fate of the coastal aquaculture which by then had established as an economically successful industry in many South Indian States. Coastal aquaculture in its modern form was a prohibited activity within CRZ. Lately, only various stakeholders of the coast realized the real impact of the CRZ rules on their property rights and

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business. To overcome the initial drawbacks several amendments were made in the regulation to suit regional needs.

In 1995, another great transformation took place in the State of Kerala as a part of the re-organization of the local self government institutions into a decentralized three tier system called “Panchayathi Raj System”. In 1997, the state government also decided to transfer the power with the required budget outlay to the grass root level panchayats (villages) and municipalities to plan and implement the various projects in their localities with the full participation of the local people by constituting Grama Sabhas (Peoples’ Forum). It is called the “Peoples’ Planning Campaign”(Peoples’ Participatory Programme—PPP for Local Level Self-Governance). The management of all the resources including the local natural resources was largely decentralized to the level of local communities and villages. Integrated, sustainable coastal zone management has become the concern of the local population.

The paper assesses the socio-economic impact of the centrally enforced CRZ and the state sponsored PPP on the coastal community in Kerala and suggests measures to improve the system and living standards of the coastal people within the framework of CRZ.

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## 1. Introduction

Awareness on sustainable development of the coastal belts for humanity is on the increase [1,2]. Like in several coastal countries, many coastal zones of India too have fragile ecosystems and these continue to degrade due to human interference. Kerala state, a narrow strip of land with a mean width of only 67 km is bordered by the Arabian Sea on the west and the Western Ghats on the east (Fig. 1). The total length of coastline is 560 km. Kerala has some 6250 sq km of brackish water area including marshes, backwaters, mangroves, inter and sub-tidal zones. This is a good feeding and nursery ground for a variety of commercially important fish, prawns, crabs and several marine organisms. These waters are also used extensively for inland transportation and were once blessed with mangroves. The state has a population of 31 million as per the latest census (2001). As most people live in the coastal area, population pressure is even higher and economic and subsistence activity infringe on the environmental quality of the region.

### 1.1. Coastal zone management

The Government of India, in 1991, issued a major notification under the Environment Protection Act, 1986, framing rules for regulation of various coastal zone activities. These rules are called the Coastal Regulation Zone (CRZ) rules. Under these Rules, the entire coastal stretch from the lowest low tide to highest high tide line and the coastal land within 500 m from the high tide line on the landward side is termed as CRZ. The latter is classified into four categories depending on the sensitivity of the zones. Prohibited and regulated activities have been listed for each zone.



Fig. 1. Map of Kerala with its boundaries and various districts. (Source: www.mapsofindia.com).

The following activities are declared as prohibited within the CRZ, namely: New industries other than the permitted like IT; disposal of hazardous substances; new fish processing units; new effluent/waste treatment plants; disposal of untreated waste and effluents; dumping of city or town waste or ash from thermal plants; land reclamation; mining of sands, rocks or corals (except rare minerals not available outside CRZ areas; harvesting or extraction of ground water other than manual wells for domestic purpose or traditional activities construction other than permitted ones, etc. The Ministry of Environment and Forests and the Government of State and Union Territory and such other authorities at the State or Union Territory levels shall be responsible for monitoring and enforcement of the provisions of this notification within their respective jurisdictions.

1.2. Kerala coastal zone management plan

In response to the Government of India CRZ Notification and Supreme Court judgement, the Government of Kerala prepared the Coastal Zone Management Plan. Because of the special features and circumstances of this state, like the limited land availability and high population density it was decided through an amendment that the distance from the HTL along the creeks, rivers and backwaters shall be kept as 100m or the width of the creek, river or backwater whichever is less for the purpose of regulation. All the mudflats, the marshy surroundings and the mangrove

ecosystem have been classified as CRZ-I. A buffer zone of 50 m distance belt around them will be maintained even if the width of the creek, backwater and river is less than 50 m. Reclamation is not permitted, nor shall there be any construction on lands reclaimed after February 1991. Dredging is allowed, but the land formed as a result of dumping of the dredged materials should not be used for development activities. Dredged materials are not allowed to be dumped in the CRZ areas. Only rare minerals not available outside the CRZ areas are allowed to be mined. No reclamation of kayals (backwaters) will be permitted within the CRZ areas. No coastal roads or railways are permitted in CRZ-I. (Letter No. J-1711/23/92-IA-III, Dated 27th September 1996, issued by the Government of India & draft notification S.O. 51 (E) dated 11-1-2002)

With this regulation in force the State Government and the Local bodies are liable to follow the guidelines while granting sanction for any developmental activities in their territory. Also, the State Governments and Union Territories have to implement and monitor the whole process. A State level committee has been constituted in each and every state to monitor the various processes and to attend to the grievances. The Local Self-Governments (villages, municipalities or cities) are the actual bodies to practice the various regulations when sanctioning any development activities including the construction of dwelling houses, factories or any resort. The local people who were already living in the CRZ have to abide by the new regulations whenever they are planning modifications to their buildings or conduct reconstruction. The investors in the unoccupied or vacant private lands in the CRZ are the real losers as they may not be able to use these lands for any future projects of their choice. Thus Local Self-Governments in the coastal belt have to plan all the development projects within the framework of CRZ.

### *1.3. Peoples' participatory programme (PPP) for self-governance of local governments*

In deep contrast to the top-down instituted CRZ regulations are the “Panchayathi Raj Nagarapalika” Legislation and the subsequent administrative reforms that lead to decentralisation of powers and empowerment of local bodies or local Governments. This was mooted by the Planning Board of Kerala State in 1995 [3]. PPP first started in the year 1997–98, which was one of experimentation followed by a year of rectification of weaknesses and defects. Based on the Panchayathi Raj Nagarapalika Legislations, the powers for local administrations and governance were transferred to a three-tier administrative set up. The base unit of development is the grama panchayat. Few grama panchayats in an area constitute a block panchayat and few block panchayats in turn constitutes a district panchayat. Now there are 991 grama panchayats, 152 block panchayats and 14 District panchayat in Kerala State. This three-tier panchayathi raj system came into existence in Kerala on 2nd October 1995. Besides these rural local bodies, there are 52 municipal councils and 5 municipal corporations in the state. The average population in grama panchayat and municipality were 25,199 and 48,785 (1991 census) respectively. The

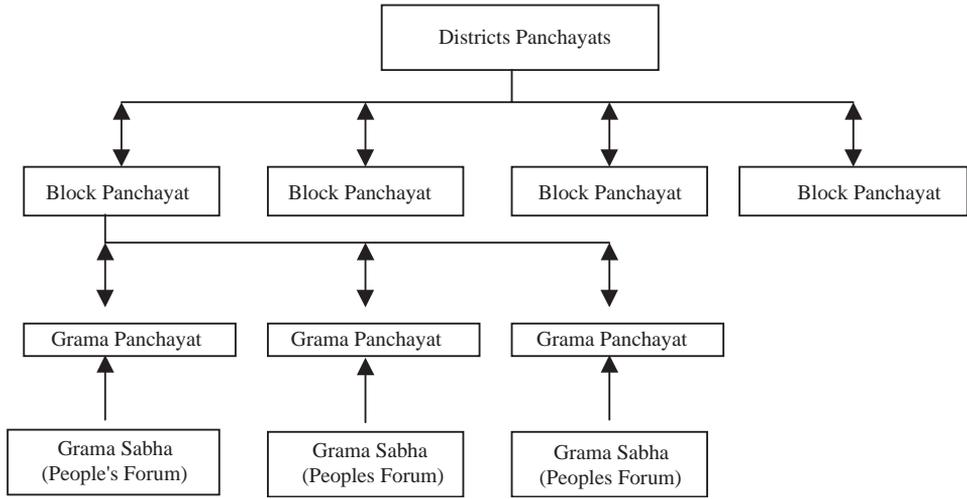


Fig. 2. Organisational structure of the decentralised local self government Institution on Kerala.

organisational structure of the Panchayathi Raj Nagarapalika system of Kerala is given in Fig. 2.

Before the introduction of Panchayathi Raj System, the role of the panchayats (grass root level villages) was confined to traditional civic functions like sanitation and health care [4]. Local Governments in the coastal zones like the panchayaths and municipalities/cities are the real guardians of the coastal zones as they are the authority to sanction the various construction activities and issue licences for industrial activities in the region as stated earlier. More details on the working mechanisms in these regions are provided by Madhusoodanan and Balchand [5] and Ajith Joseph and Balchand [6]. Richard and Barbara [7], Thomas and Richard [8] have given the evolution and the outline of the decentralisation process taken place in Kerala. The details of the various steps involved in the introduction of PPP in the governance of Local Self Government Institutions and the system of its administration are given by Ramachandran et al. [9].

Fig. 3 gives the structure of various interlinked and mutually interactive activities in the coastal villages, which have direct impact on both CRZ and PPP in Kerala. On the other hand, the CRZ and PPP have certain positive and negative impacts on the various activities going on in these regions. The symbol (+) represents that the CRZ or PPP has positive influence on the activity like development or traditional shrimp farming or waste disposal. Similarly the symbol (-) represents that CRZ or PPP having negative influence or non-supportive nature on the various activities like the ones shown in the figure. In certain cases, the CRZ/PPP is supportive (+) for activities like the development of port or defence activities in the restricted area whereas it prevents or discourages certain other activities like mining or construction of buildings in the same area. In such cases (±) symbols are used in the figure. This paper analyses the socio-economic impact of the ‘bottom up’ PPP for Local

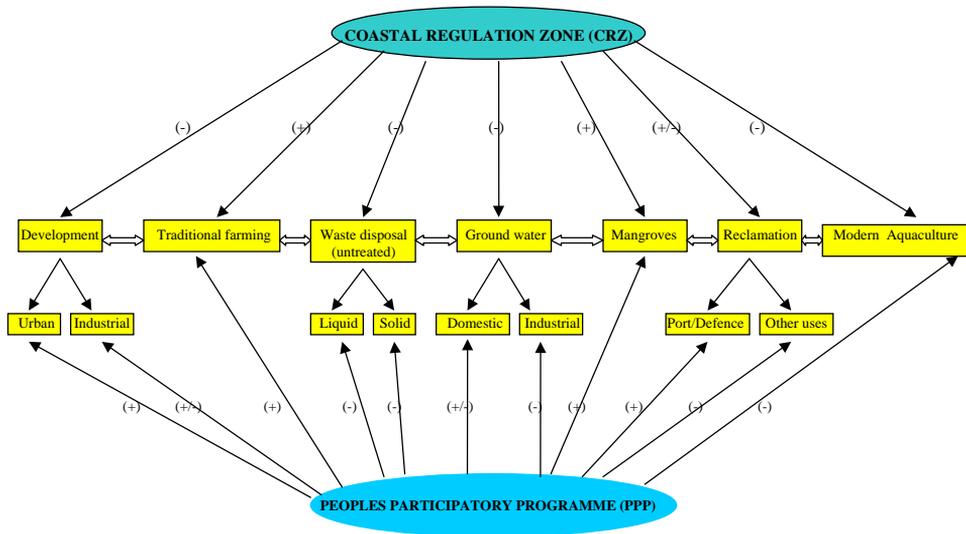


Fig. 3. Interaction of CRZ and PPP on the various coastal processes and human activities.

Self-Governance in the framework of the ‘top to bottom enforced’ CRZ rules on the coastal people in Kerala.

## 2. Methodology

The primary data for the study was collected through pre-tested structured questionnaires, interviews and Participatory Rural Appraisal Technique as described by World Bank [10]. Secondary data was collected from the various publications of Central and State Government Ministries and Agencies. For carrying out case study on the impact of CRZ on PPP and vice-versa, three grama panchayats (grass root level villages) namely Panavally Grama Panchayat in Alleppey District, Chellanam and Nayarambalam Grama Panchayats in Ernakulam District were selected. The Grama Panchayats are herein after referred to as villages for simplicity which are located in the coastal area and have experienced considerable impacts on the introduction of CRZ. Panavally Grama Panchayat is an island located in the Vembanad Lake. The other two villages have on the one hand the Arabian Sea and on the other hand, Vembanad Lake. All these three villages have networks of backwater canals and streams along the entire length and breadth with tidal influences. Two sets of structured pre-tested questionnaires were prepared—one for collecting information from the households and other for collecting information from the officials, experts and politicians who were involved in implementing the PPP in the villages. Random sampling technique was used to select 6% (750 households) of the total households in each village to collect relevant information. Similarly 20% (57 persons) of the officials, resource personnel and social workers

involved in the implementation of the PPP in the villages were selected for interviewing and collecting data.

### 3. Observation, results and discussion

#### 3.1. Kerala state and case study

The general information of the state is given in Table 1. The coastal area is having a higher density of population than the state average. This area is more dynamic and is used by several stakeholders for multiple purposes from ancient times. This also stimulates competition for utilising the resources and hence, obviously results in multi-user conflicts. More detailed information on the three villages selected for the case study is given in Table 2. Population density in Nayarambalam and Chellanam villages are more than double the population density of the state. The Insularity Index of the State is worked out to be 0.0144. Gommès et al. [11] report that the average and median values of Insularity Index for Asia are 0.611 and 0.0226, respectively. Similarly the global average and median values are 0.272 and 0.0077. This shows positive skewness of the values in which the large difference between median and average is due to the occurrence of a limited number of very high values. They have also reported the co-relation between the insularity and the population density. The less insular countries are claimed to have less population [11]. However, Kerala falls far below the Asian and global averages and still have very high population density.

#### 3.2. Impact on property rights

The most important single impact of the CRZ declaration is the change in the property rights of the land holdings in the coastal zone. As already stated, the coastal

Table 1  
General information of the State of Kerala

Items	Units
Land area	38,828 sq km
Continental shelf	40,000 sq km
Territorial sea (up to) 12 nautical miles	13,000 sq km
Population (2001)	31 million
Population density per sq. km	798.39
Coast line	560 km
Average breath of the state	67 km
Brackish water estuary having tidal influence 30 Rivers	44
West flowing (to Arabian Sea) rivers	41
Fishermen who live in the coastal belt	7,70,000
Active fishermen	2,00,000
No. of coastal districts	9 out of 14
Insularity index (Coastline/Land area)	0.0144

Table 2  
Information on the Panavally, Chellanam and Nayarambalam Grama Panchayats

Items	Grama Panchayats		
	Panavally	Chellanam	Nayarambalam
Land area	19.328 sq km	17.60 sq km	12.19 sq km
Population	13091	38000	23166
Population density	677.30/sq km	2159.09/sq km.	1783/sq km
Average land holding/ person	1476.43 sq m.	463.15 sq m	560.73 sq m
Av. Height above Sea level	6 M	Sea level (Most of the area below sea level)	Sea level (Some area below sea level)
Literacy (%)	94.69		
Boundaries	East & West—Vembanad Lake; North—Arookutti & Perumbalam Panchayat; South—Thykkattussery Panchayat	East & South Vembanad Lake; West—Arabian Sea, North—Cochin City	East—Vembanad Lake; North—Edavanakad Panchayat; South— Narakkal Panchayat
Average width of the Panchayat	4 Km	0.75 km	3.1 km

zone in Kerala is the most densely populated area in the state. The population density ranges between 677 and 2159 persons /sq. km and this is one of the highest in the world (Table 2). Most of the land in the coastal zone in Kerala is under private ownership from time immemorial. The sovereign and exclusive rights of the Landowners have been diluted forever as the CRZ notification stipulates severe strictures on the land utilisation for various construction and developmental purposes like:

- Setting up of new industries and expansion of existing industries, except those directly related to waterfront or directly needing foreshore facilities.
- Setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish drying in permitted areas).
- Harvesting of drawl of ground water and construction of mechanisms therefore within 200 m of HTL, in the 200–500 m zone. It will be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries.
- Construction activities in ecologically sensitive areas other than the specified activities under this notification.
- In Zone II, under which all the cities and towns are classified, buildings will be permitted neither on the seaward side of the existing road (or roads proposed in the approved Coastal Zone Management Plan of the area) nor on seaward side of existing authorised structures. Buildings permitted on the landward side of the existing and proposed roads as per the existing building rules of the local authorities. Reconstruction of the authorised buildings will be permitted subject

with the existing FSI/FAR norms and without change in the existing use. The design and construction of buildings shall be consistent with the surrounding landscape and local architectural style. This means the freedom, which the landowners were enjoying, was lost with this notification.

- The rural areas and suburban areas are classified as Zone III. Here an area, up to 200 m from the HTL is to be earmarked as ‘No Development Zone’. No construction is allowed here except repair of the existing authorised structures not exceeding existing FSI, existing plinth area and existing density. However, agriculture, horticulture, gardens, pastures, parks, play fields, and forestry and salt manufacture from the sea are permitted. Development of vacant plots between 200 and 500 m of HTL in designated areas of CRZ-III is now possible only with prior approval of Ministry of Environment and Forests (MEF). Construction/reconstruction of dwelling units between 200 and 500 m of the HTL permitted so long as it is within the ambit of traditional rights and customary uses such as existing fishing villages and goathans buildings. Permission for such construction/reconstruction will be subject to the conditions that the total number of dwelling units shall not be more than twice the number of existing units. Total covered area on all floors shall not exceed 33% of the plot size, the overall height of construction shall not exceed 9 m and the construction shall not be more than 2 floors. Reconstruction/alterations of an existing authorised building are permitted subjected to certain conditions.

These restrictions have had a tremendous impact on the social security and economic well being of the coastal villagers who owned only small land holdings. The pattern of land holdings in the three villages studied are given in Fig. 4. The properties in the coastal zone were priced higher than the properties in the nearby

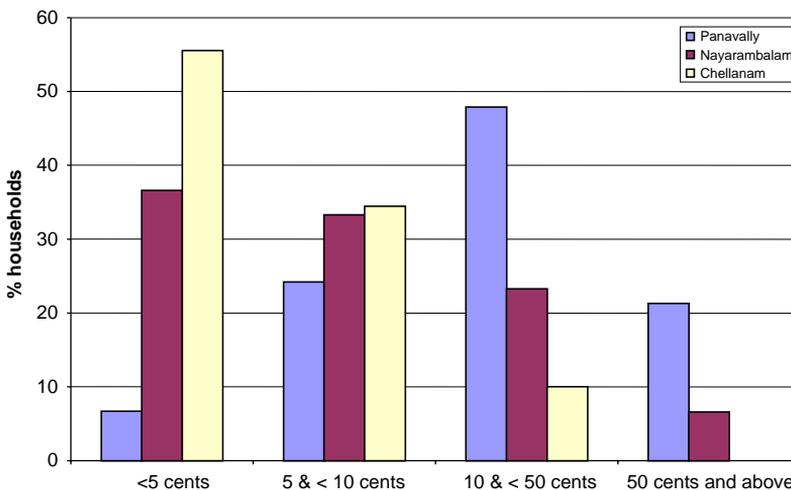


Fig. 4. Pattern of land holdings among the households in the three villages.

area before the enforcement of CRZ. During the survey, interviews and workshops, the authors could understand that the lands close to sea or backwaters were rated at a premium and the price before these regulations were imposed were running between Indian Rs. 20,000 to Rs. 1,50,000 (US \$444 to 3333) for approx. 40 sq m. Now there are no takers for the land properties in the coastal zones even at throw-away prices. The restrictions have put them in a fix and no economic activity other than conventional agriculture, animal husbandry and traditional fisheries are allowed as listed above. But these permitted activities are now economically not productive (and declining) due to various reasons described elsewhere. This has been the main negative impact of CRZ on the economic growth of the villages in the coastal belt.

### *3.3. Change in land use pattern*

Over the years, the changes in the land use pattern in the coastal belt has been creating considerable negative effects on the ecology and sustainability of the ecosystem. The three panchayats studied have indicated a similar transition over the years as far as the agriculture practices and land utilisation is concerned. All the panchayats, in general and the Panavally and the Nayarambalam Grama Panchayats, in particular, had well-established practices in coconut plantation and paddy cultivation. It is estimated that about 75% of the agricultural land were used for coconut cultivation in Panavally [12]. More recently the unscientific cultivation practices and poor breeds have considerably reduced the yield from this crop. The coconut plantation is also affected with several types of infections. It was estimated that Taycattucherry Block under which the Panavally Grama Panchayat is located, alone had 19.50 sq km of paddy fields and 108.95 sq km of other agriculture lands during the beginning of the century according to the government documents [12]. Now about 43% of the paddy fields have already been converted for construction of buildings or for planting other crops (just prior to introduction of CRZ). Till the introduction of CRZ and PPP most of the remaining agricultural fields were either not cultivated due to various reasons like high production costs or non-availability of farm labour in addition to the scope for selling these lands at high prices for various developmental construction purposes. Coconut and paddy cultivation as an occupation has now been reduced to 11.7% and 10%, respectively. This change in agriculture practice has definitely affected the ground water sources too. The paddy cultivation facilitates for fresh water infiltration to the ground, which prevents saline water intrusion. Now, with the change in cropping pattern and agricultural practices, coupled with the construction of dams in high ranges, the farmers in the coastal belts have to pump water from the ground. This has resulted in the establishment of more and more bore wells, which in turn has seriously affected the (fresh) water table of the region.

The intervening fresh water canals and ponds were once the storehouses of fresh water for various agriculture purposes, especially paddy cultivation and coconut plantations. However, with changes in the joint family system and the fragmentation of the families into small units, the division of land holdings of the joint families ultimately led to the fill-up of canals and ponds for the construction of new dwelling

houses—a good example is noticed at Nayarambalam, one among the seven grama panchayats of Vypeen Block Panchayat. Vypeen Island is considered to be the most densely populated island in the world with a population of 2,158 persons/sq km [13]. It is to be remembered that the density of population in The Netherlands is only 370/sq km and that of the United Kingdom, 240/sq km. The global population density according to the United Nations is only 39/sq km.

The Pokkali paddy cultivation was very common along the ridges of the land and inter-tidal areas in all the coastal Kerala villages during rainy season. This prevented the intrusion of saline waters into the land. These fields are now mainly used for prawn filtration by constructing sluices on the bunds of the fields and letting in sea/brackish water. This, over the years has had some definite effect on the saltwater intrusion into the land and the inland water bodies close to the shore. With the introduction of PPP there is an increasing awareness among the people to restart paddy cultivation in the fields by encouraging active participation from the public, availing development support from the villages. More projects are now identified and implemented to rejuvenate the lost glory in agriculture, especially paddy cultivation by providing financial support through the decentralised planning process. CRZ, of course has prevented the remaining coastal zone land from being converted for any industrial or construction purpose. According to CRZ rules these lands can be used only for traditional activities and for setting up of very selected industrial units like IT companies, which do not alter the coastal ecosystem or pollute it. The CRZ and PPP have also triggered the proper implementation of Land Utilisation Act by the concerned authorities wherever required, which was mainly designed for the midland and highland usage.

Fig. 5 shows the pattern of occupation among the villagers at present, in the three villages studied. Only a negligible percentage of the population now lives on coconut

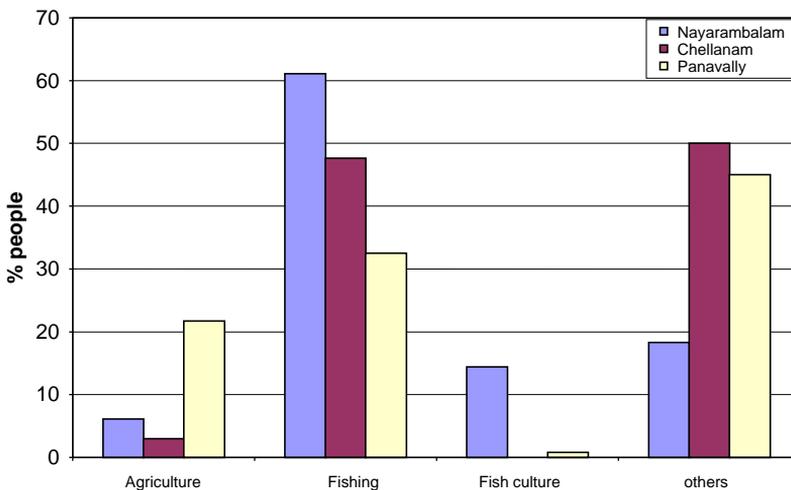


Fig. 5. Pattern of occupation among the villagers in the three villages.

or paddy cultivation. Currently, agriculture has shrunken into a minor sector offering limited employment. In all the three panchayats there has been a transition over the years in employment opportunities and the land use pattern from the agriculture oriented to fishery or fishery related activities like fishing, shrimp farming or fish processing, which has improved considerably. Pokkali paddy fields had been now converted into full time prawn farming units in some places which has resulted in severe conflicts between the fishermen and the agriculture labourers, of course with the blessings of various trade unions and political parties. This was because, agriculture as a commercial activity is not income generating as the production costs especially that of labour, had gone up in the recent times; whereas, the prawn farming results in more income generation due to its very high export demand.

### 3.4. Physical achievements during the first two years of introduction of PPP

In this section on PPP, of the total 1,01,554 projects approved in the productive, infrastructure and service sectors by the Local Bodies in Kerala during 1998–99, 32,585 projects were in the productive sector. Out of the total projects, 73,548 were the proposals from the grama panchayats (villages). Fig. 6 shows the percentage allocation of the financial outlay during 1997–98 and 1998–99 in the whole of Kerala in the Productive Sector under PPP. Major allocation was given in both the years to promote projects in the agriculture, animal husbandry and fisheries. This shows that

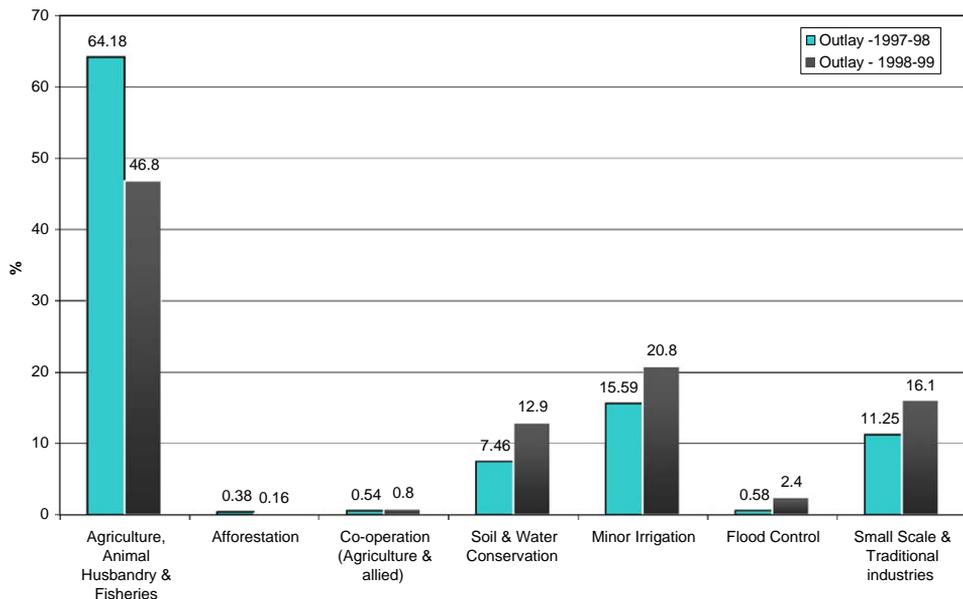


Fig. 6. Pattern of allocation of financial outlay of Productive Sector in Kerala during 1997–98 and 1998–99.

the Grama Sabhas (grass root level body of the local people to decide on the selection of projects for their villages) have chosen to preserve and promote the traditional industries in tune with the CRZ notifications. The main objective of the PPP is to give more emphasis to these segments to generate the lost employment opportunities and to prevent the conversion of the agriculture land for any other purpose. Most analysts like National Sample Survey, International Research Centre of Canada and International Food Policy Research Institute (IFPRI) while analysing on a national level, attributed the failure to reduce rural poverty to declining public investment in agriculture, which provided a livelihood to 70% of Indians. In this situation, the emphasis given to strengthen the primary sector by the various villages in Kerala under PPP is a welcome move to improve the economic conditions of the rural poor. This trend stands confirmed in the villages selected for this study too. Service sector is next in importance and the total projects approved in this sector during 1997–98 and 1998–99 were 25,618 and 37,476, respectively. Drinking water has been given top priority in both the years with the submission of 5089 and 5215 projects during 1997–98 and 1998–99, respectively. All the three villages selected for the case study had acute shortage of water. Water supply by the public distribution system is provided only once in two days for a restricted duration. It is found that 32.50%; 81.50% and 77.25% of the households in Panavally, Chellanam and Nayarambalam Grama Panchayats respectively depended on public taps for collecting potable water for drinking and cooking purposes. United Nations have set norms to provide at least 40l of drinking water per person per day to keep minimum good health. The shortage of water is found to be most acute in Chellanam than in other two villages and the main reason for the shortage was found to be the poor distribution system in existence in the said village. Looking at the availability of rain water and river systems in Kerala it is the failure in the collection and distribution system that matters more. Ground water is only available in certain pockets which can be used as potable. This is due to the salinity intrusion from the sea and backwater system coupled with the indiscriminate withdrawal of ground water beyond its carrying capacity through mechanical means over the years. CRZ rules now clearly prohibit the withdrawal of groundwater using mechanical means in the coastal zones. The village councils in these villages are also found to discourage digging of bore wells or tube wells. In spite of all this a small percentage of the villagers still draw water from their bore wells. If the network of canals and the abandoned ponds are cleaned up, the water from these sources can be used for several domestic purposes other than drinking and cooking during the rainy seasons when the water in most of these canals and ponds turn fresh water. Rainwater harvesting which was tried by some villagers in the Chellanam Panchayat is a cheap and alternate source of water in Kerala, as this state is blessed with monsoon rains for 4 to 5 months.

It is to be noted from Fig. 6 that very little emphasis was given by the various grama sabhas/municipalities in the state to reforestation efforts including mangroves and on programs related to flood control and soil erosion. Mangrove forest destruction is of course, a very serious issue in the coastal villages. In fact, the entire mangroves along the 50 m buffer zone is classified under Zone I of the CRZ rules and

needs to be protected. No reclamation, construction or destruction is permitted under the law. Tourism is one such industry, which was not given sufficient priority in the plans as there were only 63 and 75 projects, respectively, during the two years under analysis. The outlay for tourism was also very negligible. Taking into account the scope of expanding the tourism industry, the investment in this area could be enhanced substantially. This will help in augmenting the income of the villages and help in generating additional employment opportunities. Eco-friendly tourism has promotional incentives in the CRZ rules and can be explored in the coastal zones without much investment needs. Environment education under PPP was given only low priority in educating and training the public on preserving natural resource and its management. This could be taken as one of the priority segment while preparing projects under PPP to sustain the coast and its natural resources. For instance, the unscientific harvesting of clams from the Vembanad Lake has not only affected the stock but also the stability of the islands in the lake region by enhancing siltation and soil erosion.

Fig. 7 shows the major achievements from the annual plans under PPP during 1997–98 and 1998–99 in the state of Kerala. The agriculture and animal husbandry sectors got maximum priority in both the years at state level. The next in importance was the construction of sanitation facilities/latrines as it poses severe social and environmental problems in most villages. The trend was similar in the villages selected for case study also. About 20% of the households have been provided

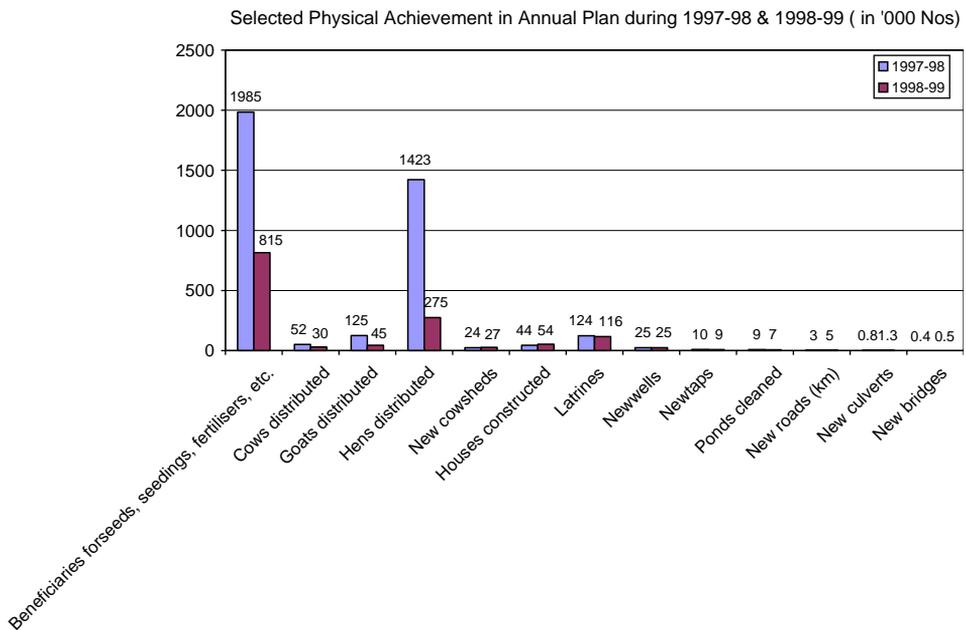


Fig. 7. Selected Physical Achievements in Annual Plan during 1997–98 and 1998–99 by the implementation of PPP in the state.

financial assistance for the construction of latrines in the three villages combined. It is to be noted that in spite of the efforts made by the various villages under PPP, 23% of the families still use backwater as a dumping ground for night soil and 21% opt for open grounds or the beach. This causes severe discomfort to the public and brings about pollution of the environment, especially of the water bodies in and around the villages. For this reason, the grama sabhas have given very high priority to construct latrines in all the houses of the villages. Very little budgetary provision was allocated by these panchayats for environmental protection apart from allocating some money for the maintenance of sea walls and strengthening of bunds.

Overall, there has been tangible improvement in job opportunities in the primary sector owing to the increase in the number of projects approved in this segment in all the panchayats. This coupled with the strong objections to the conversion of the agriculture land for other purposes is one of the main achievements and impact of PPP and CRZ.

### *3.5. Women empowerment and support to weaker section*

Women empowerment was yet another goal and great achievements were made under PPP. An allocation of 10% of grant-in-aid for Women Component Planning was mandatory. Women in India, particularly, in Kerala, were shy and had little chance for public participation. With the projects and promotions given towards women empowerment, the rural women in the villages were found to gain confidence in running their own production units. The motivation generated under PPP was so great that several women self-employment projects were found to operate successfully. The training provided under PPP helps create systematic informal networks within women societies having high team spirit and close communication facilities. This was reflected when the authors organised workshops as a part of the Participatory Rural Appraisal Method to interact with the stakeholders. The participants were mainly women from various women societies and organisations. Out of the 160 to 175 stakeholders who participated in the two workshops organised as a part of this study, 70% were representatives from women societies and organisations functioning under PPP. They participated very actively both in the discussions and brainstorming sessions. Over the last four years, in assets distribution for self-employment, 75% subsidy was granted to SC/ST communities, 50% for below poverty line families and 25% for others. Limits were also imposed on the maximum subsidy for a family and for an individual. The input subsidy in agriculture was given to marginal and small farmers only.

### *3.6. Land holdings*

The average land holdings are very low in the coastal villages with most of the families having less than 400sqm of land in these villages combined and are lowest for Chellanam. In Chellanam, majority of the people have less than half of above land. This is mainly due to the fragmentation of the land available among the family members, generation after generation; this has thence paved the way for considerabe

reduction in the agriculture practices in this region as it is not economical to conduct agriculture in small holdings. Similarly, the people in Chellanam are relatively poorer than in the other two villages. Further, this has resulted in the shifting of occupation and the change in the land use pattern as described elsewhere in this paper.

Since the families have very small land holdings in these panchayats (Table 2) and the people have been staying in the CRZ areas for generations, there arises a social problem in the panchayats. According to the CRZ regulations, these panchayats fall in CRZ-III and 200 from the HTL which has to be maintained as “No development Zone” and within 200 m to 500 m from the HTL, only permitted constructions can be carried out. If we take the case of Chellanam Grama Panchayat, 70–80% of the human settlements fall in this zone [14]. The resultant situation is that the people here cannot contemplate any future expansion programs other than conduct of routine repair work or avail the concessions granted to the traditional settlers for using land for housing purposes alone. This has considerably changed the property rights regime in the coastal zone as stated earlier. Just because these panchayats were wrongly classified under CRZ-III of the CRZ notification instead of CRZ-II, the local governments are neither in a position to use their financial resources allotted to them for local level planning and development nor the citizens who are living here have any opportunity to improve their standard of living. Currently, these differences are being sorted out but there has already been a set back to developmental activities.

With the enforcement of CRZ, there is a real positive impact on the tendency to build houses very close to the sea or to the backwater system. Largely, this has been stopped and the rules adhered to by the authorities. However, our study shows that there are certain new constructions (violations) in the CRZ areas in these villages without the approval of the village authorities who are supposed to clear these constructions under restraint of social conflicts. This amounts to financial losses to the village by way of non-taxing the property or buildings on one side and adversely affecting the overall planning of the village architecture and landscaping on the other. However, it is noticed that some of the houses which were denied construction by the panchayats are in fact allowable as per the latest amendments in the CRZ. According to the latest amendment, construction of dwelling units for use by local inhabitants may be permitted on a case to case basis provided that such constructions follow these conditions: the height of an individual unit shall be restricted to 4.5 m; the total plinth area shall be limited to 100 sq m; the house shall be constructed for his bonafide residential purpose, etc. Similarly permissions can be obtained to construct dwelling units and infrastructural facilities for the local inhabitants, housing schemes of Urban Development Authorities which had been approved prior to 19th February 1991; facilities and activities including setting up of non polluting industries in the field of information technology and other service industries in the Special Economic Zones are permitted activities. Another important amendment to CRZ-III is the construction of dispensaries, schools, public rain shelters, community toilets, bridges, roads and provision of facilities for water supply, drainage, sewage which are required for local inhabitants on a case to case basis, by the Central Government or Coastal Zone Management Authority constituted for the State/Union Territory

(Anon., 2002). With persistent demands from the state governments, the rule for demarcating a 100 m zone on either side of the canals and rivers have been reduced to 50 m. This leads us to believe that even the panchayat officials are in the darkness on the various provisions of the CRZ rules. Since CRZ is a 'Top to Bottom' enforced rule, proper dialogue has not taken place among the various stakeholders and even among the implementing agencies. To avoid hardships to the local people, a systematic training program on the various provisions of CRZ is to be given to the local people along with politicians and the officials of the villages and municipalities by the concerned authorities. This will help ease unnecessary stress and conflicts and avoid legal battles in the villages and other local bodies.

### 3.7. *Prawn farming and CRZ*

Traditional prawn farming had been practised during summer season in all these village areas after a crop of Pokalli rice cultivation which was held during the rainy season only. This practice had been going on for the past so many years; however, with the introduction of intensive and semi-intensive prawn farming techniques in Kerala and neighbouring states, yielding high profits, the situation has altogether changed. All these coastal farms are within the CRZ, as it required tidal waters to flush in and out of the fields, during high/low tides, to bring in and preserve the juveniles of prawns and other fishes. During low tide, some quantum of water from the field will be flushed out along with the wastes and other organic debris. The farmers also stopped the practice of cultivating rice during the rainy season and allowed the prawn farming to continue in these fields throughout the year simply as it is more lucrative. In this process, several agriculture labourers became jobless on one hand and due to the continuous retention of saline water, pumped from the sea or canal for longer durations, the region became more saline. Counting on the success of prawn farming, more people started converting the traditional rice fields into prawn farms. In some areas, where the tidal impact was less, the prawn farmers started using mechanical pumps to siphon the saline water into the farms and waste water out of the farms to the canals. This, the agriculture farmers and other villagers claim, did affect the fresh water table of the region and frequent conflicts crept between agriculture and prawn farmers. Since all these activities fall in the CRZ, the Supreme Court of India proclaimed a landmark judgment that no aquaculture practices should be carried out within CRZ other than the traditional or improved traditional practices (Supreme Court Writ Petition (Civil) No 561 of 1994). This judgement restricts the conduct of semi-intensive and intensive prawn or fish farming in the CRZ area. Consequently, the farmers who had engaged in this practice had to suffer huge economic losses. However, Kerala region was not immediately affected, as many prawn farms were traditional ones. But this judgement has restricted further expansion of these farms which could have given better returns. An Aquaculture Authority Bill has now being proposed in the Indian Parliament to formulate plans and policies related to aquaculture industry in India. Ramachandran (1995), Alagarswamy and Ramachandran (1995) has assessed the impact of semi-intensive and intensive prawn farming along the east coast of India and reported several environmental and social problems

related to coastal aquaculture [15–17]. The Grama Sabhas under the PPP also oppose the conversion of the Pokalli paddy fields to be used continuously for prawn farming and are willingly giving more financial support and motivation to carry out paddy cultivation during rainy season as was done in the past.

### 3.8. *Mangroves and CRZ*

Mangroves in Kerala have almost disappeared due to various anthropogenic influences and acts of urbanization. Reclamation of Vembanad Lake for various human activities like the development of ports; dumping of dredged clay from the sea mouth and ship channels; reclamation for the construction of bridges; housing & agriculture activities; additionally, locating factories too, destroyed a considerable part of the mangrove vegetation from this region. In addition to this, discharge of pollutants from these factories, located in Cochin and nearby places brought about loss in mangroves; construction of bunds and barriers along the coast and cutting of mangroves for fire wood over the years have drastically reduced the mangrove cover for this region. The estuaries and backwaters of Kerala which once occupied an area of 2426 sq km have now shrunken to 652 sq km. due to the serious alterations during the past 150 years through reclamation for agriculture and human settlements [18]. With the introduction of CRZ, these areas have been classified under CRZ-I where such activities are not permitted. With the strict enforcement of CRZ, since 1996, backed by the Supreme Court verdict, coastal villages have not allowed any further reclamation of backwaters. Due to the changes in the ecosystem, other land plants in the coast have replaced the mangroves wherever open spaces were available. The rice cum prawn farms too had a greater role for the destruction of mangroves in these regions. Reports from other regions also show that the development of shrimp farms was fast replacing the mangrove forests before the strict implementation of CRZ. Had there not been any CRZ, the country would have lost the entire mangrove forests with the development of shrimp farms than by any other means [16,19,20]. A recent survey by the aquaculture sector found that about 5% of the shrimp aquaculture farms in India have been constructed in former mangrove area [21]. With the enforcement of CRZ, the villages surveyed were found to be very vigilant in protecting the remaining (natural) ecosystem. The environmental activism is also very high among people, which in return helps the panchayats to enforce the law strictly. It was particularly noted that a good portion of the amount sanctioned for infrastructure building under PPP in these panchayats have been used for construction and strengthening of bunds to prevent further encroachment of canals and backwaters. In addition to above, disposal facilities for liquid and solid wastes will warrant necessary attention as such measures need to be strengthened too.

### 3.9. *Fishing pressure*

Fishing and fishery related industry is the one, which provide employment for majority of the people in these coastal villages. There was a shift for the job opportunities from agriculture sector to fishery sector in the recent past (Fig. 5). This

was also one of the main reasons for the changes in the land use pattern over the years in these villages as described earlier. Kerala has 2,00,000 active fishermen engaged in daily fishing and 1,50,000 people externally engaged in fisheries activities. Fisheries sector provides job opportunities for about another 1.5 million people and contributes to 3% of state income. The state has 28,000 non-mechanised, 17,000 motorised and 7300 mechanised fishing vessels, operating mostly within the 50 m depth in the coastline. It is estimated that 8000 non-mechanised, 14,050 motorised and 6155 mechanised vessels are held in excess of operational capacity [22]. Majority of the fishermen in the villages use traditional fishing methods with low investment. 41% of the people who are in fisheries field use stake net in these villages followed by 27% Chinese net. Only 8% of the local villagers have mechanised trawlers. Since there is no restriction on fishing in this area by boats coming from other areas, the fishing pressure in both backwaters and the coastal sea is very high; returns on efforts have gone down considerably. There are several reports of over fishing in these waters. Even though CRZ rules do not regulate activities in the seaward side of the low tide region, the Marine Fisheries Regulation Act 1980 of Government of Kerala envisages protection of all the aquatic resources and has provisions to regulate these activities. Due to poor enforcement, it has had a severe impact on the coastal resources and the socio-economic life of the coastal people. Again, unfortunately, the PPP in these villages have not developed any strategy or plan to sustain the fishery resources of this region as most of the measures are short termed, like distribution of nets, webbing, etc.

#### **4. Conclusion**

Kerala state has a literacy rate of 90%, which is also the highest in the country [23]. This achievement in the educational sector was achieved through a series of planned programmes over the past 3 decades as described by McKibben [24]. This is comparable to several of the developed countries. The initial CRZ notification of 1991 and the subsequent verdicts of the various courts in India upholding the provisions of the CRZ had a noticeable positive impact to reduce coastal zone destruction on one hand and at the same time had a significant negative impact on the socio-economic life of the coastal people. The property rights and economic development in the coastal zones were severely hampered with several unrealistic and unachievable restrictions when applied with a common yardstick through out the country. According to Libcap and Steven (1989), just not only currently held property rights stand affected, but also the credibility on application effect efficiency and economic growth. This may also stimulate rapid exploitation and discourage their continued preservation [25]. Johann Ali feels that greater the perceived risk of loosing existing property rights, the less likely the holders of these rights will be to forego current consumption to accumulate property, thus slowing investment that contributes importantly to economic growth [26]. Obviously, government plays an important role in the credibility of the persistence of property rights [27]. The resultant conflicts and slow down of the economic activity in the coastal zone could

have been avoided to a greater extent if a Strategic Environmental Assessment (SEA) and EIA were carried out at the beginning. The assessment should have the complete integration of environmental, social and economic issues framed in a holistic manner. The analysis of this kind in India should involve systematic analysis of social, political and economic interactions with natural resources and natural resource systems in different ecological and cultural segments. Several countries have recognised the importance of SEA and EIA for long-term sustainability [28–34]. At present, the approach of the Ministry of Environment and Forest who is responsible for the notifications seems to adjust to the diversity and variation by issuing required amendments to the various clauses to suit regional environment. Here also before issue of each amendment, proper SEA has to be carried out to avoid imbalance in the region rather than yielding to political pressure.

The PPP introduced in Kerala is a unique experimentation for decentralisation and local level governance. This has inculcated greater socio-economic and socio-political strength at grass root level in villages. The success of PPP in Kerala was due to the creation of a social network of all the stakeholders from the Chief Minister down to ground level politicians, from chief secretary to local village level clerks, from professors in the universities to school teachers, from scientists to the local public laymen. This was made possible due to the then prevailing political environment in the state where the state level administration and majority of the local level administration were in the hands of a single coalition set up. They could gear up the whole machinery of the state to motivate and train the volunteers at various levels to put into practice the theory of peoples participation in Local Level Governance. 30,00,000 people participated in the planning and development of various development projects. 12,000 task force members and experts made this possible with the training of about 1,00,000 facilitators through out the state. With the initial setback in adjusting to the new environment, the system picked up gear subsequently to a peoples' mass movement. The system mainly worked in a highly informal environment where several open-ended groups connected the network with linkages to other groups to perform the set tasks in a congenial atmosphere. This system worked in somewhat like the model described by Rob and Laurence [35]. With local level planning and active participation from people, priorities stood changed. This stimulated the traditional and small-scale industries, which were the backbone of rural areas. FAO also has recognised that the economic development in the developing world is possible only through promoting primary and small-scale sectors. However, with the change in the political scenario lately, this network seems to be loosening up and broken at several places. In order to sustain this unique and successful system beyond political barriers, the stewardship of the central connectors and other linking pins should be given to leaders with non-political affiliations having good command in the society.

## References

- [1] CEC. Communication from the commission to the council and the european parliament on the integrated management of coastal zones. (COM 95-511). Brussels-Luxembourg: ECSC-EEC-EAEC. 1995.

- [2] United Nations. National Information Analysis Unit, Division for Sustainable Development. New York, USA: United Nations Department of Economic and Social Affairs; 2002.
- [3] Isaac T, Tharakan M. Kerala: towards a new agenda. *Economics and Political Weekly* 1995;30:31–2.
- [4] Balchand AN, Nambisan PNK. On the integration of traditional practices in coastal zones. *Proceedings of International Symposium on Techno-Ocean' 88, Japan, 1988; vol. A-IV(4): p. 1–13.*
- [5] Madhusoodanan MS, Balchand AN. Coastal zone management plans for central parts of the State of Kerala. *INCHOE' 97, Trivandrum, India; 1997, p. 1266–273.*
- [6] Ajith Joseph K, Balchand AN. The application of coastal regulatory zones in coastal management—appraisal of Indian Experience. *Journal of Ocean and Coastal Management* 2000;43:515–26.
- [7] Richard WF, Barbara HC. The Kerala decentralisation experiment; achievements, origins, and implications. *Proceedings of the international conference on democratic decentralisation, Thiruvanthapuram, India; 2000.*
- [8] Thomas ITM, Richard WF. Local Democracy and development: the people's campaign for decentralised planning in Kerala, *Proceedings of the international conference on democratic decentralisation, Thiruvanthapuram, India; 2000.*
- [9] Ramachandran A, Balchand AN, Enserink B. Assessing the impact of public participation in coastal zone management—An evaluation of the peoples' participatory programmes in coastal villages in Kerala, India, *Proceedings of the international conference on impact assessment for impact assessment, IAIA, The Hague, The Netherlands, 2002.*
- [10] World Bank. Notes. No. 6, Agriculture Technology and Services Division (AGRTN). Washington, D.C.: Agriculture Technology, 1994.
- [11] Gomme R, du Guerny G, Nachtergaele F, Brinkman R. Potential impacts of sea-level rise on populations and agriculture, Food & Agriculture Organisation of the United Nations, Rome, 1998.
- [12] Haridas, TK. 2002 Peoples' planning programme—power in the hands of the people, *Technical Notes at Thykattuserry Block Panchayat, Kerala, India; 2002. p. 199.*
- [13] Narayanan S. Project document of 9th Five-Year Plan, *Technical Notes at Vypeen Block Panchayat, Kerala; India. 2002. p. 112.*
- [14] Reghu VB. 2000 Review report on peoples planning programme, *Technical Notes at Chellanam Grama Panchayat, Kerala, India; 2000. p. 16.*
- [15] Ramachandran A. Current issues in promotion/financing of hi-tech aquaculture Projects, *Proceedings of the third programme on hi-tech aquaculture Projects, College of Agriculture Banking, Reserve Bank of India; Pune, India. 1995.*
- [16] Alagarwami K., editor., with Ramachandran A. India country case study. In: *Regional study and workshop on the environmental assessment and management of aquaculture development (TCP/RAS/2253). NACA Environment and Aquaculture Development Series No. 1. Network of Aquaculture Centres in Asia and the Pacific, Bangkok, Thailand; 1995.*
- [17] Ramachandran A. Strategic planning to tide over the present crisis to sustain the brackish water shrimp aquaculture industry in India, *Proceedings of the second world fisheries congress, Brisbane, Australia; 1996.*
- [18] George G. Report on coastal zone management of India, Report by school of industrial fisheries, Cochin University of Science & Technology, Cochin, India. 2002.
- [19] Holmgren S., editor., An environmental assessment of the Bay of Bengal Region. Swedish Centre for Coastal Development and Management of Aquatic Resources, Bay of Bengal Programme, Madras, India. 1994.
- [20] Krishnamoorthy. Remote sensing of mangrove forests in Tamil Nadu Coast, India. Faculty of Civil Engineering, Anna University, Madras (Thesis), India. 1995.
- [21] ADB/NACA. Aquaculture sustainability and the environment. Report on a regional study and workshop on aquaculture sustainability and the environment, Asian Development Bank and Network of Aquaculture Centres in Asia and the Pacific, Bangkok, Thailand. 1998.
- [22] Ramesh PB. Economic analysis of traditional and mechanised fishing operations along the Cochin Coast, Report by School of Industrial Fisheries, Cochin University of Science and Technology, Cochin, (Dissertation), India. 2001.
- [23] Kerala Facts, Government of Kerala, Thiruvanthapuram; India. 2000.

- [24] McKibben B. The Enigma of Kerala, *Utne Reader*, March/April, 1996.
- [25] Libcap GD, Steven NW. the political economy of crude oil cartelization in the United States: 1933–1972. *Journal of Economic History* 1989;49:833–56.
- [26] Johanny Ali D. OPEC and the price of oil: cartelization or alteration of property rights. *J. Energy & Development* 1979;5:72–80.
- [27] David LW, editor. *The Political Economy of Property Rights—Institutional Change and Credibility in reform of centrally planned economies*. United Kingdom: Cambridge University Press; 1977 p. 363.
- [28] Dixon J, Fookes T. Environmental assessment in New Zealand: prospects and practical realities. *Australian Journal of Environmental Management* 1995;2:104–11.
- [29] Bailey J, Dixon J. Policy Environmental Assessment. In: Petts J, editor. *Handbook of Environmental Impact Assessment*. Oxford: Blackwell Science; 1999.
- [30] Partidario MdR. Strategic environmental assessment—principles and potential. In: Petts J, editor. *Handbook of environmental assessment vol. I: environmental impact assessment: process, methods and potential*. Birmingham: Blackwell Science; 1999. p. 60–71.
- [31] Brown A, Therival R. The Principles to guide the development of strategic environmental assessment methodology, Impact assessment and project appraisal, Special issue: strategic environmental assessment, planning and policy-making, 2000, vol. 18, p.183–90.
- [32] Buckley R. strategic environmental assessment of policies and plans: legislation and implementation, impact assessment and project appraisal, Special issue: strategic environmental assessment, planning and policy-making, 2000. vol. 18. p. 209–16.
- [33] Elling Bo. Integration of strategic environmental assessment into regional spatial planning, impact assessment and project appraisal, Special issue: strategic environmental assessment, planning and policy-making, 2000, vol. 18. p. 233–44.
- [34] Freeman P, Patricia V. Strategic environmental planning in the development of country strategic plans—a proposal, environmental policy and institutional strengthening indefinite quantity contract (EPIQ), USAID Africa Bureau Environment Natural Resource Policy Support, III, 2000. p. 61.
- [35] Rob C, Laurence P. The people who make organisations go or stop, *Harward Business Review*, 2002. 105–12.