ABSTRACT:

<table>
<thead>
<tr>
<th>Goal</th>
<th>To improve and sustain the ecological, cultural, economic and social benefits, we derive from ocean resources.</th>
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<tr>
<td>Motivation</td>
<td>The opportunity to enjoy ocean’s plentiful bounty is very essential to our health and well being. However, there is insufficient amount of planning associated between the government and non-profit organizations who are working in this aspect. If we want our future generations to play in ocean and enjoy the comforts of healthy ocean life, we would have to change our current practices, laws, regulations, and community-government interactions. It’s necessary to alter the ways in which we handle the ocean resources, otherwise they would become extinct one day, and our future generation would be cursing us for that unlikely scenario. Hence, it’s necessary to implement a system that collaborates the activities of government organization, non-profit sectors and various other communities in preserving the ocean resources and help in its better management.</td>
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<td>Major Challenges</td>
<td>Completely remove the Sector-based approach that are currently associated in handling ocean resources. Management efforts are fragmented with many gaps and overlaps in implementation just because of this approach. Integration of efforts between the government and non-profit organizations that are working in preserving the ocean resources. Ocean-Zoning: - A concept considered as a means to guide human uses of the ocean, to optimize utilization of marine resources and also to provide protection of marine ecosystems.</td>
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DESCRIPTION OF DOMAIN:

The main domain of the system is “Natural Resources Conservation.” This is a very vast field, wherein all the small blocks of the society are trying to contribute their parts. As everything is sector-based, what happens is that there is no mutual coordination and integration among the various communities that are working together. Due to this lack of integration, we generally waste a large amount of resources on some unwanted purposes. Replenishment of natural resources is a big challenge and ocean resources are no exceptions. Hence, how do we conserve our available ocean resources, how to best utilize them, so that it helps the country financially and how to best
maintain them, so that they are in perfect synchronization with the environment, and we enjoy its soothing nature in future, are the key milestones to be considered, while developing this system. Thus, this forms the basis of domain of system. Soil erosion, waste management, ocean-ecosystem protection are some of the few domains to be considered, while designing this system. Working with integrity and co-ordination, forms the foundation of domains to be included in the system.

**BLOCK DIAGRAM:**

Fig 1.0 Block Diagram-Ocean Resource Management System

Ocean resource management system has various departments in it and the detailed requirements of each department have been mentioned below. All the different
departments inter-communicate with each other, and has to co-ordinate with each other, in order to achieve the final goal.

**DESCRIPTION OF THE PROGRAM THAT IS WANTED:**
The system should be able to satisfy the following high-level goals/functions:-

1. **INTEGRATE RELATIONSHIP BETWEEN LAND AND SEA.**
   - Water Quality Monitoring.
   - Protection of beaches and coastal communities from shore-line erosion and other natural hazards.
   - Maintenance and appropriate use of environmental infrastructure.

2. **PRESERVING THE OCEAN HERITAGE.**
   - Improve the quality of the ocean resources for traditional, commercial and recreational purposes.
   - Enhance public access and appropriate coastal dependent uses of shoreline.
   - Promote appropriate and responsible ocean recreation for tourists and residents.
   - Encourage Ocean Science and Technology, with safeguards for ocean resource protection.

3. **PROMOTING COLLABORATION.**
   - Permit integrated and place-based approaches to the management of the ocean resources.
   - Institutionalize integrated ocean resources management.

**DETAILED REQUIREMENTS:**

a) **Functional Requirements:-**

1. Reduce soil erosion emanating from upland forest ecosystems and conversation lands.
- Uprooting of plants, loss of native forest species, weeds and other manmade factors are mainly responsible for soil erosion that ends up in streams and eventually to ocean waters. The system needs to address this issue.

2. Reduce pollutant loads from residential, agricultural, and commercial land uses in priority watersheds.
   - Construction Activities expose soil, that can be washed into streams that lead to ocean water contamination, because of improper sediment control.
   - Agricultural activities near the beaches, involve the user of pesticides, insecticides that can enter the ocean water and make it hazardous for human beings.

3. Implementation of comprehensive and integrated shoreline policy.
   - This should address the impacts of chronic and episodic coastal hazards.
   - Site specific management techniques should be developed for the beaches, that allow the natural erosion to occur with minimum impact on the ocean resources.

4. Encourage appropriate coastal-dependent development, that reduces a number of risks from coastal erosion and other hazards in priority coastal areas.
   - Coastal hazard assessment should be carried out, in order to incorporate future uncertainties and imponderables, like faster rates of erosion, high-level of flooding etc.

5. Inspect and maintain sewer collection systems, including the detection of leaks.
   - Upgrade and maintain the sewage system to minimize impact during flood conditions.

6. Reduce illegal storm-water discharges to the wastewater system.
   - Conduct public education campaign explaining the impacts of illegal storm water discharges.
   - Develop new rules and regulations establishing penalties for non-compliance.

7. Minimize the introduction and spread of marine alien and invasive species.
   - Develop risk based approach, to identify species and areas with highest potential for economic damage.
8. Establish wastewater-discharge restricted zones and conditions for commercial vessels plying in archipelagic waters.
   - Enforce laws on waste-waster discharge, with a close monitoring and enforcement plan.

9. Provide appropriate waste management infrastructure and facilities to support commercial and recreational marine facilities.
   - Provide temporary pump-out facilities.
   - Provide adequate solid waste management activities.
   - Increase frequency of inspection of marine sanitation devices.

10. Strengthen and expand marine protected area management.
    - Develop place based marine protected area plans for priority areas.
    - Identify limits of acceptable change.

11. Develop ecosystem-based approaches for near-shore fisheries management practices.
    - Identify, protect and restore fish habitat for near shore fish stocks.

12. Establish and institutionalize new approaches for restoring, operating and preserving ancient coastal fishponds and salt ponds.
    - Provide support and incentives to the communities and individuals to facilitate restoration process.

13. Improve enforcement capacity and voluntary compliance with existing rules and regulations for ocean resource protection.
    - Conduct education/research campaigns, community-based partnerships to judge ocean resource management issues.

14. Enhance the conservation of marine protected species, unique habitats and biological diversity.
    - Develop educational materials that are responsible for providing awareness to the people, and support the efforts to improve the marine water quality.

15. Enhance and restore existing public shoreline areas and scenic vistas.
    - Develop enhancement and restoration plans for the purpose stated above.
- Develop inter-agency agreements.
- Provide funding.

16. Establish new shorelines area for public and appropriate coastal dependent uses.
   - Establish criteria for identifying priority coastal areas for public acquisition.

17. Develop community-based frameworks and practices for identifying and mitigating ocean recreational use conflicts.
   - Work with existing/new advisory groups to develop tool for resource protection and conflict management.

18. Promote responsible and sustainable ocean-based tourism.
    - Establish performance standards to ensure responsible commercial ocean-based tourism.

19. Promote alternative ocean energy sources.
    - Conduct the analysis of the impact of non-ocean energy resources on ocean.

20. Plan and develop sustainable commercial aquaculture in coastal areas and ocean water.
    - Establish a database to locate coastal and ocean aquaculture projects in environmentally suitable sites.

21. Expand ocean science and technology.
    - Facilitate appropriate research and innovation in marine technologies.

22. Develop standardized tools for Ocean Resource Management.
    - Investigate how limit of Acceptable change, can be used in resource management.

23. Develop legislative and administrative proposals to improve management of ocean resources.

24. Build the required capacity for community participation for preserving the ocean resources.

    - Establish public advisory group, in order to help the above group for assessment.

b) Non-functional Requirements:
1. Lifetime
   - When is the present project supposed to get completed?
   - After how many years, should the project be reviewed again for any changes?

2. Cost.
   - What is the estimated cost behind the project?

3. Reconfigurable.
   - Can the project change, as per environmental/human requirement changes?

4. Scalability.
   - Can we add a new functionality to project, without disturbing its original implementation?

5. Robustness.
   - Is the project versatile enough to provide support for all the beaches in country?

USE CASE AND USER CONTEXT:

USE CASE DESCRIPTION:

Case 1:

Use Case Name: Improve coastal water quality.

Use Case Description:

For improving the coastal water quality, different departments of this system must concentrate on reducing land-based sources of pollution and restoring natural habitats.

Actors:

➢ Tourists
➢ Fishermen
➢ Exporters/Importers
➢ Residents

Case 2:

Use Case Name: Protecting ocean resources from coastal hazards

Use Case Description:
Develop a comprehensive and integrated shoreline policy and guideline for the coastal hazards, which addresses the impacts of chronic and episodic coastal dangers. Also, develop shoreline management plan, with specific measure of erosion and other coastal areas.

**Actors:**
- Residents
- Researchers
- Ecosystem protector

**Case 3:**

**Use Case Name:** Maintain environmental infrastructure.

**Use Case Description:**
Maintain sewer collection systems, by including the detection of leaks, which also reduce illegal storm-water discharges to the waste water system. Also, improve and ensure maintenance and appropriate use of environmental infrastructure.

**Actors:**
- Echo system protectors
- Residents
- Researchers
- Tourists

**Case 4:**

**Use Case Name:** Reduce marine sources of pollution.

**Use Case Description:**
Establish wastewater discharge restricted zones and conditions for commercial vessels plying in archipelagic waters. Also, provide appropriate waste management infrastructures to support commercial and recreational marine facilities.

**Actors:**
- Fishermen
- Residents
- Tourists
Case 5:

Use Case Name: Improve health of coastal and ocean resources.

Use Case Description:

Develop ecosystem based approaches for fisheries management and also establish and institutionalize approaches for restoring, operating and preserving ancient coastal fishponds and salt ponds. Enhance the conservation of marine protected species, unique habitats and biological diversity.

Actors:
- Resident
- Ecosystem protectors
- Exporters/Importers

Case 6:

Use Case Name: Enhancing public access.

Use Case Description:

Enhance and restore existing public shoreline areas and scenic vistas. Also establish new shoreline areas for public and appropriate coastal dependent uses.

Actors:
- Residents
- Tourists

Case 7:

Use Case Name: Preserve Ocean resources.

Use Case Description:

Encourage cutting edge and appropriate ocean science and technology measures with safeguards for ocean resource protection.

Actors:
- Researchers
- Fishermen
- Residents
Case 8:

**Use Case Name:** Manage ocean resources.

**Use Case Description:**
Apply integrated and place based approaches to the management of ocean resources. Develop standardized tools and build additional capacity for community participation in ocean resources management.

**Actors:**
- Fishermen
- Exporters/Importers

Case 9:

**Use Case Name:** Integrate the beaches and surrounded area.

**Use Case Description:**
Maintain the beaches for the tourism and also provide the different kinds of facilities for the tourists.

**Actors:**
- Tourists
- Residents

Case 10:

**Use Case Name:** Create awareness.

**Use Case Description:**
Local residents need to be educated, so that they understand the importance of Ocean Resources. Slideshows, seminars, workshops must be organized by the native education and research centers, and non-profit organizations to help people realize the essentials of ocean resources.

**Actors:**
- Residents
- Fishermen
- Researchers
>

Tourists

REFERENCES:

1. http://coastalmanagement.noaa.gov/

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