



## **Sustainable Development of West Bengal Coast**

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*Received: 29 October 2017*  
*Reviewed and Accepted: 15 December 2017*  
*Published: 17 January 2018*

**Abstract** The sustainable development as a vital apparatus requires a procedure of regulation and proper administration that unites a series of interests and the entire stakeholder's concern through proper management of growth and development. The effects of coastal development on various stakeholders include social, economic, cultural, and political issues. Hence, keeping in view the significance and importance of the people's participation and other key strategic partners in sustainable coastal advancement, the goal of the present study is to concentrate on the general viewpoints required in having an all encompassing improvement of the concerned area and proposing the key intercessions to meet the future needs. To conduct the study, essential information were gathered from 200 respondents by doing field surveys and further assessment of the data was done using diverse statistical tools and techniques. The result highlights the presence of some genuine environmental issues like oil spill, coastal erosion and others. Over 35% of the general population feel that their focus should be on spreading awareness about coastal conservation, whereas over 20% feel that coastal pollution should be prioritized. On the other hand, more than 30% are of the view that coastal erosion should to be given the most extreme significance. The review finding proposes that the diverse stakeholders' cooperation and participation is important to make the coastal advancement more supportable.

**Keywords** Sustainable development; environmental degradation; coastal area; integrated coastal zone management; coastal environment; mangrove.

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## **Introduction**

Seas, oceans and seaside territories are a significant portion of the Earth's ecosystem and are basic to sustainable development of any region, but unfortunately these are progressively debilitated, debased and annihilated by human action, thereby, diminishing their capacity to give essential ecosystem services. This gives rise to few critical issues like global environmental change, marine contamination, unsustainable extraction of marine assets and physical modifications and annihilation of seaside natural surroundings. The weakening of marine environments and living spaces is contrarily influencing human prosperity around the world (United Nations, 2015).

Coastal zone of West Bengal is thickly populated which makes its fragile surrounding (both core and fringe) progressively vulnerable. This vulnerability is a consequence of combination of various issues, among which tourism plays a significant role. For these zones to continue to be helpful and bolster various activities, sustainable tourism and its allied activities should be properly regulated and focussed upon (Jarviluoma, 1992).

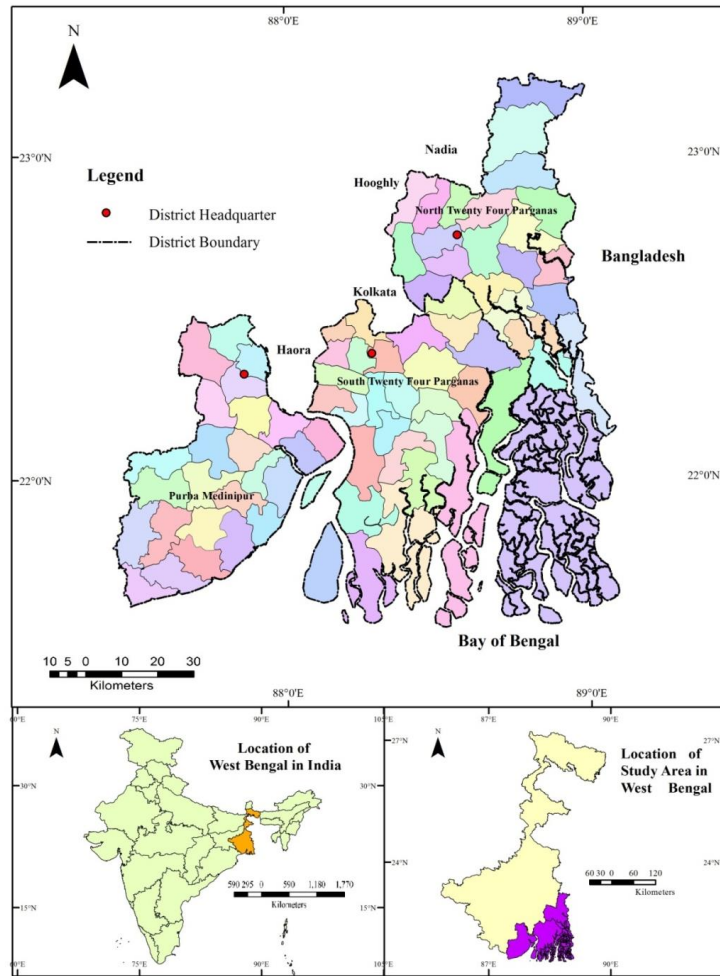
The burden from developing populaces in the seaside zones of the state, extending coastal tourism, escalated fisheries, and countless other economic exercises represent an expanding risk, which endanger the nature of these waterfront and marine environment. Significant destruction of a portion of the state's most important assets, mangroves and the coastal forest, coral reefs and the lagoons has caused genuine devastation of the planet. This, therefore influences the life of the beach front occupants and the economic improvement of the locale (Baitalik and Majumdar, 2015).

## **Study Area**

Topographically, the coastal zone of West Bengal falls inside three districts viz. Purba (East) Medinipur, South Twenty Four Parganas and North Twenty Four Parganas as delineated in Figure 1. Reaching out from 22°11'6" N to 22°33'45" N parallel and from 87°46'34" E to 89°5'0" E Meridians, the area supports a population of 22,330,266 people. The aggregate territory secured by the districts is 18,790 sq. Km., out of which 10,158.22 sq km is under coastal region.

The total area is being divided into three Coastal Regulation Zone (CRZ). Out of the total area falling within the coastal zone of the state, CRZ-I covers an area of 8,184.91 sq km, while CRZ-II and CRZ-III account for 3.41 sq km and 1,969.90 sq km respectively. Area under CRZ-I comprises areas of all the 14 coastal blocks of South 24 Parganas, 6 of North 24 Parganas and 2 i.e., Khejuri-II and Sutahata-II of Purba Medinipur district. Area of CRZ-II comprises areas of Haldia Dock Complex and Digha Township, falling under the respective legally designated urban areas of Haldia and Digha Planning area. CRZ-III includes all 21 coastal block areas of the district Purba Medinipur, 2 blocks i.e., Sagar (part) and Kulpi (part) of South 24

Parganas and 2 legally designated urban areas of Haldia urban area and Digha planning area and 1 municipality i.e., Contai Municipality — all falling within Purba Medinipur district. The area has a varied topography and that can be seen from the given plate (Figure 2).



Source- Census Atlas of India, Census of India, 2011.

**Figure 1: Location of Study Area**



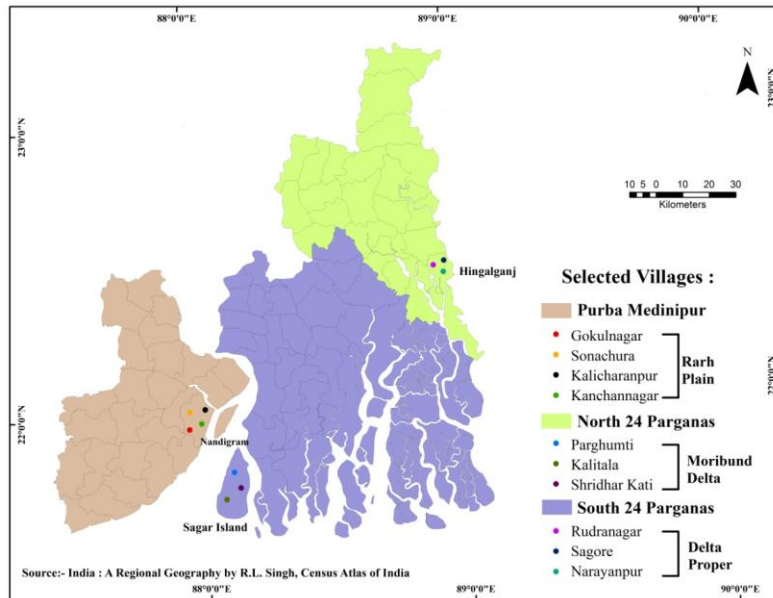
**Figure 2:** a. The mangrove area in Sundarban, b. The barren land in tamluk area of Purba Medinipur, c. The coconut area along the beach area, d. The sea-side view of Digha, e. Mandarmani beach

### **Database and Methodology**

Ecological problems were identified doing the field survey using data reports, economic survey of West Bengal, District Gazetteers, Planning Department, Directorate of Fisheries, Directorate of Planning & Statistical Abstract of Districts.

The study was primarily based on secondary data but first hand primary data was acquired for ground truthing by conducting household surveys in the field. A variety of techniques were used for primary data collection such as questionnaire survey, face to face interviews, focused group discussion, participant observant based on extensive field work to get information related with general picture of the area and gradually proceeding towards specific issues.

During the field investigation, the interviews of the local people were done to collect the information related with coastal issues, existing schemes, level of awareness, probable solutions of the problems etc. Data was obtained through structured and semi-structured questionnaire where the questionnaire Survey was conducted as per Proportionate Stratified Sampling. The villages for survey were selected according to the broad physiographic division of the lower Ganga Plain given by R.L. Singh. Hence, 4 villages (Figure 3) (Gokulnagar, Sonachura, Kalicharanpur and Kanchannagar- all from Nandigram Block of Purba Medinipur district) were selected from Rarh Plain, which was dominated by laterite alluvial landscape, 3 villages (Parghumti, Kalitala and Shridhar Kati- all from Hingalganj block of North 24 Parganas) from Moribund Delta or the land of dead and decaying rivers and the remaining 3 villages (Rudranagar, Sagore and Narayanpur- all from Sagar block of South 24 Parganas) from Delta Proper.



**Figure 3:** Location of selected villages for field survey

Twenty households were selected from each of the villages, making it a total of 200 households. These respondents were selected through a mix of random and stratified sampling, from different back grounds but they were directly or indirectly related with the coast such as shop keepers and vendors of the beach areas, local inhabitants of the coasts, fishermen and some government personals.

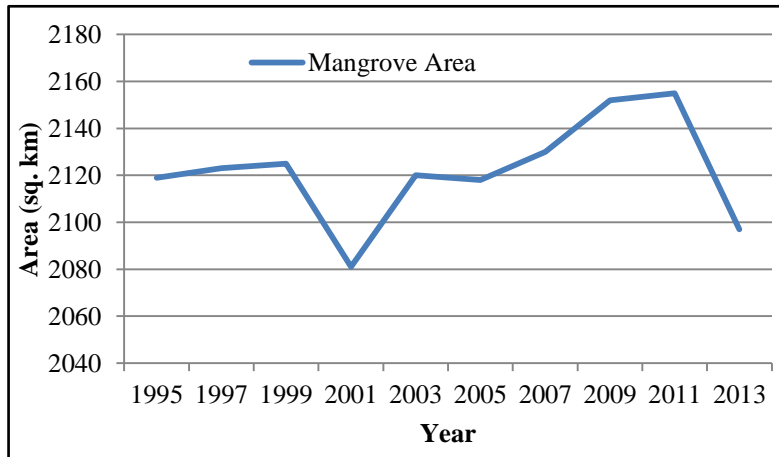
The information collected from various secondary data sources and the field interview was processed through MS Office and other softwares. The data was arranged and tabulated according to the need of the study. For analysis of the data, descriptive statistics has been used frequently. For presentation of the data, statistical and cartographic methods were used in the form of tables, charts, pie diagrams, bar diagrams, line graphs, choropleths etc. For carrying out this study software which was used are ArcGIS and ERDAS Imagine.

## **Result and Discussion**

### ***Analysis of present ecological problems***

Out of 2.45 million population of the study area of West Bengal, around 80 percent are occupied with agribusiness and the rest in fisheries and nectar. The Hooghly system too is overburdened with wastes from all the corners including the agricultural, domestic and industrial wastes which unfavourably influence the marine organisms. Matlah and other eastbound estuaries receive sewage mainly from Kolkata and also from other suburban sewage. Because of poor drainage arrangement, wetlands are normal and are utilized for saline water cultivation. The Purba Medinipur coast

gives favourable port facilities in light of stable soil and good connectivity. Sunderbans has unstable river banks, mediating wetlands, silting of beds and the ever changing topography which does not allow lasting port facilities (Institute for Ocean Management, 2008). Among all these, it is also being noticed that the mangroves of Sunderbans have begun declining as of late (Figure 4).



Source: West Bengal Forest Department, 2014

**Figure 4** Mangrove Area (1995-2013)

### ***Pollution of coastal water***

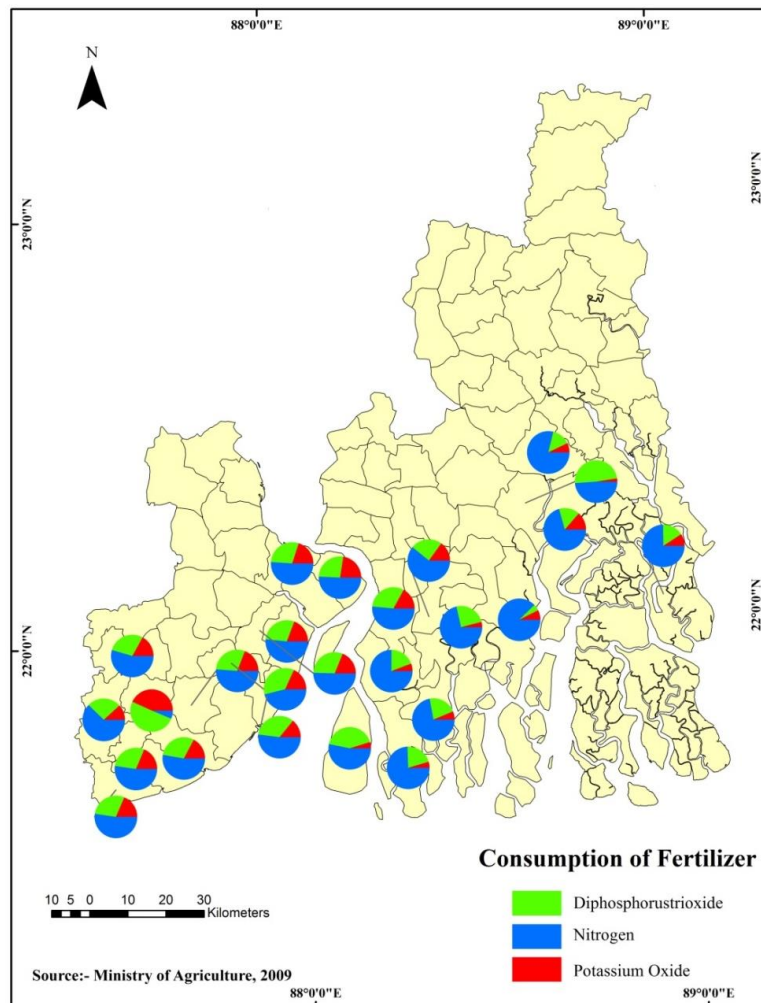
The coast of West Bengal is polluted by wastewater which comes from many sources like domestic, farming sector and industrial activities. Status of these releases and their impact (quantitative) on the coastal zone are discussed below in detail (Department of Environment, Govt. of West Bengal, 2012).

### **Household Waste**

The domestic waste of the state mainly comes from the coastal towns and hotels of Digha, Haldia, Kakdwip, Bakkhali, Diamond Harbor, Canning and Basanti. These wastes are absolutely untreated and they make their way into the ocean. According to evaluations of CPCB (Central Pollution Control Board), around 785.4 MLD (million litres per day) sewage is produced from urban communities and towns in West Bengal of which just around 141.7 MLD is dealt with and the rest is released untreated into the coastal waters. It is assessed that around 400 tons of sewage from Kolkata is consistently being released into the adjoining zones of Sunderban (Department of Environment, Government of West Bengal. 2012).

### Agricultural Waste

Farming sector produces a lot of waste including composts, pesticides, insecticides and other contaminated load, which deplete at last into the beach front waters through rivulets and waterways. It is accounted for that in 2003-04, the aggregate compost use in the state was around 12,61,450 tons (Department of Environment, Government of West Bengal. 2012). Figure 5 below shows the consumption of fertilizers in few blocks and thereafter these wastes then play a big role in polluting the coastal water.



**Figure 5:** Consumption of Fertilizer (2009)

### ***Coastal Erosion***

Specialists from School of Oceanography (Hazra et. al, 2002), Jadavpur University attempted a temporal and spatial analysis of the modification in the shape, size and geomorphic components of the islands over a time of 32 years (1969-2001). The imperative perceptions with respect to the erosion-accretion pattern of the island said that the aggregate disintegration over the 30 years time span is assessed to be 162.879 sq.km. Couple of islands like Lohachara and Bedford (6.212 sq. km.) have officially vanished from the location. Zones which are most vulnerable to erosion are the 12 sea confronting southern islands from Sagar toward the west to Bhangaduni in the east. The western banks of the internal islands are more vulnerable against disintegration than the eastern banks and the rate of withdrawal of western banks is more extreme.

### ***Oil and Hazardous Waste Spilling***

The significant scenario that prompt oil spills are the collision and other accidents, particularly the tankers that carry oil based commodities to the Haldia and Kolkata ports and such vessels passing through the Paradeep port. Minor oil spill may happen in seaside region of Sundarban and seaward ranges of the state's coast from mishaps including fishing trawlers, large ferry carrying passengers and boats carrying different loads (Qasim and Wafar, 1979).

### ***Pollution to Aquatic Zone in light of Heavy Metals and Pesticides***

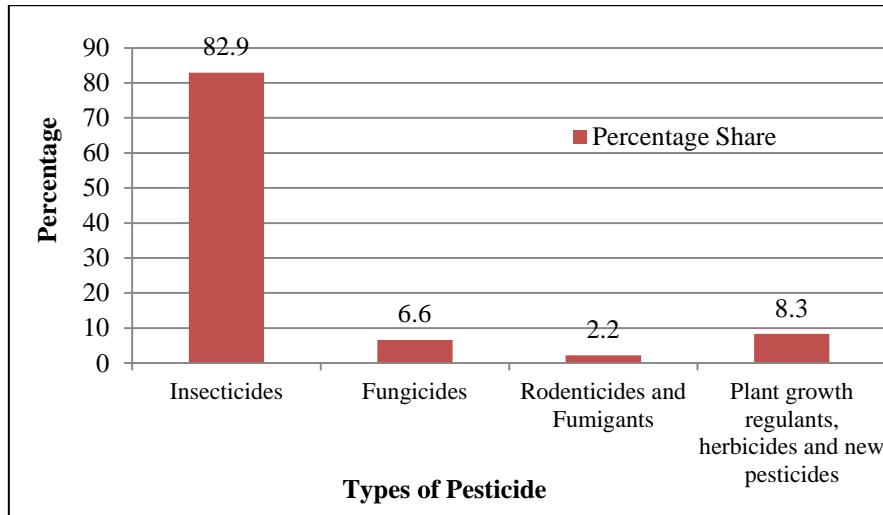
The vital source of pesticide contamination is from the farming sector. River runoff, rain and subsurface leaching carry the pesticide to the ocean. Floods transport substantial amount of silt to the open ocean and when it comes from rural land, the sediment carries a significant amount of adsorbed pesticides with it (Figure 6).

Insecticides share the most percentage among the pesticides which are carried in runoff. This is being followed by herbicides, fungicides and then rodenticides.

### ***Seawater Intrusion in Paddy Fields due to Failure of Embankments***

Agriculture is the dominant occupation in the state but it is dependent on monsoon rainfall as there is no facility of any surface water irrigation and the ground water too occurs very deep. Tides in combination with storm surges tend to intrude into the agrarian fields making it salty which ultimately become unsuitable for doing agriculture. Once a field is contaminated with salty water it takes a few rainstorm seasons to wash out the salt from the field in order to make the region appropriate to do the farming again (Kathiresan and Bingham, 2001).





Source: Ministry of Chemicals & Fertilizers, West Bengal

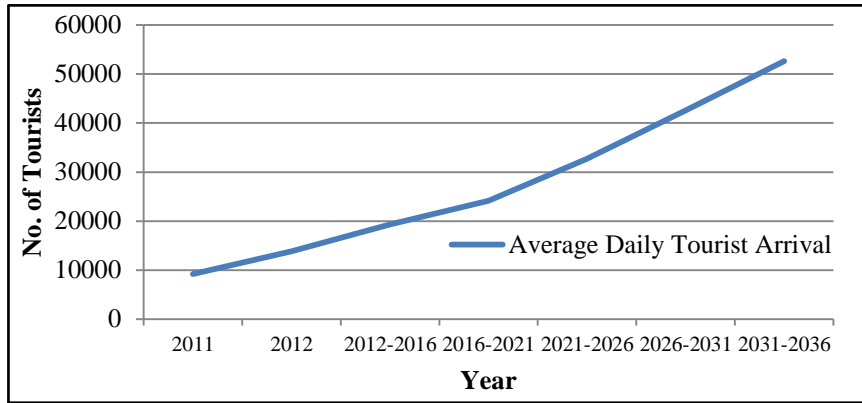
**Figure 6:** Percentage Share of Technical Grade Pesticides in India (2010)

### ***Tourism Related Problems***

Every year a large number of individuals as tourist are going to the Sundarban Tiger Reserve and other natural parks. Huge number of tourists regularly flocks to this moderately little territory and create an immense negative effect. They add to the contamination, waste, and increase the water needs of the nearby residents, putting neighbourhood foundation and territories under tremendous pressure. In numerous zones, enormous establishments for tourists have come up including airplane terminals, marinas, resorts, and others. Figure 7 demonstrates the developing pattern of the number of travellers in the Digha-Shankarpur range of Purba Medinipur region. In this manner the daily average footfall for the year 2011 is coming to be 9221 and the yearly data stands at 33.65 lakh. After 2011, the growth rate in the number of tourists have hovered around 10 percent. Consequently remembering this pattern only for this small region, there is a need to oversee the entire zone.

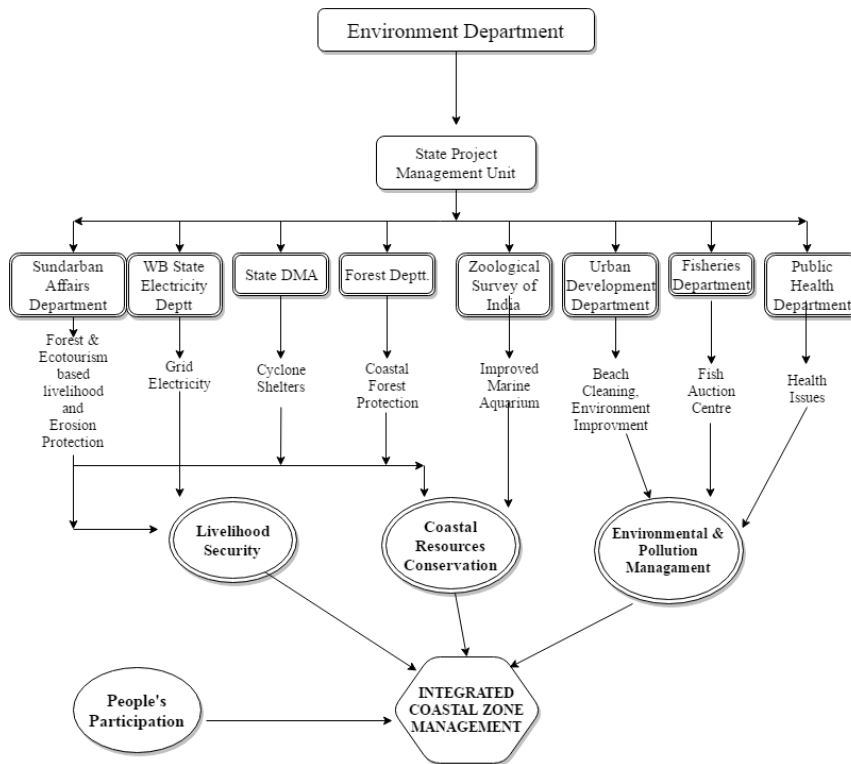
### ***People's perception on development***

There needs to have a coordination between different institutions (Figure 8) for bringing up a suitable plan for sustainable development. These organizations perform different responsibilities and functions under integrated coastal zone management. All the stakeholders' contribution including people's participation must form a substantial part of the upcoming Master Plan.



Source: Report by Beachfront Area Development Plan for Digha Shankarpur Area

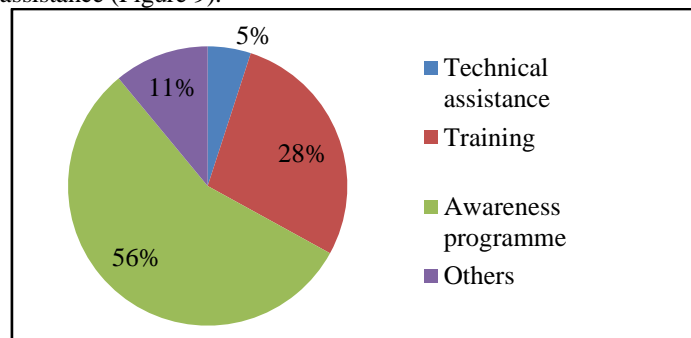
**Figure 7:** Projected Tourist Population for the Digha-Shankarpur Area (2010)



**Figure 8:** Institutional Arrangement

The flowchart shows the institutions visited by the researcher during the field visit. These institutions are connected to each other and holistically they work to conserve the environment, resource and livelihood security. Together with people's role, the whole process will come as Integrated Coastal Zone Management (ICZM).

According to the primary survey done in year 2015-16, most of the assistance by the institutions was being done through awareness programmes, as it is evident from the response taken from the local people of the coastal zone. As per the respondents, 56 percent of the aggregate work done by the authorities of the coastal area was towards making individuals aware about the different prevailing issues, 28 percent of help was in commitment towards training the local people and making them efficient in conserving the area and 5 percent are inclined towards the view of receiving technical assistance (Figure 9).



Source: Primary Survey

**Figure 9:** Assistance Programmes and Respondents (2015-16)

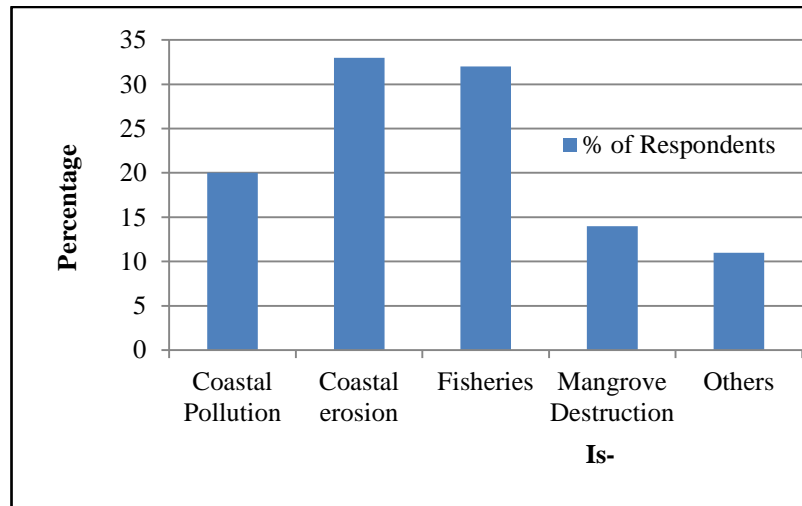
This highlights that the coastal authorities need to work really hard in order to achieve sustainable coastal development. It should broaden their part in the administrative planning. There is a need to expand the present facility which is there to mitigate any hazard, so that it becomes easier to handle these issues in future.

Furthermore it is very unfortunate to see that the role of local communities is not significant. This is evident from the fact that the vast majority of the nearby individuals are not made to believe that they form an important part of the system planning process. This is evident from the survey that just 13 percent of the total respondents feel that local individuals can be of any use to the planning process. This mindset is due to certain reasons. The most important among those is the level of awareness about the importance of coast conservation. 58 percent of the people who were interviewed gave us an insight that they were not even aware of the idea of ICZM. Indeed, even among the section of the people who were aware, more than one-third of the respondents among them were uninformed of CRZ (Coastal Regulation Zone) regulations.

Furthermore various programmes which were laid down by the government have not been planned in a way that local people individuals can take an interest in implementing them as their views were not taken into account initially, hence this

results in failure of the full implementation of the programmes. This is obvious from the way that, most of the general population 71.39 percent are uninformed of the projects propelled by the administration.

Maximum people are of the view (Figure 10) that Fisheries should be given the utmost priority. This might be the case because of commercialization of fisheries, and we have also seen that maximum land has been given for fishery.



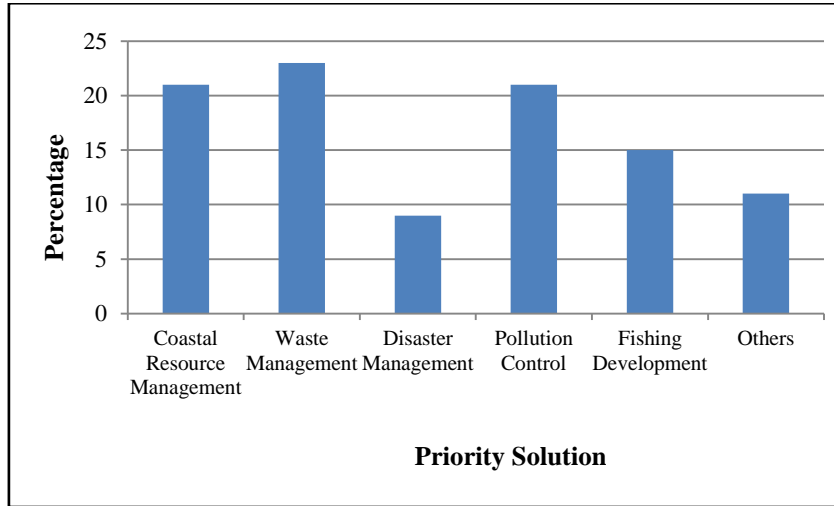
Source: Primary Survey

**Figure 10** People's Response on Issues to Prioritise (2015-16)

According to the survey conducted (Figure 11), Government's maximum focus was on dealing with waste management (23 per cent) followed by management of coastal resources (21 per cent) and pollution control (21 per cent). Now this is very evident that the fishing community is not satisfied with the govt. response in dealing with their issues, which received very less attention. For a holistic development government needs to satisfy all the stakeholders concerned.

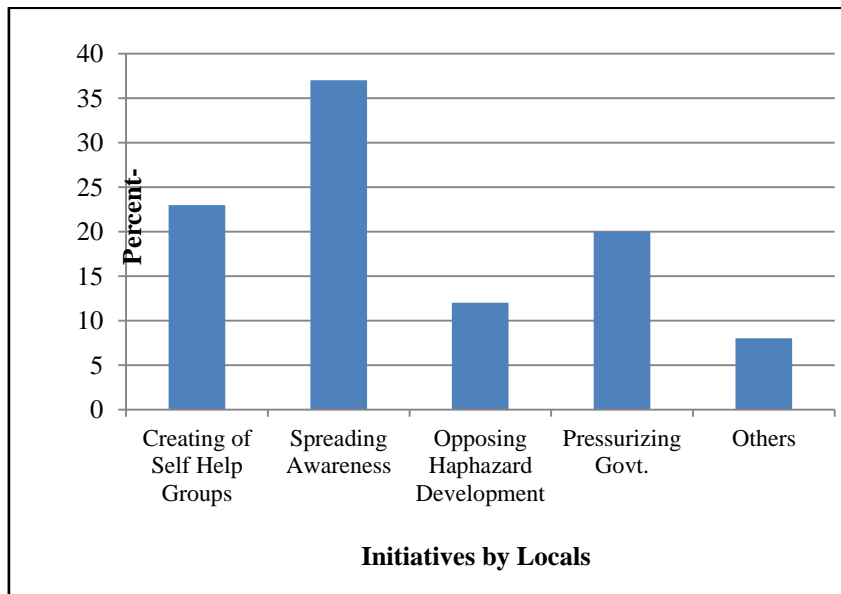
Whatever contribution have been made by the local people, is mainly in the form of spreading awareness about the coastal issues which are emerging in the coastal zone of West Bengal (Figure 12), followed by creating self help groups and pressurizing the government for saving their environment from the unregulated development.

The contribution of the neighbourhood bodies in the waterfront zone administration is likewise not exceptionally attractive. Nonetheless, 64 percent of the respondents of the aggregate admit that local bodies are contributing enough, however another dimension about the local contribution is recounting distinctive story which is antagonistic to insights. The job of the local bodies is just limited to spreading awareness and mobilizing youths to become sensitive towards the prevailing issues. In this manner it is obvious from above exchange that individuals' support in the beach front zone administration in West Bengal is not up to the mark.



Source: Primary Survey

**Figure 11** Sectors Receiving Maximum Attention (2015-16)



Source: Primary Survey

**Figure 12** Role of Local People in Coastal Zone Management (2015-16)

### ***Measures for the sustainable development of the region***

It is now observed that Government of India and the state of West Bengal have made a considerable measure of strides in directing and dealing with the seaside environment, consequently starting many projects for sustainable coastal development. Ministry of Environment and Forests might be the main division to co-ordinate all other coastal related department. A state-level coastal zone management committee group (CZMC) might be shaped with agents of all the concerned Departments/Agencies. Before bringing up Coastal Zone Management Plan in reality, major concerned Departments/Agencies ought to be flowed with a plan which needs to be worked upon right from the initial stage.

Extensive usage of non conventional energy helps in reaching conservation and developmental goals. Eco-tourism in the Sundarbans or Shankarpur or Sagar Marine Park, optimum use of fisheries as a resource, salty water aquaculture, use for coconut estates through individuals' support, utilization of renewable resources, utilization of mangrove fuel in degraded zones are few praiseworthy cases of different utilization of sustainable coastal assets. While making arrangements for setting up secured zones, public opinion must be sought from the local neighbourhoods and their inputs must be incorporated seriously else the implementation strategy may not come up satisfactorily.

Technical assets of the departments must be used in an optimum way in a manner which will permit their skill to play a full role and furthermore cover some degree to accomplish the common targets. The issue of Subarnarekha estuary in finding the solution for the erosion taking place in Digha will require support from the Odisha State Government. Issue of fresh water stream in the Hooghly river will require worldwide consent towards a common goal. Seaside administrative planning envisages a nature synchronous approach. This must underline the significance of natural evaluation and at later stages the Environmental Impact Assessment amid the development advancement and planning process. In this manner, Coastal Zone Management requires strong, multi-disciplinary methodologies and in addition multi-dimensional vision. Sustainable livelihood security in every one of its aspect like ecological, cultural, human prosperity, ethical and economic, as far as the well being and bliss for both human and nature ought to be the objectives of an enlightened Coastal Zone Management strategy. The usage of such a strategy will require suitable directions bolstered by powerful monitoring strategy and in addition training, public and political comprehension of dangers and advantages.

### **Conclusion**

Sustainable Development of West Bengal coast should be carried out in light of Integrated Coastal Zone Management (ICZM) which has now been perceived and utilized as a basic apparatus for formulating plans to ensure and develop coastal biological system and assets. Remembering this, the government need to find some suitable plan and prepare projects for each of the concerned block in order to have a go at ICZM. Then those project reports need to be integrated with the district project reports. The districts' project reports must be intended to incorporate points of inter-

est of the key segments of the project mirroring some key environmental, livelihood, developmental and governance issues along some chosen stretches of the shore. Basically the report ought to create execution plan of which can be executed at block level in order to deal with ICZM. Hence, there ought to be integration among the institutions and other sectors in asset management. Distinctive organizations ought to cooperate and assume a complementary role to each other. In this manner, an advanced view towards the nature is required, without trading off livelihood security of the nearby inhabitant of this fragile zone.

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