

Assessment of Yawri Bay Marine Protected Area Vulnerability to Climate Change in Sierra Leone

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Background to the Study

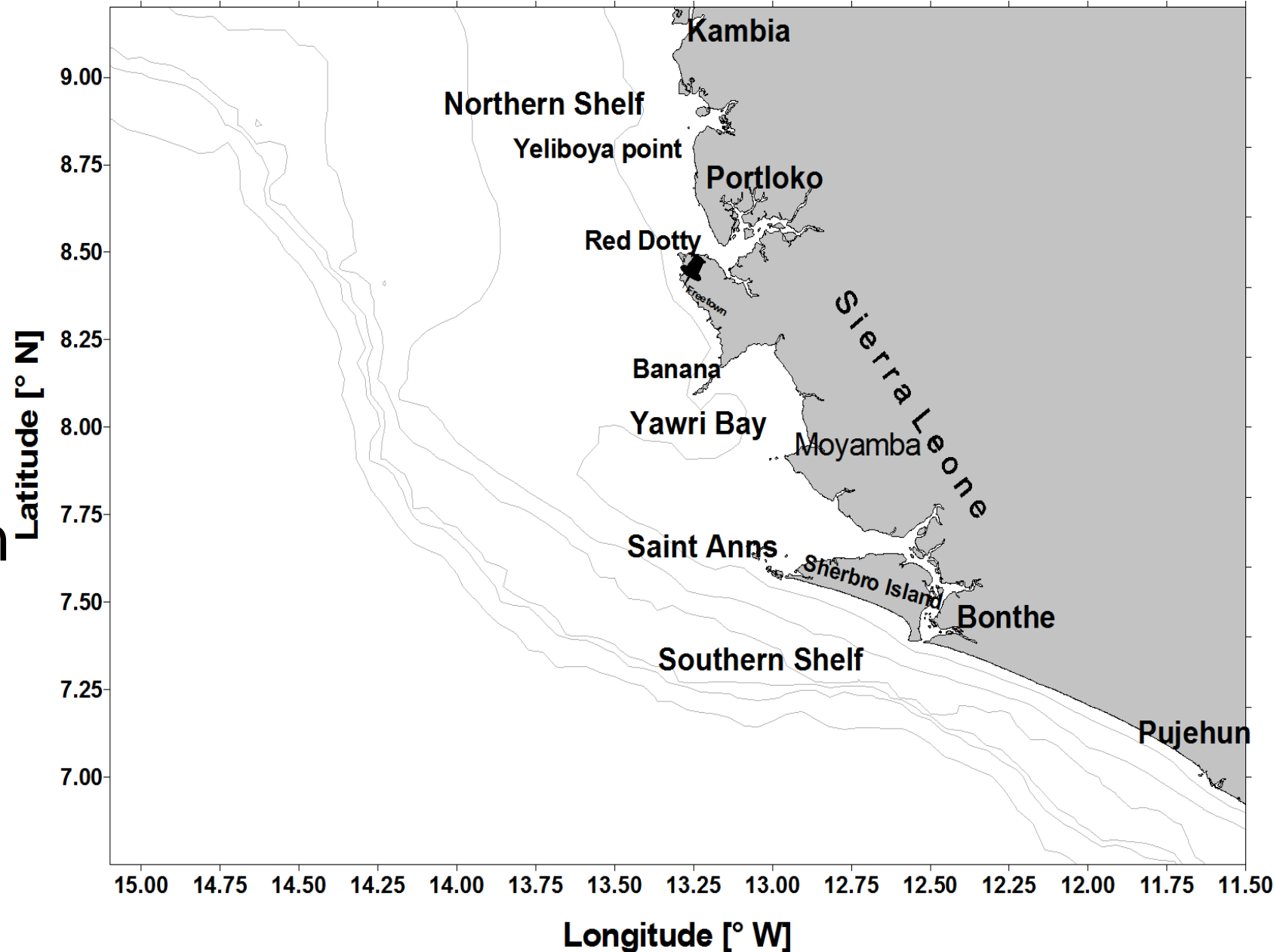
- Sierra Leone Capture Fisheries consist of industrial and artisanal sub-sectors. The industrial sub-sector is highly mechanised and vessels are mostly foreign owned – main source of income for Govt.

- Artisanal Sector is the main source of protein food for 80% of local population, fetching over 120,00mt/Yr



Major Fishing Grounds in Coastal Sierra Leone

- Major fishing Grounds are Within rivers and bays and offshore in the Northern and Southern Continental Shelf



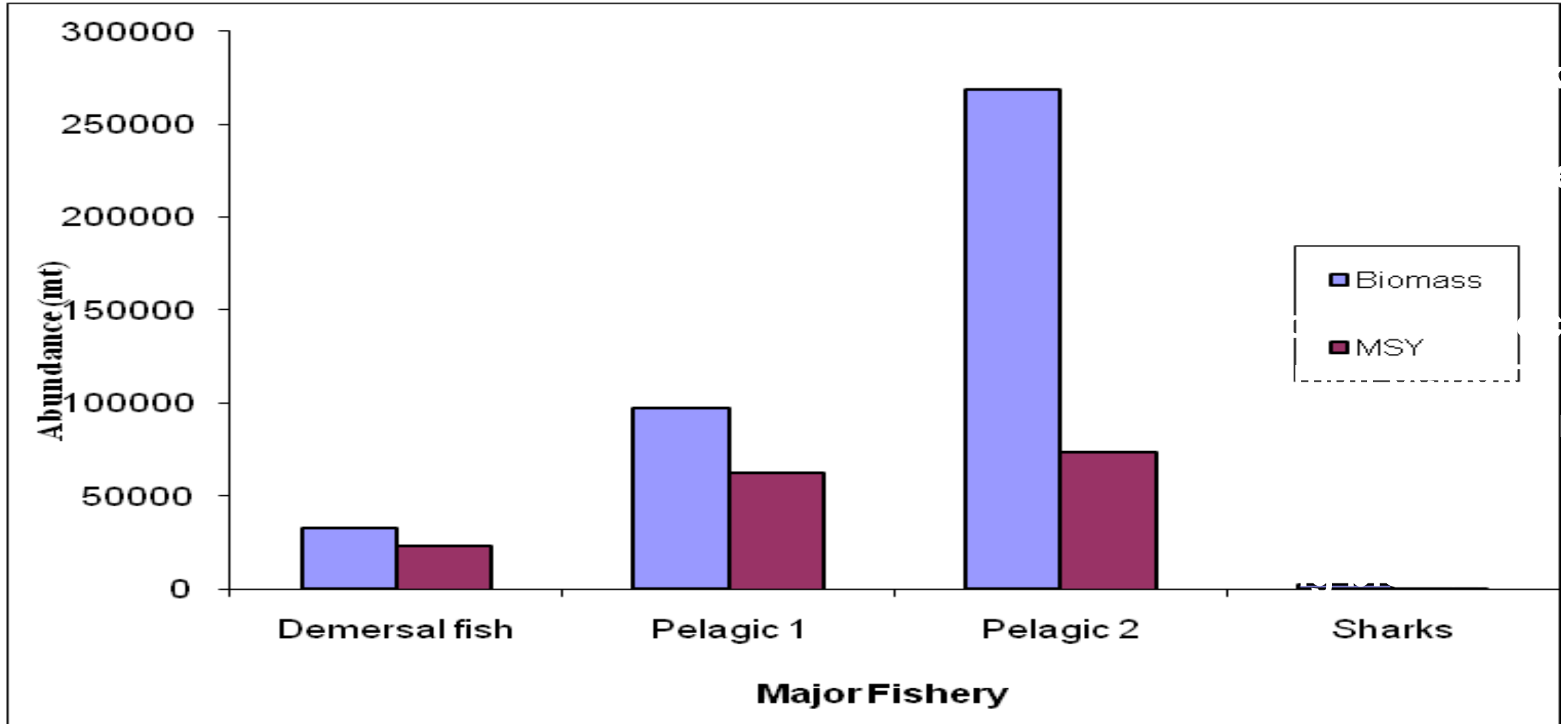
Background to the Study

- Overcapitalization from the open access fisheries regime and illegal destructive fishing in sensitive coastal communities, warranted the institution of territorial use rights in fisheries (TURF) through co-managed marine protected areas (MPA) in Sierra Leone
- The Yawri Bay MPA in Southern Sierra Leone is the first pilot MPA which has been performing progressively well. Community management associations (CMAs) have been constituted, where local authorities are controlling illegal fishing in their localities
- However, in recent times, coastal Erosions have inundated homes of fisherfolks who have been forced to quickly relocate to safer zones at heavy costs
- People living in the Yawri Bay community are heavily reliant on fisheries for income, food and employment, but they have low capacity to respond to adverse climatic impacts to protect livelihood elements and tenure rights.




Study objectives

- The main objective of this research is to evaluate the causes and impacts of climatic variation on fishing communities in and around the Yawri Bay, through vulnerability assessment and to identify challenges for the sustainability of MPA management initiatives including alternative livelihood supports
- We present details of the MPA establishment process and the challenges as lessons learnt. This will serve as safeguards that could be useful to other coastal artisanal fisheries elsewhere that are under the influence of climate change and desirous of instituting right based fisheries management

Why MPAs in Sierra Leone?-Some Fish Stocks Under Pressure



Why Marine Protected areas in Sierra Leone?

| Fish Stock | Status | |
|---|-----------------|--|
| Pseudotolithus elongatus (Bobo Croaker) | Overexploited |  A photograph of a Bobo Croaker (Pseudotolithus elongatus) fish, showing its elongated body, silvery scales, and prominent dorsal fin. |
| <i>Pseudotolithus spp</i> (Other Croakers) | Fully Exploited | |
| <i>Galeiodes decadactylus</i> (African Threadfin) | Overexploited |  A photograph of an African Threadfin (Galeiodes decadactylus) fish, characterized by its slender body, silvery scales, and long, thin dorsal fin. |
| <i>Arius spp</i> (Sea Catfish) | Fully Exploited |  A photograph of a Sea Catfish (Arius spp) fish, showing its characteristic whiskers, large head, and deep body. |

Why Marine Protected Areas?

| Fish Stock | Status |
|------------|--------|
|------------|--------|

Ethmalosa fimbriata
(Bonga Shad)

Overexploited



Cynoglossus spp
(Soles)

Overexploited






Pomadasyd spp
(Grunts)

Overexploited



....Some Fish Stocks at Risk.....

| Fish Stock | Status | |
|--|-----------------|---|
| Sparidae (Dentex and Sea Breams) | Fully Exploited |  |
| <i>Sardinella aurita</i> (Round Herring) | Fully Exploited |  |
| <i>Sardinella maderensis</i> (Flat Herring) | Overexploited |  |

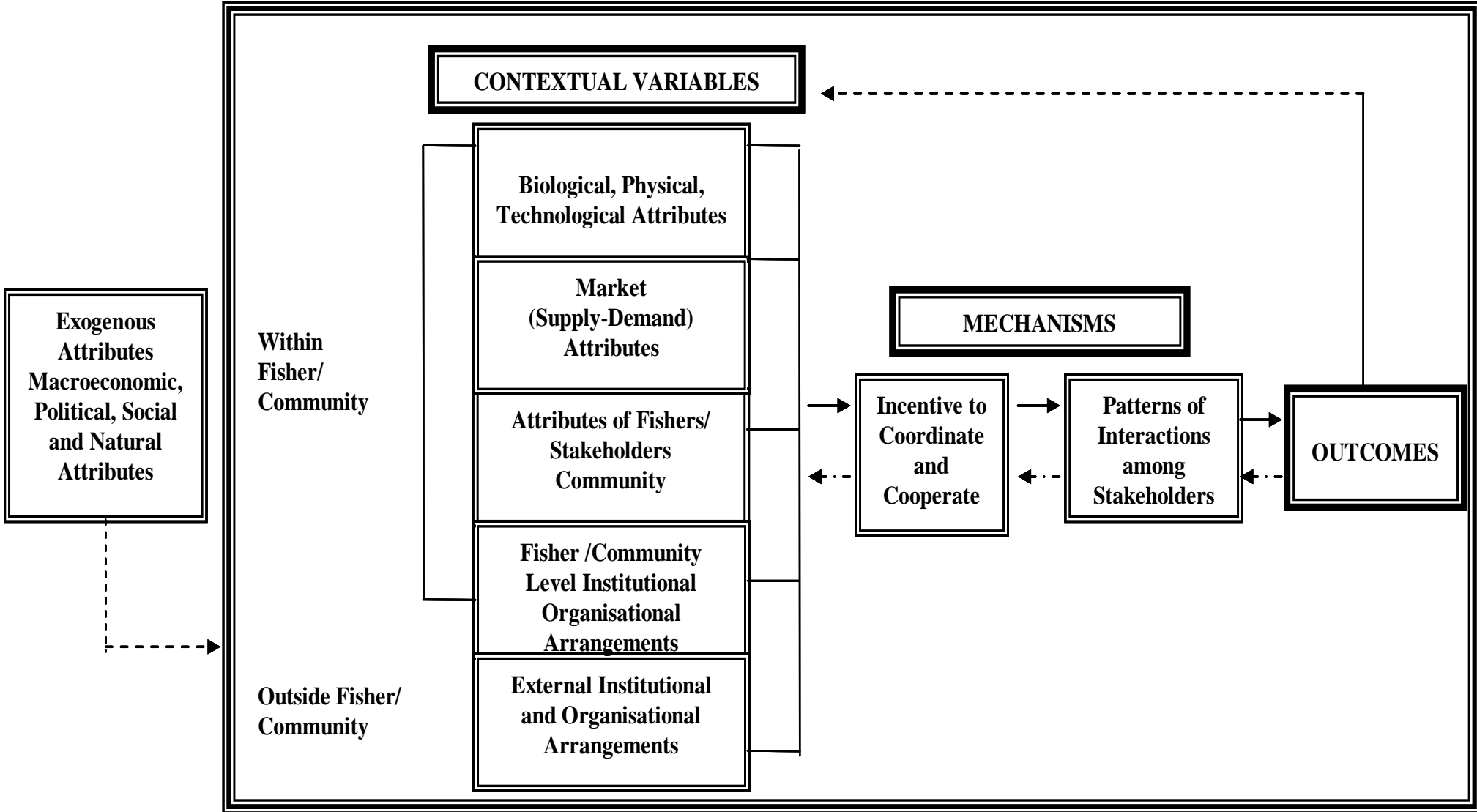
METHODOLOGY

- We consider MPA as an investment in stock rebuilding, where the opportunity cost is the value of the catch that would have been harvested without the MPA. In pursuing its purpose, we define MPA as an *institution* with “human prescription intended to organise and influence structured human interactions using rules, norms and knowledge systems”.
- We have followed a framework of common property adapted from Oakerson (1992) and Eleanor Ostrom *et al* (1994) in order to examine four key variables considered to be important for effective collective actions - namely:
- *The contextual variables* such as: **Biological, physical and technological attributes** (type of ecosystem; boundaries e.g. physical, administrative, restrictions to access; resource health, target resources; characteristics of exploited resources e.g. technology used, types of resources, seasonal variations and exogenous factors such as climate change. It is important that the context is emphasized and carefully considered because contextual misfit may render MPA not fit for purpose.
- Market, Socio-economic and External institutional and organizational attributes

METHODOLOGY.....

- Incentives to cooperate and coordinate
- Patterns of interaction among stakeholders
- Outcomes(Efficiency, equity and sustainability)
- Assessment of MPA establishment process: Stakeholder awareness raising, formation of community management associations (CMAs), Bye Law implementation, incentives for cooperation etc

Contextual Variables considered



Sampling and Questionnaire Administration

- The questionnaires were designed to accommodate contemporary queries of user perception on the qualitative variables
- The Yawri Bay in the Moyamba District of Southern Sierra Leone were surveyed in order to capture the socio-economic arrangements for the Southern Region Marine Protected Area establishment and management. A total of 198 questionnaires were administered using gate keepers (Key Opinion leaders) as respondents
- A sampling frame of 9 elements per coastal community with 25 fishing villages sampled which targeted key stakeholders in fishing communities located in and around the proposed MPAs. This frame comprised of the following stakeholders:
 - (i) *Fishers* (ii) *Fisher Organisations (SLAFU, SLAAFU)* (iii) *Harbour Master* (iv) *Master Fisherman* (v) *Councillors* (vi) *Headman* (vii) *Chiefs* (viii) *Youth Leaders* (ix) *Financiers*

Sampling Frame

- Neither random sampling of sample elements nor stratified method was employed for two reasons.
- First it was difficult to get the reliable sampling frame from which to draw a random sample. The second reason for not employing a random sampling method was that gatekeepers and fishing households were skewed towards few districts with varying weights
- The questionnaire module as rolled out on Contextual variables including Biological, physical and technological attributes, b) Market attributes, (c) Socio-economic and Cultural attributes of the coastal community (d) Institutional and organizational arrangement at community level, e) External Exogenous attributes including climate change
 - e) Incentives to cooperate and coordinate, f) Patterns of interaction among stakeholders and (g) Outcomes (Efficiency, equity and sustainability of MPA management arrangements).

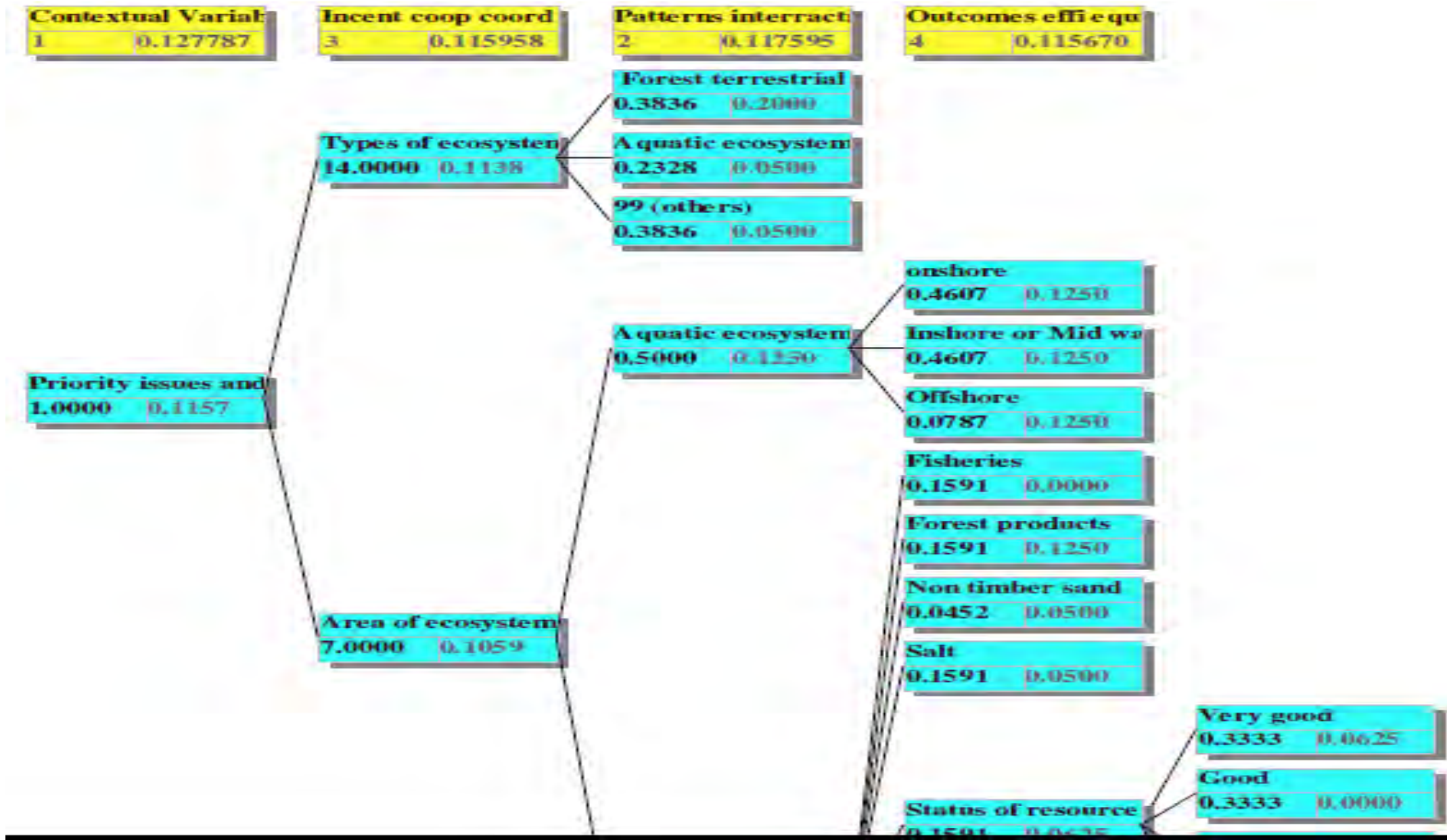
Assumptions for Data Collection

- We have made the following important assumptions:
- That the sampling was representative of the entire Yawri Bay Communities- However each region is differently endowed and fishing is skewed to a few Regions
- Sampling followed a stratified purposive non-probability sampling technique
- There will be willingness of respondents for questions
- MPAs are some form of savings and or investment

Data Analysis

- Realizing that most of the data collected is qualitative, and considering that most communities have multi stakeholders with different views captured on conceptual variables considered,
- A multi-criteria analysis using Intelligent support system (IDS) multi-criteria assessor was used to convert qualitative data into quantitative data in order to prioritize and rank the importance of the different judgements captured from the stakeholders
- This multi-criteria analysis procedure employed is based on evidential reasoning. Priority issues were identified based on reasoning and ranks. The ranks were based on assignment of weights that relies on an Analytical Hierarchy Process (AHP) embedded in the Intelligent Decision Support Multi Criteria Assessor (IDS) (See Saaty, T.L., (1977). A scaling method for priorities in hierarchical structures. *Journal of Mathematical Psychology* 15 (3), 234-281.
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Attributes and Alternatives for MPA establishment



Yawri Bay MPA Multi-Criteria Assessment Results

• Priority Issues for Institutional Arrangements

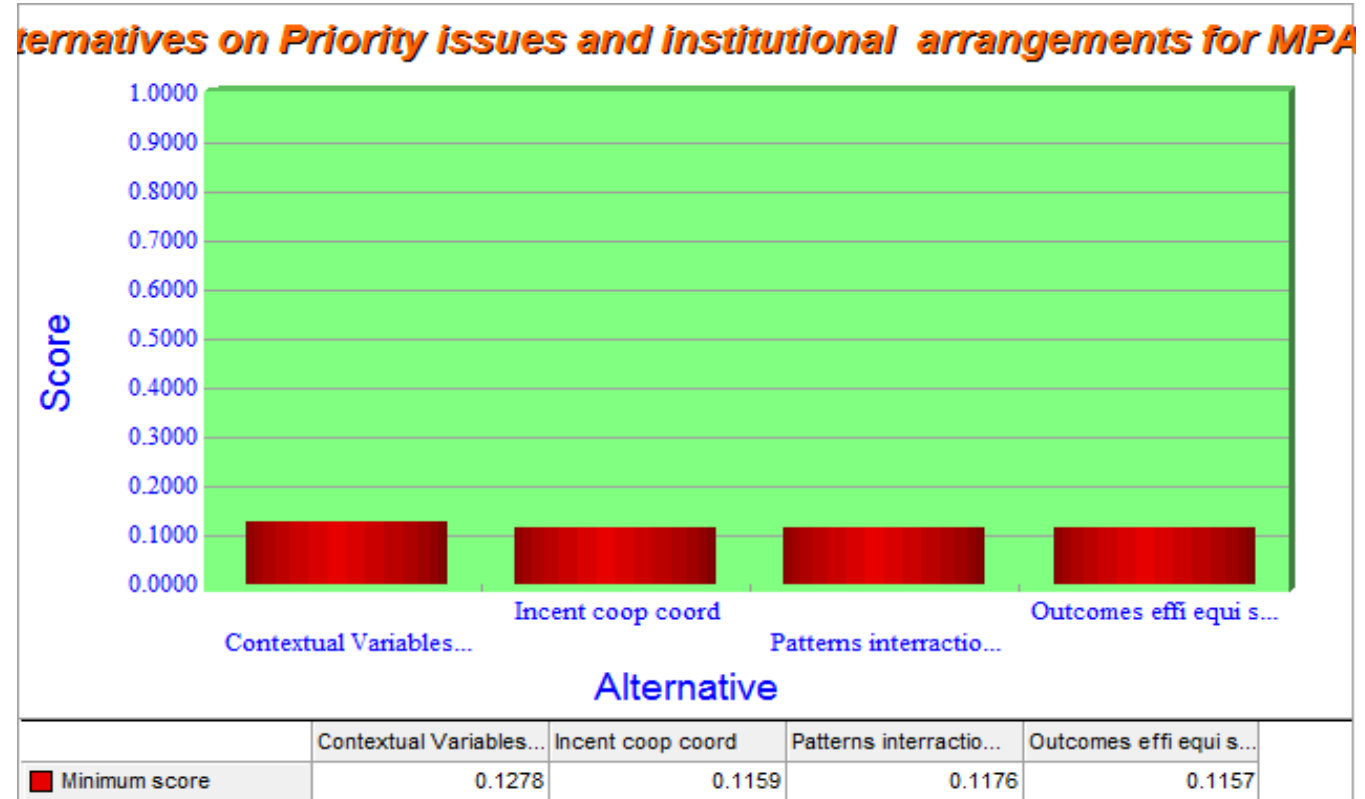
- Stakeholders interaction and incentives to cooperate

And Coordinate needs to be improved

- Efficiency and equity in stakeholder involvement in programme implementation are very low, < 0.5 . These are important alternatives that needs to be improved

- There is some level of stakeholder collaboration already in place for the Yawri Bay MPA institution

- **However, The contextual variables for institutional arrangement scored highest (0.1278) on the IDS scoring of alternatives against priority issues**

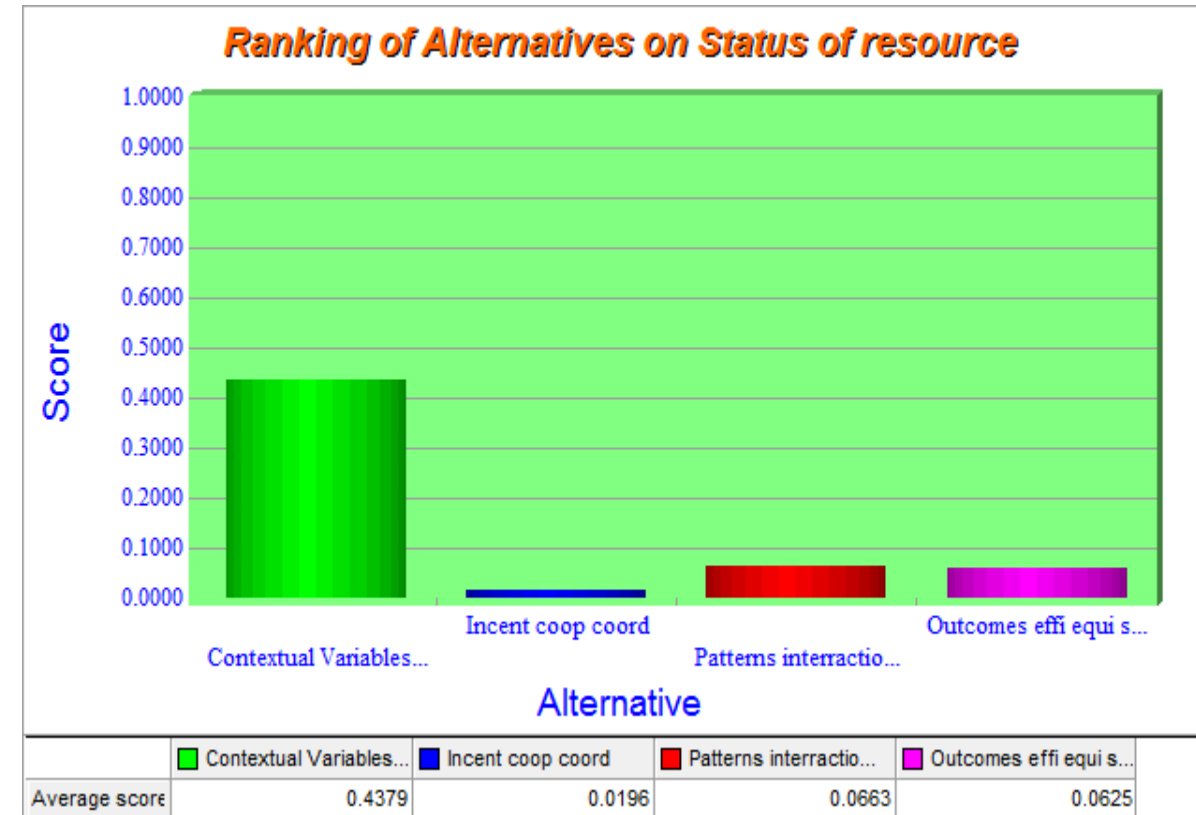


Contextual Variables being established

- These variables include: biological and physical attributes, market structures, socio-economic and cultural arrangements and the institutional framework of the communities are slowly been established in the Yawri Bay.
- This has been effected mainly by the intervention of non- governmental organizations such as Wetlands International, an environmental NGO that funded a pilot project for sustainable coastal zone management and the World Bank funded West Africa Regional Fisheries Programme (WARFP). Some alternative livelihoods scheme and fishing gear subsidy incentives for cooperation has improved awareness on MPA institution. Fishers have started controlling illegal fishing in their communities

Modeling of Alternatives on Resource Status

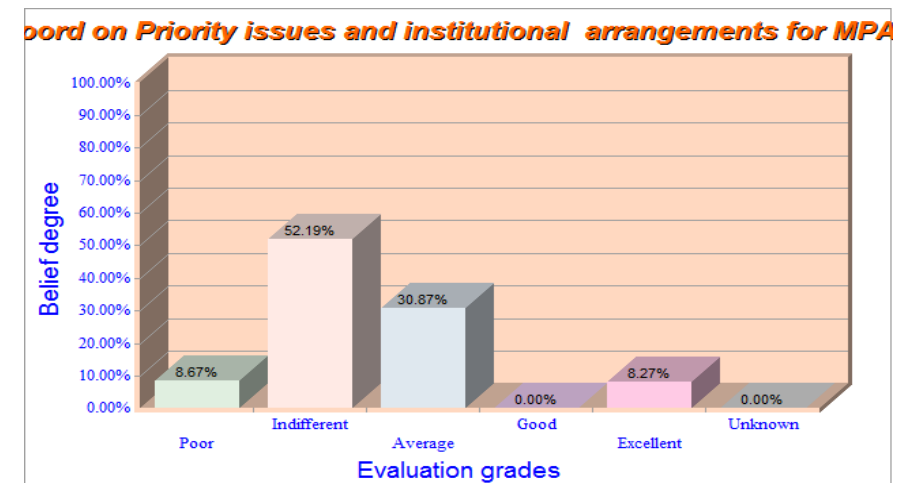
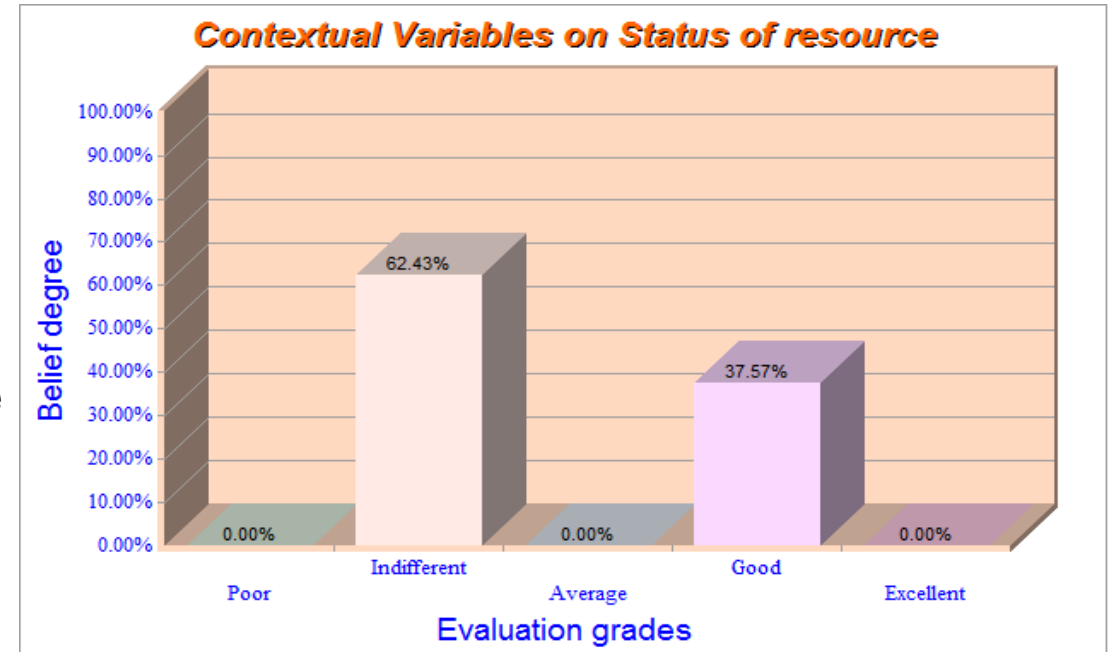
- Although there is an improving contextual variable, the awareness on exogenous factors is low, particularly coastal erosions which inundates fishing communities. With the loss of fishing input and livelihoods asset change.
- This has affected the incentives of resource users to cooperate. With fisheries management measures and the MPA and TURF Principles.



- Contextual variables rank highest on the status of the resource. This presents the case of a fairly good knowledge of the resource users on the status of the resource with some degree of stakeholder interaction.

Belief Degrees and evaluation Grades

- The high value of stakeholder indifference on the modeling of belief degrees on resource status is a concern and may be a deliberate incentive for the practice of illegal fishing practices
- When fisheries become indifferent in perceptions on resource management measures, the incentives to cooperate must be stepped up.
- It was very clear during the assessments that the re-use of previously abandoned illegal fishing gears (e.g monofilament nets.) suddenly returned when fishing communities experienced severe coastal erosions that makes them to lose their legal fishing inputs including fishing nets



What are the Key Priorities to Address

- The MPA establishment process did not Consider Climate change adaptation strategies
- The Issue of sustainable alternative livelihoods schemes is yet to be addressed
- It is urgent that climate change adaptation Program must be integrated with the MPA and TURF establishment process in order to ensure sustainable implementation of key management measures
- Capacity Building and awareness raising Must continue in order to minimize mangrove Cutting which further exposes communities to climate change



THANK YOU FOR YOUR ATTENTION