

Draft TOR

Terms of Reference for the Project on Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman

Ministry of Foreign Affairs
Members of the
Steering Committee on Marine Environment
Conservation, Sultanate of Oman
and
Japan International Cooperation Agency

November 2015

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Abbreviations and acronyms

CBD	Convention on Biological Diversity
DGAFA	Directorate General of Administrative and Financial Affairs
DGCA	Directorate General of Climate Affairs
DGEA	Directorate General of Environmental Affairs
DGNC	Directorate General of Nature Conservation
EBSA	Ecologically and Biologically Significant Areas
EEZ	Exclusive Economic Zone
EICD	Environmental Inspection and Control Department
FP	Focal Point
GCC	Gulf Cooperation Council
ITD	Information Technology Department
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JICA	Japan International Cooperation Agency
MAFW	Ministry of Agriculture and Fisheries Wealth
MECA	Ministry of Environment & Climate Affairs
MECD	Marine Environment Conservation Department
MOFA	Ministry of Foreign Affairs
MOT	Ministry of Tourism
MOTC	Ministry of Transport and Communications
MPAs	Marine Protected Areas
MRMWR	Ministry of Regional Municipalities and Water Resources
MSFC	Marine Science & Fisheries Center
NC	National Committee
ODA	Official Development Assistance
QEIC	Qurm (Mangrove) Environment Information Center
QNR	Qurm Natural Reserve
ROPME	Regional Organization for the Protection of the Marine Environment
SC	Steering Committee
SQU	Sultan Qaboos University
SST	Sea Surface Temperature
TC	Inter-Ministerial Technical Committee
TOR	Terms of Reference
WG	Working Group

1. Background

Since the early years, the Omani environment drew His Majesty's attention and care, who advised to conserve and maintain its resources as a natural important evolving heritage to be utilized for the development plans and projects (MECA website). The Ministry of Environment and Climate Affairs (MECA) was established in 2007, which is a manifestation of the importance of environment placed by His Majesty as well as the Omani society at large. In particular, marine environment of Oman is unique because of its diversity and abundance of nature as the habitat and ecosystem of the meeting place of the three oceans, namely, Arabian Gulf, Sea of Oman and Arabian Sea. In addition, the marine environment of Arabian Sea off Omani shore is believed to influence the African East Coast, particularly in winter, which makes its conservation even more important.

In 2013, Japan's Prime Minister Shinzo Abe announced JICA's new scheme of technical cooperation targeted at graduates of ODA recipient status, particularly with the Gulf Cooperation Council (GCC) countries including the Sultanate of Oman. The Japan International Cooperation Agency (JICA), which is an arm of the Government of Japan in charge of international cooperation, has a long history of collaborating with Oman in the field of environmental conservation in support of MECA's efforts for environmental conservation, particularly in the field of mangrove conservation. Thus, cooperation in the field of marine environmental conservation has been identified as a strong candidate for that new technical cooperation scheme, based on the history of cooperation between Oman and Japan in that field. In particular, since Oman is in the process of developing long-term strategies in all sectors in line with the Oman Vision 2050, sustainability of the marine environment and sustainable use of ecosystem services are important challenges during the next several decades. Based on the above, a bilateral cooperation between Oman and Japan for the development of a long-term strategy for marine environment conservation has been proposed. In the meantime, MECA has taken an initiative to establish a Steering Committee of the coordination of the project (SC), comprising of 3 Ministries and academic institutions¹ concerned with the preparation of the this Terms of Reference, including financial proposal. MECA chairs the SC and undertakes coordinating roles of the SC. SC will be dissolved after the this TOR and financial proposal is approved by the cabinet council.

¹ Ministry of Environment and Climate Affairs, Ministry of Agriculture and Fishery Wealth, Ministry of Tourism, Sultan Qaboos University.

The present document provides the terms of reference (TOR) for collaboration between the Ministry of Foreign Affairs (MOFA), SC coordinated by MECA and JICA for development of the Marine Environment Conservation Strategy 2050 ('the Strategy') and its Action Plans.

2. The Overall Scope and Justifications for the Cooperation

This project is aimed at contributing to address **economic diversification**, **financial sustainability** and **sustainable resource use** in the marine environment of Oman under **Vision 2050**. Scientifically sound management is one of the key issues in sustainable use of natural resources, and the ecological condition of the marine environment is crucial for ensuring sustainable income of the nation, particularly from fisheries and tourism sectors. Developing an appropriate conservation strategy and action plan for the use of marine resources also supports multilateral environmental commitment such as the **Aichi Biodiversity Targets** (e.g. Targets 6, 7, 10 and 11) of the Convention on Biological Diversity (CBD). To this end, it seems to be ideal to develop a marine conservation plan by MECA, containing sustainable fishing managed by the Ministry of Agriculture and Fisheries Wealth (MAFW) and eco-tourism activities implemented by the Ministry of Tourism (MOT).

The Marine Environment Conservation Strategy comprises of a vast area of work, which requires inter-Ministerial and multidisciplinary cooperation involving other closely related Ministries as well as the academic sectors, represented by the National Committee (NC).

With respect to the reporting process of the Project, MOFA is proposed to play the liaison roles between the Cabinet Supervisory Committee. While implementation body is MECA, the Inter-Ministerial Technical Committee (TC), consists of 10 ministries and academic institutions² chaired by MECA, is formed to implement the project in cooperation with JICA (International Partner). This is depicted in Figure 1 below.

² Ministry of Environment and Climate Affairs (MECA), Sultan Qaboos University(SQU), Ministry of Agriculture and Fishery Wealth(MAFW), Ministry of Tourism(MOT), Ministry of Transportation and Communication, Supreme Council for Planning, Ministry of Regional Municipalities and Water Resources, Ministry of Legal Affairs, Ministry of Housing, Ministry of Culture and Heritage and other organizations concerned.

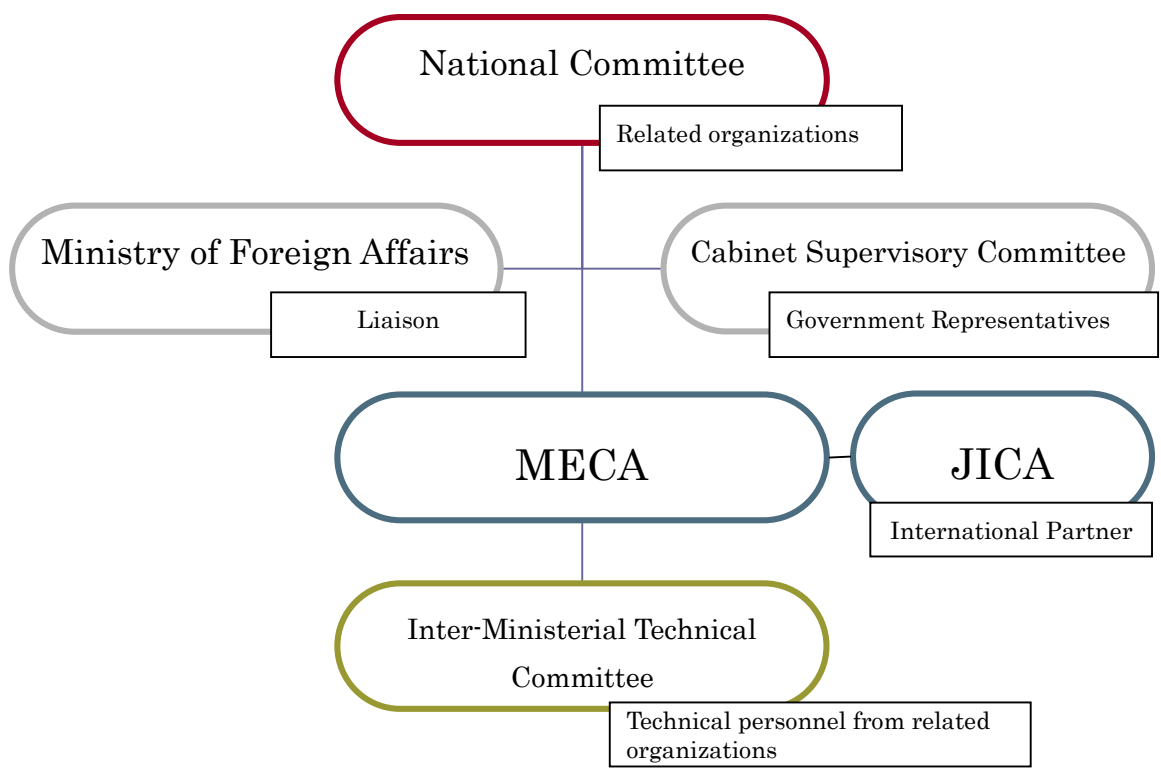


Figure 1 Reporting Process Structure

The overall scope of the substantive content of the Strategy is shown in the Figure 2 below. As the Figure 2 shows, some parts of the Strategy are being developed by several different Departments of MECA with their own resources.

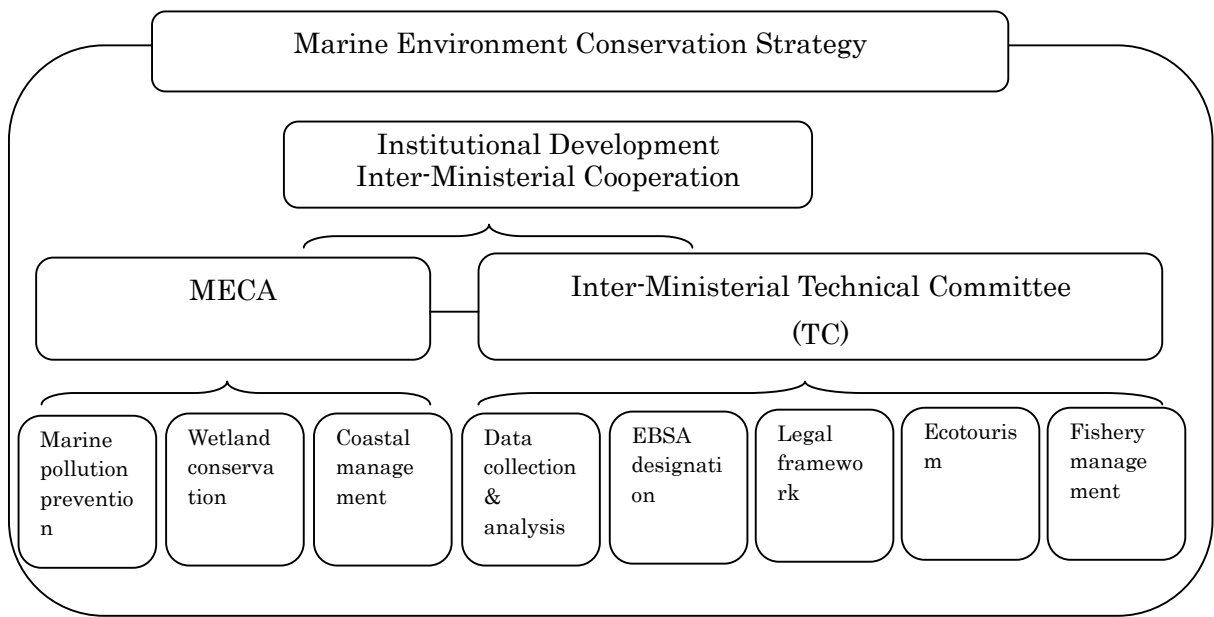


Figure 2 Substantive Scope of the Strategy

As the Figure 2 above shows, the MECA-TC comprises the key segments of the Marine Environment Conservation Strategy, which may be characterized as follows:

1) **Integration of marine environmental conservation and economic development**

Marine environment conservation in Oman is one of the most important tasks of the country, not only from the ecological point of view but also from **economic and industrial development perspectives**. Development of sustainable fishery and ecotourism, harmonizing human activity and nature conservation, is important for overall economic development of Oman. Thus, it is not an overstatement to indicate that a long-term strategy to ensure sustainable use of marine resources for the future of the fisheries and tourism sector of Oman.

2) **Promotion of job opportunity**

The proposed project aims at developing environmentally friendly sustainable fishing and eco-tourism strategy and as a result, generation of job opportunity is expected.

3) **Fulfilment of Oman's international Commitment**

As a Party to the Convention on Biodiversity (CBD), Oman has a duty to designate 10% of the coastal and marine areas as Marine Protected Areas (MPAs). The activity under the proposed Project, which is part of the Marine Environment Conservation Strategy is indispensable in order for Oman to achieve the Aichi Target 11 and fulfils its important international commitment. Aichi Target 11³ of the CBD and the definition of an MPA is introduced in the Box 1 and Box 2, respectively.

³ By 2020, at least 10% of coastal and marine areas are conserved through effectively and equitably managed.

Box 1. Aichi Target 11 of the Convention on Biodiversity

Aichi Target 11 of CBD

By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Box 2. Definition of Marine and coastal Protected Area

"Marine and coastal protected area means any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings. "

"Areas within the marine environment include permanent shallow marine waters; sea bays; straits; lagoons; estuaries; subtidal aquatic beds (kelp beds, seagrass beds; tropical marine meadows); coral reefs; intertidal muds; sand or salt flats and marshes; deep-water coral reefs; deep-water vents; and open ocean habitats."

(by the Ad Hoc Technical Expert Group in CBD COP7)

Table 1 shows the management categories of a protected area by IUCN, which are utilized as categorization of a protected area.

Table 1 IUCN Protected Area Management Categories

Category of protected areas		Main objectives of managing areas
Ia	Strict nature reserve	Strict protection (mainly for scientific research)
Ib	Wilderness area	Strict protection (mainly for preservation of
II	National park	Ecosystem conservation and protection
III	Natural monument or feature	Conservation of natural features
IV	Habitat and species management area	Conservation through active management
V	Protected landscape and seascape	Landscape and seascape conservation and
VI	Protected Area with sustainable use of natural resources	Sustainable use of natural resources

* “Protected Area” in this table refers to both land and marine areas.

Reference: Dudley ed. (2008) Guidelines for Applying Protected Area Management Categories

4) Human resources, institutional and legal systems development for implementation of the Strategy

Due to the nature of the Marine Environment Conservation Strategy, its development as well as implementation requires inter-ministerial and multidisciplinary cooperation, which is coordinated by the NC. As such, capacity development in human resources, institutional and legal systems are expected to benefit from collaboration between Oman and JICA, which has an extensive international experience in these areas.

3. Outline of the Project

In this document, the scope for MECA-TC-JICA cooperation within the overall Marine Environment Conservation Strategy and its Action Plan development, which is planned as a 5-year collaborative project, is referred to as ‘the Project’. The following shows the hierarchy of objectives for the Project.

3.1 Title of the Project

Development of Marine Environment Conservation Strategy and Action Plans

3.2 Project Purpose

To develop a Marine Environment Conservation Strategy and Action Plans through institutional collaboration of multiple stakeholders coordinated by the Inter-Ministerial Technical Committee (TC).

3.3 Project Duration

Five years from 2016

3.4 Implementing Agency and Committee

Ministry of Environment and Climate Affairs (MECA), Chair of the TC

Inter-Ministerial Technical Committee (TC)

Ministry of Environment and Climate Affairs (MECA), Sultan Qaboos University(SQU), Ministry of Agriculture and Fishery Wealth(MAFW), Ministry of Tourism(MOT), Ministry of Transportation and Communication, Supreme Council for Planning, Ministry of Regional Municipalities and Water Resources, Ministry of legal affairs, Ministry of Housing, Ministry of Culture and Heritage and other organizations concerned.

3.5 Target Year of the Master Plan and the Action Plan

Mid-term Target 2020 (Aichi Biodiversity Targets) and Long-term Target 2050 (Oman Vision 2050)

3.6 Funding Source

Cost-sharing between the Governments of Oman and Japan

3.7 Proposed project budget for 5 years

(JICA covers 50% of Project budget allocation)

6,440,000 Oman Riel

Oman Government	3,220,000 OMR	(8,333,000 US\$)
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JICA	3,220,000 OMR	(8,333,000 US\$)
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(Exchange rate 1 OMR=2.588US\$)

3.8 Expected Role of JICA

- Overall technical supervision of the project with MECA
- Support facilitation of the interagency collaboration through the TC
- Dispatch of Japanese experts to meet specific technical needs of Oman
- Financial contribution in kind

4. Project Approach

Establishment of marine protected areas (MPAs) and its effective utilization is one of the practical methods of promoting sustainable use of marine resources. The importance of MPAs is widely recognized, but data collection is a resource demanding process, and available data are often limited. In this circumstance, the procedure of identifying representative networks of MPAs defined in the CBD such as shown in the following figure is used in this project (UNEP/CBD/COP/DEC/IX/20).

Figure 3 Four Initial Steps to Identify Representative Networks of MPAs
(UNEP/CBD/COP/DEC/IX/20)

Step 1	Step 2	Step 3	Step 4
Scientific identification of ecologically or biologically significant areas (EBSAs)	Develop/choose a biogeographic, habitat, and/or community classification system.	Drawing upon steps 1 and 2, iteratively use qualitative and/or quantitative techniques to identify sites to be included.	Assess the adequacy and viability of the selected sites.
Use the best scientific information available for scientific screening.	Key ecological features in the target area – at least separate two realms of pelagic and benthic.	Consideration of ecological importance or vulnerability, and address the requirements of ecological coherence through representativity, connectivity, and replication	Consideration of size, shape, boundaries, buffering, and appropriateness of the site-management regime.
<u>EBSA Criteria</u> (1) Uniqueness or Rarity, (2) Special importance for life history stages of species, (3) Importance for threatened, endangered or declining species and/or habitats, (4) Vulnerability, Fragility, Sensitivity, or Slow recovery, (5) Biological Productivity, (6) Biological Diversity, and (7) Naturalness	<u>This Project:</u> It is envisaged that the pelagic realm is focused in the project.	<u>MPA Criteria</u> 1. Areas will benefit from more proactive and comprehensive management. 2. Areas will provide important components for a representative network of MPAs. 3. Areas are identified as being subject to higher levels of human pressures and related threats.	<u>This Project: Pilot Activity</u> Eco-tourism (MOT) and sustainable fishing (MAFW) are examined as pilot in candidate MPAs, and lessons learned be reflected in the Marine Environment Conservation Strategy and Action Plan.

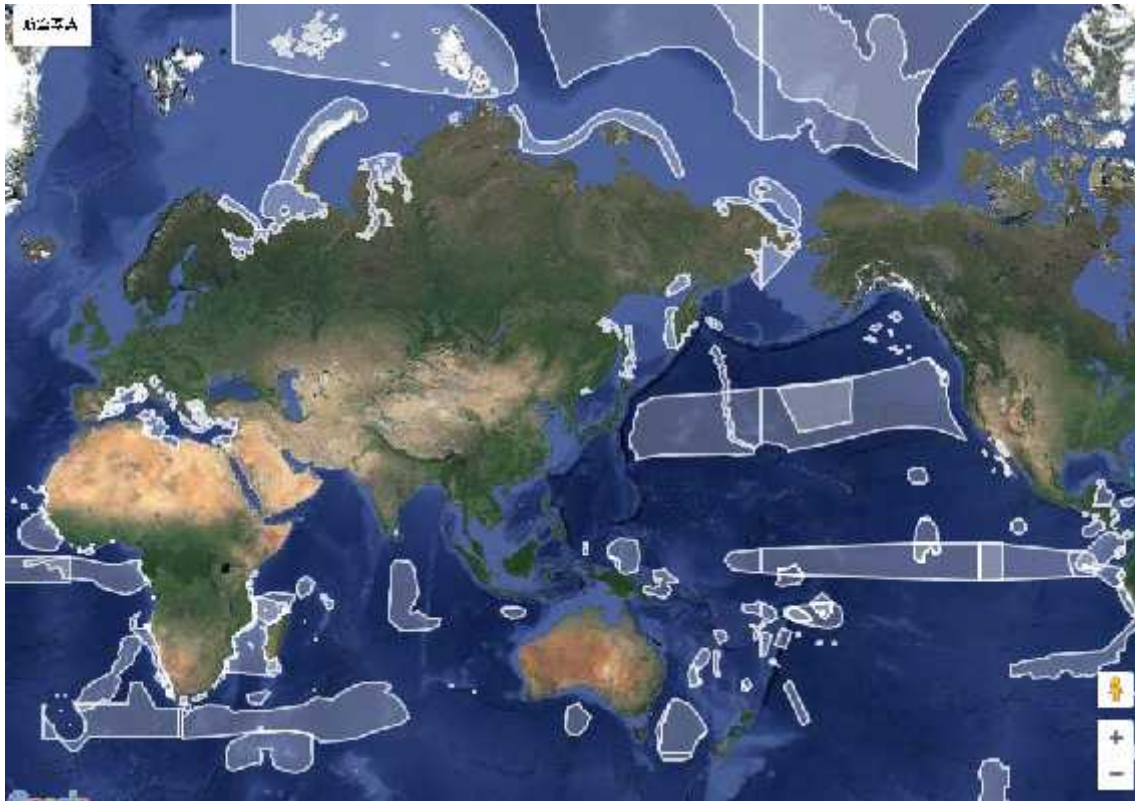
The four initial steps to be considered in the development of representative networks of MPAs from ecologically or biologically significant area (EBSAs) are described in Annex III of CBD COP Decision IX/20. MPAs in Oman is legally declared areas for protection under the Royal Decree. An EBSA is a specific area in the ocean that serves important ecological and biological functions in need of protection in open-ocean waters and deep-sea habitats. It is not a legally binding instrument, but is for identifying a basis for determining potential areas may be in need of a higher level of protection (i.e. Scientific screening to identify candidate MPAs). The choice of management measures for EBSAs depends on the CBD member States in accordance with international regulations, including the UN Convention on the Law of the Sea.

This process such as shown in the above figure is defined as the basic approach of identifying potential MPAs in this project, and the detailed description of such process is an important part of the Strategy and Action Plan.

In reference to the CBD process of identifying potential MPAs, Step 1, a scientific environmental screening using EBSA criteria, should be a quick process, primarily using existing data (e.g. Geographic, bathymetric, mangrove, coral, cetaceans & chelonians) and satellite images (e.g. Sea surface temperature: SST, chlorophyll, coastal habitats) and information based on field reconnaissance and interviewing. After analysis of the key ecological characteristics in Step 2, detailed socio-economic data (e.g. Traditional fishing) should be collected in Step 3 to identify potential MPAs. Pilot activities should be implemented in Step 4 in order to examine practical measures to control the drivers to cause potential negative impacts to the candidate MPAs. Practical experience and lessons learned from the pilot activities should be reflected in the Marine Environment Conservation Strategy and Action Plan.

Target coverage of the candidate MPAs in the Action Plan: 10% of the coastal territorial water of Oman (the area extending a distance to 12 nautical miles out from its coastal baseline)

The entire process of identifying potential MPAs as well as the implementation of management actions is administered by the TC that is responsible for achieving interagency cooperation in order to make collective decisions and establishment of legal framework. Details of the TC such as membership, roles and responsibilities still need to be defined in the Strategy and Action Plan. Its legal power will be crucial in the implementation stage.



Source: CBD homepage, <https://www.cbd.int/ebsa>

Figure 4 Areas, meeting EBSA Criteria

5. Tentative Schedule of the Project

Table 2 proposes the tentative schedule of the project.

Step 1 is a screening stage of the candidate areas of the project. **Step 2** and **Step 3** are ecological evaluation of the candidate areas, which includes scientific studies. After ecological evaluation of the candidate areas, pilot projects will be implemented in **Step 4**, to study appropriateness of the strategy for conservation of the marine environment and sustainable fishery and ecotourism. Then a master plan including action plans will be prepared in **Step 5**, based on the result of the pilot projects.

Table 2 Tentative Schedule of the Project

	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Step 1: EBSA Screening	MECA (Biodiversity) to cover the rest of the territorial water of Oman.				
Step 2: Ecological classification based on key characteristics	Define key ecological features, e.g. important habitats, wildlife communities, etc, and a long list of candidate MPAs (20-30 sites?) shall be identified within EBSAs, primarily using existing data.				
Step 3: Qualitative and Quantitative analysis to identify potential MPAs		Criteria to be defined for developing a short list of MPAs (5 sites?). Biological and socio-economic surveys in 5 (?) candidate MPAs, and 2 to 3 sites (?) be selected for pilot actions.			
Step 4: Pilot activities to examine management techniques		Planning of pilot activities.	Pilot activities on ecotourism (MOT) and sustainable fishing (MAFW) to be implemented in 2 to 3 sites (?) of the candidate MPAs.		
Final Stage: Complete the Strategy and Action Plan with lessons from the pilot activities		Develop a draft strategy and action plan (master plan) with relevant guidelines and manuals of identifying MPAs. <u>General management guidelines (conservation strategy) to be prepared for the MPAs in the long list. More specific management and action plan be prepared for the MPAs in the short list. For those MPAs with pilot activities, the lessons from the experience will be reflected.</u>			Final Stage Symposium with ROPME to share experience with other GCC nations

6. Project Boundary

Among the several definitions of the water area in a country, the territorial water (coastal water) is chosen as the project water area.

- **Territorial waters (Coastal waters):** The area extending a distance to 12 nautical miles out from its coastal baseline in principle, which is under full national jurisdiction and sovereignty.
- **Exclusive Economic Zone (EEZ):** Waters with restrictions on national jurisdiction and sovereignty. The area extending a distance to 200 nautical miles (370 km) out from its coastal baseline. Areas subject to impacts, particularly from commercially-based activities.
- **International waters (open sea):** Waters regulated with international jurisdiction, such as the UN Convention on the Law of the Sea.

7. Project Implementation Flow

The project will be implemented as shown in Figure 5, following the steps shown in Table 2.

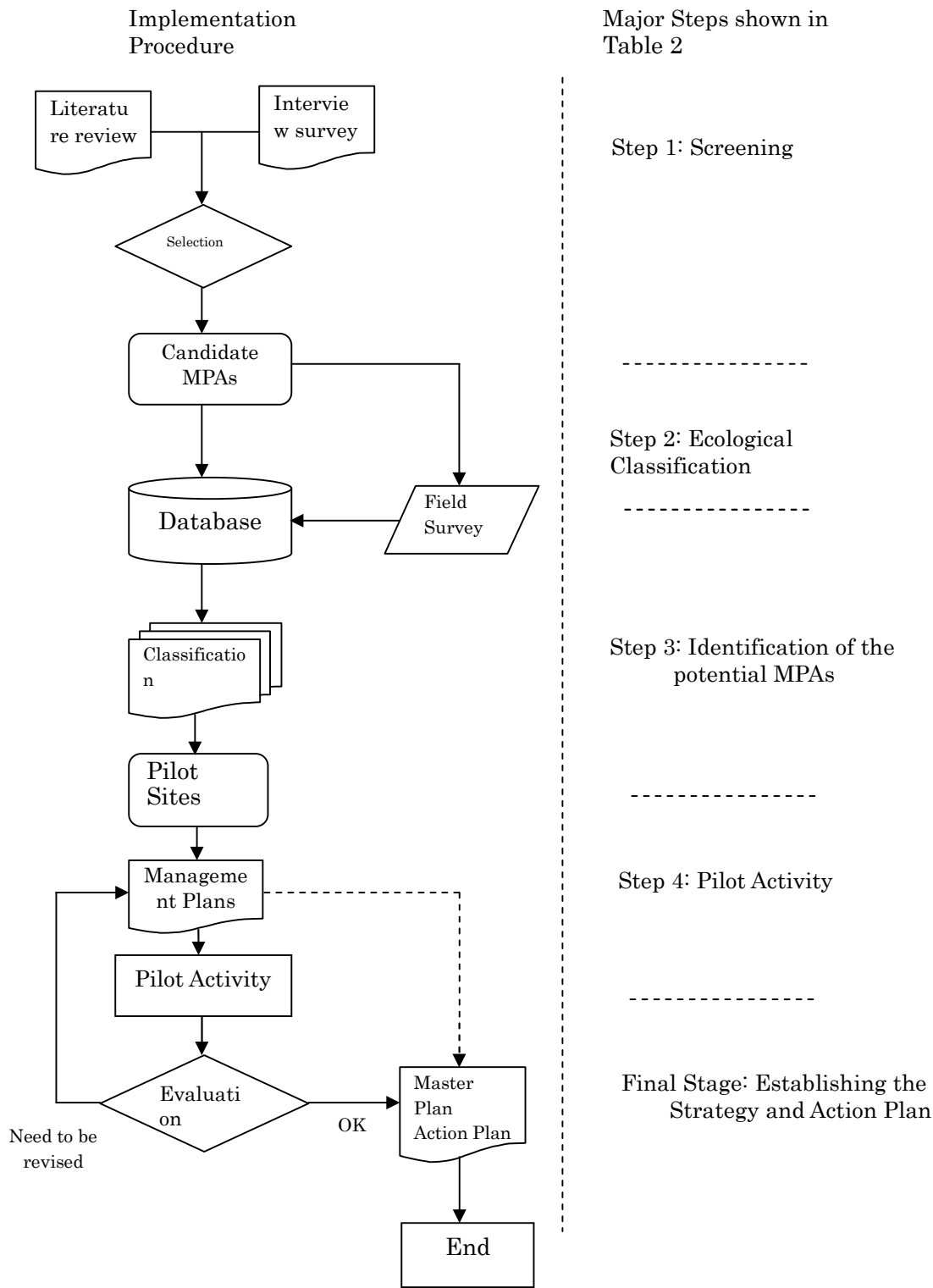


Figure 5 Major Steps and Procedure of the Project

8. Project Activities

Project activities at each step are summarized below.

8.1 Step 1: Screening

Candidate EBSA sites will be screened to select suitable EBSA sites.

1) Literature review

Existing data and literature will be studied to assess the potential EBSA sites, following EBSA criteria. Information of the study on the Coastal Zone Management Plan⁴ will also be referred.

The available satellite image is also obtained to study the area. Table 3 summarizes the criteria for selecting EBSA.

Table 3 Criteria, Definition and Rationale for Selecting EBSA

Criteria	Definition	Rational
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features	Irreplaceable Loss would mean permanent disappearance of diversity or a feature, or reduction of the diversity at any level
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive	Various biotic and a biotic conditions coupled with species-specific physiological constraints and preferences tend to make some parts of marine regions more suitable to particular life-stages and functions than other parts.
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species	To ensure the restoration and recovery of such species and habitats
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by	The criteria indicate the degree of risk that will be incurred if human activities or natural events in the area or component cannot be managed effectively, or are pursued at an unsustainable rate.

⁴ Oman Coastal Zone Management Plan, 1991, prepared for the Ministry of Commerce and Industry by IUCN

Criteria	Definition	Rational
	natural events) or with slow recovery	
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity	Important role in fuelling ecosystems and increasing the growth rates of organisms and their capacity for reproduction
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity	Important for evolution and maintaining the resilience of marine species and ecosystems
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation	To protect areas with near natural structure, processes and functions To maintain these areas as reference sites To safeguard and enhance ecosystem resilience

Source: Azores Science Criteria and Guidance, 2009, CBD Secretariat

2) Interview survey

Interview survey targeting related organization will be conducted to supplement the information gathered in the above procedure 1).

3) Assessment

Gathered information will be studied and compared to assess the candidate EBSA sites.

4) Selection of candidate EBSAs

Several candidate EBSA sites will be selected with a discussion between study team and SC.

8.2 Step2: Ecological Classification

1) Literature review

Detailed data on the candidate EBSA site will be gathered for the ecological classification of the areas.

2) Integration/Development of database

Existing database will be integrated to cover available data in Oman.

3) Study on National/Regional Development Plan and the legal system

National and regional development plan will be studied to classify a coastal area as for conservation, commercial, residential, tourism, industrial, and so on.

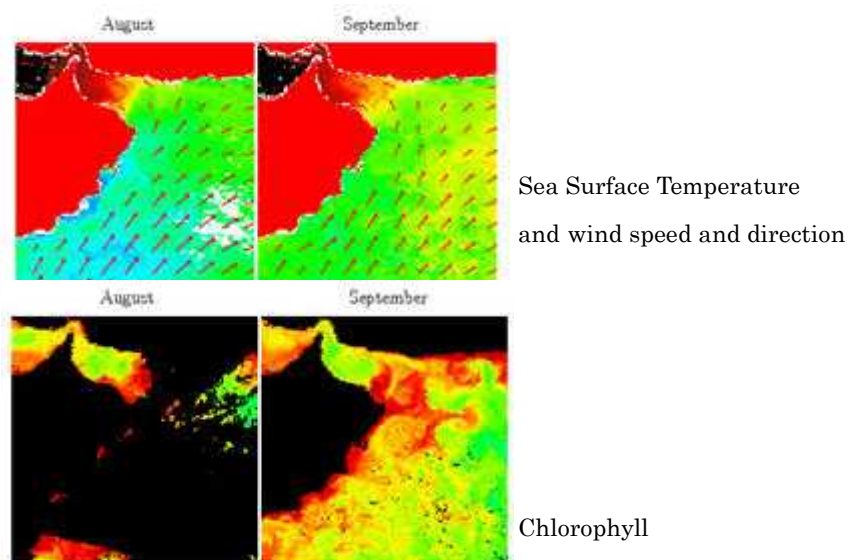
Existing relevant legal and institutional framework, including Royal Decrees, Ministry Decree, Guidelines and International conventions will also be reviewed.

4) Satellite image analysis

Satellite images along the coastal area in the candidate EBSA sites will be analyzed

to classify an area as for tidal flat, rocky shore, coral, seagrass/sea weed bed, mangrove, and so on.

Sea water surface temperature and chlorophyll concentration analyzed using satellite images will also be studied to identify the productivity of the area (see Figure 6).



Source: MSFC, 2001

Figure 6 Example of Sea Water Surface Temperature and Chlorophyll

8.3 Step 3: Identification of the potential MPAs

1) Field survey

Intensive field survey will be conducted. Table 4 summarizes the surveys.

Although composition of ecosystem won't drastically change in a year, 4 time-a-year-survey is proposed to know the micro size impact, such as implantation rate and growing rate of coral polyp and fish juvenile, and seasonal change.

The discharges from rivers are not considered in Oman in normal condition. However, the study of the impact from rivers on rain event is important to know the land-based pollution load. Therefore, the study on river discharge on rain event is included.

Table 4 Summary of Intensive Field Survey

Item	Parameter	Frequency	Methodology
Ecosystem	Coral, Mangrove, Sea grass, Fish and shell fish, Tidal flat, Sea mammal	4 times/year	Satellite image analysis on the distribution of ecosystem Field visual observation, including scuba diving
Water quality	Sea area, Effluent water, River discharge		Sampling and laboratory analysis
Sediment quality	Sea area bottom sediment	2 times/year	Sampling and laboratory analysis
Point source distribution	Water quality and volume	1 time/year	Filed reconnaissance, Sampling and laboratory analysis
Marine litter	Distribution	2 times/year	Field reconnaissance
Flow rate	River discharge (on a rain event), Effluent	4 times/year	Field measurement
Wave, Tide	Wave height, period and direction Water level Water speed and direction	Continuous measurement	Self contain measurement equipment
Fishery Status	Fishery species composition, Fish population, Annual catch Livelihood	2 times/year	Interview, Test sampling, Population estimation
Tourism potential	Tourism potential Tourist population Activity	2 times/year	Interview, Questionnaire

Table 5 shows the proposed pilot study by the related organizations. These items will be divided into two categories, Scientific study and Pilot project, which will be included in Step 3 and Step 4, respectively.

Table 5 Proposed Pilot Activity by the Related Organizations

Organization	Proposed project	Outline of the project	Category
MECA	Project in BAH*	Promotion of eco tourism Monitoring program	Pilot project
	Project in QNR*	Establishment of visitor centre (QEIC)	Pilot project
	Research activity	Monitoring and capacity building	Scientific study
MAFW	Technical training	Academic and technical training for capacity building (Dissertation study, summer school, lectures)	Pilot study
	Development of coastal model	Satellite image analysis Systematic conservation plan	Scientific study
	Fishery resource control	Control of by-catch , overfishing and ghost fishing	Pilot project
	Promotion of small-scale fishing	Participation of fishermen into the fishery control Education program Evaluation of fishery resources	Pilot project
SQU	Ecosystem connectivity	Study on passive dispersal of larvae, using existing models	Scientific study
	Database	Historical Oceanographic Data Mining	Scientific study
	Biodiversity and biogeography of marine invertebrates	Sampling and development of distribution map	Scientific study
	Status of the health of coral communities	Evaluation of the health of coral communities	Scientific study
	Coral environmental record	Evaluation of long-term marine climate change	Scientific study
	Field guide	Development of field guides for MPAs	Pilot project
MOT	Development of sustainable (socially, economically and environmentally) eco tourism	Baseline survey (ecological and environmental survey, socio economic survey)	Scientific study
		Development of management plan, communication plan Capacity building	Pilot project

*: Location will be decided with screening process

2) Data integration into the database

Obtained data will be integrated into the database developed in the Step 2.

3) Qualitative and Quantitative Analysis

Qualitative and quantitative analysis will be carried out to identify the potential MPAs from the scientific viewpoint. Figure 7 shows an image of selection of candidate MPAs, using GIS. In this case, a habitat map overlaying several components, such as ecosystem (e.g. seagrass bed, coral, fish diversity) and water quality, was developed to scientifically identify the candidate MPAs.

Existing information, such as the Coastal Zone Management Plan⁵, is also referred.

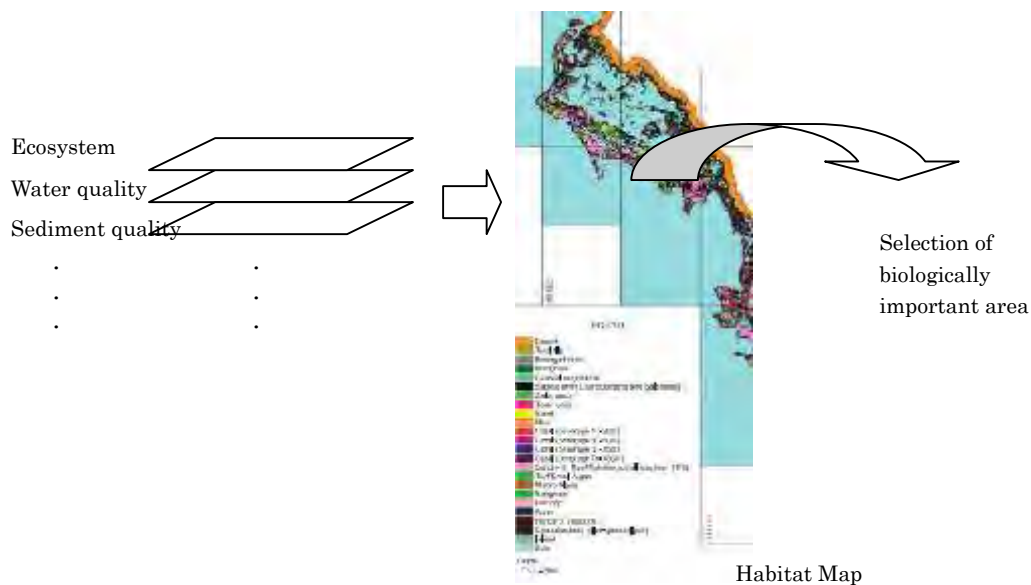


Figure 7 Image of the Database

8.4 Step 4: Pilot Activity

After selection of the candidate MPAs, management plan will be prepared for sustainable managing of the marine environment.

A pilot project will be implemented in each candidate MPA to evaluate the prepared plans.

The proposed pilot project is discussed in the Section 13.

1) Preparation of plans

Various plans, such as environmental management plan, monitoring plan, tourism

⁵ Oman Coastal Zone Management Plan, 1991, prepared for the Ministry of Commerce and Industry by IUCN

promotion plan, education plan and fisheries resource conservation plan will be prepared in advance upon commencement the pilot activities.

2) On the Job Training (OJT)

In the series of pilot activity, On the Job Training (OJT) will be carried out. The Japanese expert team and Omani counterpart team will jointly work in the activity. Taxonomy and ecology of marine organisms and ecosystem will also be trained.

3) Holding training courses/workshops

The training will be held in Japan six (6) times in total. The tentative subject will be i) General, ii) Satellite image analysis, iii) Ecosystem survey, iv) Ecological survey, v) GIS, vi) EBSA, vii) Ecotourism, viii) Sustainable fishery and ix) Administration. Workshops to notify the activity will be held in Oman for three (3) times during the project period, targeting domestic stakeholders and neighbor countries.

4) Evaluation of the activities

At the midterm of the activity, the outcomes of the activity will be evaluated. Based on the evaluation, prepared plans will be modified.

8.5 Final Stage: Establishing the Strategy and Action Plan

1) The finalization of the plans based on the lessons and learns

After the pilot activity, the outcomes will be evaluated and lessens and learns will be studied. Procedures and methodologies for the selection of EBSA and MPAs will be organized as a guideline.

2) Preparation of the draft master plan and action plan

A strategy for conservation of marine environment, utilizing MPA candidate sites (e.g. Ecotourism, Environmental education, Sustainable fishing), its action plans and implementation plan will be prepared targeting the year 2020 (Aichi Biodiversity Targets) and year 2050 (Oman Vision 2050).

3) Recommendation of ideal organizational structure

Ideal organization structure for implementation of the master plan, including demarcation of each organization, will be recommended.

4) Recommendation of ideal regal framework and delivery system

Modification of regal framework will also be recommended.

9. Output from the Project

Following outputs are expected from the project.

- Output 1: Data is collected for determination of candidate MPAs.
- Output 2: Candidate MPAs are scientifically determined.

- Output 3: Legal and institutional framework is established and the Marine Environment Conservation Strategy is drafted.
- Output 4: Pilot project is implemented and the result is evaluated to utilize for the Output 3.

And following products will be prepared on the project.

- Good Practice of aquaculture operated in coastal areas from the viewpoint of marine resource utilization and environmental conservation aspects
- Guidelines for monitoring system for coastal marine environment
- Guidelines for marine environmental education
- Action Plan for determining the Marine Protected Area (MPA)
- Action Plan for development of research system

10. Plan of Operation

The Plan of Operation of the project is proposed in Table 6.

Table 6 Plan of Operation of the Project

Step and Activities		2016		2017		2018		2019		2020	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1. Screening											
	1) Literature review										
	2) Interview survey										
	3) Assessment										
	4) Selection of candidate EBSAs										
2. Ecological Classification											
	1) Literature review										
	2) Integration/development of database										
	3) Study on National/Regional Development Plan and legal system										
	4) Satellite image analysis										
3. Identification of the potential MPAs											
	1) Field survey										
	2) Data integration into the database										
	3) Qualitative and quantitative analysis										
4. Pilot activity											
	1) Preparation of plans										
	2) On the Job Training (OJT)										
	3) Holding training course/workshop										
	4) Evaluation of the activities										
5. Establishing the strategy and action plan											
	1) Finalization of the plans based on the lessons and learns										
	2) Preparation of the draft master plan and action plan										
	3) Recommendation of ideal organizational structure										
	4) Recommendation of ideal regal system										

11. Proposed inputs

Inputs from both governments are proposed in this section.

11.1 Demarcation of the major role

Major role	Oman Side	Japan Side
1) Output 1: Data is collected for determination of MPAs.		
a. To determine the data required for EBSA	Responsible to determine	Provide necessary information to determine thorough TC and workshop.
b. To develop the collection strategies and methods	Responsible to develop	Assist Oman side
c. To establish the data collection team	Establish the team on Oman side and cooperate with Japan side	Establish the team of Japan side and cooperate with Oman side
d. To analyze satellite image to identify coastal ecosystem	Appoint the proper members to be transferred the satellite image analysis technique.○	Transfer the satellite image analysis technique to Oman side in Japan and Oman
e. To collect existing information	Responsible to collect	Assist Oman side○
f. To integrate the existing database	Responsible to integrate	Assist Oman side
g. To train specialists of taxonomy and ecology	Appoint the proper trainees, and coordinate with SQU and MAFW	Train specialist under the collaboration with SQU and MAFW
h. To collect data through field survey	Responsible to conduct field surveys with Japan side	Responsible to conduct field surveys with Oman side and provide necessary information for capacity development on the ecosystem survey
i. To develop a database with GIS	Appoint the specialist(s) on GIS and cooperate with Japan side for developing database	Assist to develop database through dispatching expert and holding a training in Oman and Japan
j. To develop manuals and handbooks for biological and ecological surveys	Appoint the responsible person to cooperate with Japan side	Assist to develop manuals and handbooks
2) Output 2: MPAs are scientifically determined.		
a. To evaluate data and conduct GIS mapping	Appoint the responsible staff(s) for EBSA determination to cooperate with Japan side	Transfer the procedures of EBSA determination to Oman side through a training course in Japan and Oman
b. To conduct data analysis	(ditto)	(ditto)
c. To select more than 10% MPAs of coastal area		
d. To develop a manual for selection of MPAs		
3) Output 3: Legal and institutional framework is established and the Marine Environment Conservation Strategy is drafted.		
a. To establish the Inter-Ministerial Technical Committee (TC) (*: Hold the TC)	Responsible to establish and steer the TC	Assist Oman side

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Major role		Oman Side	Japan Side
	b. To define the terms of reference (TOR) of TC	Responsible to define the TOR	Assist Oman side
	c. To evaluate the current status of the marine environment and ecosystem services in Oman territorial water	Appoint responsible staff to organize WG and discuss on these issues	Assist Oman side
	d. To analyze the current and expected issues on the marine environment		
	e. To review the relevant exiting legal and institutional framework		
	f. To review other relevant plans and strategies		
	g. To develop a policy on marine environment conservation and ecosystem service utilization		
	h. To demarcate the roles of relevant organization for marine environment conservation		
	i. To establish WGs and work on		
	- Guideline for Good Practice on Aquaculture	Appoint responsible staff to organize WG and discuss on this issue (ditto)	Assist Oman side (ditto)
	- Guideline for monitoring system	(ditto)	(ditto)
	- Guideline for marine environmental education		
	- Action Plan for determining the MPA		
	- Action Plan for development of research system for open sea		
	j. To draft Marine Environment Conservation Strategy	Appoint responsible staff to organize WG and discuss on this issue	Assist Oman side
	k. To hold national and international workshops on marine environment conservation	Appoint responsible staff to organize WG and discuss on this issue	Assist Oman side
4) Output 4: Pilot project is implemented and the result is evaluated to utilize for the Output 3.			
	a. To identify the candidate site	Appoint responsible staff to coordinate and supervise the cooperation.	Assist Oman side
	b. To develop plans for a project for sustainable utilization of the area	Appoint responsible staff to coordinate and supervise the cooperation.	Assist Oman side
	c. To implement the project		
	d. To develop monitoring and evaluation plans of the project		
	e. To develop efficient management system		
	f. To evaluate to project and modify		

11.2 Resource Inputs

1) Human resources and institutions in Oman

- Cabinet Supervisory Committee
- Ministry of Foreign Affairs
- MECA

(MECA)

- Project Manager

Overall responsibilities to direct the project and coordinate within the Oman side and with Japan side (Director of Marine Environment Conservation Department, MECA.)

- Deputy Project Manager

Assist the Project Manager

- Marine Ecosystem Specialist/leader of field survey team

Responsibilities to implement activities and coordinate with SQU, MSFC and Japan side

- Unit leader of field survey on seagrass, seaweed, tidal flat and birds

Responsibilities to implement field surveys on mentioned above.

- Unit leader of field survey of coral reef

Responsibilities to implement field surveys on mentioned above.

- Unit leader of field survey on marine animals and open sea

Responsibilities to implement field surveys on mentioned above.

- GIS/ Database Specialist

Responsibilities to develop a database, GIS database and satellite image analysis model under the assistance of Japan side

- Environmental Education Specialist

Responsibilities to develop an environment education plan

- Nature Reserve (Ecotourism) Specialist

Responsibilities to implement activities and to coordinate with MOT

- Field survey assistant team in each Environmental Agency of Governorate

Formulate field survey assistant team consists of a staff and several members and support field surveys in each governorate

- Administrative and finance officer

Manage project budget of Oman side

(SQU)

- Coral reef Specialist
Implement and instruct a coral reef survey with MECA and Japan side
- Student(s)
Assist coral reef survey, literature review and other survey
- Administrative and finance officer
Manage project budget of Oman side

(MAFW)

- Personnel for academic study and survey
Supervise the academic studies
- Personnel for sustainable fishery
Supervise and advise the pilot activities for sustainable fishery
- GIS/ Database Specialist
Responsibilities to develop a database, GIS database and satellite image analysis model under the assistance of Japan side
- Administrative and finance officer
Manage project budget of Oman side

(MOT)

- Adviser of basic study
Supervise and advise the basic study
- Advisor of eco tourism
Supervise and advise the pilot activities for eco tourism
- Administrative and finance officer
Manage project budget of Oman side

2) Dispatch of Experts from Japan

- Team Leader/ Marine Environment Conservation planning
Overall responsibilities of quality management of the project and coordinate with Oman side
- Deputy Team Leader/ Marine Environment Management
Assist the Team Leader, manage the implementation of the project and supervise the implementation of activities
- Deputy Team Leader/Marine biology (Seagrass, Seaweed, Tidal flat)
Assist to implement activities and coordinate with Oman side

- Marine biology (Coral reef)
Assist to implement the coral reef survey
- Marine biology (Marine animals)
Assist to implement marine animal survey
- Marine biology (Birds)
Assist to implement bird survey
- Marine Biology (Fish)
Assist to implement the fish survey
- Satellite image Analysis
Assist and instruct to develop the satellite image analysis model
- GIS/Database Specialist
Assist and instruct to develop the GIS database and relevant database for EBSA
- Environment Education
Assist and instruct to develop an environmental education plan
- Ecotourism
Assist to implement activities and to coordinate with MOT
- Fishery Promotion
Assist to implement activities and to coordinate with MAFW
- Organizational/administrative framework
Assist to study and recommend the legal framework
- Coordinator
Coordinate the overall activities of Japan Team in both Oman and Japan

3) Machinery and Equipment

- Car
- Research vessels (SQU, Ministry of Foreign Affairs, MSFC)
- Boats (To be hired from fisherman)
- Multi water quality meter (from Japan)
- Satellite image
- Image processing software and computer
- Necessary analytical equipment and lab apparatus

12. Implementation Structure

Figure 8 shows the Project organization chart for implementation of activities

With regard to the reporting structure of the Project, refer to

Figure 1.

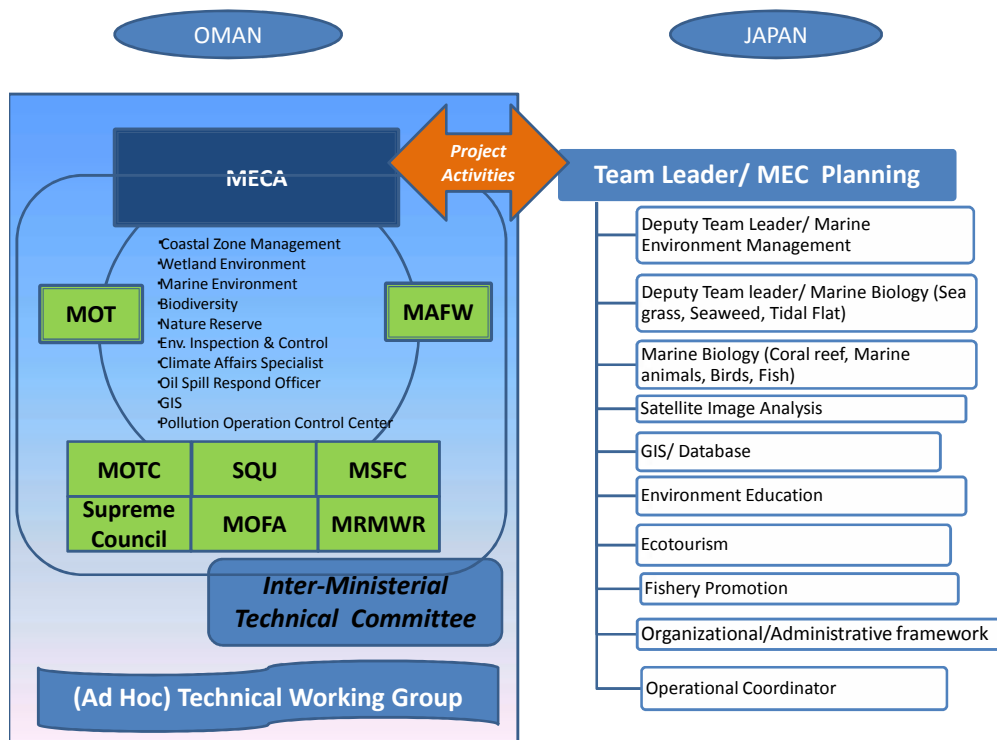


Figure 8 Implementation Structure

The roles and assignments of relevant organizations are as follows:

1) Inter-Ministerial Technical Committee

MECA will arrange the Inter-Ministerial Technical Committee, consists of Ministry of Environment and Climate Affairs (MECA), Sultan Qaboos University(SQU), Ministry of Agriculture and Fishery Wealth(MAFW), Ministry of Tourism(MOT), Ministry of Transportation and Communication, Supreme Council for Planning, Ministry of Regional Municipalities and Water Resources, Ministry of Legal Affairs, Ministry of Housing, Ministry of Culture and Heritage and other organizations concerned.

In addition, the necessary technical working group (TWG) will be formulated under the NC, but member of the TWG will not be limited to the representatives.

3) JICA Experts

The JICA experts will give necessary technical guidance, advice and recommendations to MECA, MAFW, MOT and SQU on any matters pertaining to the implementation of the Project.

4) Joint Coordinating Committee

The Joint Coordinating Committee is usually established in cooperation of projects implemented with JICA support, in order to facilitate inter-organizational coordination. Since TC for this Project is expected to function for similar purposes, the necessity of the JCC will be determined through discussion between Oman and Japan sides.

13. Pilot Project

The details of the pilot project are discussed in this section.

13.1 Basic Concepts

The Basic concepts of the Pilot Projects are as follows.

- 1) The Sustainability Action Plan is essential for Sustainable **Environment** Conservation Strategy
- 2) The sustainable action plan can only be backed up by a demonstration of Sustainable Project harmonized with the **Society** and its own **Culture**
- 3) Sustainability of the project depends on its **Economics**, that is, **Financial Sustainability**
- 4) Financial sustainability depends solely on Sustainable Generation of Revenue from Project

13.2 Objectives

Objectives of the Pilot Projects are to obtain various experiences and lessons from a limited number of the Pilot Projects and reflect them on the Draft Marine Environment Conservation Strategy.

Through the implementation of the Pilot Projects, following outcomes will be achieved.

- 1) To motivate and mobilize local community to generate revenue by themselves through **Sustainable Fishery and Eco-tourism in and around Potential/Existing Marine Protection Areas (MPAs)**
- 2) To increase benefits from the 2 Pilot Project Sites for the local Community by **involving them for the Management of the 2 sites** to carry out Sustainable Fishery and Eco-tourism
- 3) To demonstrate that revenue generation is the key for sustainable development for the government and for the community
- 4) **To contribute the Oman Vision 2050, Sustainable Society in Oman**



13.3 Potential Project Sites

Following sites are potential candidate sites. Although those are considered as the candidate site, actual selection of the sites will be discussed using the methodology which will be established in the project.

- Qurm Nature Reserve (QNR: Mangrove area, Wetland)
- Bar Al-Hickman (BAH: Tidal flat, Wetland)
- Daymaniyats islands (DYI: Coral reef)

13.4 Methodology

(1) Procedure

- 1) To develop an Action Plan focusing on Sustainable Fishery and Eco-tourism in and around QNR and BAH (**Design**)
- 2) To carry out Feasibility Study (F/S) including **Marketing** on the Pilot Project focusing on Sustainable Fishery and Eco-tourism in and around QNR and BAH (**Develop**)
- 3) To carry out the Pilot Projects based on the Action Plan, including **Public Participation** and the result of the F/S focusing on Sustainable Fishery and Eco-tourism in and around QNR and BAH (**Implement/Analyze**)
- 4) To compile experiences and lesson through the Pilot Projects to be utilized for the Development of Marine Environment Conservation Strategy (**Evaluate**)



(2) Legal Issues to be required

- 1) To elaborate Financial Regulation in collaboration with the Ministry of Agriculture & Fishery Wealth (MAFW) and with the Ministry of Tourism (MOT), which allows the Ministries (MECA, MAFW & MOT) to utilize revenue generated by the Activities (Pilot Projects) for their sustainable activities focusing on Sustainable Fishery and Eco-tourism in and around Potential/Existing MPAs
- 2) To elaborate Financial Regulation in collaboration with MAFW and MOT to allow the Ministries to receive donation from private sectors for their activities focusing on Sustainable Fishery and Eco-tourism in and around Potential/Existing MPAs
- 3) To elaborate structure with legitimacy to allow the local community to be involved in the management of Ministries' activities focusing on Sustainable Fishery and Eco-tourism in and around Potential/Existing MPAs

- 4) To establish a legal procedure to allow Ministries' activities focusing on Sustainable Fishery and Eco-tourism in and around Potential/Existing MPAs to be handed over to local communities to carry them out by themselves

13.5 Activities

Activity 1 Sustainable Fishery

- 1) Promoting Sustainable fishery strategy to propose methodologies tackling a) Fish bycatch or discards, b) Overfishing, c) ghost fishing by MAFW
- 2) Promoting small-scale fisheries management and development and to improve in a sustainable manner the livelihoods of fishing communities by MAFW
- 3) Improving the livelihoods of fishing communities with sustainable manner in selected coastal Wilayats of Oman, by promoting small-scale fisheries management and development, especially for Kingfish fishing, Shark fishing, Sea cucumber fishery, Abalone fishery, and Scalloped spiny lobster fishing by MAFW
- 4) Providing environmental education, which focuses on the people who want to start aqua culture business
- 5) Providing environmental program to the fishermen for conserving fishery resources, including limitation of fishing gear, for sustainable fishing
- 6) Promoting self resource control and conservation, educating fishermen's union
- 7) Promoting collaboration between fishermen and eco tourism
- 8) Sea bottom cleaning campaign with fisherman
- 9) Providing opportunity for capacity development of concerned personnel

Activity 2 Eco Tourism

- 1) Promoting Eco-tourism by MOT
- 2) Fostering tour conductors from the local communities for the tourists to learn and experience the Life Style & Culture of Bedouin through the MOT
- 3) Introducing one-night camping in Bedouins' Tent for the tourists by MOT
- 4) Creating a small scale fish market to be utilized with the tourists for camping by MAFW
- 5) Providing opportunities to tourists for Game Fishing & Sport Fishing MAFW
- 6) Renting boats for the tourists for above activities by MAFW/MOT
- 7) Diffusing the recommended methodology to protect coral/marine biodiversity to the local fisherman through MAFW/MECA
- 8) Providing small scale paid "Nature School" targeting tourists of all-age-group to ensure sustainable daily revenue for the operation of the Visitor Center of QEIC

- 9) Establishment of research and visitor center
- 10) Providing tour, such as hiking and kayaking
- 11) Installment of boardwalk and jetty for better accessibility to the water area
- 12) Installment of mooring buoys at diving area to avoid coral damage by anchoring
- 13) Providing software map service through mobile phone network to lead tourist to the tourism spots with the information of the area
- 14) Establishing some shops or facilities for the visitors such as follows
 - Book Shop is focusing on Nature/Biodiversity Conservation
 - Souvenir Shop selling local hand craft and mementos
 - Coffee Shop
 - Small Scale Live-Aquarium
 - Small Scale Sample Aqua Culture Farm
- 15) Providing opportunity for capacity development of concerned personnel

Activity 3 Research Activity (Field guide development, Monitoring)

- 1) Developing the two (2) field guides from the local communities for the tourists to gain the knowledge on the creatures living at the sites and for the manager and researchers to gain standard operating method for the environmental monitoring and Eco Tourism by SQU
- 2) Develop two (2) coffee-table books on the nature and geography on the two (2) pilot project sites by SQU
- 3) Providing portable water quality meters for local governments so that they can carry out periodical environmental monitoring by MECA
- 4) Training fishermen to be able to conduct environmental monitoring by their selves by MECA/MAFW
- 5) Conducting core research community surveys, In-situ and Satellite-sensor based spatial-temporal dynamics in relation to the variation of local environmental conditions by MAFW/MECA

Activity 4 Environmental Education

- 1) Environmental education program, targeting school children, community people, local fishermen
- 2) Utilization of the facility of QEIC (Qurm Environmental Information Center) for education program and others
- 3) International environmental workshop/education program using QEIC facility

14. Copy Right

Obtained data/information can be utilized for personal study, under the supervision of MECA, Inter-Ministerial Technical Committee and JICA.

ANNEX 1: Tentative Schedule for the Dispatch of Japanese Expert Team

[illegible]

Executive Summary

Executive Summary

Draft Terms of Reference for the Project on “Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman”

1. Background

The Sultanate of Oman and Japan have a good relationship and cooperation. In 2014, Japan’s Prime Minister Shinzo Abe visited Oman and announced a new scheme of technical cooperation on a cost-sharing basis through the Japan International Cooperation Agency (JICA), which has been implementing in other GCC countries. His Majesty, Sultan Qaboos welcomed it. JICA has a long history of collaboration with the Ministry of Environment and Climate Affairs (MECA) for environmental conservation, particularly in the field of mangrove conservation. Since Oman is in the process of developing a long-term strategy in all sectors to create sustainable society in line with the Oman Vision 2050, sustainability of the marine environment and sustainable use of ecosystem services, diversification of revenue sources by utilizing natural resources are extremely important. Based on this concept, a bilateral cooperation between Oman and Japan for the development of a long-term strategy for marine environmental conservation, including effective utilization of protected areas with their buffer areas through pilot project plans is proposed.

2. The Objective and Overall Scope

This project is aimed at contributing to **address economic diversification, financial sustainability and sustainable resource use** in the marine environment of Oman under **Vision 2050**. Scientifically sound management of natural resources and the ecological condition of the marine environment are crucial for ensuring sustainable income of the nation, particularly from fisheries and tourism sectors. Developing an appropriate conservation strategy and action plans for the use of marine resources also supports multilateral environmental commitment such as the **Aichi Biodiversity Targets** of the Convention on Biological Diversity (CBD). To this end, the project aims to prepare marine conservation plan by MECA, containing sustainable fishing managed by MAFW and eco-tourism activities implemented by MOT.

3. Outline of the Project

Title of the Project

Development of Marine Environment Conservation Strategy 2050 and Action Plans

Project Purpose

To develop a Marine Environment Conservation Strategy and Action Plans through institutional collaboration of multiple stakeholders coordinated by the Inter-Ministerial Technical Committee (TC).

Project Duration

Five years from 2016

Implementing Agency

Ministry of Environment and Climate Affairs (MECA), Chair of the TC

Inter-Ministerial Technical Committee (TC)

Ministry of Environment and Climate Affairs (MECA), Sultan Qaboos University(SQU), Ministry of Agriculture and Fishery Wealth(MAFW), Ministry of Tourism(MOT), Ministry of Transportation and Communication, Supreme Council for Planning, Ministry of Regional Municipalities and Water Resources, Ministry of legal affairs, Ministry of Housing, Ministry of Culture and Heritage and other organizations concerned.

Target Year of the Master Plan and the Action Plans

Mid-term Target 2020 (Aichi Biodiversity Targets) and Long-term Target 2050 (Oman Vision 2050)

Funding Source

Cost-sharing between the Governments of Oman and Japan

Proposed project budget for 5 years

(JICA covers 50% of Project budget allocation)

6,440,000 Oman Riel

Oman Government	3,220,000 OMR	(8,333,000 US\$)
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JICA	3,220,000 OMR	(8,333,000 US\$)
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(Exchange rate 1 OMR=2.588US\$)

4. The main features of the proposed project:

1) **Integration of marine environmental conservation and economic development**

Marine environment conservation in Oman is one of the most important tasks of the country, not only from the ecological point of view but also from **economic and industrial development perspectives**. Development of sustainable fishery and ecotourism, harmonizing human activity and nature conservation, is important for overall economic development of Oman. Thus, it is not an overstatement to indicate that a long-term strategy to ensure sustainable use of marine resources for the future of the fisheries and tourism sector of Oman.

2) **Promotion of job opportunity**

The proposed project aims at developing environmentally friendly sustainable fishing and eco-tourism strategy and as a result, generation of job opportunity is expected.

3) **Fulfilment of Oman's international commitment**

Being a party to the Convention on Biological Diversity (CBD), Oman has a duty to designate 10% of the territorial water as Marine Protected Areas (MPAs). The activity under the proposed Project, which is part of the Marine Environment Conservation Strategy is indispensable in order for Oman to achieve important international commitment, including Aichi Target 11¹.

4) **Human resources, institutional and legal systems development for implementation of the Strategy**

Due to the nature of the Marine Environment Conservation Strategy, its development as well as implementation requires inter-ministerial and multidisciplinary cooperation, which is coordinated by the NC. As such, capacity development in human resources, institutional and legal systems are expected to benefit from collaboration between Oman and JICA, which has an extensive international experience in these areas.

¹ By 2020, at least 10% of coastal and marine areas are conserved through effectively and equitably managed.

Annex Proposed Schedule of the Project

Step 1 is a screening stage of the candidate areas of the project. **Step 2** and **Step 3** are ecological evaluation of the candidate areas, which includes scientific studies. After ecological evaluation of the candidate areas, pilot projects will be implemented in **Step 4**, to study appropriateness of the strategy for conservation of the marine environment and sustainable fishery and ecotourism. Then a master plan including action plans will be prepared in **Step 5**, based on the result of the pilot projects.

Tentative Schedule of the Project

	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Step 1: EBSA Screening	MECA (Biodiversity) to cover the rest of the territorial water of Oman.				
Step 2: Ecological classification based on key characteristics	Define key ecological features, e.g. important habitats, wildlife communities, etc, and a long list of candidate MPAs (20-30 sites?) shall be identified within EBSAs, primarily using existing data.				
Step 3: Qualitative and Quantitative analysis to identify potential MPAs		Criteria to be defined for developing a short list of MPAs (5 sites?). Biological and socio-economic surveys in 5 (?) candidate MPAs, and 2 to 3 sites (?) be selected for pilot actions.			
Step 4: Pilot activities to examine management techniques		Planning of pilot activities.	Pilot activities on ecotourism (MOT) and sustainable fishing (MAFW) to be implemented in 2 to 3 sites (?) of the candidate MPAs.		
Final Stage: Complete the Strategy and Action Plan with lessons from the pilot activities		Develop a draft strategy and action plan (master plan) with relevant guidelines and manuals of identifying MPAs. <u>General management guidelines (conservation strategy)</u> to be prepared for the MPAs in the long list. <u>More specific management and action plan</u> be prepared for the MPAs in the short list. For those MPAs with pilot activities, <u>the lessons from the experience will be reflected.</u>			Final Stage Symposium with ROPME to share experience with other GCC nations

Implementation Manual of Cost Sharing (draft)

GUIDELINE FOR THE IMPLEMENTATION OF THE TECHNICAL COOPERATION PROJECT THROUGH COST SHARING BETWEEN JAPAN INTERNATIONAL COOPERATION AGENCY (HEREINAFTER REFERRED TO AS “JICA”) AND THE GOVERNMENT OF SULTANATE OF OMAN (HEREINAFTER REFERRED TO AS “GSO”) BASED ON THE AGREEMENT ON THE COST SHARING TECHNICAL COOPERATION PROJECT ON THE CONSERVATION OF MARINE ENVIRONMENT OF PERSIAN GULF BETWEEN JICA AND GSO (HEREINAFTER REFERRED TO AS “THE PROJECT”)

I. GENERAL PRINCIPLE

Section 1. Cost Sharing

Necessary cost for the implementation of the Project shall be shared as is agreed in the Implementation Agreement (hereinafter referred to as “I.A.”) signed on Date of Month of Year between JICA and GSO represented by Ministry of Environment and Climate Affairs (hereinafter referred to as “MECA”) and Ministry of Finance (hereinafter referred to as “MOF”).

Section 2. Procurement

(1) As to the procurement of goods and services in Category A and B (independent procurement) specified in the I.A.¹, Each Party shall procure necessary goods and services for the implementation of the Project following the rules and regulations of respective country and supervise the implementation.

(2) As to the procurement of goods and services in Category C (joint contribution procurement) specified in the I.A., the procurement shall be made by JICA following the rules and regulations of JICA and disbursement of Omani contribution shall follow the procedure specified in Section 2 (2) of III.

Section 3. Management of the Fund

(1) Each Party shall be responsible for management of the fund contributed by respective party.

¹ I.A.にはオマーン拠出金のうち A.オマーンで支出するもの、C.JICA と共同で支出するもの (JICA が調達) 及び B.JICA 拠出金 (すべて日本で調達支出) の 3 カテゴリーに分類した予算を記載することとしている。

(2) Payment to the Supplier(s) for the portion to be paid by Japanese Yen shall be made by JICA in accordance with the contract(s) made between JICA and the Supplier(s).

(3) Contribution by the GSO jointly used with contribution by JICA for the procurement of goods and services by JICA in Japan shall be transferred in US dollar to the account of JICA in authorized bank in Japan.

(4) Disbursed amount by each party in each year shall be reported to the Joint Coordinating Committee to be held at the end of each implementation year.

(5) Omani contribution retained in JICA account shall be settled soon after the end of the Project.

(6) Total amount of Omani contribution used in Oman shall be allocated to MECA soon after the approval of the budget and managed by MECA following the rules and regulations in Oman.

II. IMPLEMENTATION PROCEDURE

Section 1 Project Preparation

(1) Project Formation shall be made through discussion between JICA and the Executing Agency of GSO on the Term of Reference for the Project and Estimated Cost.

(2) Executing Agency shall submit TOR and the budget necessary for the implementation of the Project to the Ministry of Foreign Affairs of GSO for the approval by the Cabinet of Oman of the Project

(3) After approval of the Project by the Cabinet of Oman, Executing Agency and JICA shall discuss and prepare the detailed plan of operation and exchange Minutes of Understandings (MOU) with the signatory of Executing Agency and JICA.

(4) MECA submit the detailed break down of the Omani contribution portion based on MOU to the MOF for the allocation of the budget.

(5) Total amount of Omani budget for five (5) years of the Project shall be allocated to Executing Agency in the first year of operation of the Project.

Section 2 Request of the Project to Japanese Government

GSO shall submit the official request of the Project to Japanese Government (hereinafter referred to as “GOJ”) through the Embassy of Japan in Oman following the sample form of request hereto attached in **Schedule 1.**

Section 3 Notice of Adoption

- (1) GOJ shall notify the adoption of the request after consulting with JICA.
- (2) GOJ and GSO shall exchange Note Verbale on the implementation of the Project.

Section 4 Executing Agency and Organization of Oman

- (1) GSO shall designate MECA as the Executing Agency for the Project.
- (2) GSO shall establish Technical Committee for the Project consists of the representatives of MECA, Ministry of Agriculture, Fisheries Welfare (hereinafter referred to as “MAFW”), Ministry of Tourism (hereinafter referred to as “MOT”), Sultan Qaboos University (hereinafter referred to as “SQU”), , Ministry of Regional Municipalities and Water Resources (hereinafter referred to as “MRMWR”), Ministry of Transport and Communications (hereinafter referred to as “MOTC”), Ministry of Culture and Heritage (hereinafter referred to as “MOCH”) , Ministry of Housing (hereinafter referred to as “MOH”, Ministry of Legal Affairs (hereinafter referred to as “MOLA” and the Supreme Council for Planning.
- (3) MECA shall chair the Technical Committee of Oman.

Section 4 Implementation Agreement

The Ministry of Finance and the Executing Agency shall draft the I.A. on the Project in consultation with JICA following the sample form of the I.A. hereto attached in **Schedule 2.**

Section 5 Signing on the Implementation Agreement on the Project

The signatories of the I.A. shall be MOF and MECA for Omani side and JICA for Japanese side.

Section 6 Project Implementation

- (1) The GSO shall, upon exchange of Note Verbale, make available the budget for the Project and order to execute the budget to the Executing Agency.

- (2) JICA shall, upon exchange of Note Verbale, prepare the procurement of the Supplier(s) following the procurement rules and regulations of JICA.
- (3) JICA shall notify MECA of the initiation of the Project prior to mobilizing the Japanese expert team.
- (4) MECA shall notify JICA of the acknowledgement of the Notice of Initiation.
- (5) JICA and MECA shall procure necessary human resources, equipment and facilities and other necessities to implement the Project.
- (6) JICA and MECA shall each other notify the mobilization of respective implementation team for the Project.
- (7) At the end of each year, both team shall jointly produce the progress report and submit it to Joint Coordinating Committee.
- (8) At the end of the final year, both team shall jointly produce the project completion report and report on the settlement of account for the approval of Joint Coordinating Committee.

Section 7 Joint Coordinating Committee

- (1) For the effective and successful implementation of technical cooperation for The Project, Joint Coordinating Committee shall be established in order to fulfill the following function:
 - a. To approve the annual work plan of The Project based on the Tentative Schedule of Implementation within the framework of I.A.
 - b. To report and review progress of the Project and the result of annual expenditure of GSO and JICA and take necessary measures to adjust the budget for next year if needed.
 - c. To exchange opinions on major issues that arises during the implementation of the Project
- (2) The Joint Coordinating Committee shall be held at least once a year. The Chairperson will be the Chairperson of the Technical Committee of Oman and shall bear overall responsibility for the administration and implementation of the Project.

III Contributions of the Fund for the Project

Section 1 Amount and Purpose of the Contributions

(1) JICA agrees to contribute an amount of not exceeding _____ US Dollar (\$) _____) as the fund for the implementation of the Project described in the **Schedule 3** attached hereto on the terms and conditions set forth in the I.A. and in accordance with the relevant laws and regulations of Japan (hereinafter referred to as “JICA Contribution”, provided, however, that when the cumulative total of disbursements under the I.A. reaches the said limit, JICA shall not make no further disbursement.

(2) The GSO agrees to contribute an amount of _____ US Dollar (\$) _____) as the fund for the implementation of the Project described in the **Schedule 3** and in accordance with the relevant laws and regulations of the Sultanate of Oman (hereinafter referred to as “Omani Contribution”, provided, however, that should the funds available from the proceeds of the Contribution be insufficient for the implementation of the Project, the GSO shall make arrangements promptly to provide such funds as shall be needed.

Section 2 Use of the Proceeds of the Contributions

(1) JICA shall use the proceeds of the Contributions for the purchase of eligible goods and services necessary for the implementation of the Project from suppliers or consultants (hereinafter collectively referred to as “the Supplier(s)”) in Japan following the procurement guideline of JICA, in accordance with the allocation described in **Schedule 3** attached hereto.

(2) As to the procurement of goods and services in Japan using joint contribution of GSO and JICA in accordance with the allocation described in Schedule 3, MECA shall disburse the amount claimed by JICA following either the procedure attached hereto as in **Schedule 4 or Schedule 5.**²

(3) The GSO shall arrange the necessary fund for the implementation of the Project by the Executing Agency other than the Contributions agreed.

Section 3 Disbursement Procedure

(1) The GSO shall authorize MECA to manage the contribution of GSO for the

² Schedule 4 Transfer Procedure and Schedule 5 Reimburse Procedure

Project.

(2) MECA shall proceed with the necessary procedure for disbursement of proceed of Omani Contribution.

(3) Should the funds available from the proceeds of the contributions be insufficient for the implementation of the Project, the GSO shall make arrangements promptly to provide such funds as shall be needed.³

(4) Other Omani organization related to the Project shall request disbursement to MECA with the claims for payment and MECA shall disburse Omani budget.

(5) As to the disbursement of Omani contribution used jointly with JICA contribution, disbursement shall follow either procedure in Schedule 4 or Schedule 5 based on the request of JICA.

Section 5 Settlement of Account

(1) As to the contribution used independently by Omani side and JICA shall settle the account of the relevant portion following the respective accounting rule.

(2) As to the settlement of account for the portion of Omani Contribution jointly used by JICA, JICA shall follow the accounting rule of JICA and Oman.

(3) As to the settlement of account for item(s) of which payment be completed within each implementation year, JICA shall settle such account at the end of the same year.

(4) As to the settlement of account for item(s) of which payment not be completed within a year, JICA shall settle such account provisionally based on the actual payment made in such year with the certified copies of necessary documents such as invoice and payment record etc.

(5) When payment is made in Japanese Yen, currency exchange risk shall be borne by JICA.⁴

(6) As to the items of which payment be finalized, settlement of account shall be finalized at the end of the year when final payment is made.

(7) Final settlement of account of all the expenditure during the Project period shall be made at the end of the Project period and settlement of account report

³ この規定は必要か？

⁴ Oman 側からは USD で振り込まれるため、為替リスクは JICA 側で負うことで良いか？

shall be included in the Project Completion Report.

Section 6 Audit

(1) JICA shall accept the auditing by the GSO and prepare necessary documents when the GSO requests JICA to do so as far as laws and regulations of Japan on the audit allows.

DRAFT

Schedule 1

Form of Request for Technical Cooperation – Development Study
through Cost Sharing Scheme with JICA

APPLICATION FORM FOR JAPAN'S COST SHARING TECHNICAL COOPERATION

1. Project Title

2. Procedural Status in Omani Government

Please check box

- ☐ Approved (☐ Concept Clearance Paper ☐ budget nomination)
☐ Under Preparation of Budget Setting
☐ Part of the 5/10 year Plan or medium Term Development Framework

3. Site Location

Please attach a rough map with this form. The map should be at a scale that clearly shows the study/project site. Mark the site.

4. Background of the Project

(1) Current condition of the sector _____

(2) Issues and problems to be solved _____

(3) Related Government's Policy _____

(National/Provincial Development Plan & Sector Development Plan)

(4) Other relevant projects or activities for solving said issues and problems _____

5. Outline of the Project

(1) Overall Goal/Long-term objective _____

(2) Project Purpose/Short-term objective _____

(3) Output _____

(4) Project Activities /Scope of the Study _____

(5) Beneficiaries

Please identify the beneficiaries and population for which positive change are intended directly and indirectly by implementing the project, if available

(6) Related Activities (Other donors and NGOs)

(7) Input from the Oman side (Arrangement done by Oman side as its responsibility)

1) Counterpart personnel and support staff attached to the project (Number and Position)

2) Available office space, vehicles, equipment and etc.

3) Running expensed (allocation in national budget)

4) Available data, information, documents, maps, etc

(8) Input from the Japanese side (Request to Japanese side)

1) Experts (Number, Field and qualification)

2) Training, seminars and workshops (Expected participants and numbers)

Please check box

☐ Not Necessary

☐ Yes, in Oman

Participants

Number

☐ Yes, in Japan or third country

Participants

Number

3) Equipment

Please check box

☐ Not Necessary

☐ Yes

①Function of the equipment

②Name of main equipment

③Cost of Purchase (Cost breakdown)

④Specifications, the quantity, and unit price (if available)

⑤Amount of the equipment

Total Amount OMR. _____

6. Implementation Schedule

Month

Year

~

Month

Year

7. Implementing Agency

- (1) Attach an organization chart
- (2) Annual Budget
- (3) Staffing (on a category basis)

8. Security Conditions

9. Undertakings for the Study

The Government of the Sultanate of Oman assures that the matters referred to in this form will be ensured for the smooth conduct of the Study by the Japanese Study Team.

(1) To facilitate the smooth conduct of the Study, the Government of the Sultanate of Oman shall take necessary measures:

1) To permit the members of the Team to enter, leave and sojourn in Oman for the duration of their assignments therein in connection with their assignment therein, and exempt them from foreign registration requirements and consular fees;

2) To exempt the member of the Team from taxes, duties and any other charges on equipment, machinery and other material brought into Oman for the implementation of the Study.

3) To exempt the member of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study,

4) To provide necessary facilities to the Study Team for remittance as well as

utilization of the funds introduced in Oman from Japan in connection with the implementation of the Study,

(2) The Government of the Sultanate of Oman shall bear claims, if any arise against the member(s) of the Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the Team.

(3) The implementing Agency shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

(4) The Implementing Agency shall, at its own expenses, provide the Team with the following, in cooperation with other organizations concerned.

1) Security-related information on as well as measures to ensure the safety of the Team;

2) Information on as well as support in obtaining medical service;

3) Available data and information related to the Study;

4) Counterpart personnel;

5) Suitable office space with necessary office equipment and furniture;

6) Credentials or identification cards; and

7) Vehicles with drivers

(5) The Implementing Agency will, as the executing agency of the project, take responsibilities that may arise from the products of the Study.

13. Others

Schedule 2
Sample Form of Implementation Agreement

IMPLEMENTATION AGREEMENT
ON
THE DETAILS OF THE COSTSHARING TECHNICAL COOPERATION
FOR
DEVELOPMENT OF THE MARINE ENVIRONMENT CONSERVATION STRATEGY
2040 AND ACTION PLANS IN THE SULTANATE OF OMAN
BETWEEN
THE JAPAN INTERNATIONAL COOPERATION AGENCY
AND
THE MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS
OF THE SULTANATE OF OMAN

Dated DD, MM, YYYY

This Implementation Agreement (hereinafter referred to as “I.A.”) is made as of this DD day of MM YYYY between **Japan International Cooperation Agency** (hereinafter referred to as “JICA”) of One Party, and **Ministry of Environment and Climate Affairs of the Sultanate of Oman** (hereinafter referred to as “MECA”) and **Ministry of Finance of the Sultanate of Oman** (hereinafter referred to as “MOF”), of the Other Party (individually a “Party” and collectively the “Parties”);

WHEREAS the Government of the Sultanate of Oman (hereinafter referred to as “GSO”) wishes to develop an appropriate conservation strategy and action plan for the use of marine resources for ensuring sustainable income of the nation, particularly from fisheries and tourism sectors;

WHEREAS Japan’s Prime Minister Shinzo Abe announced JICA’s new scheme of technical cooperation targeted at graduates of ODA recipient status, particularly with the Gulf Cooperation Council (GCC) countries including the Sultanate of Oman;

WHEREAS a bilateral cooperation between Oman and Japan for the development of long-term strategy for marine environment conservation has been proposed;

NOW THEREFORE, both parties agreed on the details of the cost sharing technical cooperation for Development of Marine Environment Conservation Strategy 2040 and Action Plans in the Sultanate of Oman (hereinafter referred to as the “Project” as follows, in accordance with Terms of Reference which has been Approved by the Cabinet of the Sultanate of Oman on DD, MM, YYYY :

Article I

Contributions of the Fund for the Project

Section 1. Amount and Purpose of Contributions

(1) JICA agrees to contribute an amount not exceeding US Dollar Thousand (US\$) as the fund for the implementation of the Project described in Section 1 of the **Schedule** 2 attached hereto on the terms and conditions set forth in this I.A. and in accordance with the relevant laws and regulations of Japan (hereinafter referred to as “JICA Contribution”), provided, however, that when the cumulative total of disbursements under I.A. reaches the said limit, JICA shall not make no further disbursement.

(2) The GSO agrees to contribute an amount US Dollar Thousand (US\$) as the fund for the implementation of the Project described in

Section 1 of the **Schedule 2** attached hereto and in accordance with the relevant laws and regulations of the Sultanate of Oman (hereinafter referred to as “Omani Contribution”), **provided, however, that should the funds available from the proceeds of the Contributions be insufficient for the implementation of the Project, the GSO shall make arrangement promptly to provide such funds as shall be needed.**⁵

Section 2 Use of the Proceeds of the Contributions

(1) JICA shall provide the Japanese Project Team, Equipment, if any, and training services of Omani counterpart personnel by the use of the proceeds of the JICA Contribution as is specified as Category A in section 2 of **Schedule 2** attached hereto.

(2) GSO shall provide the Omani Project Team, Facilities and Equipment etc. by the use of the proceeds of the Omani Contribution as is specified as Category B in section 2 of **Schedule 2** attached hereto.

(3) JICA shall also provide the Equipment, if any, and training services of Omani counterpart personnel by the use of the proceeds both of JICA Contribution and Omani Contribution as is specified in Category C in section 2 of Schedule 1 attached hereto.

(4) The GSO shall arrange the necessary fund for the implementation of the Project by the Executing Agency other than the Omani Contributions agreed, if such need arises.⁶

Section 3 Disbursement Procedure

(1) The GSO shall authorize Ministry of Environment and Climate Affairs (hereinafter referred to as the “Executing Agency”) to implement the Project.

(2) The Executing Agency shall proceed with the necessary procedure for disbursement of proceed of Omani Contribution upon delivery of notice of Initiation of the Project **by JICA.**⁷

(3) Should the Executing Agency wish to entrust the procurement of equipment to JICA, Transfer Procedure attached hereto as **Schedule 3** shall apply for

⁵ Oman 側がコンティンジェンシーを準備する？

⁶ この項は必要か否かオマーンに要確認

⁷ Initiative は JICA か Oman か？

disbursement of the proceeds of the Omani Contribution for the purchase of equipment.

(3) As to the disbursement of Omani Contribution for the expenditure in Category C in Section 2 of Schedule 2 attached hereto, Reimburse Procedure attached hereto as **Schedule 4** shall apply for disbursement of the proceeds of the Omani Contribution.

Section 4 Settlement of Account

(1) As to the contributions used independently by Omani side and JICA shall settle the account of the relevant portion following the respective accounting rule.

(2) As to the settlement of account for the portion of Omani contribution jointly used by JICA, JICA shall follow the accounting rule of JICA and Oman.

(3) As to the settlement of account for item(s) of which payment be completed within each implementation year, JICA shall settle such account at the end of the same year.

(4) As to the settlement of account for item(s) of which payment not be completed within a year, JICA shall settle such account provisionally based on the actual payment made in such year with the certified copies of necessary documents such as invoice and payment record etc.

(5) When payment is made in Japanese Yen by JICA, currency exchange risk shall be borne by JICA.

(6) As to the items of which payment be finalized, settlement of account shall be finalized at the end of the year when final payment is made.

(7) Final settlement of account of all the expenditure during the Project period shall be made at the end of the Project period and settlement of account report shall be made at the end of the Project period and settlement of account report shall be included in the Project Completion Report.

Section 5 Audit

(1) JICA shall accept the auditing by the GSO for the Omani Contribution if necessary and prepare necessary documents when the GSO requests JICA to do so as far as laws and regulations of Japan on the audit allows.

Article II

Project Implementation

Section 1 Project Preparation

(1) Total amount of Omani budget for five years of the Project shall be allocated to Executing Agency in the first year of operation of the Project.

(2) GSO shall establish Interministerial Technical Committee (hereinafter referred to as “TC”) for the Project consists of the representative of MECA, Ministry of Agriculture, Fisheries Welfare (hereinafter referred to as “MAFW”), Ministry of Tourism (hereinafter referred to as “MOT”), Sultan Qaboos University (hereinafter referred to as “SQU”), Ministry of Regional Municipalities and Water Resources (hereinafter referred to as “MRMWR”), Ministry of Transport and Communications (hereinafter referred to as “MOTC”), Ministry of Culture and Heritage (hereinafter referred to as “MOCH”), Ministry of Housing (hereinafter referred to as “MOH”), Ministry of Legal Affairs (hereinafter referred to as “MOLA” and the Supreme Council for Planning chaired by MECA.

Section 2 Project Implementation

(1) JICA shall, upon exchange of Note Verbale, prepare the procurement of the Supplier(s) following the procurement rules and regulation of JICA.

(2) JICA shall notify MECA of the initiation of the Project prior to mobilizing the Japanese Expert Team.

(3) MECA shall notify JICA of the acknowledgement of the Notice of Initiation.

(4) JICA and MECA shall procure necessary human resources, equipment and facilities and other necessities to implement the Project.

(5) JICA and MECA shall each other notify the mobilization of respective implementation team for the Project.

(6) At the end of each year, both team shall jointly produce the progress report and submit it to Joint Coordinating Committee.

(7) At the end of the final year, both team shall jointly produce the project completion report and report on the settlement of account for the approval of

Joint Coordinating Committee.

Section 3 Joint Coordinating Committee

(1) For the effective and successful implementation of technical cooperation for the Project, Joint Coordinating Committee (hereinafter referred to as “JCC”) shall be established in order to fulfil the following function:

- a. To approve the annual work plan of the Project based on the Tentative Schedule of Implementation within the framework of I.A.
- b. To report and review progress of the Project and the result of annual expenditure of GSO and JICA and take necessary measures to adjust the budget for next year if needed.
- c. To exchange opinions on major issues that arises during the implementation of the Project.

(2) JCC shall be held at least once a year. The Chairperson shall be the Chairperson of the TC and shall bear overall responsibility for the administration and implementation of the Project.

Article III

Intellectual Property Rights

Section 1 Intellectual Property Rights of JICA

(1) The ownership of all copyrights and other intellectual property rights with respect to any data compilations, research, or any other documents which are clearly understood to be developed under the Contribution of JICA through the Project (hereinafter referred to as the “intellectual property of JICA”) shall exclusively vest in or remain with JICA.

(2) The Executing Agency may use the intellectual property of JICA for the purpose of education, training, and research for free with prior written consent from JICA, provided, however, that the Executing Agency may not use the intellectual property of JICA for commercial use.

(3) The Executing Agency may not modify, amend, process or remove the object material and reports containing the intellectual property of JICA without

JICA's prior written consent.

Section2 Intellectual Property Rights of the Executing Agency

(1) The ownership of all copyrights and other intellectual property rights with respect to any data compilations, research, or any other documents which are clearly understood to be developed under the Omani Contribution through the Project (hereinafter referred to as the "intellectual property of Oman") shall exclusively vest in or remain with Oman.

(2) JICA may use the intellectual property of Oman for the purpose of education, training, and research for free with prior written consent from the Executing Agency, provided, however, that JICA may not use the intellectual property of Oman for commercial use.

(3) JICA may not modify, amend, process or remove the object material and reports containing the intellectual property of Oman without prior written consent of the Executing Agency.

Article IV

Breach of Agreement

Section 1 Breach of the Agreement

(1) In the event of a breach of any terms and conditions of I.A. by JICA or the GSO (hereinafter referred to as the "Breaching Party"), either Party that has been affected by the material damage caused by such breach (hereinafter referred to as the "Affected Party") shall give written notice of the breach to the Breaching Party.

(2) The Breaching Party shall make every reasonable effort to rectify such breach upon receiving such notice.

(3) If such breach is not rectified within reasonable period of time after receiving such notice, the Affected Party may terminate this Agreement in accordance with Article VI.

Article V

Applicable Laws; Notice and Request; Execution

Section 1 Applicable Laws

The validity, interpretation and performance of this Agreement, which shall be legally binding on the Parties except for the **Schedule 1**, shall be subject to the relevant laws and regulations of Japan.

Section 2 Notices and Requests

Any notice or request required to be given or made or which one or both parties have the right to give or make under this Agreement shall be in writing. Such notice or request shall be deemed to have been duly given or made when it shall have been delivered by hand, received by mail or registered mail to the party to which it is to be given or made at such party's address specified in **Schedule 5** attached hereto or at such other address as that party shall have designated by notice to the party giving the notice or making the request.

Section 3 Execution

I.A shall be executed in duplicate in the English language, each copy being considered to be an original.

Article VI

Effectiveness; Termination; Amendment

Section 1 Effectiveness

(1) I.A. shall enter into force on the date of signature by JICA and the GSO, after the said Note Verbales are exchanged.

Section 2 Termination

(1) When JICA or the GSO recognizes any of the following situations, JICA or the GSO may terminate I.A. after mutual consultation between the Parties and when necessary with the consent of the GOJ or the GSO,

i) The GOJ and the GSO have agreed to terminate the said Note Verbales.

ii) A fundamental change of circumstances, such as Force Majeure, relating to the Parties concerned has occurred with regard to those existing at the time of the entry into force of I.A..

iii) In the event of a material breach of I.A., as set forth in Article IV, when the Breaching Party has failed to rectify such breach within reasonable period of time after receiving the notice from the Affected Party.

Section 3 Provisions on Intellectual Property Rights

The provisions concerning the intellectual rights and the obligations imposed under Article III shall remain even after the termination of I.A.

Article VII

Force Majeure; Mutual Consultation; Dispute Resolution

Section 1 Force Majeure

(1) If either Party is temporarily unable to perform any of its obligations under I.A. due to Force Majeure, such as flood, earthquake, war and civil conflict of Japan or Oman, and if the said Party notifies the other Party in writing of the details of the non-performance and its cause within fourteen (14) days from its occurrence, such obligations of the Party shall be suspended as long as the inability continues or I.A. may be terminated based on mutual agreement by both Parties, as set forth in Article VI.

(2) Neither Party shall be liable to the other Party for losses or damages sustained by the other Party if the loss or damage arises from the non-performance caused by any event of Force Majeure.

Section 2 Mutual Consultation

JICA and GSO shall consult with each other whenever any material issues arise during the Project implementation.

Section 3 Dispute Resolution

(1) Any dispute, which cannot be resolved through mutual consultations between the Parties, arising out of or in connection with I.A. shall be referred to arbitration in Tokyo, Japan and finally settled in accordance with the Rules of Arbitration of the International Chamber of Commerce.

(2) The tribunal constituted pursuant to this Agreement shall consist of three arbitrators, one nominated by each Party, and an arbitrator, who shall be president of the tribunal, nominated by agreement of the Parties within thirty (30) days of confirmation of the respondent's party-appointed arbitrator or, failing such agreement, in accordance with the said Rules.

(3) The Language to be used in the arbitration shall be English.

(4) Any hearings shall be held in Tokyo.

IN WITNESS WHEREOF, JICA and GSO, acting through their duly authorized representatives, have caused the I.A. to be duly executed in their respective names and delivered at [Name of Place, Address of the Place], as of the day and year first above written.

For

JAPAN INTERNATIONAL
COOPERATION AGENCY

For

THE GOVERNMENT OF THE
SULTANATE OF OMAN

[NAME AND TITLE]

[NAME: MINISTRY OF
ENVIRONMENT AND CLIMATE
AFFIARS]

[NAME: MINISTRY OF FINANCE]

Schedule 1

Description of Project

Section 1. Outline of the Project

(1) Objective:

To develop the Marine Environment Conservation Strategy and Action Plans and to develop institutional capacity among the core organization

(2) Location:

Oman coastal territorial water plus Exclusive Economic Zone of Oman

(3) Executing Agency:

Ministry of Environment and Climate Affairs

(4) Scope of the Work

(i) Procurement of Equipment for the Project

(ii) Consulting Services for the followings:

(a) Data Collection for designation of Ecologically or Biologically Significant Area (EBSA) in the coastal area including ecologically related open sea area

(b) Designation of EBSA based on data evaluation and analysis

(c) Establishment of legal and institutional framework on marine environmental conservation and drafting Marine Environment Conservation Strategy and Action Plan

The proceeds of the Contributions are available for the above item (i) and (ii).

Any portion not covered by the Contributions on the aforementioned items and all other items are to be financed by the GSO.

Section 2 Initiation of the Project

The Project is expected to be started in April 2016.

Section 3 Completion of the Project

The Project is expected to be completed by December 2020.

Schedule 2

Estimated Cost and Allocation

Section 1 Estimated annual fund requirements are as shown below;

Calendar Year (Jan.-Dec.)	Contribution of GSO (in Thousand US Dollar)	Contribution of JICA (in Thousand US Dollar)
2016		
2017		
2018		
2019		
2020		
Total		

(Exchange Rate: OMR 1 = 2.5969ISD: 1USD=118.3948JPY)

Section 2 Allocation Among Categories

Category	A Amount of Contribution of GSO (in Thousand US Dollar) used by GSO	B Amount of Contribution of JICA (in Thousand US Dollar) Used by JICA	C Amount of Contribution of GSO (in Thousand US Dollar) Used in Japan by JICA
(1) Equipment			
(2) Consulting Services			
(3) Human Resources			
(4) Others			
(C) Contingencies			

Total			
-------	--	--	--

Note: Items not eligible for financing are as shown below.

- (a) General administration expenses
- (b) Taxes and duties
- (c) Purchase of land and other real property
- (d) Compensation
- (e) Other indirect items

Section 3 Reallocation upon change in cost estimates

(1) If the estimated cost of items included in any of Categories (1), (2), (3) and (4) shall decrease, the amount then allocated to, and no longer required for, such Category will be reallocated by the GSO to Category (5).

(2) If estimated cost of items included in any of Category (1), (2), (3) and (4) shall increase, the amount equal to the portion, if any, of such increase to be financed out of the proceeds of the Contribution, will be allocated by the GSO, at the request of JICA, to such Category from Category (5), subject, however, to the requirements for contingencies, as determined by the GSO, in respect of the cost of items in the other Categories.

Schedule 3

Transfer Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO is to be made. JICA shall request MECA to make transfer the amount expected to be paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Transfer in accordance with the attached Form RFD(T). Each Request for Transfer shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(T); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Transfer in order and in conformity with the relevant provisions of the I.A, MECA shall make transfer in US Dollar. Transfer will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Transfer by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Transfer shall be in US Dollar. When the currency used for the expected payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Transfer shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Transfer is made. The amount estimated to be paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(T) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

Request for Disbursement

Date:

App. Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF THE SULTANATE
OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of the Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

1. The undersigned certifies that:

(a) the expenditures described in the Summary Sheet(s) are to be made for the purposes specified in the I.A.

(b) the goods and services to be purchased with these expenditures will be procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;

2. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

3. This request consists of ___page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Signature)

Summary Sheet of Payments

■ Transfer Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Expected Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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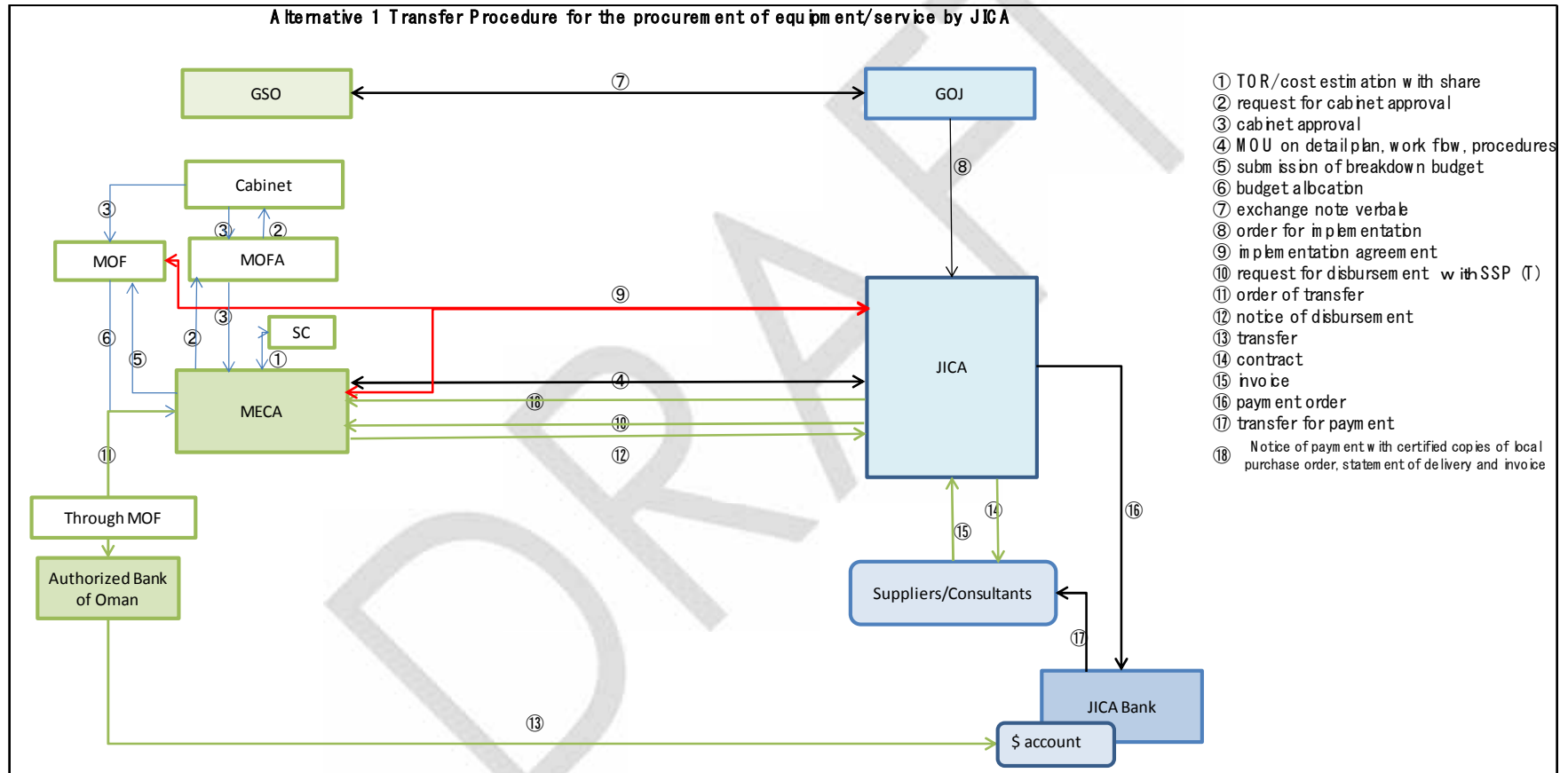
The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

--

(Reference)



Schedule 4

Reimbursement Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO have already been incurred. JICA shall request MECA to make reimbursement for a sum not exceeding the amount actually paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Reimbursement in accordance with the attached Form RFD(R). Each Request for Reimbursement shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(R); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Reimbursement in order and in conformity with the relevant provisions of the I.A, MECA shall make reimbursement in US Dollar. Reimbursement will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Reimbursement by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Reimbursement shall be in US Dollar. When the currency used for the actual payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Reimbursement shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Reimbursement is made. The amount paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(R) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or

permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

(Form RFD(R))

Request for Reimbursement

Date:

Application Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF SULTANATE OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

2. The undersigned certifies that:

- (a) the expenditures described in the Summary Sheet(s) were made for the purposes specified in the I.A.
- (b) the goods and services purchased with these expenditures have been procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;
- (c) the said goods and services were or will be supplied by the Supplier(s) specified in the attached Summary Sheet(s) of Payments.

3. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

4. This request consists of __page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Person's Signature, Name & Title)

Summary Sheet of Payments

■ Reimbursement Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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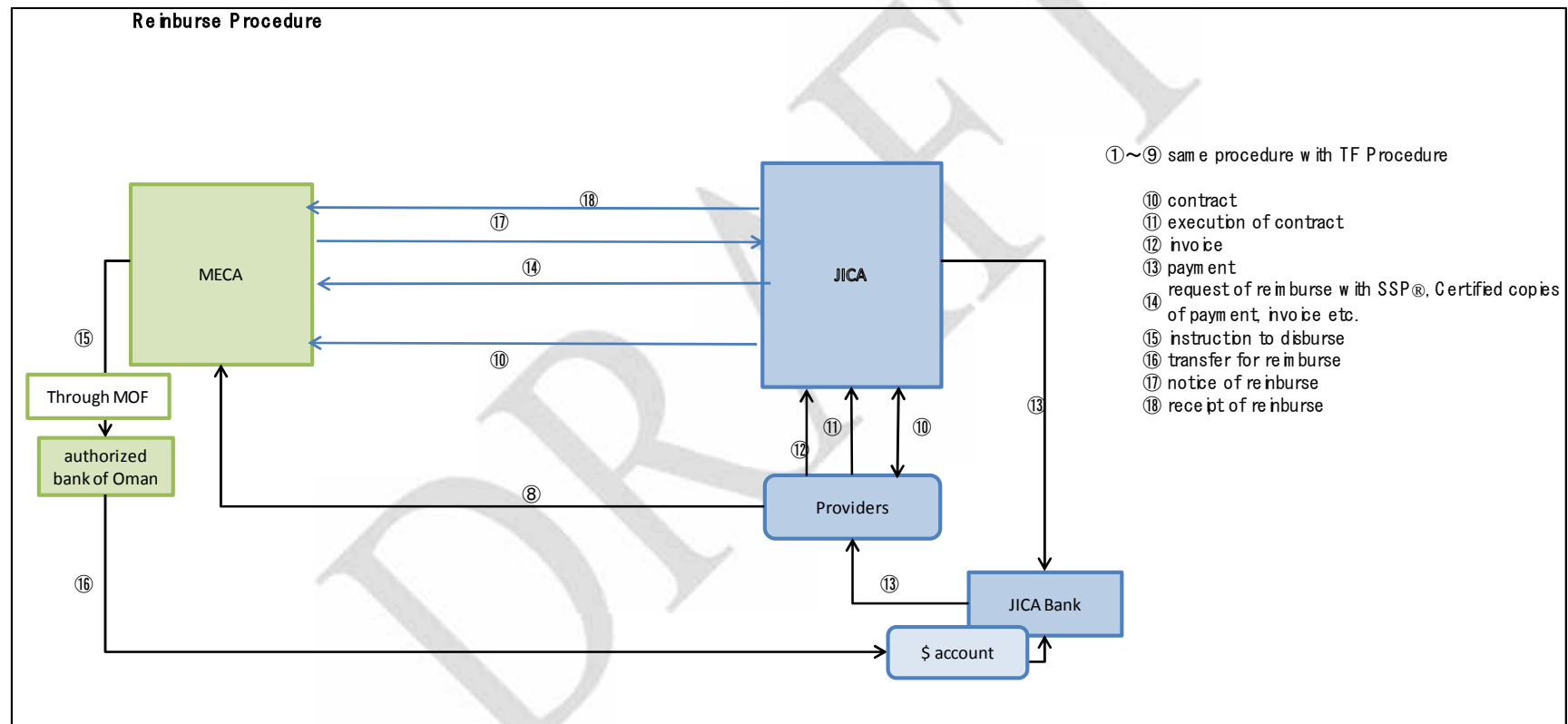
The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

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(Reference)



Schedule 5

Notices and Request

The following addresses are specified for the purpose of Section 2 of Article IV of the Project Agreement:

For JICA

Postal address:

JAPAN INTERNATIONAL COOPERATION AGENCY

Attention: _____

For GSO

Postal address :

MINISTRY OF FINANCE

Attention: _____

For Executing Agency

Postal address:

MINISTRY OF ENVIRONMENT AND CLIMATE AFFIARS

Attention: _____

If the above addresses and/or names are changed, the parties concerned shall immediately notify the other parties hereto in writing for the new addresses and/or names.

Schedule 3

Estimated Cost and Allocation

Section1 Estimated annual fund requirements are as shown below.

Calendar Year (Jan.-Dec.)	Contribution of GSO (in Thousand US Dollar)	Contribution of JICA (in Thousand US Dollar)
2016		
2017		
2018		
2019		
2020		
Total		

(Exchange Rate: OMR 1 = 2.5969USD: 1USD=118.3948JPY)

Section 2 Allocation Among Categories

Category	A Amount of Contribution of GSO (in Thousand US Dollar) used by GSO	B Amount of Contribution of JICA (in Thousand US Dollar) Used by JICA	C Amount of Contribution of GSO (in Thousand US Dollar) Used in Japan by JICA
(1) Equipment			
(2) Consulting Services			
(3) Human Resources			
(4) Others			
(C) Contingencies			
Total			

Note: Items not eligible for financing are as shown below.

- (a) General administration expenses
- (b) Taxes and duties
- (c) Purchase of land and other real property
- (d) Compensation
- (e) Other indirect items

Section 3 Reallocation upon change in cost estimates

(1) If the estimated cost of items included in any of Categories (1), (2), (3) and (4) shall decrease, the amount then allocated to, and no longer required for, such Category will be reallocated by the GSO to Category (5).

(2) If estimated cost of items included in any of Category (1), (2), (3) and (4) shall increase, the amount equal to the portion, if any, of such increase to be financed out of the proceeds of the Contribution, will be allocated by the GSO, at the request of JICA, to such Category from Category (5), subject, however, to the requirements for contingencies, as determined by the GSO, in respect of the cost of items in the other Categories.

Schedule 4

Transfer Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO is to be made. JICA shall request MECA to make transfer the amount expected to be paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Transfer in accordance with the attached Form RFD(T). Each Request for Transfer shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(T); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Transfer in order and in conformity with the relevant provisions of the I.A, MECA shall make transfer in US Dollar. Transfer will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Transfer by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Transfer shall be in US Dollar. When the currency used for the expected payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Transfer shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Transfer is made. The amount estimated to be paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(T) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

(Form TRF)

Request for Disbursement

Date:

App. Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF THE SULTANATE OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of the Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

1. The undersigned certifies that:

(a) the expenditures described in the Summary Sheet(s) are to be made for the purposes specified in the I.A.

(b) the goods and services to be purchased with these expenditures will be procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;

2. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

3. This request consists of ___page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Signature)

Summary Sheet of Payments

■ Transfer Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Expected Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

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Schedule 5

Reimbursement Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO have already been incurred. JICA shall request MECA to make reimbursement for a sum not exceeding the amount actually paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Reimbursement in accordance with the attached Form RFD(R). Each Request for Reimbursement shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(R); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Reimbursement in order and in conformity with the relevant provisions of the I.A, MECA shall make reimbursement in US Dollar. Reimbursement will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Reimbursement by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Reimbursement shall be in US Dollar. When the currency used for the actual payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Reimbursement shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Reimbursement is made. The amount paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(R) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or

permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

(Form RFD(R))

Request for Reimbursement

Date:

Application Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF SULTANATE OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

2. The undersigned certifies that:

- (a) the expenditures described in the Summary Sheet(s) were made for the purposes specified in the I.A.
- (b) the goods and services purchased with these expenditures have been procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;
- (c) the said goods and services were or will be supplied by the Supplier(s) specified in the attached Summary Sheet(s) of Payments.

3. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

4. This request consists of __page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Person's Signature, Name & Title)

Summary Sheet of Payments

■ Reimbursement Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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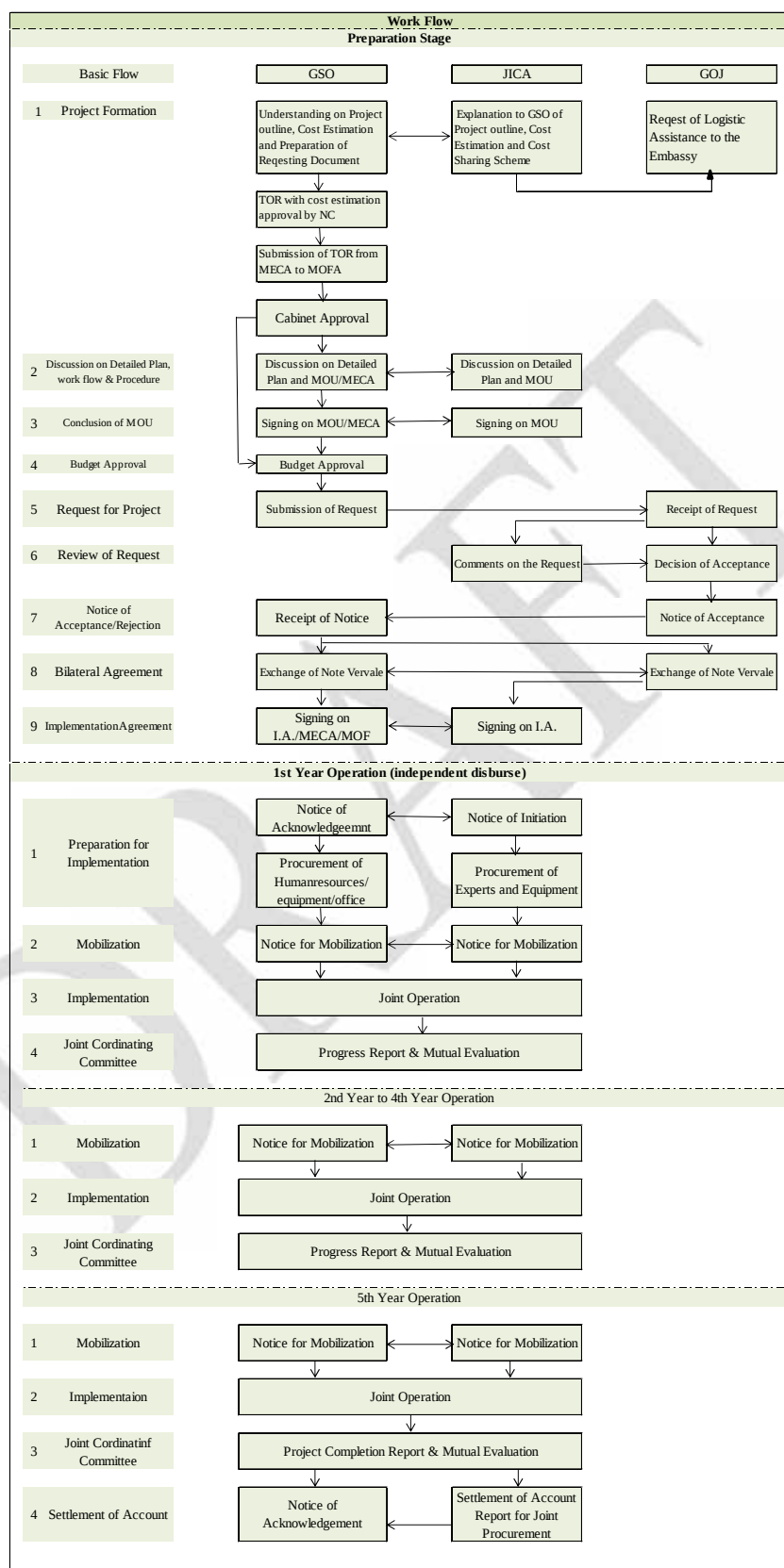
The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

--

(Reference)



Draft MOU on Cost Sharing

MEMORANNDAM OF UNDERSTANDING
ON
THE DETAILS OF THE COSTSHARING TECHNICAL COOPERATION
FOR
DEVELOPMENT OF THE MARINE ENVIRONMENT CONSERVATION STRATEGY
2040 AND ACTION PLANS IN THE SULTANATE OF OMAN
BETWEEN
THE JAPAN INTERNATIONAL COOPERATION AGENCY
AND
THE MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS
OF THE SULTANATE OF OMAN

Dated DD, MM, YYYY

This Memorandum of Understanding (hereinafter referred to as “MOU”) is made as of this DD day of MM YYYY between **Japan International Cooperation Agency** (hereinafter referred to as “JICA”) of One Party, and **Ministry of Environment and Climate Affairs of the Sultanate of Oman** (hereinafter referred to as “MECA”), of the Other Party (individually a “Party” and collectively the “Parties”);

WHEREAS the Government of the Sultanate of Oman (hereinafter referred to as “GSO”) wishes to develop an appropriate conservation strategy and action plan for the use of marine resources for ensuring sustainable income of the nation, particularly from fisheries and tourism sectors;

WHEREAS Japan’s Prime Minister Shinzo Abe announced JICA’s new scheme of technical cooperation targeted at graduates of ODA recipient status, particularly with the Gulf Cooperation Council (GCC) countries including the Sultanate of Oman;

WHEREAS a bilateral cooperation between Oman and Japan for the development of long-term strategy for marine environment conservation has been proposed;

NOW THEREFORE, both parties agreed on the details of the cost sharing technical cooperation for Development of Marine Environment Conservation Strategy 2040 and Action Plans in the Sultanate of Oman (hereinafter referred to as the “Project” as follows, in accordance with Terms of Reference which has been Approved by the Cabinet of the Sultanate of Oman on DD, MM, YYYY :

Article I

Contributions of the Fund for the Project

Section 1. Amount and Purpose of Contributions

(1) JICA agrees to contribute an amount not exceeding US Dollar Thousand (US\$ _____) as the fund for the implementation of the Project described in the **Schedule 1** attached hereto on the terms and conditions set forth in this Minutes of Understanding (hereinafter referred to as “MOU”) and in accordance with the relevant laws and regulations of Japan (hereinafter referred to as “JICA Contribution”), provided, however, that when the cumulative total of disbursements under the Project Agreement reaches the said limit, JICA shall not make no further disbursement.

(2) The GSO agrees to contribute an amount US Dollar Thousand (US\$ _____) as the fund for the implementation of the Project described in

the **Schedule 1** attached hereto and in accordance with the relevant laws and regulations of the Sultanate of Oman (hereinafter referred to as “Omani Contribution”), **provided, however, that should the funds available from the proceeds of the Contributions be insufficient for the implementation of the Project, the GSO shall make arrangement promptly to provide such funds as shall be needed.**¹

Section 2 Use of the Proceeds of the Contributions

(1) JICA shall provide the Japanese Project Team, Equipment, if any, and training services of Omani counterpart personnel by the use of the proceeds of the JICA Contribution as is specified as Category A in section 2 of **Schedule 2** attached hereto.

(2) GSO shall provide the Omani Project Team, Facilities and Equipment etc. by the use of the proceeds of the Omani Contribution as is specified as Category B in section 2 of **Schedule 2** attached hereto.

(3) JICA shall also provide the Equipment, if any, and training services of Omani counterpart personnel by the use of the proceeds both of JICA Contribution and Omani Contribution as is specified in Category C in section 2 of Schedule 2 attached hereto.

(4) The GSO shall arrange the necessary fund for the implementation of the Project by the Executing Agency other than the Omani Contributions agreed, if such need arises.²

Section 3 Disbursement Procedure

(1) The GSO shall authorize Ministry of Environment and Climate Affairs (hereinafter referred to as the “Executing Agency”) to implement the Project.

(2) The Executing Agency shall proceed with the necessary procedure for disbursement of proceed of Omani Contribution upon delivery of notice of Initiation of the Project **by JICA.**³

(3) Should the Executing Agency wish to entrust the procurement of equipment to JICA, Transfer Procedure attached hereto as **Schedule 3** shall apply for

¹ Oman 側がコンテインジェンシーを準備する？

² この項は必要か否かオマーンに要確認

³ Initiative は JICA か Oman か？

disbursement of the proceeds of the Omani Contribution for the purchase of equipment.

(3) As to the disbursement of Omani Contribution for the expenditure in Category C in Section 2 of Schedule 2 attached hereto, Reimburse Procedure attached hereto as **Schedule 4** shall apply for disbursement of the proceeds of the Omani Contribution.

Section 4 Settlement of Account

(1) As to the contributions used independently by Omani side and JICA shall settle the account of the relevant portion following the respective accounting rule.

(2) As to the settlement of account for the portion of Omani contribution jointly used by JICA, JICA shall follow the accounting rule of JICA and Oman.

(3) As to the settlement of account for item(s) of which payment be completed within each implementation year, JICA shall settle such account at the end of the same year.

(4) As to the settlement of account for item(s) of which payment not be completed within a year, JICA shall settle such account provisionally based on the actual payment made in such year with the certified copies of necessary documents such as invoice and payment record etc.

(5) When payment is made in Japanese Yen by JICA, currency exchange risk shall be borne by JICA.

(6) As to the items of which payment be finalized, settlement of account shall be finalized at the end of the year when final payment is made.

(7) Final settlement of account of all the expenditure during the Project period shall be made at the end of the Project period and settlement of account report shall be made at the end of the Project period and settlement of account report shall be included in the Project Completion Report.

Section 5 Audit

(1) JICA shall accept the auditing by the GSO for the Omani Contribution if necessary and prepare necessary documents when the GSO requests JICA to do so as far as laws and regulations of Japan on the audit allows.

Article II

Project Implementation

Section 1 Project Preparation

- (1) Executing Agency shall submit the detailed break down of the Omani Contribution based on this MOU to the Ministry of Finance of the Sultanate of Oman (hereinafter referred to as “MOF”) for the allocation of the budget.
- (2) Total amount of Omani budget for five years of the Project shall be allocated to Executing Agency in the first year of operation of the Project.
- (3) GSO shall submit the official request of the Project to Japanese Government (hereinafter referred to as “GOJ”) through the Embassy of Japan in Oman.
- (4) GOJ shall notify the adoption of the request after consulting with JICA.
- (5) GOJ and GSO shall exchange Note Verbale on the Implementation of the Project.
- (6) GSO shall establish Technical Committee (hereinafter referred to as “TC”) for the Project consists of the representative of MECA, Ministry of Agriculture, Fisheries Welfare (hereinafter referred to as “MAFW”), Ministry of Tourism (hereinafter referred to as “MOT”), Sultan Qaboos University (hereinafter referred to as “SQU”), Ministry of Regional Municipalities and Water Resources (hereinafter referred to as “MRMWR”), Ministry of Transport and Communications (hereinafter referred to as “MOTC”), Ministry of Culture and Heritage (hereinafter referred to as “MOCH”), Ministry of Housing (hereinafter referred to as “MOH”), Ministry of Legal Affairs (hereinafter referred to as “MOLA” and the Supreme Council for Planning chaired by MECA.
- (7) The Ministry of Finance and the Executing Agency shall draft the Implementation Agreement (hereinafter referred to as “I.A.”) on the Project in consultation with JICA based on this MOU.
- (8) The signatories of the I.A. shall be MOF and MECA for Omani side and JICA for Japanese side.

Section 2 Project Implementation

- (1) GSO shall, upon exchange of Note Verbale, make available the budget for the Project and order to execute the budget to the Executing Agency.
- (2) JICA shall, upon exchange of Note Verbale, prepare the procurement of the Supplier(s) following the procurement rules and regulation of JICA.
- (3) JICA shall notify MECA of the initiation of the Project prior to mobilizing the Japanese Expert Team.
- (4) MECA shall notify JICA of the acknowledgement of the Notice of Initiation.
- (5) JICA and MECA shall procure necessary human resources, equipment and facilities and other necessities to implement the Project.
- (6) JICA and MECA shall each other notify the mobilization of respective implementation team for the Project.
- (7) At the end of each year, both team shall jointly produce the progress report and submit it to Joint Coordinating Committee.
- (8) At the end of the final year, both team shall jointly produce the project completion report and report on the settlement of account for the approval of Joint Coordinating Committee.

Section 3 Joint Coordinating Committee

- (1) For the effective and successful implementation of technical cooperation for the Project, Joint Coordinating Committee (hereinafter referred to as “JCC”) shall be established in order to fulfil the following function:
 - a. To approve the annual work plan of the Project based on the Tentative Schedule of Implementation within the framework of I.A.
 - b. To report and review progress of the Project and the result of annual expenditure of GSO and JICA and take necessary measures to adjust the budget for next year if needed.
 - c. To exchange opinions on major issues that arises during the implementation of the Project.
- (2) JCC shall be held at least once a year. The Chairperson shall be the Chairperson of the TC and shall bear overall responsibility for the administration and implementation of the Project.

Article III

Intellectual Property Rights

Section 1 Intellectual Property Rights of JICA

(1) The ownership of all copyrights and other intellectual property rights with respect to any data compilations, research, or any other documents which are clearly understood to be developed under the Contribution of JICA through the Project (hereinafter referred to as the “intellectual property of JICA”) shall exclusively vest in or remain with JICA.

(2) The Executing Agency may use the intellectual property of JICA for the purpose of education, training, and research for free with prior written consent from JICA, provided, however, that the Executing Agency may not use the intellectual property of JICA for commercial use.

(3) The Executing Agency may not modify, amend, process or remove the object material and reports containing the intellectual property of JICA without JICA’s prior written consent.

Section2 Intellectual Property Rights of the Executing Agency

(1) The ownership of all copyrights and other intellectual property rights with respect to any data compilations, research, or any other documents which are clearly understood to be developed under the Omani Contribution through the Project (hereinafter referred to as the “intellectual property of Oman”) shall exclusively vest in or remain with Oman.

(2) JICA may use the intellectual property of Oman for the purpose of education, training, and research for free with prior written consent from the Executing Agency, provided, however, that JICA may not use the intellectual property of Oman for commercial use.

(3) JICA may not modify, amend, process or remove the object material and reports containing the intellectual property of Oman without prior written consent of the Executing Agency.

Article IV

Breach of Agreement

Section 1 Breach of the Agreement

(1) In the event of a breach of any terms and conditions of I.A. by JICA or the GSO (hereinafter referred to as the “Breaching Party”), either Party that has been affected by the material damage caused by such breach (hereinafter referred to as the “Affected Party”) shall give written notice of the breach to the Breaching Party.

(2) The Breaching Party shall make every reasonable effort to rectify such breach upon receiving such notice.

(3) If such breach is not rectified within reasonable period of time after receiving such notice, the Affected Party may terminate this Agreement in accordance with Article VI.

Article V

Applicable Laws; Notice and Request; Execution

Section 1 Applicable Laws

The validity, interpretation and performance of this Agreement, which shall be legally binding on the Parties except for the **Schedule 1**, shall be subject to the relevant laws and regulations of Japan.

Section 2 Notices and Requests

Any notice or request required to be given or made or which one or both parties have the right to give or make under this Agreement shall be in writing. Such notice or request shall be deemed to have been duly given or made when it shall have been delivered by hand, received by mail or registered mail to the party to which it is to be given or made at such party’s address specified in **Schedule 5** attached hereto or at such other address as that party shall have designated by notice to the party giving the notice or making the request.

Section 3 Execution

I.A shall be executed in duplicate in the English language, each copy being considered to be an original.

Article VI

Effectiveness; Termination; Amendment

Section 1 Effectiveness

(1) I.A. shall enter into force on the date of signature by JICA and the GSO, after the said Note Verbales are exchanged.

Section 2 Termination

(1) When JICA or the GSO recognizes any of the following situations, JICA or the GSO may terminate I.A. after mutual consultation between the Parties and when necessary with the consent of the GOJ or the GSO,

i) The GOJ and the GSO have agreed to terminate the said Note Verbales.

ii) A fundamental change of circumstances, such as Force Majeure, relating to the Parties concerned has occurred with regard to those existing at the time of the entry into force of I.A..

iii) In the event of a material breach of I.A., as set forth in Article IV, when the Breaching Party has failed to rectify such breach within reasonable period of time after receiving the notice from the Affected Party.

Section 3 Provisions on Intellectual Property Rights

The provisions concerning the intellectual rights and the obligations imposed under Article III shall remain even after the termination of I.A.

Article VII

Force Majeure; Mutual Consultation; Dispute Resolution

Section 1 Force Majeure

(1) If either Party is temporarily unable to perform any of its obligations under I.A. due to Force Majeure, such as flood, earthquake, war and civil conflict of Japan or Oman, and if the said Party notifies the other Party in writing of the details of the non-performance and its cause within fourteen (14) days from its occurrence, such obligations of the Party shall be suspended as long as the inability continues or I.A. may be terminated based on mutual agreement by both Parties, as set forth in Article VI.

(2) Neither Party shall be liable to the other Party for losses or damages

sustained by the other Party if the loss or damage arises from the non-performance caused by any event of Force Majeure.

Section 2 Mutual Consultation

JICA and GSO shall consult with each other whenever any material issues arise during the Project implementation.

Section 3 Dispute Resolution

(1) Any dispute, which cannot be resolved through mutual consultations between the Parties, arising out of or in connection with I.A. shall be referred to arbitration in Tokyo, Japan and finally settled in accordance with the Rules of Arbitration of the International Chamber of Commerce.

(2) The tribunal constituted pursuant to this Agreement shall consist of three arbitrators, one nominated by each Party, and an arbitrator, who shall be president of the tribunal, nominated by agreement of the Parties within thirty (30) days of confirmation of the respondent's party-appointed arbitrator or, failing such agreement, in accordance with the said Rules.

(3) The Language to be used in the arbitration shall be English.

(4) Any hearings shall be held in Tokyo.

IN WITNESS WHEREOF, JICA and GSO, acting through their duly authorized representatives, have caused the I.A. to be duly executed in their respective names and delivered at [Name of Place, Address of the Place], as of the day and year first above written.

For

For

JAPAN
COOPERATION AGENCY

INTERNATIONAL

THE GOVERNMENT OF THE
SULTANATE OF OMAN

[NAME AND TITLE]

[NAME: MINISTRY OF
ENVIRONMENT AND CLIMATE
AFFIARS]

DRAFT

Schedule 1

Description of Project

Section 1. Outline of the Project

(1) Objective:

To develop the Marine Environment Conservation Strategy and Action Plans and to develop institutional capacity among the core organization

(2) Location:

Oman coastal territorial water plus Exclusive Economic Zone of Oman

(3) Executing Agency:

Ministry of Environment and Climate Affairs

(4) Scope of the Work

(i) Procurement of Equipment for the Project

(ii) Consulting Services for the followings:

(a) Data Collection for designation of Ecologically or Biologically Significant Area (EBSA) in the coastal area including ecologically related open sea area

(b) Designation of EBSA based on data evaluation and analysis

(c) Establishment of legal and institutional framework on marine environmental conservation and drafting Marine Environment Conservation Strategy and Action Plan

The proceeds of the Contributions are available for the above item (i) and (ii).

Any portion not covered by the Contributions on the aforementioned items and all other items are to be financed by the GSO.

Section 2 Initiation of the Project

The Project is expected to be started in April 2016.

Section 3 Completion of the Project

The Project is expected to be completed by December 2020.

Schedule 2

Estimated Cost and Allocation

Section 1 Estimated annual fund requirements are as shown below;

Calendar Year (Jan.-Dec.)	Contribution of GSO (in Thousand US Dollar)	Contribution of JICA (in Thousand US Dollar)
2016		
2017		
2018		
2019		
2020		
Total		

(Exchange Rate: OMR 1 = 2.5969ISD: 1USD=118.3948JPY)

Section 2 Allocation Among Categories

Category	A Amount of Contribution of GSO (in Thousand US Dollar) used by GSO	B Amount of Contribution of JICA (in Thousand US Dollar) Used by JICA	C Amount of Contribution of GSO (in Thousand US Dollar) Used in Japan by JICA
(1) Equipment			
(2) Consulting Services			
(3) Human Resources			
(4) Others			
(C) Contingencies			

Total			
-------	--	--	--

Note: Items not eligible for financing are as shown below.

- (a) General administration expenses
- (b) Taxes and duties
- (c) Purchase of land and other real property
- (d) Compensation
- (e) Other indirect items

Section 3 Reallocation upon change in cost estimates

(1) If the estimated cost of items included in any of Categories (1), (2), (3) and (4) shall decrease, the amount then allocated to, and no longer required for, such Category will be reallocated by the GSO to Category (5).

(2) If estimated cost of items included in any of Category (1), (2), (3) and (4) shall increase, the amount equal to the portion, if any, of such increase to be financed out of the proceeds of the Contribution, will be allocated by the GSO, at the request of JICA, to such Category from Category (5), subject, however, to the requirements for contingencies, as determined by the GSO, in respect of the cost of items in the other Categories.

Schedule 3

Transfer Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO is to be made. JICA shall request MECA to make transfer the amount expected to be paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Transfer in accordance with the attached Form RFD(T). Each Request for Transfer shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(T); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Transfer in order and in conformity with the relevant provisions of the I.A, MECA shall make transfer in US Dollar. Transfer will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Transfer by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Transfer shall be in US Dollar. When the currency used for the expected payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Transfer shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Transfer is made. The amount estimated to be paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(T) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

(Form TRF)

Request for Disbursement

Date:

App. Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF THE SULTANATE OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of the Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

1. The undersigned certifies that:

(a) the expenditures described in the Summary Sheet(s) are to be made for the purposes specified in the I.A.

(b) the goods and services to be purchased with these expenditures will be procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;

2. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

3. This request consists of ___page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Signature)

Summary Sheet of Payments

■ Transfer Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Expected Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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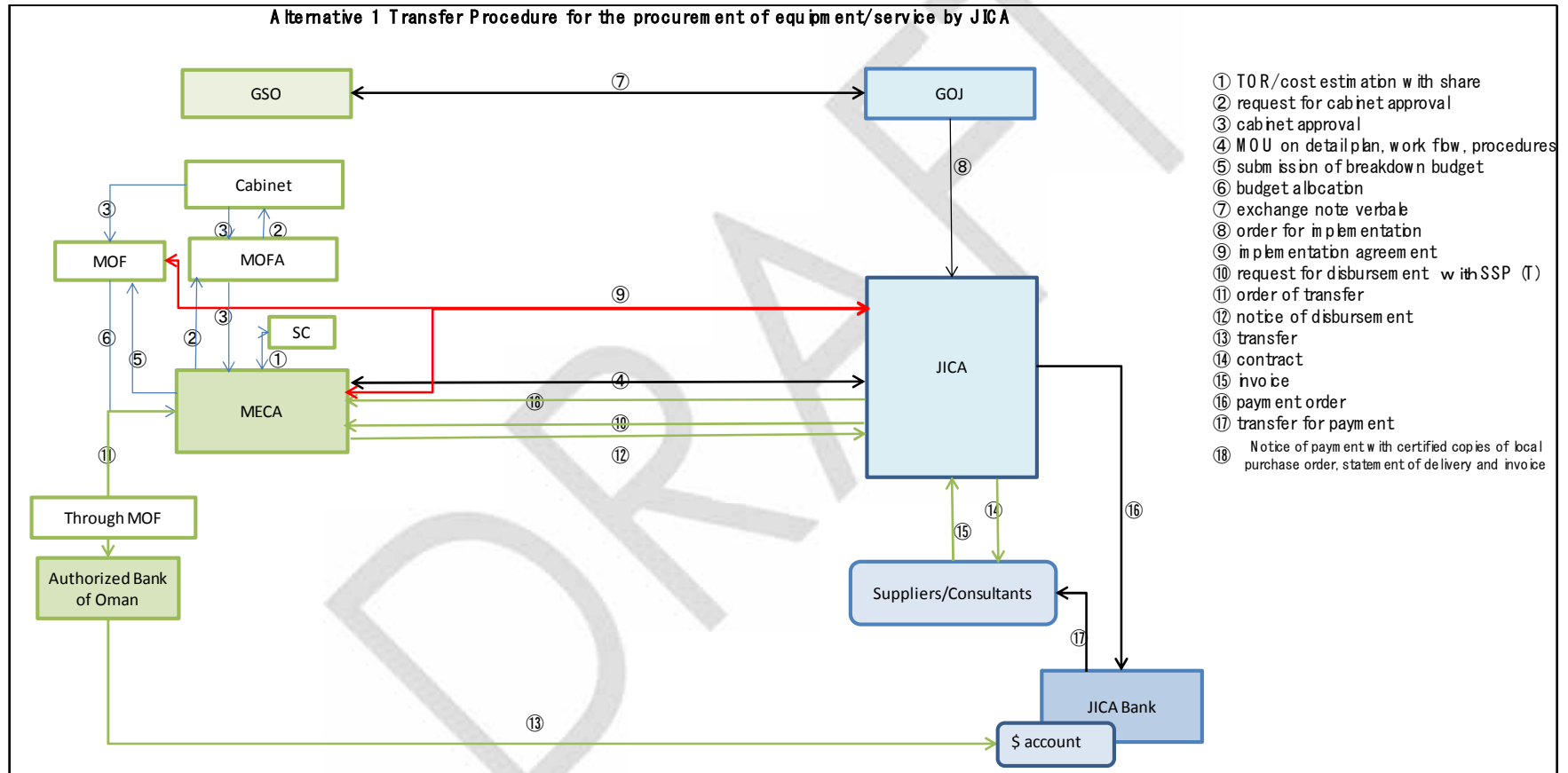
The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

--

(Reference)



Schedule 4

Reimbursement Procedure for Cost Sharing Technical Cooperation

Section 1. Procedure

1. This Schedule is to be followed in cases where expenditures by JICA, eligible for financing by contributions of GSO have already been incurred. JICA shall request MECA to make reimbursement for a sum not exceeding the amount actually paid to the suppliers, contractors or consultants (hereinafter collectively referred to as the “Supplier(s)”) by sending to MECA a Request for Reimbursement in accordance with the attached Form RFD(R). Each Request for Reimbursement shall be accompanied by the following documents:

- (a) Summary Sheet of Payments made substantially as per Form SSP(R); and
- (b) supporting documents evidencing each payment and its usage, as stipulated in the I.A.

2. When MECA finds the Request for Reimbursement in order and in conformity with the relevant provisions of the I.A, MECA shall make reimbursement in US Dollar. Reimbursement will be made, in principle, within fifteen (15) business days from the date of receipt of the Request for Reimbursement by paying into the US Dollar account of the Bank in Tokyo designated by JICA (hereinafter referred to as the “JICA Bank”), as stipulated in the I.A.

3. The amount stated in the Request for Reimbursement shall be in US Dollar. When the currency used for the actual payment to the Supplier(s) is different from US Dollar, the amount stated in the Request for Reimbursement shall be calculated using the telegraphic transfer buying (TTB) rate quoted by a foreign exchange bank authorized as such by the authority in Japan, one (1) business day prior to the date on which the Request for Reimbursement is made. The amount paid to the Supplier(s) and exchange rate used for conversion to US Dollar shall be described in the Summary Sheet of Payments as per Form SSP(R) and submitted together with the evidence of such conversion rate.

Section 2 Banking Arrangement

1. MECA shall designate a foreign exchange bank in Oman (hereinafter referred to as the “Agent Bank”), as stipulated in I.A., as its agent for the purposes of taking any action or entering into any arrangement or agreement, on behalf of MECA, required or

permitted under this procedure.

2. Any action taken or arrangement or agreement entered into by the Agent Bank pursuant to the authority conferred on the Agent Bank shall be fully binding on MECA and shall have the same force and effect as if such action was taken or such arrangement or agreement was entered into by MECA. MECA may revoke or modify the authority conferred on the Agent Bank if consent of JICA is obtained.

3. MECA shall cause the Agent Bank to make necessary arrangement with the JICA Bank, including, but not limited to, the following for this procedure:

(a) to open a Contribution Account on behalf of MECA with the JICA Bank; and

(b) to confirm necessary arrangement for transaction of the funds after the proceeds of the contribution is credited to the Contribution Account.

Section 3. Foreign Exchange Risk

1. JICA shall bear all risks associated with foreign exchange fluctuations arising from disbursement and MECA shall not be liable therefor.

(Form RFD(R))

Request for Reimbursement

Date:

Application Serial No.:

To: MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS OF SULTANATE OF OMAN

Attention: Director General of Nature Conservation

Dear Sir:

Pursuant to the Implementation Agreement (hereinafter referred to as "I.A.") dated _____, 2016, between Japan International Cooperation Agency (hereinafter referred to as "JICA") and The Government of Sultanate of Oman (hereinafter referred to as "the GSO"), the undersigned hereby requests for disbursement under the said I.A. of the sum of US Dollar _____ (Say _____) for the payment of expenditures as described in the Summary Sheet(s) attached hereto.

2. The undersigned certifies that:

- (a) the expenditures described in the Summary Sheet(s) were made for the purposes specified in the I.A.
- (b) the goods and services purchased with these expenditures have been procured in accordance with the applicable procurement procedures agreed with the GSO pursuant to the said I.A. and the cost and terms of purchase thereof are reasonable;
- (c) the said goods and services were or will be supplied by the Supplier(s) specified in the attached Summary Sheet(s) of Payments.

3. Please disburse the amount herein requested by paying into the US Dollar account of JICA with The Bank of Tokyo-Mitsubishi UFJ Ltd., Tokyo.

4. This request consists of __page(s) and signed and numbered Summary Sheet(s).

Very truly yours,

For: JICA

By: _____

(Authorized Person's Signature, Name & Title)

Summary Sheet of Payments

■ Reimbursement Procedure

Date:

Application Serial No.:		Category:		Contract No:	
				(A)	(B)
				(C)=(A)*(B)	
Item No.	Contract Amount	Description	Amount Payable (without Tax)	Share of Omani Contribution	Amount for Oman Financing
1.					
2.					
3.					

Total (A) _____ Total (C) _____

If requested currency is different from (C) above: **Exchange rate (E): 1JPY=XX** <dated DDMMYYYY>

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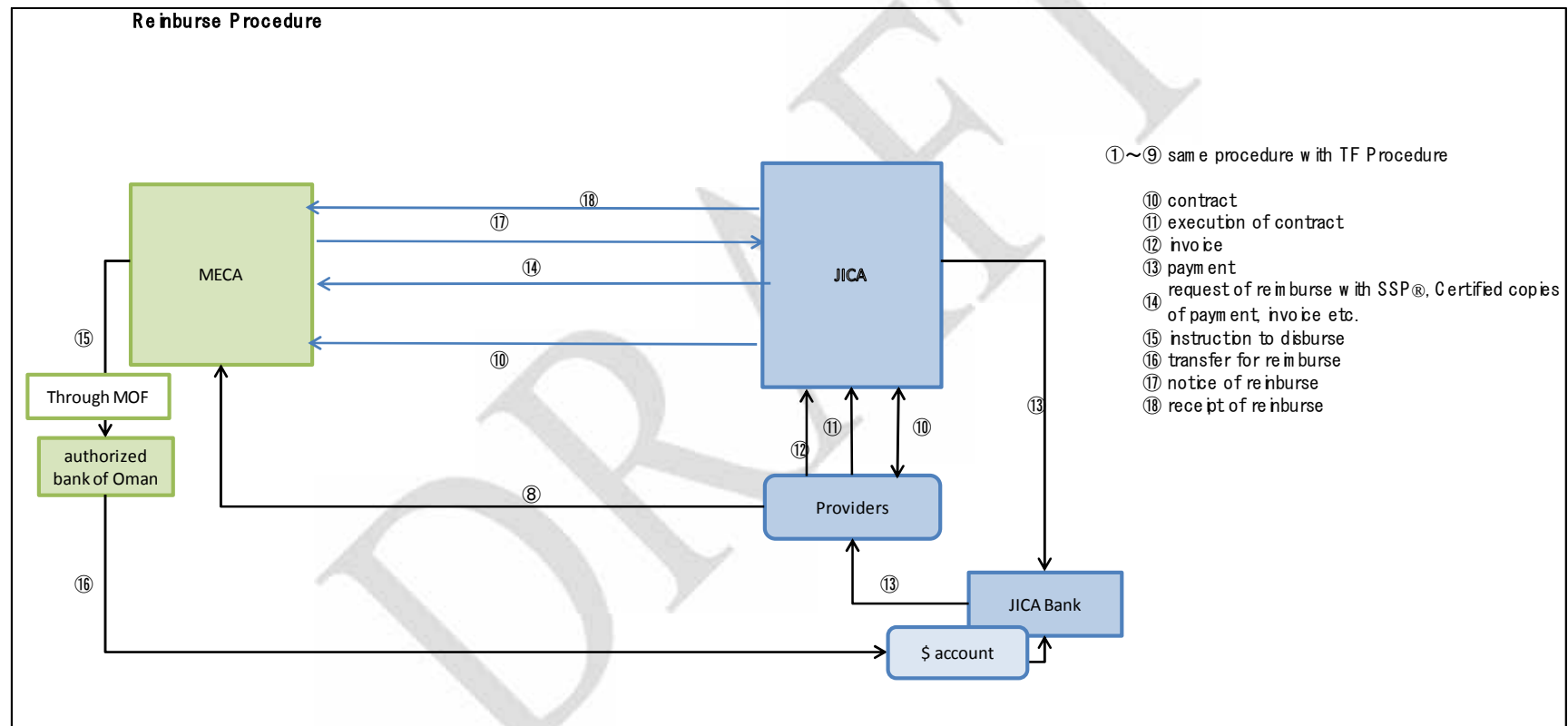
The undersigned certifies that the payments stated above are eligible under the I.A.

For JICA

 Authorized Person's
 Signature, Name & Title

--

(Reference)



Schedule 5

Notices and Request

The following addresses are specified for the purpose of Section 2 of Article IV of the Project Agreement:

For JICA

Postal address:

JAPAN INTERNATIONAL COOPERATION AGENCY

Attention: _____

For GSO

Postal address :

MINISTRY OF FINANCE

Attention: _____

For Executing Agency

Postal address:

MINISTRY OF ENVIRONMENT ANDCLIMATE AFFIARS

Attention: _____

If the above addresses and/or names are changed, the parties concerned shall immediately notify the other parties hereto in writing for the new addresses and/or names.

Preparatory Survey for the Project
on
Development of Marine Environment
Conservation Strategy 2050 and Action Plans
in the Sultanate of Oman

First Draft Report

April 2018

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List of abbreviations

CBD	Convention on Biological Diversity
EBM	Ecological Based Management
EBSA	Ecologically or Biologically Significant Area
GCC	Gulf Cooperation Council
GIS	Geographic Information System
IUCN	International Union for Conservation of Nature
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JICA	Japan International Cooperation Agency
LANDSAT	Renamed from the “Earth Resources Technology Satellite”
MAFW	Ministry of Agriculture and Fishery Wealth, Sultanate of Oman
MECA	Ministry of Environment and Climate Affairs, Sultanate of Oman
MOT	Ministry of Tourism, Sultanate of Oman
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MTP	Mangrove Transplanting Project
NOAA	National Oceanic and Atmospheric Administration, United States of America
OJT	On the Job Training
QEIC	Qrum Environmental Information Center, MECA
RESTEC	Remote Sensing Technology Center of Japan
ROPME	Regional Organization for the Protection of the Marine Environment
SQU	Sultan Qaboos University, Sultanate of Oman
TOR	Terms of Reference
UNEP	United Nations Environment Programme
WG	Working Group

CHAPTER 1 OUTLINE OF THE PREPARATORY SURVEY

1.1 Background

The Project for the Development of Marine Environment Conservation Strategy 2050 and Action Plans in the Sultanate of Oman was proposed to the Government of Sultanate of Oman in November 2015 by the Ministry of Environment and Climate Affairs in cooperation with JICA.

Since then, due to the downslide of oil price, the approval of commencement of the Project by the government is being awaited.

While the government of Oman is aiming the development of Marine Environment Conservation Strategy 2050, immediate launch of the project is highly expected.

In the circumstances, Japan International Cooperation Agency (JICA) decided to implement a part of the proposed project (here in after referred to as the Preparatory Survey), in the framework of the ROPME-JICA Partnership Programme¹.



Source: <https://upload.wikimedia.org/wikipedia/commons/2/2d/Oman.PNG>

Figure 1-1 Sultanate of Oman

¹ ROPME-JICA Partnership Program has been started on November 2015, based on the MOU which was signed on November 2014.

1.2 Objectives

The Preparatory Survey was carried out a part of the Project, aiming the following objectives;

- To understand the present situation of marine environment conservation,
- To establish an implementation structure for the proposed project, which were proposed in the proposed TOR of the Project,
- To implement several activities in the proposed TOR, and
- To hold ROPME-JICA Regional workshop for the common understandings towards the Ecosystem Based Management (EBM) Strategy.²

1.3 Framework and Components of the Preparatory Survey

The Preparatory Survey is basically a part of the Project. Table 1-1 shows the proposed schedule of the Project. And the Preparatory Survey covers the Step 1 and a part of Step 4 of the Project.

Several components, however, are considered as listed below, considering the movement of international organizations, such as Regional Seas Programs by UNEP and ROPME-JICA Partnership Program³.

- Workshops on screening of candidate EBSA sites
- Workshop on utilization of satellite images for EBM Strategy
- Regional Workshop on sharing the outcomes of the Preparatory Survey among the member countries

Figure 1-2 shows the composition of the Preparatory survey.

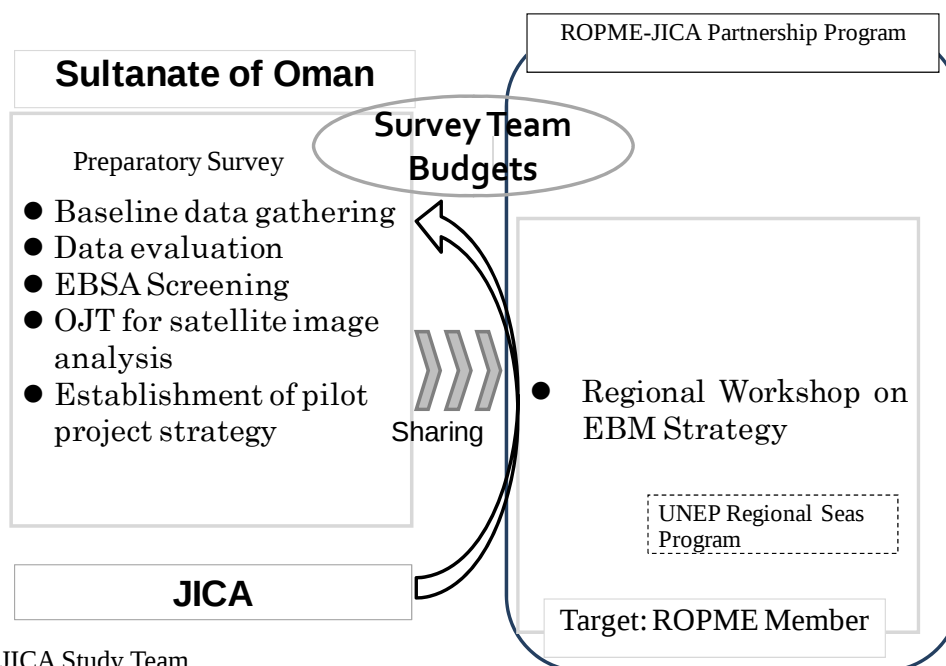
² This idea was recently agreed in the ROPME-UNEP Workshop held in Dubai, April 2016.

³ Establishment of EBM Strategy in the ROPME Sea Area was agreed in the ROPME-UNEP Workshop in April 2016, as a part of the Regional Seas Program by UNEP. ROPME-JICA Partnership Program plans to hold Regional Workshops for the conservation of marine environment.

Table 1-1 Framework of the Preparatory Survey and Project

	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Step 1: EBSA Screening	MECA (Biodiversity) to cover the rest of the territorial water of Oman.	(Preparatory Survey) Original Activity of Step 1, OJT for satellite image analysis Regional workshop for the EBM Strategy			
Step 2: Ecological classification based on key characteristics	Define key ecological features, e.g. important habitats, wildlife communities, etc, and a long list of candidate MPAs (20-30 sites?) shall be identified within EBSAs, primarily using existing data.				
Step 3: Qualitative and Quantitative analysis to identify potential MPAs		Criteria to be defined for developing a short list of MPAs (5 sites?). Biological and socio-economic surveys in 5 (?) candidate MPAs, and 2 to 3 sites (?) be selected for pilot actions.			
Step 4: Pilot activities to examine management techniques		Planning of pilot activities.	Pilot activities on ecotourism (MOT) and sustainable fishing (MAFW) to be implemented in 2 to 3 sites (?) of the candidate MPAs.		
Final Stage: Complete the Strategy and Action Plan with lessons from the pilot activities		Develop a draft strategy and action plan (master plan) with relevant guidelines and manuals of identifying MPAs. <u>General management guidelines (conservation strategy)</u> to be prepared for the MPAs in the long list. <u>More specific management and action plan</u> be prepared for the MPAs in the short list. <u>For those MPAs with pilot activities, the lessons from the experience will be reflected.</u>			Final Stage Symposium with ROPME to share experience with other GCC nations

Source: JICA Study Team



Source: JICA Study Team

Figure 1-2 Component of the Preparatory Survey

1.4 Methodologies of Preparatory Survey

(1) Literature review

Existing data and literatures were gathered and studied to assess the potential EBSAs, following EBSA criteria (see Appendix-1). Information of the study on the Coastal Zone Management Plan⁴ was also referred.

National policies for conservation of marine environment were also gathered.

(2) Working group discussion

Working group meetings were held twice to input and discuss about EBSA candidate sites and pilot project of eco-tourism. The working group consisted of following 4 organizations.

- Ministry of Environment and Climate Affairs
- Ministry of Agriculture and Fishery Wealth
- Ministry of Tourism
- Sultan Qaboos University

(3) Assessment

Gathered information will be studied and compared to assess the candidate EBSA sites.

(4) Selection of candidate EBSAs

Several candidate EBSA sites were based on the working group discussion.

(5) Planning on future pilot projects

Future pilot project was discussed and planned into the working group meeting.

(6) Workshop on Satellite Image Analysis

Workshop on satellite image analysis was held to transfer the techniques for processing and assessing satellite images.

(7) Regional Workshop

Regional workshop, targeting ROPME member countries, was held to share the outcomes of the survey and discuss.

1.5 Schedule of the Preparatory Survey

Schedule of the Preparatory Survey is shown in Table 1-2.

⁴ Oman Coastal Zone Management Plan, 1991, prepared for the Ministry of Commerce and Industry by IUCN

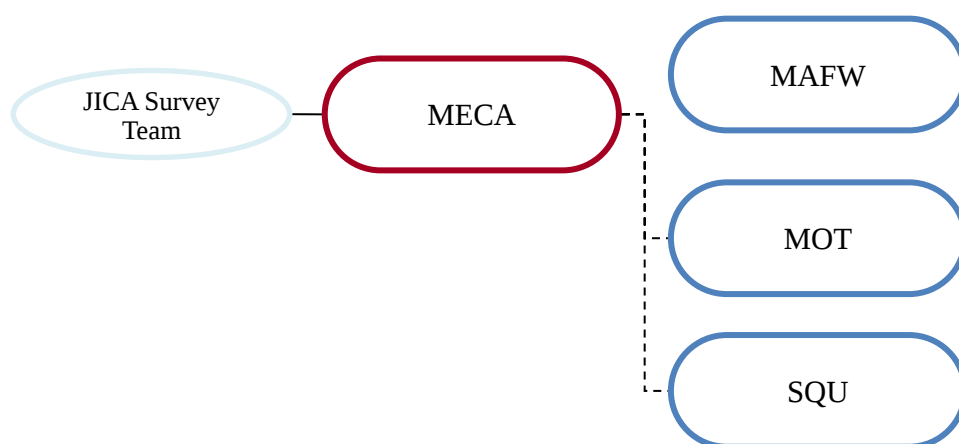
Table 1-2 Schedule of the Preparatory Survey

Activity Phase	Period	Activity
1	25-29 September 2016	■ Establishment of Working Group - Explanation of Activities ■ Interview survey - Confirmation of available resources - Field of interesting
2	23 October – 17 November 2016	■ EBSA Screening - Literature survey - Evaluation of EBSA candidate sites ■ Conceptual design of the Pilot Project - Discussion at the working group meeting - Field survey
3	22 January – 2 February 2017	■ Workshop on satellite image analysis - Basic course - Advanced course
4	17-19 September 2017	■ Regional Workshop Sharing the results of the Preparatory Survey with ROPME member countries

Source: JICA Study Team

1.6 Formation of Working Group

The activity of the Preparatory Survey was conducted under the cooperation of Working Group shown in Figure 1-3.



Source: JICA Study Team

Figure 1-3 Structure of Working Group

1.7 Regional Workshop

In order to share the results of the Preparatory Survey in Oman, ROPME-JICA Regional Workshop was held in Muscat in 17-19 September 2017.

CHAPTER 2 ANALYSIS OF BASELINE DATA

2.1 Preliminary Evaluation of EBSA Candidates

2.1.1 Data collection

A large number of scientific papers, articles, books, reports, booklets and leaflets were provided from all the stakeholders, namely, MECA, Ministry of Agriculture & Fisheries Wealth (MAFW), Ministry of Tourism (MOT) and Sultan Qaboos University (SQU). In total, more than 500 scientific papers, articles, etc., relevant to the activity of P/S were provided from MAFW, MOT and SQU. They were all up-loaded in a cloud drive to be shared by all the stakeholders. This was very important procedure to avoid the most serious obstacles for any kind of collaboration activities by multiple stakeholders.

Major information provided by working group member are listed in Table 2-1.

Table 2-1 Major information provided by working group member

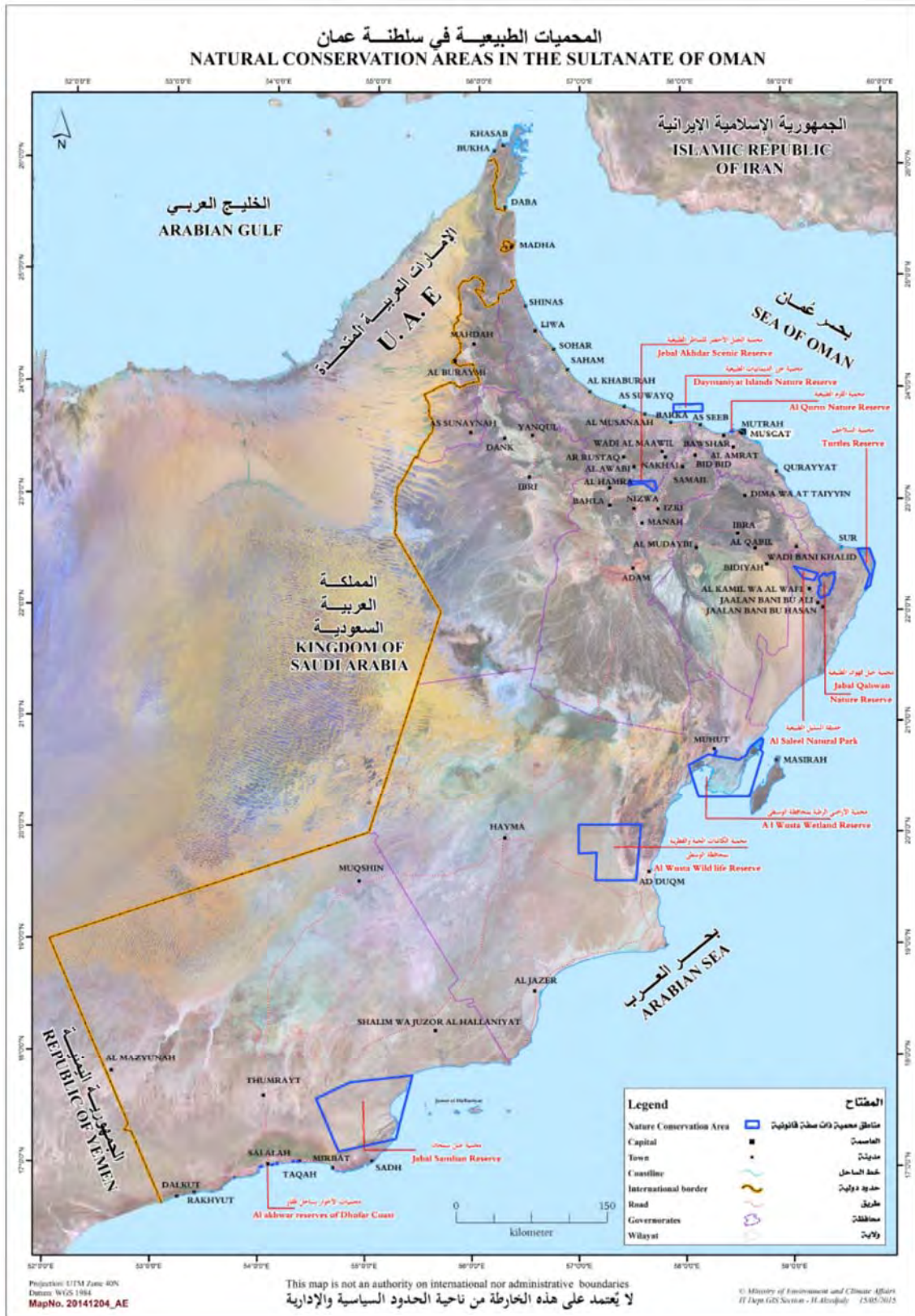
Organization	Major information
MECA	Rock oyster monitoring, Wetland management strategy, Seaweed project
MOT	Tourism statistics, IUCN zoning, Social economical survey, Tourism strategy
MAFW	Fishery statistics, Ecological habitat, Spawning ground, Fishing ground
SQU	Study papers are available on web site. Marine ecology assessment in Bandar Khayran.

Source: JICA Study Team

2.1.2 Marine Protected Area (MPA)

Nature reserves in Sultanate of Oman (as of 2015) are shown in Figure 2-1, and currently, Daymanyat Islands, Ra's Al-Hadd Turtle Reserve and Barr Al Hikman & Masirah Island are designated as MPA.

All nature reserves are shown in Annex-2.

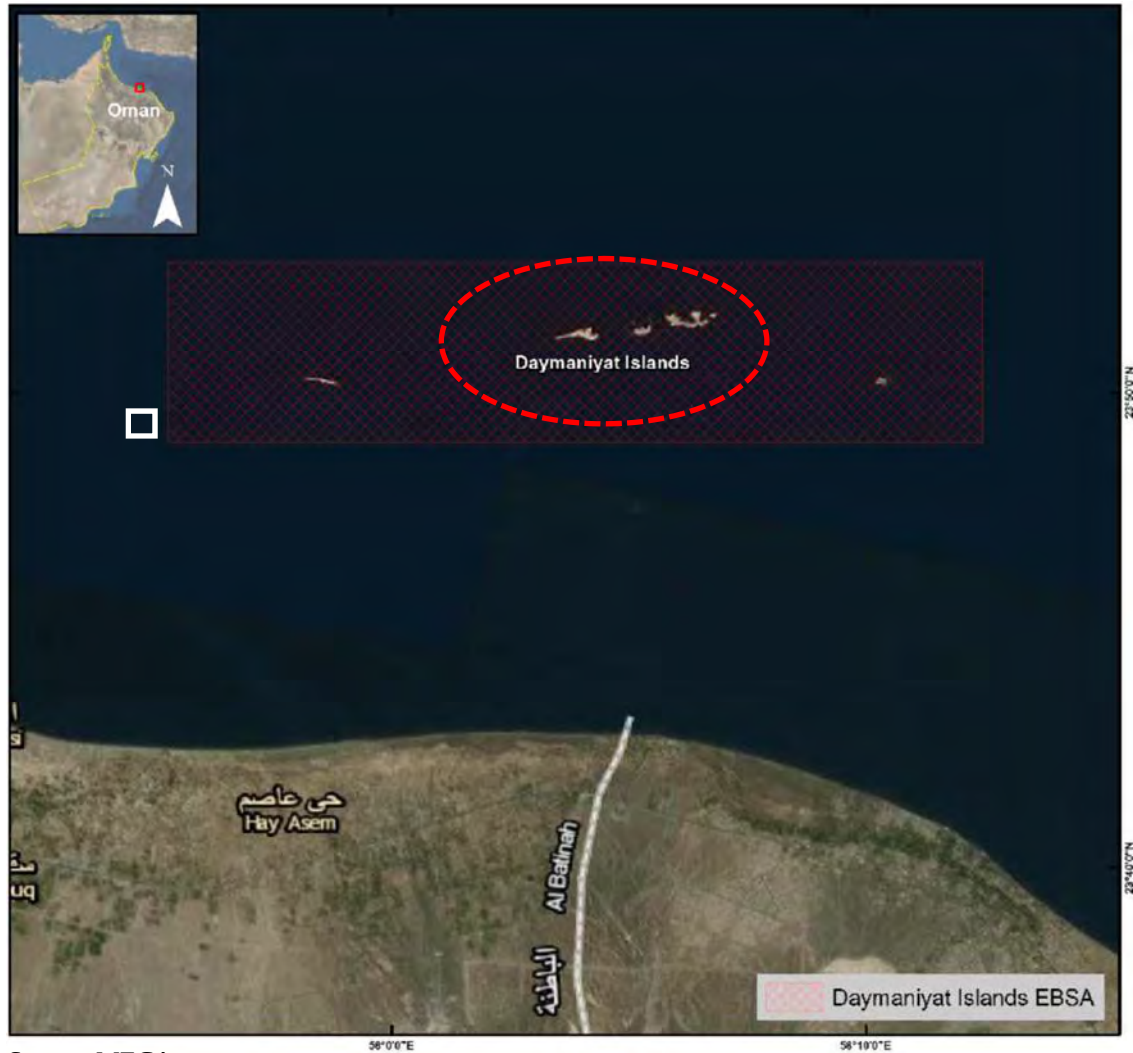


Source: MECA

Figure 2-1 Nature Reserves in the Sultanate of Oman

2.1.3 Registered EBSA

Two areas, Daymaiyat Islands and Oman Arabian Sea are registered as EBSAs in CBD (Figure 2-2, 2-3). While Musundam Peninsula was also proposed in the Workshop held in Dubai in April, 2016, only two areas above have been approved.



Source: MECA

Figure 2-2 Daymaniyat Islands registered as EBSA in CBD



Source: MECA

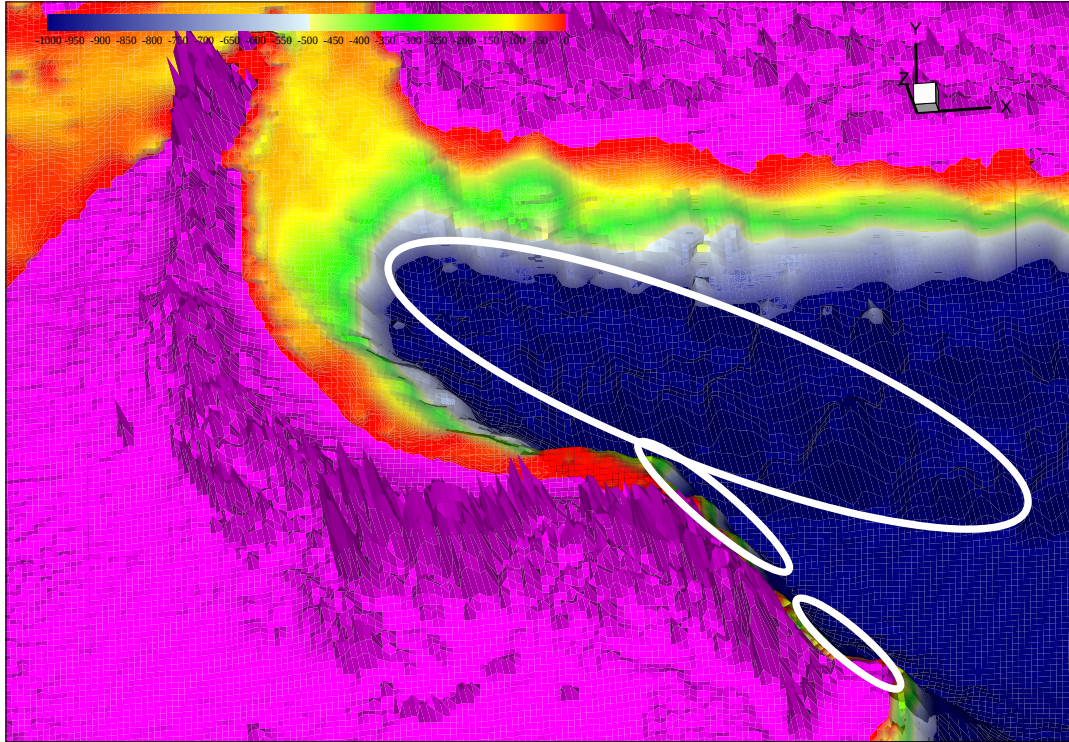
Figure 2-3 Oman Arabian Sea registered as EBSA in CBD

2.1.4 Selection of Candiate EBSA

As Oman Sea is very unique marine area in both biological and oceano graphic features because of topographic and meteorological characteristics, EBSA screening on Oman Sea was conducted based on the collected secondary data. However the progress report submitted to CBD Workshop in Dubai was not referred to North and South Batinah, Muscat Governorate and the

coast from Quriyat to Sur.

Accordingly, EBSA screening was conducted to focus on the coast and offshore in Oman (Figure 2-4).



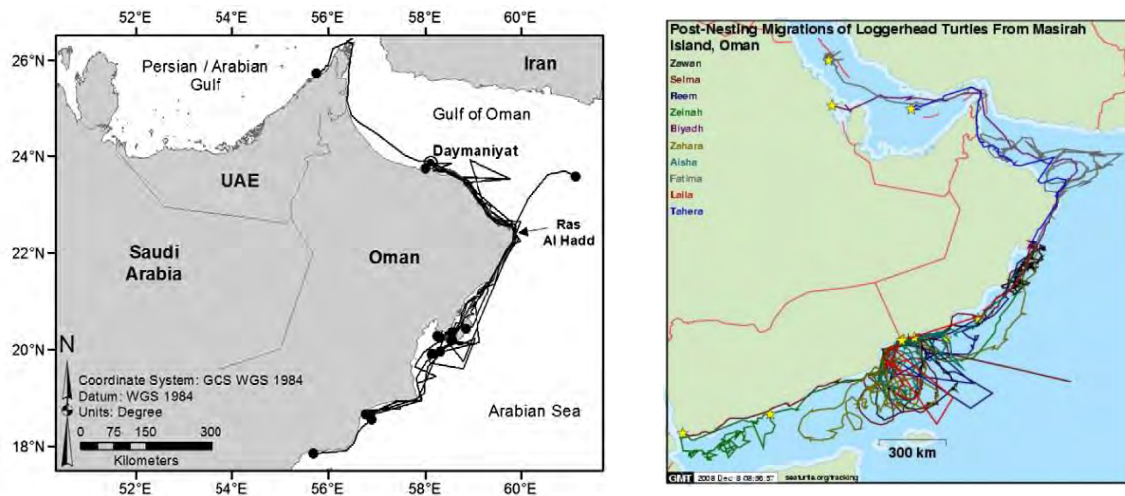
Source: JICA Study Team (Topographic data: NOAA)

Figure 2-4 Topographic map of Oman Sea and the study area

(1) Offshore

According to the interviews with the local environmental consultant, marine mammals such as whales and dolphins are migrating this area, although the number is less than that in the Arabian Sea. They even feed and reproduce in the offshore deep area.

Sea turtles are also using this area for migration and feeding, and laying eggs, although the number is less than that in the Arabian Sea (see Figure 2-5).



Hawksbill turtle

Green turtle

Source: Pilcher et al. (2014)

Figure 2-5 Migration Routes of Sea Turtles

(2) Coastal Area between Muscat and Quryat

IUCN has studied around this area and identified as ecologically important area (Figure 2-6). This area characterized as below, according to the study of IUCN.

- Rocky shore with small scale sandy beach
- High density coral habitat
- Sea turtle nesting beach
- Seabird nesting place
- High productivity caused by upwelling
- Natural mangrove area



Source: Coastal Zone Management Plan, IUCN 1986

Figure 2-6 Coastal Area between Muscat and Quryat

Although this area is close to the urban area, Muscat, traditional fishing villages still exists, maintaining sustainable livelihood. Especially, Bandar Kayran is included in this area. Based on the gathered information, quick assessment on EBSA screening was carried out and summarized in Table 2-2.

Table 2-2 Result of EBSA Screening on the Coastal Area between Muscut and Quryat

CBD EBSA Criteria	Ranking of criterion relevance	
	Ranking	Reason
Uniqueness or rarity	Medium	Balance between nature and human activities
Special importance for life-history stages of species	Medium	Feeding and nesting of sea turtles Seabirds nesting, Mangrove area
Importance for threatened, endangered or declining species and/or habitats	Medium	Habitat of Red List species
Vulnerability, fragility, sensitivity, or slow recovery	Medium	Limited area of mangrove, nesting area of sea turtles and sea birds
Biological productivity	Medium	Upwelling
Biological diversity	Low	High genera of coral and fish
Naturalness	Low	Original coastline and water area Traditional villages
Other Criteria (Educational and scientific value)	Medium	Close to the capital area

Source: JICA Study Team

(3) Coastal Area between Quryat and Sur

History of scientific studies in the coast of Oman Sea focused on between Quryat and Ra's Al Hadd were shown in **Table 2-3**.

Although this area does not seem to have significant ecosystem, natural mangrove as well as transplanted mangrove area exist and the khawr, where mangrove grows, is considered as important habitat for juveniles of marine creatures. This fact was also confirmed in the interview with staffs of Sur Office of MECA.

During the field reconnaissance, swimming Sea turtles were observed in the coastline close to Quryat. This suggests that Seaweeds grow around this area and provide Sea turtles as feeding area.

Table 2-3 History of scientific studies in Oman Sea and the coast between Quriyat and Ra's Al Hadd

Year	Activities	Specific results	Reference
1986	Reconnaissance Survey was carried out to identify, describe and map 43 different Land Classes and 12 Marine Habitats and identified 94 plant and 100 animal taxa judged to be of special interest in "Proposal for A System of Nature Conservation Area".	59 NNR (National Nature Reserve), 20 NSR (Natural Scenic Reserve) and 12 NNR (Natural Resource Reserve) were proposed as Nature Conservation Areas. A comment "Lagoons and inlets are often focal points for both marine and terrestrial wildlife; and in the desert conditions of Oman, the conservation of their mangroves is, especially important" is worth to consider.	<u>Proposals for a System of Nature Conservation Areas</u> Clarke: IUCN (1986)
1988	International Union for Conservation of Nature and Natural Resources (IUCN) conducted ecological surveys of the shore and coastal waters, Greater Capital Area (1986), Quriyat and Ra's Al Hadd (1988), Dhofar (1989), Musandam (1991), A Frame Work for Action (1992).	1) Resources Data: Productive marine habitat, Turtles, Historical and archaeological sites, Aesthetic resources 2) Uses data: Recreational activities, Fisheries, coastal land uses, Proposed conservation areas 3) Data analysis: three principal threats to resources and environment are; - ad hoc settlement and development of coastal properties, - careless recreational and fisheries activities, - incidental damage to sites of high recreational, archaeological, or conservation value 4) Recommendations: The identification of Sur as an area that requires special study prior to development in cooperation with all concerned Ministries	<u>Oman Coastal Zone Management Plan, Quriyat to Ra's Al Hadd</u> IUCN (1988)
1992	The NOAA reSearch vessel <i>Mt. Mitchell</i> operated in the ROPME Sea Area (RSA), comprised of the Gulf, Strait of Hormuz, and Sea of Oman, from February to June, 1992. (1) over 500 CTD casts were made; (2) seven current meter moorings were deployed and six were recovered yielding eleven, quality current meter records at different depths; (3) thirty-six drifting buoys with Argos positioning were deployed; and (4) continuous shipboard measurements of meteorological and oceanographic variables were recorded.	The complete data set covers the important Seasonal transition from mid-winter to early summer. During this period of time, solar heating created an intense thermocline which decoupled the surface mixed layer from the interior water. As one of recommendations, Central Gulf. A better understanding of the circulations in the Sea of Oman, their Seasonal and spatial variations, and the exchange of water with the Strait of Hormuz and the Arabian Sea is needed. A combination of current-meter moorings and wind stations is required in a multi-year study.	<u>Physical Oceanography of the Gulf, Strait of Hormuz, and the Gulf of Oman, Results from the Mt Mitchell Expedition</u> Reynolds(1993)

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Year	Activities	Specific results	Reference
1994	A Master Thesis focusing on mangrove vegetation in Khawr Shinas (North Batinah) and Qurum Nature Reserve (Muscat) and their resources management.	1)The number of crustacea species recorded was 40, 2) The number of bird species recorded was 200, 39 The number of mollusk species was about 100 and other types of marine life have also been recorded thus showing the crucial importance of mangrove to the marine environment	<u>Resource management of mangroves in the arid environment in the Sultanate of Oman</u> Al-Muharrami, M.(1994) From Ministry of Environment & Climate Affairs (2010)
2001	On the second week of August 2000, a massive fish kill was detected along Al-Azaiba shores, approximately 10 km from Muscat. Two weeks later (around August 28-29), another fish kill was reported in Barka, some 80 km from Muscat. Preliminary reports, published by the media, suggested that the observed fish mortalities were due to toxins associated with harmful algal blooms (HABs). This raised local concerns regarding the safe consumption of Sea and food products. What followed were a substantial depression in the market price of fish and a corresponding reduction in fishermen's income as seafood consumption sharply declined. Analysis of historical records and recently collected data by the staff of the Department of Marine Sciences and Fisheries points to asphyxiation and not HABs as the most likely cause of the observed fish kill. <i>In addition to the above, jellyfish outbreak caused shutdown of Oman LNG Plant at Sur (Qalahat) in 2002 by choking its Seawater cooling water intake followed by shutdown of desalination plants at Ghubra and at Barka in 2003 by choking their Seawater cooling water intake as well.</i>	IR satellite images documented the occurrence of an extensive upwelling event prior to and during the time of the massive fish kills in the Gulf of Oman. Although summer upwelling appear to be common occurrence in this region, this year's event may have been one of the high sea strong and persistent events on record. The cold Sea surface temperatures registered on the satellite images suggest that these waters came from depths below 100 m. At those depths, oxygen concentration is dangerously low for most fish species to survive. The upwelling of a cold layer of water into the Gulf of Oman may have literally herded and trapped shallow water fish assemblages into confined areas where they later died of asphyxiation when the upwelling persisted and the hypoxic water reached the surface.	<u>Plausible Cause of Massive Fish Kills in the Gulf of Oman</u> Claereboudt et al. (2001)

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Year	Activities	Specific results	Reference
2003	This book aims to combine an understanding of whales and dolphins gained from ever progressing reSearch around the world, with the peculiar attribute of a regional fauna about which the world remains largely uninformed. The book examines whales and dolphins, known collectively as cetaceans, in their natural habitat as well as in the context of human lives; the latter not just in relation to fishermen and Seamen who daily encounter them, but also in terms of the broader issues of fisheries, whaling, conservation, scientific study and tourism in one of the world's most rapidly developing regions.	A map showing the distribution of each of Arabia's whales and dolphins accompanies the following species accounts <u>BALEEN WHALES</u> Bryde's whale, Blue whale, Humpback whale <u>ODONTOCETE WHALES AND DOLPHINS</u> Sperm whale, Dwarf sperm whale, Cuvier's beaked whale, Long-beaked common dolphin, Pygmy killer whale, Short-finned pilot whale, Risso's dolphin, Killer whale, Melon-headed whale, False killer whale, Indo-Pacific humpback dolphin, Pantropical spotted dolphin, Striped dolphin, Spinner dolphin, Rough-toothed dolphin, Common bottlenose dolphin, Indo-Pacific bottlenose dolphin, Finless porpoise	<u>Whales & Dolphins of Arabia</u> Baldwin (2003)
2003	This is a Report on field visits for Khawrs all over the Sultanate (109 khawrs in total, from Musandam to Dhofar) jointly by MRMEWR (Ministry of Regional Municipalities, Environment & Water Resources, now MECA) for seeking Khawrs suitable for transplanting mangroves and seeking Khawrs suitable for Tourism Development.	Locations (GPS coordinates), salinity, present conditions, some pictures and availability of khawrs for mangrove transplanting and for tourism development were briefly described. This report has been utilized for site selection of khawrs for mangrove transplanting project by MECA.	<u>Site Visit for Khawrs in Musandam, Batinah, Muscat, Shirqiya, Wustan and Dhofar</u> T. SHOJI (2003), <i>unpublished but in the Google Drive</i>
2004	This Master Plan Study was requested by MECA to JICA to carry out by JICA in collaboration with MECA describing several action plans focusing mainly on Khawrs with/without mangrove.	Inventory of some Khawrs (e.g. mangrove vegetation, Lists of Sea Birds, Mollusks Crustaceans, flora) and Action plans for selected Khawrs. The idea of Qurm Environmental Information Center in Qurm Nature Reserve proposed by the Ministry is one of action plans recommended in this report for the first time. In addition, technical information on nursery of mangrove, cultivation of seedlings and selection of site for transplanting seedlings are also	<u>The Master Plan Study on Restoration, Conservation and Management of Mangrove in the</u>

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Year	Activities	Specific results	Reference
		described.	<u>Sultanate of Oman (2002-2004), Final Report</u> , JICA and MRMEWR (2004)
2006	<u>Reef corals and coral reefs of ‘the Gulf of Oman</u> is the first comprehensive photographic guide for the visual identification of true corals in the Sultanate of Oman	More than 100 species of corals have been catalogued and photographed in the coastal coral communities of the Sultanate of Oman. GPS coordinates of 29 diving spots in Bandar Al Khiran, 9 (Bandar Al Jissa), 10 (Muscat Area), 6 (General Coastline) and 11 (Al Fahl Island) are indicated with species found each spot. <i>Shallow coral populations were severely damaged by Cyclone Gonu in June, 2007.</i>	<u>Reef corals and coral reefs of ‘the Gulf of Oman</u> , Michel R. Claereboudt (2006)
2007	This work examines conditions in Southern Arabia as an example of a coral rich upwelling area, in order to judge the relative importance of complex processes leading to the reef formation.	In upwelling areas two physiochemical factors in particular, high nutrients and low aragonite saturation state, result in a cascade of ecological consequences that ultimately reduce coral reef forming potential in such areas. Low temperatures are often mistaken as being limiting but in Southern Arabia at least temperatures rarely fall below the lower temperature threshold (i.e. 18°C) that is widely acknowledged as being necessary for reef formation. High nutrients stimulate increased primary production in the water column and on the benthos, which leads to competition for light and stimulates high growth rates of invertebrates which compete for space on the benthos, feed on coral larvae and parasitize coral skeletons. Greater productivity of algal turf supports a greater abundance of urchins and other grazers which in turn lower the survival rate of newly recruited corals.	<u>Ecology of Coral Communities in a Marginal Environment: Southern Arabia (Doctor Thesis)</u> Wilson (2007)
2014	The first partially materialized action plan by JICA’s Master Plan Study (2004)	Although the Center was not constructed, training plan and materials, Mangrove Monitoring Guideline, Mangrove Protection Guideline, and Guideline for Development of	<u>The Qurm Environmental Information</u>

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Year	Activities	Specific results	Reference
		Environmental Education Program were completed. The QEIC will be located in the heart of the capital and inside Qurm Nature Reserve (MPA) and one of the Lamsar Wetlands and it will definitely play the major role for the Development of Marine Environmental Conservation Strategy 2040 and Action Plan in Oman. In addition, it will be a center of excellence in the region by utilizing MPA once it starts its operation.	<u>Center (QEIC) Project, Final Report and Technical Document (2014)</u>
2014	The first data on hawksbill turtle post-nesting migrations and behavior in the Arabian region.	Tracks from 90 post-nesting turtles (65 in the Gulf and 25 from Oman) revealed that hawksbills in the Arabian region may nest up to 6 times in a Season with an average of 3 nests per turtle. Omani turtles migrated south towards Masirah island and to Quwayrah, staying close to the mainland and over the continental shelf. The widespread dispersal of hawksbill foraging grounds across the SW Gulf may limit habitat protection options available to managers, and we suggest these be linked to preservation of shallow water habitats and fishery management. In contrast, the two main foraging areas in Oman were small and could be candidates for protected area consideration. Critical migration bottlenecks were identified at the easternmost point of the Arabian Peninsula as turtles from Daymaniyat Islands migrate southward, and between Qatar and Bahrain. Our results provide the first evidence of migration pathways and critical bottlenecks, one at Ras Al Hadd, the easternmost point of the Arabian peninsula, and one between Qatar and Bahrain, where a causeway is planned; locations of foraging grounds and clustering of these in the SW Gulf and close to Masirah island in Oman; temporary summer emigration thermoregulatory responses among Gulf turtles, and proportion of time spent at various reproductive biology life stages for critically endangered hawksbill turtles.	<u>Identification of Important Sea Turtle Areas (ITAs) for hawksbill turtles in the Arabian Region</u> Pilcher et al. (2014)
2015	This reSearch paper presents a situation analysis of	<i>(Even though this study is not targeted to the area between</i>	<u>The fisheries</u>

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Year	Activities	Specific results	Reference
	artisanal fishermen on the Batinah coast of Oman, conducted within the scope of a project that had a broader mandate on training needs assessment (TNA). The collection of data followed a structured survey approach where the questionnaires were administered to 1934 fishermen and were analyzed by a mixed method approach.	<u>Quiryat and Ras al Hadd, it would be good reference for analysis of the questionnaire.)</u> The reSearch found that the majority of fishermen on the Batinah coast were not appropriately educated and trained. Most of them followed irregular routines, earned little money from fishing, had low savings, faced financial constraints, and lacked knowhow of modern fishing techniques and post-harvest dealings. The fishermen's performance over several key variables revealed a need for a consolidated marine policy that takes into consideration a host of issues related to the governance of artisanal fisheries and its sustainability and contribution to the economic activities in Oman.	<u>of Oman: A situation analysis</u> Belwal (2015)
2016	The status of coral reef in Oman, Musandam, Daymaniyat Island, the capital area, Barr Al-Hikman & Masirah island, Hallaniyat island and Mirbat is evaluated based on the existing information.	Oman's coral communities occur in marginal environmental conditions for reefs, and hence are quite vulnerable to anthropogenic effects. The authors recommend a focus on developing conservation-oriented coral research to guide proactive management and expansion of the number and size of designated protected areas in Oman, particularly associated with critical coral habitat.	<u>Oman's coral reefs,</u> Burt et al. (2016)

Source: JICA Study Team

Based on the gathered information, EBSA screening was carried out and summarized in **Table 2-4**.

Table 2-4 Result of EBSA Screening on the Coastal Area between Quryat and Sur

CBD EBSA Criteria	Ranking of criterion relevance		
	Ranking	Reason	Way forward
Uniqueness or rarity	Potentially High	Diversity of organisms owing to the diversity of topography	Topographic evaluation
Special importance for life-history stages of species	Potentially Medium	Feeding area of cetacean and sea turtles	Cooperate with scientist & NGO
Importance for threatened, endangered or declining species and/or habitats	Potentially High	Blue whale and fin whale	(ditto)
Vulnerability, fragility, sensitivity, or slow recovery	Medium	Coastal development	(ditto)
Biological productivity	Potentially Medium	Upwelling from Indian Ocean may contribute productivity	Food chain evaluation
Biological diversity	Potentially High	Coastal habitats, sea turtles and cetaceans	Cooperate with scientist & NGO
Naturalness	Medium	Comparing with the coast, offshore can be conserved	Scientific evaluation
Other Criteria (Educational and scientific value)	Potentially High	Biologically and oceanographically important	(ditto)

Source: JICA Study Team

2.1.5 Evaluation of Khawr

(1) Background

The Ministry of Environment & Climate Affairs (MECA) and Japan International Cooperation Agency (JICA) have a long history of bilateral technical cooperation regarding mangrove issues as summarized below.

- (1) Dispatching JICA Long Term Expert on Mangrove (2000-2007)
- (2) JICA Master Plan Study on Restoration, Conservation and Management of Mangrove in the Sultanate of Oman (2002-2004) (MP)
- (3) JICA The Qurm Environmental Information Center Project (2012-2014) (QEICP)

Among these projects above, the most of all khawrs along the coast in the Sultanate of Oman have been surveyed for evaluating mangrove restoration and conservation sites, and those results provide valuable information for evaluate the potential of habitat.

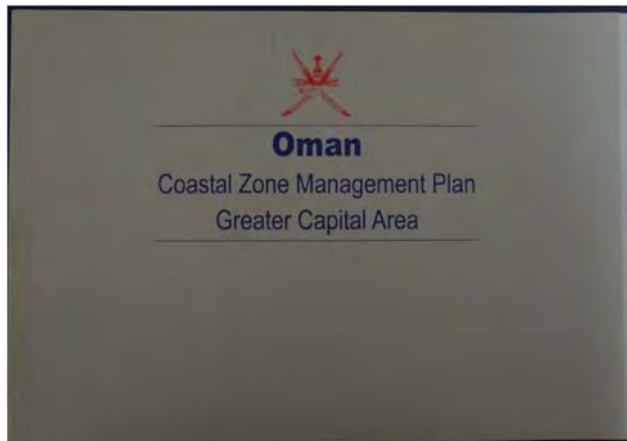
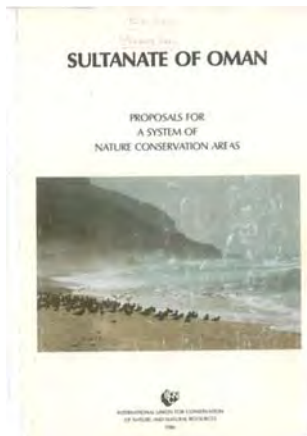
IUCN described, 1) Khawrs, 2) Mangrove, 3) Coral Reefs and 4) Algal Turf as “Productive Marine Habitats” in their reports on Coastal Zone Management Program.

Japan.

Khawr is playing an important role as feeding place for avifauna, nesting place and resting place beside its role as a nursery for marine organisms. In addition khawr is very common not only in Oman, but also in UAE, Qatar, Saudi Arabia and Bahrain.

(2) Analysis of Data and Information

In this section, analysis of data and information on khawr is in habitat basis. The historically important references of PROPOSALS FOR A SYSTEM OF NATURE CONSERVATION AREAS (Clarke et.al. 1986, IUCN) and Coastal Zone Management Plan by IUCN (1986-1992) pointed out that 1) Khawrs 2) Mangrove in addition to 3) Coral Reefs and 4) Algal Turf as “Productive Marine Habitats”.



These IUCN's documents were partially updated because these documents were once very useful but very old and the Sultanate witnessed huge development since 80's till present. Updating them is focused on latest information from the reports on khawr & mangrove mentioned before.

Among these references, MECA/MOT-2003 describes khawrs on their GPS location, salinity, brief description, suitability for transplanting mangrove seedlings or sown its seed and this small report was and still is utilized by the task forces (Wetland Section, Department of Marine Environment Conservation, MECA) especially in Wusta Region.

Khawrs has various meanings in topography. It means arms of the Sea, tidal inlets, tidal lagoons, tidal creeks, tidal flat, etc. Some of them have good habitat for *Avicennia marina*. Several salt tolerant plants such as *Suaeda*, *Amarantaceae*, *Chenopodiaceae*, etc., are also commonly observed in relatively higher elevation around khawrs, which can be a good habitat for birds' nesting as well. When khawrs spread like mudflat, wading birds looking for preys are often observed. Some khawrs in Wusta have pink-colored and green colored water.



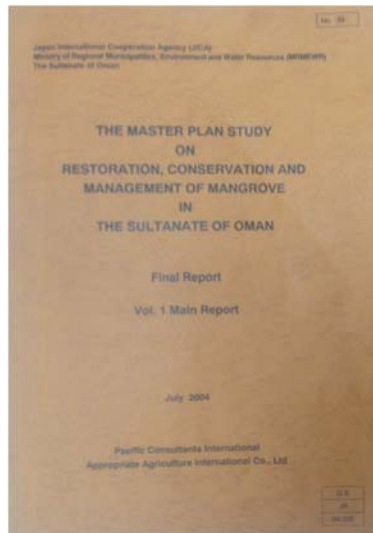
Khawr Mirh, N18°39' 08.9", E56°42' 29.4", Salinity much higher than 30%



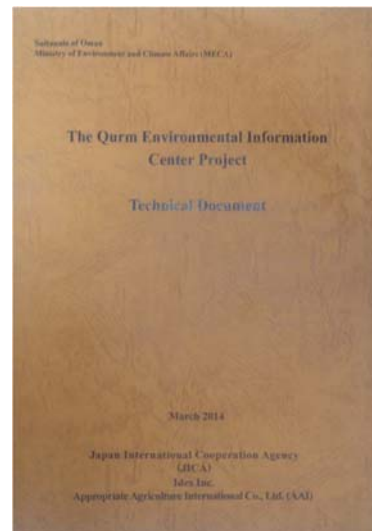
Khawr Haitham, N18°48' 57.2", E56°56' 11.3", Salinity of 9.0%. Water color is green



Pink color of the lagoons may come β -carotene from *Dunaliella salina* and green color may come from *Halobacteria cutirubrum*, but verification is awaited. By the way, *Dunaliella salina* is commercially cultivated for its anti-oxidant characteristics of β -carotene, as food supplement for Vitamins and cosmetic additives.



JICA's MP (2004)



QEICP Final Report (2014)

JICA's MP (2004) and QEICP Final Report (2014) are considered the most practically useful documents for their consistency in focusing the subject on mangrove and Khawrs (arms of the Sea/tidal inlets/tidal lagoons/tidal creeks) and for their description on flora & fauna, salinity, recommended action plans, and concrete form action plan for selected khawrs, which added new knowledge on khawrs & mangrove from both tourism development point and mangrove transplanting point of views.

A noteworthy information and knowledge also comes from MECA's long continuous Mangrove Transplanting Project (MTP) since 2000, which was documented in a form of reports but not in a form for the practical use. MTP covers all area from Musandam to Dhofar and the task force has visited almost all khawrs in the Sultanate since 2000 for transplanting mangrove seedlings. The full screening of EBSAs and deliberation on candidate sites for MPA will be carried out after intensive field studies in the full scale project.

In the meantime, MECA and JICA have long history in MTP activities from Musandam to Dhofar visiting almost all of Khawrs with mangroves and without mangroves, tidal inlets, tidal flats, salt marshes, wadis, etc. This information on Khawrs obtained from the field activities of MTP since 2000 was summarized in Annex 2.

(3) Khawrs with high potential as habitat

Except Damaniyat Islands (MPA), all Marine Nature Reserves are khawrs or related with khawrs and mangroves.

A quite localized area from the border with Yemen to the west of Sadah will be covered with Southwest Monsoon (Khareef) from the end of June till the beginning of September every year. Thanks to this khareef, coastal areas covered with Khareef developed "Fog Forest" predominated by *Anogeissus dhofarica*. Usually forest can be developed with precipitation above 500mm per annum. This means that the Seareas with fog forests have precipitation at least 500mm per annum or more. Therefore, areas covered with Khareef in Dhofar, very small area in Yemen as well, can't be called as hyper arid environment.

Except for khawrs in Dhofar, all the other khawrs in Oman are located in hyper arid

environment. If there are healthy forests in mountains close to the coastal marine environment, aquatic flora in the coastal marine environment will get benefit from the forests that provide nutrients from their litter transported by surface water and seepage water recharging ground water table connected to khawrs, some of which has less salinity than Seawater in Dhofar and Wusta. Distribution of algal turfs from Mirbat to Sadah may suggest that the mountains and their forests enrich the nearby marine environment to make suitable habitat for *Sarconema scinaoides* Borgesen for *Haliotis mariae* (abalone). Distribution of “Algal Turf” (IUCN, 1992) above all, *Tplipiocladia glomerulata* (C. Agardh) in Oman Sea may have significant importance for *Chelonia mydas* (Green turtle)(Barry Jupp, 2002).

It is, therefore, important to consider to carry out studies on watershed management and on impact of dams inhibiting natural water paths to marine environment, especially Algal Turf in the full scale project.

(4) Covered area/length by MPAs and SEAs

- a) Existing MPAs
 - 1) Damaniyat Islands 20 km²
 - 2) Qurm Nature Reserve 0.61 km²
 - 3) Ra's Al-Hadd 300 km² (or 89 km)
 - 4) Bar Al-Hickman 2,634 km² (or 160 km)
 - 5) Khawr Rowri 8.2 km²
 - 6) Khawr Taqah 1.07 km²
 - 7) Khawr-Sawli 0.5 km²
 - 8) Khawr Dahareez 0.6 km²
 - 9) Khawr Baleed 1.0 km²
 - 10) Khawr Salalah 0.6 km²
 - 11) Khawr Awqad 0.16 km²
 - 12) Khawr Qurm Al Kabeer 0.01 km²
 - 13) Khawr Qurm Al Sagheer 0.004 km²
 - 14) Khawr Mugsail 0.18 km²

- b) Area covered by Sea with natural mangrove forest: BK is excluded because BK is under Royal Decree (not for Nature Reserve) but also has natural mangrove forest.
 - 1) Khawr Shinas 1.80 km²
 - 2) Khawr Nabr 1.24 km²
 - 3) Khawr Quriyat 0.35 km²
 - 4) Khawr Al Khwair 0.1 km²
 - 5) Khawar Sukeikra 0.58 km²
 - 6) Khawrs in Bar Al Hickman 46.3 km² (or 54 km)

- c) Area covered by Sea with man-made mangrove forest
 - 1) Khawr Wadiyat 0.25 km²
 - 2) Khawr Shinas North (N/A)
 - 3) Khawr Grim (N/A)
 - 4) Khawr Sawadi 2.95 km²
 - 5) Khawr Batah and Sukeikra 0.43 km²
 - 6) Khawr Durf 1.3 km²
 - 7) Khawr Gauwi 6.66 km² (or 8.3 km)
 - 8) Coast from Mirbat to Sadah 6 km² (or 135 km): Algal Turf

2.2 Concept Design of Pilot Project in MPA Candidate Site

2.2.1 Pilot Project Site

At the beginning of this preparatory survey, the suggested sites for the pilot projects based on several exchange of opinions between MECA and JICA are shown in Table 2-5. Finally, the working group has decided Bandar Kayran as a pilot project site.

Table 2-5 Candidate sites for pilot project from exiting and potential MPA

	Candidate Site for Pilot Project	Characteristics of Site
1	Bandar Khayran	Close to Muscat, General Environmental Tourism Area. Mangrove, tourism, fishermen community
2	Musandam	Remote place, corals, fisheries,
3	Bar Al-Hickman	MPA, remote area, under procedure to be a Ramsar Site, shallow water, corals, migratory birds, close to Masirah Island
4	Damanyat Islands	MPA, relatively close to Muscat, fisheries activities, lot of research in the past, dolphins
5	Qurm Nature Reserve	In the midst of Muscat, mangrove vegetation, mangrove nurseries, bird watchers, QEIC is scheduled
6	Masira Island	Remote place, world largest nesting place of Loggerhead, dolphins, whales
7	From Mirbat to Sadah	Remote place, abalone fishing, important seagrass, corals, dolphins, whales
8	Hallaniyat Islands	Remote place, corals, dolphins, mating place of whales

Source: JICA Study Team

2.2.2 Interview Survey

Interview surveys were carried out targeting fishermen in Bandar Kayran and staffs of Sur branch office of MECA.

(1) Fishermen in Bandar Khayran

During the absence of JICA Study Team, MAFW distributed questionnaires to the fishermen in Bandar Khayran. Eleven (11) answers were collected and analyzed. Following are the main findings of the survey:

- 1) Around half of the fishermen were experiencing decrease in fish catch/stock and income.
- 2) Many of the fishermen mentioned the importance of stronger law/regulation enforcement and establishing MPAs to keep fisheries sustainable.
- 3) Over half of the fishermen suggested for improving the boat landing sites as access to sea is now limited during low tide.
- 4) Over half of the fishermen were keen to be involved in alternative income sources such as tourism for improving their livelihood.

The report of the questionnaire survey is attached as Appendix 3.

Based on the results of the questionnaire survey, interview with fishermen was conducted in Bandar Khayran. The findings are as follows.

- 1) Fishermen are suffering from decreasing fish catch.
- 2) They keen to cooperate with a project.

- 3) Tourism is welcomed.
- 4) But, they require that they want to participate in a project from the planning stage, based on the past experience.

(2) Staffs of Sur office of MECA

Interview with staffs of Sur office of MECA was conducted in order to understand the ecosystem of the area between Quryat and Sur.

- 1) Some important areas between Quryat and Ras Al-Had were shared.
- 2) Some kholes are recognized as important nursery of shrimps and crabs.
- 3) Existing of corals were confirmed.

On the way back from Sur, filed reconnaissance was conducted along the coastline, between Sur and Quryat. Several swimming sea turtles were observed close to the shore lines. This suggests that seaweeds grow around this area and provide sea turtles as feeding area.

2.2.3 Analysis of the Management Plan by IUCN, December 2011

The Bandar Al Khayran (BK) Ecotourism Development Project is part of the Ministry of Tourism-IUCN project Strengthening Ecotourism in Oman project. The project is committed to employ local people in the first instance. It will provide opportunities for a range of employment. In the longer-term it will provide training and capacity development opportunities.

2.2.4 Discussion of on a pilot study

Discussion on a pilot study, which is planned in the full scale project, was discussed among the working group members, since the ideas of the pilot study proposed by each organization (MECA, MOT, MAFW and SQU) in the current TOR don't show uniformity.

With the series of discussion regarding the concept of a pilot project, it is considered that the basic concept and viewpoints of a pilot project was integrated.

Major points that have been agreed regarding the commencement of a pilot project are as follows:

- Early commencement is necessary, especially in Bander al Khayran to respect the Management Plan
- The pilot project should be prioritized based on the importance of inter-ministerial/multi stakeholder cooperation and urgency of conservation in the aspect of ecosystem based management sustainable fishery

*Preparatory Survey for the Project
on
Development of Marine Environment Conservation Strategy 2050 and Action Plans in the Sultanate of Oman*

First Draft Report

CHAPTER 3 WORKSHOP ON SATELLITE IMAGE ANALYSIS

3.1 Outline of the Workshop

3.1.1 Purpose

This workshop was targeted supervisors and staffs working in the field of coastal marine environment and fishery and GIS, and aimed to have them to understand the necessities and availabilities of satellite image analysis techniques, and processes.

This opportunity was expected to provide necessary knowledge on actual processes of satellite image analysis, and to be the preparation step for developing experts in this field.

3.1.2 Schedule and Venue

The workshops on the basic course and advance course were held on 23-25 January and 30 January – 1 February 2017, at the No. 014 Room, Engineering Laboratories, Sultan Qaboos University.

3.1.3 Programme

The programmes are shown in Table 3-1 and 3-2.

Table 3-1 Programme on Basic Course of Satellite Image Analysis

Time	Content	Lecture	Assistant
23 January 2017			
9:00	Introduction of Oman Project	Mr.Harada	
9:05	Self-introduction		
	Group photo		
9:20	Introduction of JICA Project	Dr.Sakaguchi	
9:50	Overview of the lecture & Introduction of RESTEC	Mr.Kamimura	
10:05	Overview of remote sensing for coastal management	Dr.Sagawa	
10:35	Break		
10:50	Overview of optical remote sensing	Mr.Hino	
11:50	Application use of remote sensing data	Mr.Hino	
12:15	Break		
12:30	How to download Satellite data Introduction of the curriculum of the next day	Mr.Hino	Mr.Kamimura, Dr.Sagawa
14:00	Adjourn		
24 January 2017			
9:00	Data import/export and display	Mr.Hino	Mr.Kamimura, Dr.Sagawa

9:20	Basic operation of QGIS	Mr.Hino	Mr.Kamimura, Dr.Sagawa
10:00	Break		
10:15	Visual interpretation	Mr.Hino	Mr.Kamimura, Dr.Sagawa
11:15	Break		
11:30	Geometric correction	Mr.Hino	Mr.Kamimura, Dr.Sagawa
14:00	Adjourn		
25 January 2017			
9:00	Change extraction	Mr.Hino	Mr.Kamimura, Dr.Sagawa
10:15	Break		
10:30	Classification	Mr.Hino	Mr.Kamimura, Dr.Sagawa
11:45	Break		
12:00	Practice using LANDSAT/WorldView data in Oman	Mr.Hino	Mr.Kamimura, Dr.Sagawa
13:00	Explanation for practice results	Mr.Hino	Mr.Kamimura, Dr.Sagawa
13:30	Closing session	All	
14:00	End of the course		

Source: JICA Study Team

Table 3-2 Programme on Advance Course of Satellite Image Analysis

Time	Content	Lecture	Assistant
30 January 2017			
9:00	Overview of the lecture	Dr.Sagawa	
9:10	Overview of coastal habitat mapping	Dr.Sagawa	
9:30	Visual Interpretation	Dr.Sagawa	Mr.Kamimura, Mr.Hino
11:00	Break		
11:15	Radiometric correction	Dr.Sagawa	Mr.Kamimura, Mr.Hino
14:00	Adjourn		
31 January 2017			
9:00	Water column correction	Dr.Sagawa	Mr.Kamimura, Mr.Hino
10:30	Break		
10:45	Water column correction	Dr.Sagawa	Mr.Kamimura, Mr.Hino
12:15	Break		
12:30	Habitat Mapping	Dr.Sagawa	Mr.Kamimura, Mr.Hino
14:00	Adjourn		
1 February 2017			

9:00	Practice using LANDSAT/WorldView data in Oman	Dr.Sagawa	Mr.Kamimura, Mr.Hino
12:30	Explanation for practice results	Dr.Sagawa	
13:00	Presentation for CMOBAH	Dr.Sagawa	
13:30	Closing session	All	
14:00	Endo of the course		

Source: JICA Study Team

3.1.4 Participants

Participants were invited from MECA, MOT, MAFW and SQU.

The number of participants in the basic course and advance course was 13 persons and 15 persons respectively.

The participant list is in Annex 5.

3.2 Outcomes

3.2.1 Basic Course

In the basic course, each participant used PC and learned about procedures of downloading satellite data, operating the data with GIS application, and processing the data, and practiced the all procedures using LANDSAT/WorldView data in Oman.

All participants have understood the processes, necessary applications, skills/techniques, time and so on.

3.2.2 Advance Course

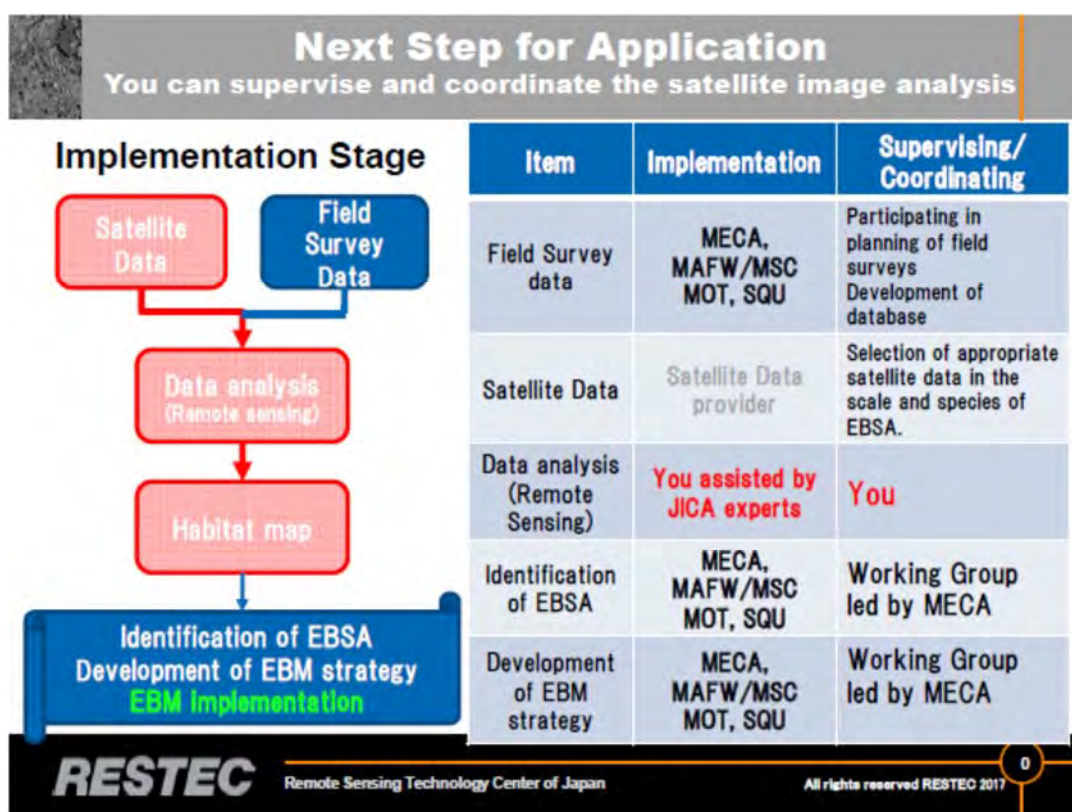
In the advance course, each participant also used PC and learned about practical procedures to analyze coastal habitats such as coral reef and seagrass bed.

As same as the basic course, all participants have understood the processes of coastal habitat mapping. And some of them those who have had some experience related this field seemed be able to apply in their actual work.

3.2.3 Wrap-up

As mentioned above, this workshop was aimed to provide an opportunity to participants to understand the procedures of satellite image analysis. Lecturers from RESTEC have wrap-upped this workshop as Figure 3-1. It was strengthen that this technique would be effective and efficient for EBM implementation, and all participants should make further efforts for application in the actual field.

At the closing session, all participants have received the certifications shown in Figure 3-2.



Source: JICA Study Team

Figure 3-1 Next Step for Application of Satellite Image Analysis as the Wrp-up of Workshop



Source: JICA Study Team

Figure 3-2 Certification of Participation in the Workshop

CHAPTER 4 REGIONAL WORKSHOP

4.1 Outline of the Workshop

4.1.1 Title

The title of workshop was as follows.

“Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman –Preparatory survey for Full Scale Project”

4.1.2 Objectives

- 1) To share the process and results of preparatory survey for EBSA screening among the Sea of Oman
- 2) To share an example of ecotourism planning based on environmental and socio-economic aspects
- 3) To share the effects of satellite image analysis for coastal habitat mapping, and procedures of the training course
- 4) To expand the outcomes to ROPME Sea Area strategy and action plan

4.1.3 Period

The workshop was held on 17 - 19 September, Sunday - Tuesday, 2017. And EBM WG Workshop was held back-to –back on 20-21 September, Wednesday and Thursday.

4.1.4 Venue

Crown Plaza Hotel, Muscat, Sultanate of Oman

4.1.5 Programme

The programme of workshop is shown in Table 4-1.

Table 4-1 Programme of JICA-ROPME Regional Workshop

Time	Programme	Speaker
Day 1 : Sunday, 17 September 2017		
08:30 – 09:00	Registration	
09 :00 – 09:30	Opening	- Eng. Suleman Al Akzami, MECA - Dr Hassan Mohammadi, ROPME - Mr. Hideyaki Yamamoto,

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		Embassy of Japan - Mr. Hiroyuki Mori, JICA
09:30 – 09:45	Break	
09:45 -10:00	Outline of the preparatory survey and full scale project for marine conservation strategy in Oman	Mr. Yoichi Harada, JICA Expert Team
10:00 – 10:10	JICA’s cooperation strategy in the region	Dr. Noriaki Sakaguchi, JICA
<i>Presentation on current status in Oman (20 min / speaker – 5 min Q & A)</i>		
10:10 – 10:35	Conservation of coastal ecosystem (coral reef & mangrove)	Mr. Badar Al Bulushi Ministry of Environment & climate affairs
10:35 – 11:00	A case study on eco-tourism planning in Bandar Al Khayran	Ministry of Tourism
11:00 – 11:10	Break	
11:10 – 11:35	Policy and measures on sustainable fisheries	Ministry of Agriculture & fishery Wealth
11:35 – 12:00	Coral reef significance in Oman coast and contribution of scientists for the conservation	Dr. Micheal Claereboudt Sultan Qaboos University
12:00 – 13:30	Lunch & Pray	
13:30 – 13:55	Study of Marine mammals & turtles stranding in Oman	Ms. Aida Al Jabri MECA
<i>Presentation on satellite image analysis (40 min / speaker – 10 min Q & A)</i>		
13:55 – 14:45	Application of remote sensing using satellite image on coastal mapping for coastal management	Dr. Tatsuyuki Sagawa RESTEC
14:45 – 15:00	Break	
<i>Presentation on Japan’s experience and recommendations</i>		
15:00 – 16:00	Conservation of Marine biodiversity and ecosystem service-Several case studies in Japan and CBD, and some suggestion to Oman and other ROPME Sea Area	Dr. Yoshihisa Shirayama JAMSTEC
Day 2: Monday, 18 September 2017		
<i>Site visit</i>		
08:30 – 12 :00	Qurum Nature Reserve (near the hotel) and Khawr Al Sawadi Mangrove Transplanting Area (60km to the east from the hotel)	
12:00 – 13:30	Lunch in Sawadi	
13:30 – 14:30	Back to the hotel	
Day 3: Tuesday, 19 September 2017		

<i>Linkage to the EBM Strategy Working Group</i>		
08:30 - 09:00	Results of inventory survey and challenges	Dr. Simon Wilson 5 OES
09:00 - 10:30	Ecosystem assessment and gap analysis	Dr. David Medio 5 OES
10:30 - 10:45	Break	
10:45 - 11:30	Discussion (Towards WBM Strategy)	
<i>Towards the regional activities</i>		
11:30 - 12:00	Regional activities to be collaborated	AGEDI
12:00 – 13:00	Case study of habitat mapping based on remote sensing using satellite image and its application to the region	Dr. Tatsuyuki Sagawa RESTEC
13:00 – 14:30	Lunch & Pray	
14:30 – 15:00	Wrap – up of Oman case and its expansion to RSA	JICA Expert Team
15:30 - 15:30	Closing	JICA & MECA

Source: JICA Study Team

4.1.6 Participant

Participants were H.E. Najeeb Al Rawas, Under Secretary, Ministry of Environment and Climate Affairs (MECA) and Mr. Hideaki Yamamoto, Deputy Head of Mission, Embassy of Japan, and 4 persons from ROPME member states (except Qatar), UNEP (Headquarter and ROWA) and other international organizations (CEFAS, MEDREC), ROPME, consultant firms, Japan Embassy, JICA (JICA Headquarter, Saudi Arabia Office), JAMSTEC, RESTEC and JICA Study Team.

Participant list for both Regional Workshop and EBM Working Group Meeting is shown in Annex 6.

4.2 Outcomes

4.2.1 Discussions in the Workshop

(1) Day 1: Results of activities of the preparatory survey and approaches to marine environment conservation of relevant organizations in Sultanate Oman

- In developing the master plan, the importance of inter-ministry cooperation and local people involvement from the earliest stage was reported.
- The concept and procedures of satellite image analysis were introduced based on the workshop held in January and February 2018.
- Examples of Japanese marine environmental conservation initiatives and issues of application to the ROPME region were introduced by Dr. Shirayama of JAMSTEC.
- Relevant ministries and SQU introduce each effort on coastal environment conservation.

(2) Day 2: Site visit on the Qrum Nature Reserve and Khawr Al Sawadi Mangrove Transplanting Area

Qrum Nature Reserve, Mangrove transplanted by JICA's cooperation and the first RAMSAR registered site in Oman, and Khawr Al Sawadi Mangrove Transplanting Area were visited and introduced as good practices for the coastal environment conservation measures in Sultanate of Oman.

(3) Day 3: Sharing results of baseline survey by JICA and ecosystem assessment survey by ROPME on EBM (Ecosystem Based Management) strategy, and ideas on EBM strategy

- In the baseline survey conducted by JICA, as a part of activities related to the EBM strategy development that UN Environment, ROPME and JICA cooperate with, the information that can be used differs widely among member states and further cooperation for information collection was requested. It was confirmed that the results at the present would be compiled and circulated to each country, and necessary information should be provided by each country.
- In the ecosystem assessment survey conducted by ROPME, it was confirmed that the comments of each country will be compiled and finalized.
- In the idea sharing related to the EBM strategy, an application of satellite image analysis using actual images in Oman were introduced.
- In the wrap-up session, the importance and necessity of data sharing were confirmed.

4.2.2 Summary of the Workshop

- Outcomes of preparatory survey in Oman which can be linked with EBM strategy were shared and information exchange and good communication between member states were valuable.
- The necessity of grasping the current status of the marine environment as well as the ecosystem and data sharing were strongly recognized again, and the expectation for the full scale project in Oman and interest in similar projects were raised.
- While persons in charge of environmental and fishery fields participate from the member states, further discussion of fishery issues and the cooperation between fishery and environmental sectors should be needed in future works.

APPENDIX

List of Appendix

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Appendix 1 Criteria, Definition and Rationale for Selecting EBSA

Criteria	Definition	Rational
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features	Irreplaceable Loss would mean permanent disappearance of diversity or a feature, or reduction of the diversity at any level
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive	Various biotic and a biotic conditions coupled with species-specific physiological constraints and preferences tend to make some parts of marine regions more suitable to particular life-stages and functions than other parts.
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species	To ensure the restoration and recovery of such species and habitats
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery	The criteria indicate the degree of risk that will be incurred if human activities or natural events in the area or component cannot be managed effectively, or are pursued at an unsustainable rate.
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity	Important role in fuelling ecosystems and increasing the growth rates of organisms and their capacity for reproduction
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity	Important for evolution and maintaining the resilience of marine species and ecosystems
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation	To protect areas with near natural structure, processes and functions To maintain the Seareas as reference sites To safeguard and enhance ecosystem resilience

Source: Azores Science Criteria and Guidance, 2009, CBD Secretariat

Appendix 2 Nature Reserves and khawrs in the Sultanate of Oman

Appendix 2-1 Nature Reserves

There are 18 Nature reserves in the Sultanate at this moment as follows.

(1) Marine:

1) Damaniyat Islands (Batinah, MECA-coral reef, birds and turtle)

(R/D 23/96, 3/4/1996)(20 km²)



GPS Coordinate: 23° 51.491'N, 58° 6.225'E

Covering an area of 20,000 Ha (20 km²). Thousands of migratory birds are nesting in summer. Common Terns (*Sterna hirundo*) prefer to nest on the vegetated islands. 15 species of wild plants covering densely in Al Kharaabah Island and Al Jibaal Al Kibaar Island. More than 100 species of reef fish. Green Turtle (*Chelonia mydas*) and Hawksbill (*Eretmochelys imbricata*) are frequently seen. Maximum 250 Hawksbill turtles nesting annually (as of 1999). Hosting bottlenose dolphins (*Tursiops*), common dolphins (*Delphinus*), spinner dolphins (*Stenella longirostris*) and humpback whale (*Megaptera novaeangliae*).

2) Qurm Nature Reserve (Muscat, MECA-mangrove, birds, khawr)

(R/D 38/1975)(0.61 km²)



GPS Coordinate: 23° 37.305'N, 58° 28.474'E

Covering an area of 174 Ha including 74 Ha of mangrove forest. Sheltering numerous marine species with economic value inhabited by about 80 species of molluscs. 194 species of bird are recorded. The first nursery (pump irrigation system) of mangrove in Oman was established in August 2000. The first tidal irrigation nursery was established in November 2001. The second tidal irrigation nursery was established in 2007 after the nursery of 2000 was destroyed by Cyclone Gonu in 2006. The first boardwalk was established in 2008 and the second boardwalk with a bird-hide was established in 20013. Since the nursery was established in this nature reserve, MECA has been utilizing the reserve for various kind of environmental awareness activities. This reserve is a Ramsar Wetland as well.

3) Ra's Al-Hadd (Sharqiyah South, MECA-turtles, mangrove, coral reefs and khawrs)

(R/D 52/96, 23/4/1996)(120 km²)



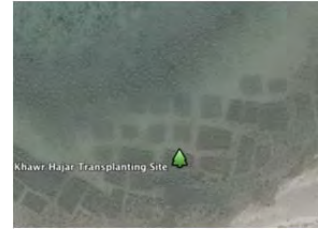
Visitor Center in Ra's Al Jinz
Transplanting Site



Sea turtle



Babies



GPS Coordinate: 22° 25.532'N, 59° 49.684'E

Covering an area of 120 km² of beaches, coastal lands including two khawrs, Khaw Al Jarama (with mangrove stands) and Khawr Al Hajar (with transplanted mangrove stand). Hosting 6,000 ~ 13,000 turtles annually for their nesting. Ras Al Jinz Visitor Center plays an important role for the promotion of environmental tourism in collaboration with MECA attracting tourist both domestic and international.

4) Bar Al-Hickman (Wusta, MECA-birds, coral reef, mangrove, tidal flat, khawr)(R/D)(600 km²<)



Sand Plover



Montipora



Salt flat (Salt Farm)

GPS Coordinate: 20° 24.616'N, 58° 20.553'E

The latest proclaimed area and proposed to be a Ramsar Wetland under procedure. This reserve covers almost all of Bar Al-Hickman peninsula consist of tidal flat, salt marshes, tidal inlets and khawrs (km²). Hosting over 400,000 birds of different species in 2013 including 7,000 Crab plover in three years. Southern coastal shallow water has predominant *Montipora* community. *A. marina* stands are distributed mainly in the north-eastern part of this peninsula around Shennah. Fishing activity carried out mostly by Bangladeshi using dowships.

5) Khawr Rowri (Dhofar, DIWAN-historical site, turtle, birds and khawr) (R/D 49/97, 28/6/1997)(8.2 km²)



GPS Coordinate: 17° 1.876'N, 54° 26.189'E

Remains of Samharam Ancient Frankinsence Port City (World Heritage Site): the 2nd C. AD (Samharam). Covering an area of 8.2 km². Vegetated with more than 20 species of plants excluding *A. marina*, inhabited with 11 species of fish and more than 100 species of birds are frequently recorded.

6. Khawr Taqah (Dhofar, MECA-birds, scenic values and khawr) (R/D 49/97, 28/6/1997)(1.07 km²)



GPS Coordinate: 17° 2.127'N, 54° 22.225'E

Covering an area of 1.07 km². Vegetated with predominant *Phragmites*, *Typha*, *Schoenoplectus* and *Paspalum* without Mangrove. More than 200 species of birds and around 20 species of fish have been recorded. The water in this khawr is brackish thanks to in-flow of spring water to this khawr at a flow rate of 201.6 m³/day (140 l/min) supporting both halophytic and brackish vegetations.

6) Khawr-Sawli (Dhofar, DIWAN)

(R/D 49/97, 28/6/1997)(0.5 km²)



GPS Coordinate: 17° 2.041'N, 54° 19.802'E

Covering an area around 50 Ha. 44 species of invertebrates, 66 species of birds, 26 species of fish and more than 70 species of plants have been recorded. Vegetated with predominant *Phragmites* without Mangrove. Suitable site for reSearch and monitoring biodiversity. Salinity of 1.0%.

7) Khawr Dahareez (Dhofar, MECA-birds, khawr, Mangrove: Manmade)

(R/D 49/97, 28/6/1997)(0.6 km²)



GPS Coordinate: 17° 0.839'N, 54° 10.592'E

Covering an area of 0.6 km². Vegetated with predominant *Phragmites*, *Prosopis juliflora* and transplanted and sown *A. marina* in 2004 followed by transplanting of *A. marina* in 2010 & 2011. Providing breeding areas for important birds. The recreational area was constructed at the western bank of this khawr around 2010. More than 20 species of birds have been recorded. There is moderate diversity of fish, which rely on regular connection to the Sea via the sand bar. Pressing issues are over grazing and invasive plant *Prosopis juliflora*. Salinity of the water at the sand bar of this khawr is 1.2% as NaCl.

8) Khawr Baleed (Dhofar, DIWAN-birds, khawr, historical site)

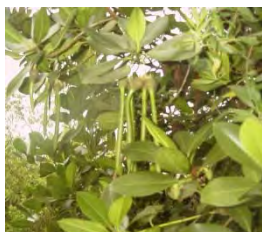
(R/D 49/97, 28/6/1997)(1 km²)



GPS Coordinate: 17° 0.365'N, 54° 8.519'E

Covering an area of 1 km². A very famous archaeological site of an ancient city (from 8th century till 16th century, UNESCO's World Heritage Site). Al Baleed Archaeological Park attracts tourist both domestic and international. Vegetated with predominant *Phragmites*. *Avicennia marina* is not found in Khawr Baleed, however, several mangrove species and associates were found. There are three plant species, that is, *Rhizophora stylosa* or *mucronata*, *Bruguiera gymnorhiza*, *Lumnitzera racemosa* and *Conocarpus erectus*. These plants were said to be transplanted by Japanese researchers in 1980's (Japan Cooperation Center for the Middle East, A REPORT OF MANGROVE RESEARCH IN SULTANATE OF OMAN, The Fourth Research on Mangroves in the Middle East, p11, 1986) and are also said to be transplanted by the people in the Ministry of Agriculture and Fishery in Salalah. Salinity is 0.7~0.8‰.

Photographs taken in July 10, 2000 and in January 8, 2003



R. stylosa or *mucronata*



Bruguiera gymnorhiza



Lumnitzera racemosa



Conocarpus

erectus



These plants were growing together in a very small area of 20 m x 20m, therefore, it was speculated that Khawr Baleed may be a site chosen as an experimental creek for introduction of these exotic plant species. But these plants were removed owing to the civil works for Museum later. MECA carried out transplanting seedlings at the mouth of this khawr, but its water quality is almost sweet water not even blackish. Presumably

because of flash flood (mouth is prone to be washed out) or of its water quality, they could not survive in this khawr.

9) Khawr Salalah (Dhofar, DIWAN-bird, mangrove, khawr)

(0.6 km²)



Photographs taken in July 10, 2000

GPS Coordinate: 16° 59.869'N, 54° 4.310'E

Covering an area of approximately 60 Ha. Vegetated with predominant *Phragmites* and *Zoysiae* (*Spartina* ? *Sporobolus*?) along its bank. *Avicennia marina* was introduced to this site by MECA's staff in late 90's just by sowing seeds. This site is restricted area under Ministry of Diffence surrounded by fence. The management of this khawr, therefore, is out of scope of MECA. Salinity is 0.7~0.8‰.

10) Khawr Awqad (Dhofar, MECA-birds, mangrove, khawr)

(R/D 49/97, 28/6/1997)(0.16 km²)



Photograph taken in July 10, 2000

GPS Coordinate: 16° 59.358'N, 54° 2.098'E

Covering an area of 16 Ha. Vegetated with predominant *Phragmites* and *Zoysiae* (*Spartina* ? *Sporobolus*?) along its bank. Once used as a dumping site for garden refuse and other refuse. Serving as an important breeding site for some bird species. *Avicennia marina* is not found in this khawr. MECA carried out direct sowing of seeds in this khawr in January 2004.



Only one tree in January 2004

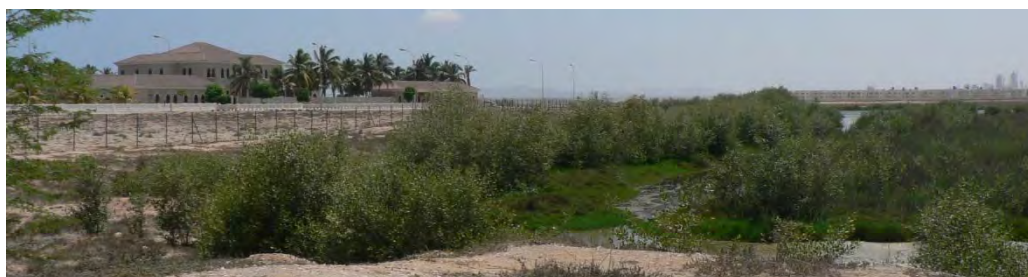


Direct sowing of seeds carried out in January 2004

MECA also carried out transplanting seedlings of *Rhizophora* in July 28, 2006.



Khawr Awqad in April 24, 2010



Khawr Awqad in April 24, 2010

Seedlings of *Rhizophora* were washed out by flash flood in 2007, but *A. marina* survived and showing

good growth covering an area around 1.5 Ha.

11) Khawr Qurm Al Kabeer (Dhofar, MECA-mangrove, khawr)

(R/D 49/97, 28/6/1997)(0.01 km²)



As of January 2000, mangroves covering an area around 1.3 Ha
 GPS Coordinate: 16° 59.012'N, 54° 1.194'E
 Covering an area of 9.7 Ha. This khawr and the next khawr, Khawr Qurm Al Sagheer are sometimes referred to as "Khawr Thet". Vegetated with predominant *A. marina*. Banks predominated by *Zoicidae*. There are 9 species of fish and 13 species of plant. Proclaimed as Nature Reserve to protect from overgrazing pressure mainly by camels.
 MECA established a permanent nursery (pump irrigation) in collaboration with JICA in July 2002. MECA carried out transplanting mangrove seedlings to enhance existing mangrove vegetation in collaboration with JICA in 2003 by reclaiming new area at the end of this khawr for transplanting. The first seedlings cultivated in this nursery were of seeds from Qurm Nature Reserve transported by a flight in August 2002 because it was not to sure to find seeds in Salalah.



As of July 2, 2002



Peeling off seed coat



Sowing seeds (as of July 2, 2002)



Growth as of October 14, 2002



After transplanting seedlings, as of January 2003



Growth as of January 2007, mangroves covering an area around 2.7 Ha (more than 3 times larger)
Although the reserve is enclosed by fence, fence itself is easily corroded by saline environment.

12) Khawr Qurm Al Sagheer (Dhofar, MECA-mangrove, khawr)

(R/D 49/97, 28/6/1997)(0.004 km²)



As of June 2000, mangroves covering an area around 0.33 Ha
GPS Coordinate: 16° 58.781'N, 4° 0.823'E
Covering an area of 4.2 Ha. Vegetated with predominant *A. marina*. Banks predominated by *Zoicidae* and other area by *Suaeda*. Proclaimed as Nature Reserve to protect from overgrazing pressure mainly by camels. MECA carried out transplanting mangrove seedlings to enhance existing mangrove vegetation in collaboration with JICA in 2003 by reclaiming new area at the end of this khawr for transplanting.



Land reclamation and transplanting as of February 2003



As of February 2007, mangroves covering an area of 0.99 Ha (3 times larger)

13) Khawr Mugsail (Dhofar, MECA-birds, mangrove, khawr)

(R/D 49/97, 28/6/1997)(0.18 km²)



GPS Coordinate:

Covering an area around 18 Ha. In 90's a road was constructed crossing over the sand bar at the mouth of the khawr which might have made difficult to connecting this khawr with the Sea by occasional flash flood. The dominant vegetation consists of *Schoenoplectus litoralis* (Cyperaceae). The reserve is enclosed by fence to protect its vegetation and establishing a bird heaven, but allowing local community to cut fodder only at a certain period. MECA transplanted mangrove seedlings to try to diversify its vegetation.



As of January 2003



As of May 2003



As of November 2005



As of January 2007

Some of the transplanted area were lost because of a flash flood, however, this demonstrated that *A. marina* can grow in this khawr.

(2) Land (listed only)

- 1) Jabal Akhdar (Dakhiliyah, MECA)
- 2) Al Saleel (Sharqiyah North, MECA)
- 3) Jabal Kafwan (Sharqiyah South, MECA)
- 4) Arabian Oryx Sanctuary (Wusta, DIWAN)
- 5) Jabal Samhan (Dhofar MECA)

Appendix 2-2 Khawrs with high potential as habitat

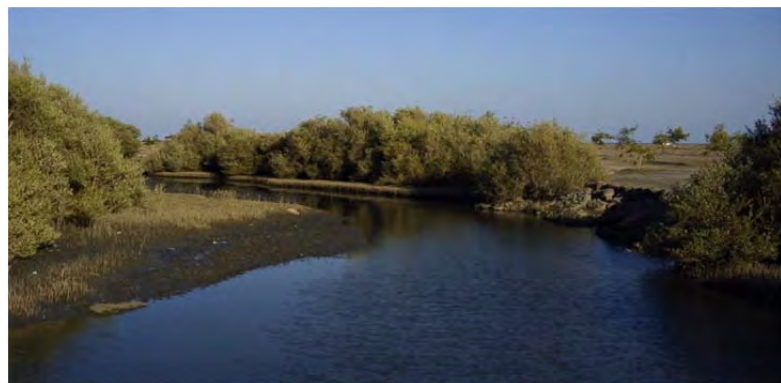
a) Sea with Natural Mangrove Forest

(1) Khawr Shinas (North Batinah)(Birds, mangrove, fish, khawr)

(1.80 km²)

GPS Coordinate: 24° 43.034'N, 56° 28.797'E

Khawr Shinas has a natural mangrove forest (approx. 35 Ha), which has been long utilized as a public park prepared by the Regional Municipality before 2000. There is a fishermen harbor to the north of the khawr. Creeks spread in Shinas maintain Seawater always and the mouth of this khawr is always open to the Sea. Fish and other marine organisms can come inside and go outside of this khawr, which can makes this khawr as an important habitat providing nursery for marine creatures.



Khawr Shinas



Public Park from Google Earth



Public Park, as of May 2017



A bridge crossing over the khawr, as of May 2017

This khawr has been used as public park since late 90's. Although this khawr is not nature reserve, the local municipality put a notice board "al Qurm Natural Park" and in reality this site has been providing services as a public park. It is important to develop a special design for a dust bin in a natural park different from "ordinary" dust bin.



Suitable design of dust bin with high functionality

In addition decent and comfortable toilet should be equipped in each park. This is a very important point especially for female visitors.



Important concept for public toilet is cleanliness

Public toilet should be maintained as clean as possible so that female visitor will be happy to use. In order to maintain them clean, Pay Toilet System can be an alternative to be introduced to create job opportunity for the local community as "House Keeper".

(2) Khawr Nabr (Harmul) (North Batinah)(Birds, mangrove, fish, khawr)

(1.24 km²)

GPS Coordinate: 24° 32.395'N, 56° 35.258'E

Khawr Nabr, similar to Khawr Shinas, has a natural mangrove forest (approx. 60 Ha) larger than the forest in Shinas.



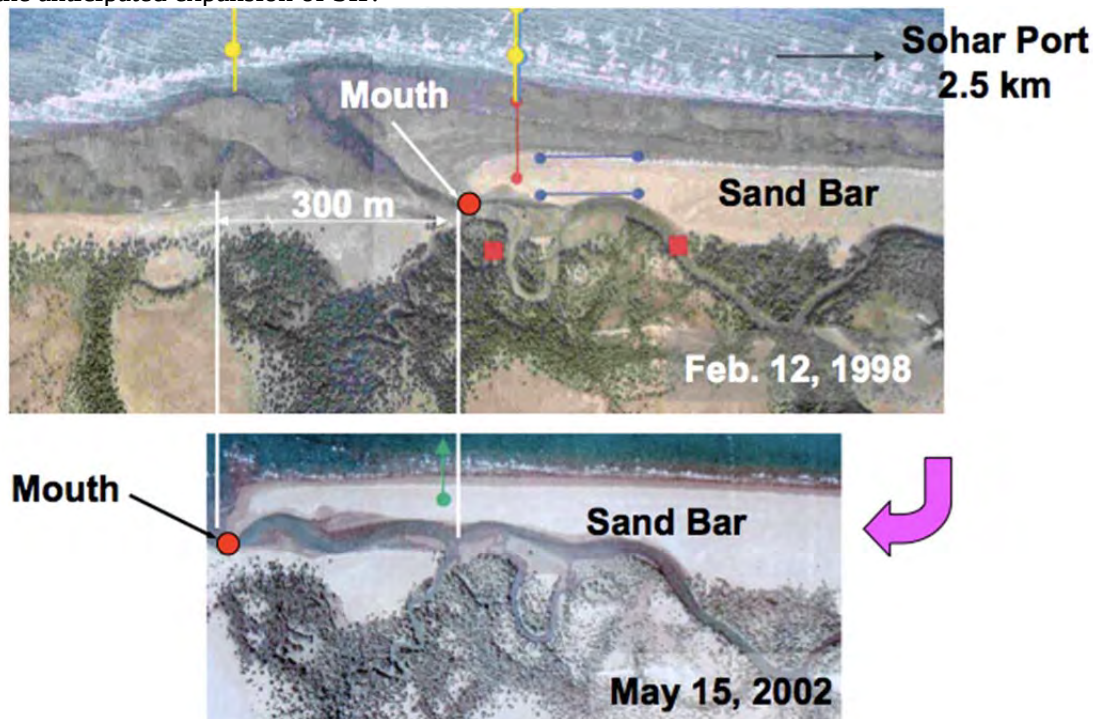
Khawr Nabr

It was reported in the Final Report (WS Atkins, September 2002) on Environmental Monitoring

of Sohar Industrial Port (SIP) Project that the mouth of the Khawr Nabr was shifted 300m to the north during the period from 1998 till 2002. This happened presumably because of the location of this khawr being close to the huge breakwater of Sohar Industrial Port. Nevertheless, the mouth of this khawr is always open to the Sea.

The next aerial photographs show the development of sandbar at the mouth of this khawr.

Being located adjacent to SIP, this forest is highly vulnerable to the expansion of SIP in the near future. Therefore, MECA should have basic strategy, Avoid, Compensation or Suspension to the anticipated expansion of SIP.



General view of Liwa Forest as of May 2017

At this moment (as of May 2017), this khawr is not used as a public park like Khawr Shinas accordingly there are neither toilets nor dustbins around this khawr for visitors. If the local municipality has a plan to develop a public park around this khawr, it is strongly recommended to have a consultation with Directorate General of Nature Conservation, MECA HQ.

(3) Khawr Quriyat (Muscat)(Mangrove, fish, khawr)

(0.35 km²)

GPS Coordinate: 23° 16.444'N, 58° 55.222'E



As of January 28, 2002

Khawr Quriyat has a mangrove forest covering an area of 20 Ha or more. Being located at the end of Wadi Majlas, the mouth of this khawr and its vegetation are prone to be changed and washed out by occasional flash floods. At the same time this forest was threatened by overgrazing by domestic animals mainly by goats. A fence was established from the southern edge of the forest along the road along the khawr in 2013. When I visited this khawr in January 2002, I asked the young locals walking around this forest why they came here. Their reply was so impressive that I can't forget. They said, "We don't know why but I think it is comfortable to come here, that is why". Generalization is dangerous, but rich vegetation in hyper arid environment can attract local residents, domestic and international tourists as well. This khawr is so popular and familiar to the local community, therefore, it is recommended to designate this khawr and its environment as SEA (such as Public Park) so that over exploitation of this khawr can be avoided and its sustainability can be secured.

(4) Khawr Al Khwair (Muscat)(Mangrove, khawr)

(0.1 km²)

GPS Coordinate: 23° 8.487'N, 58° 59.887'E



As of April 2003



As of April 2003

Located at the end of a wadi. Covering an area around 6.5 Ha. Predominantly vegetated with *A. marina*, *Tamarx nilotica* (?), *Phoenix dactylifera*. Mangrove area is less than 1 Ha. There is no access road to this khawr. We can visit this khawr only by a boat. This small hidden khawr will attract visitors and tourists to the coast from Muscat Governorate to Sharqiyah and will play a role as a rest area after a long cruise. This khawr seems very difficult to be exploited, but it is recommended to designate this khawr and its environment as SEA (such as Public Park of scenic beauty).

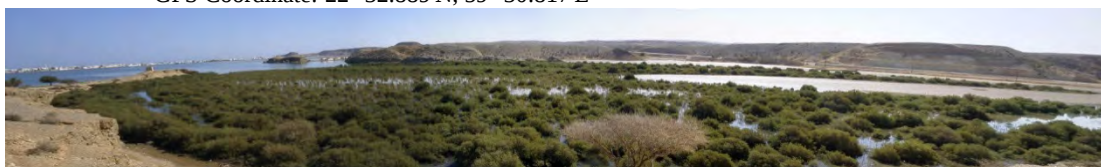
(5) Khawar Sukeikra (Sharqiyah)(Mangrove, birds, khawr)

(0.58 km²)

GPS Coordinate: 22° 33.087'N, 59° 30.412'E (Nursery)



GPS Coordinate: 22° 32.889'N, 59° 30.817'E



Located within a vast khawr systems consist of Khawr Batah, Khawr Attina & Khawr Sukeikra. There are two large stands of natural predominant *A. marina* in this khawr. These natural stands covering an area of 25 Ha as of December 2003. MECA established a tidal irrigation nursery in July 2002 to enhance the existing vegetation by transplanting in Khawr Batah and Khawr Attina till 2013.



Nursery in Sur, as of July 20, 2002

The natural mangrove vegetation in this khawr was smaller in the past. As shown in the next page, the aerial photograph taken in 1986 has no road around this khawr, but we can see the road in the photograph taken in 1994. In addition, the vegetation in 1986 looks not that much as that in 1994.



As of May 22, 1986



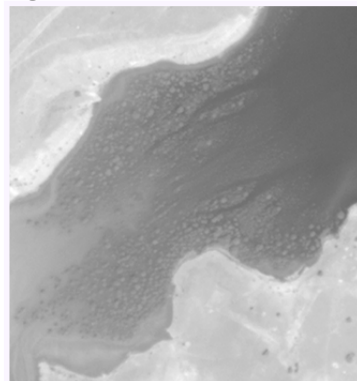
As of April 10, 1994

An Aerial Photograph of Khawr Batah, Sur, Courtesy of NSA

According to the explanation of local residents in Sur, the constructed road was so dangerous for camel to cross to go to browse mangroves and the owners of camels keeps them not to cross the road. Consequently the vegetation was protected by this road development. The following pictures explain the growth of mangrove vegetation from 1991 till 2000.



An Aerial Photograph of Khawr Sukeikra, 1991
Courtesy of NSA



A Satellite Image (IKONOS) of the same area in December 2000
Courtesy of PDO LLC

The mangrove vegetation in Khawr Sukeikra is the largest natural forest in Sharqiyah, Wusta and in Salalah, therefore, it is urgently necessary to protect from exploitation by recent urbanization and development in this region. We would like to designate this khawr and its environment as SEA (such as Public Park).

(6) Khawrs in Bar Al Hickman (Sharqiyah, Wusta)

(500 km²<)

b) Sea with Man-made Mangrove Forest

In addition to the existing MPAs, man-made mangrove forests such as **Wadiyat, Sawadi**, etc., are potential candidate sites as MPAs as well, however, because of the circumstance mentioned above, they will be better to be designate as SEA instead of MPA.

(7) Khawr Wadiyat (North Batinah)

(0.25 km²)

GPS Coordinate: 24° 45.797'N, 56° 27.938'E



As of January 25, 2003



As of January 17, 2004



As of April 15, 2004



As of January 7, 2007
(Two *A. marina* trees are shown)



As of January 7, 2017



There were only two mangrove trees at the mouth of this khawr in 2003 as shown in the pictures above. MECA transplanted seedlings of *A. marina* from 2004 till 2017. The area covered by mangrove is around 2.9 Ha as of June 20, 2016. This is newly created the first manmade mangrove vegetation in North Batinah. Natural regeneration was observed 2009(?) and expanding little by little from the area covered by transplanted seedlings (1.27 Ha) to 2.9 Ha at this moment. Although the mangrove area is not so big, it looks almost natural now. It is, therefore, highly recommended to protect this khawr as SEA so that it will be sustainably utilized as a public park accessible to everyone.

(8) Khawr Shinas North (School Side) (North Batinah)

(9) Khawr Grim (South Batinah)

(10) Khawr Sawadi (South Batinah)

(2.95 km²)

GPS Coordinate: 23° 45.856'N, 57° 47.508'E



Before transplanting, as of December 10, 2000

Predominated by halophytic plants such as *Atriplex-Suaeda* community and no mangrove vegetation in this khawr in the past. There was a study team from Japan Cooperation Center for the Middle East (JCCME) who visited Oman during the period from 1983 till 1984 led by Mr. Motohiko Kogo. They recommended Khawr Sawadi to Ministry of Environment (at that time) as a suitable place for developing manmade mangrove vegetation. The first transplanting of seedlings of *Avicennia marina* was carried out in February 2001 by MECA in collaboration with JICA. Transplanting activity was consecutively carried out till 2007.



Just after transplanting, as of February 28, 2001

Transplanting seedlings in this khawr was the first ever in Oman and it was among the most successful transplanting site in Oman. Natural regeneration was observed 4 years after transplanting and since then the forest started quick expansion.



As of January 7, 2017



No Mangrove before 2001

Approx. 23 Ha of *A.*

marina forest

These vegetation can be utilized as public park equipped with boardwalks and bird-hides just same as Qurm Nature Reserve, but as SEA (as Public Park) for the certain duration of time so that the concerned authorities can assess this khawr to be MPA or not in the near future based on its functions and environmental services. In addition, this manmade forest will provide various kinds of ecological reSearch opportunities to the academic sectors to study about procedure of increasing biodiversity by monitoring this khawr.

(11) Khawr Batah, Attina and Sukeikra (Sharquiya)

(0.43 km²)

There were only few *A. marina* trees surviving in this area in 2001. In order to enhance the existing vegetation, MECA started transplanting seedlings from November 2001 transported from Qurm Nursery in Muscat.



At Bata

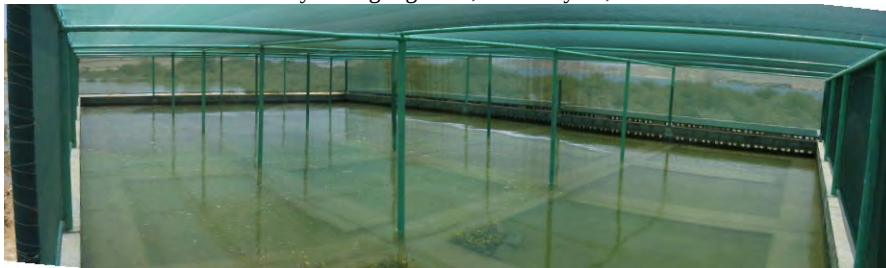
At Sukeikura

At Attina

In July 2002, a tidal irrigation nursery was established in Khawr Sukeikura.



Nursery during high tide, as of July 20, 2002



Nursery during high tide, as of December 18, 2004



Nursery during low tide, as of October 4, 2004

In February 2003, seedlings cultivated in this Sur nursery were transplanted in this khawr.



As of February 18, 2003

Transplanting activity in this area came to an end in 2012. More than 17 Ha in this khawr is covered by manmade mangrove vegetation

- **Attina**

GPS Coordinate: 22° 34.390'E, 59° 31.224'N



Before transplanting, as of September 16, 2001



One year after transplanting, as of March 22, 2004



Growth as of July 4, 2004



Growth as of November 28, 2005



Growth as of February 24, 2007



Growth as of November 8, 2015



Thinning, as of November 8, 2015



After thinning, as of November 8, 2015

- **Batah**

GPS Coordinate: 22° 33.970'E, 59° 30.672'N



As the forest expands, rats and snakes around the households started to migrate in to the forest to escape from the heat and comfortably staying under the shade of the forest. Since the local residents started to complain that the forest became the nests of rodents and blaming the transplanting project. In parallel with these opposition against MECA's transplanting project, request of environmental permit by the people in Sur for the development projects inside this khawr is increasing recently. MECA agreed with the request of Municipal Council of Sur to carry out thinning in Khawr Attina in 2015. Thinning may be necessary every 5 years in Attina, because the speed of natural regeneration is very fast there.

According to the observation of satellite images, the mangrove vegetation both natural and manmade in this khawr (Attina + Bata + Sukeikura) are expanding year by year. These vegetation can be utilized as public park equipped with boardwalks and bird-hides just same as Qurm Nature Reserve but as SEA (as Public Park) for the certain duration of time so that the concerned authorities can assess this khawr to be MPA or not in the near future based on its functions and environmental services. In addition, this manmade forest will provide many reSearch opportunities to the academic sectors to study about enriching procedure of biodiversity by monitoring this khawr.

(12) Khawr Durf (Wusta)

(1.30 km²)

GPS Coordinate: 18° 56.258'N, 57° 20.707'E



As of March 21, 2003

Salinity with 1.8~1.9% at the mouth and 1.0% at inland side suggesting inflow of freshwater. Located inside Arabian Oryx Sanctuary and at the end of a wadi with its mouth closed by a sand bar. Many kinds of wildlife are dependent with this khawr. This khawr with extraordinary rich in bio-diversity especially in avifauna, can be said the best khawr in Wusta for tourism development, however, many creatures including domestic animals and abandoned domestic animals (donkey) are dependent with this khawr and the location of this khawr (inside Arabian

Oryx Sanctuary) makes any kind of development project restricted. Naturally, this khawr is protected already. Considering the urgency to encourage diversifying industrial sectors beside oil industry, all the government sectors involved with tourism development, including DIWAN, should have the opportunities to discuss on the sustainable utilization of this khawr, one of Oman's rich natural environment, as SEA (as Camping Area).

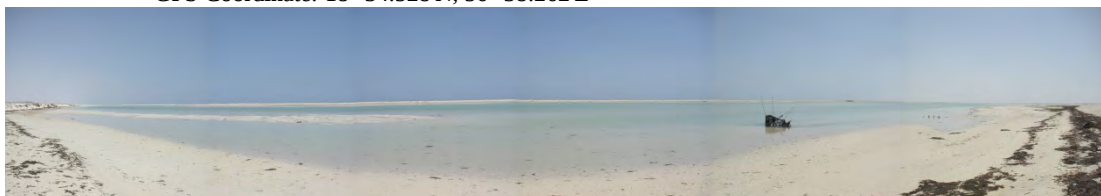


Transplanting, as of February 7, 2005

(13) Khawr Gauwi (Wusta)

(6.66 km²)

GPS Coordinate: 18° 34.528'N, 56° 38.262'E



As of March 16, 2003



A view at the mouth

This khawr is the largest khawr or tidal inlet in Oman. Total area of water surface of this khawr covers an area approximately 300 Ha. Located in a remote place at the end of several wadis with its mouth open surrounded by very long beautiful sand bar, with light sandy soil, beautiful white color will attract visitors and tourists who love unexploited virgin nature. There is almost no vegetation in this khawr. The water is 3%(at the innermost part)~3.2%(at the mouth) of salinity (as NaCl) suggesting inflow of freshwater. MECA started transplanting seedlings since March 15, 2005.



Transplanting, as of March 15, 2005



Growth, as of May 15, 2013

Just same as Khawr Durf, they are growing very well but their height seemed a bit suppressed by strong wind throughout the year. It is recommended to designate this khawr also as SEA (as Camping Area) for its scenic beauty.

Appendix 3. Results of the fishermen questionnaire survey in Bander Khayran

1. Objective

The Oman government is planning to develop “Marine Environment Conservation Strategy 2050 (hereinafter “Strategy 2050”)” with cooperation of the Japanese government (JICA), which aims to develop strategies and action plans for the conservation of marine environment through protection and sustainable use of marine environment resources covering up to the year 2050.

Fishery is a key industry in Oman, and development of a sustainable fishery strategy will be integral for the conservation of marine environment as well as for sustaining and improving the livelihood of fishermen. Such strategy can only be developed through consulting various stakeholders most importantly the local fishing communities.

A questionnaire survey was undertaken in Bander Khayran as a sample location to understand the issues that the fishermen face and collect ideas for sustainable fisheries and ways to improve their livelihood. The findings will be referred when considering the pilot project to be implemented during the full-scale stage of this project.

2. Method

Eleven fishermen based in Bander Khayran were interviewed using a questionnaire prepared in advance by MECA/MAFW. The survey was implemented in October 2016 by MAFW officers. See Appendix 1 for the questionnaire.

3. Results

3.1. Brief background on the interviewed fishermen

(1) Type of fish caught

A total of 15 fish species were mentioned as their main targeted fish. Yellowfin tuna and Longtail tuna were the most common fish caught followed by Emperors, Kingfish, Mackerel tuna and Indian Mackerel. Other less common fishes mentioned were Seabream, Jacks, Red mullet, Sardine, Grouper, Rabbit fish and so on.

(2) Fishing ground and landing area

Most of the fishermen fished in offshore waters in the regions between Muscat, Sifah and Qurayat. The caught fish are mostly landed in Mattrah and next in Qurayat. Some land in Bander Khayran mainly for local consumption.

3.2. Issues with current fishing activities

Figure 1 shows the main issues raised by the fishermen. The most common issues raised were decrease in fish catch/stock and income. Overfishing and pollution were common reasons raised by the fishermen for the decrease in fish catch/stock. Other issues raised were high price/lack of equipment, lack of infrastructure (e.g. no landing site), lack of government support and conflict with other water users.

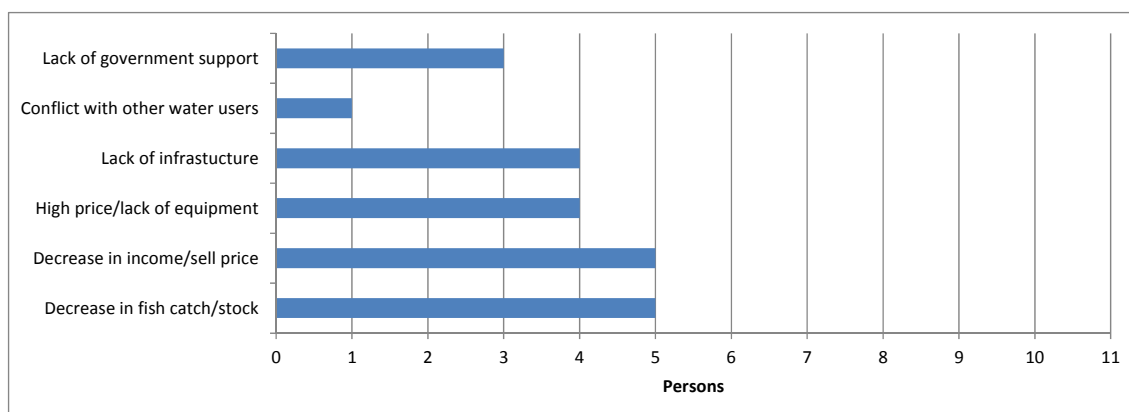


Figure 1 Main issues raised by the fishermen regarding current fishing activities

3.3. Measures for sustainable fisheries

Figure 2 shows the measures for sustainable fisheries suggested by the fishermen. Around half of the fishermen raised the importance of stronger enforcement of laws/regulations as well as regulating fishing activity (e.g. establishing fishing season, limit equipment size, limit fish catch/size). Five fishermen suggested establishing marine protected areas.

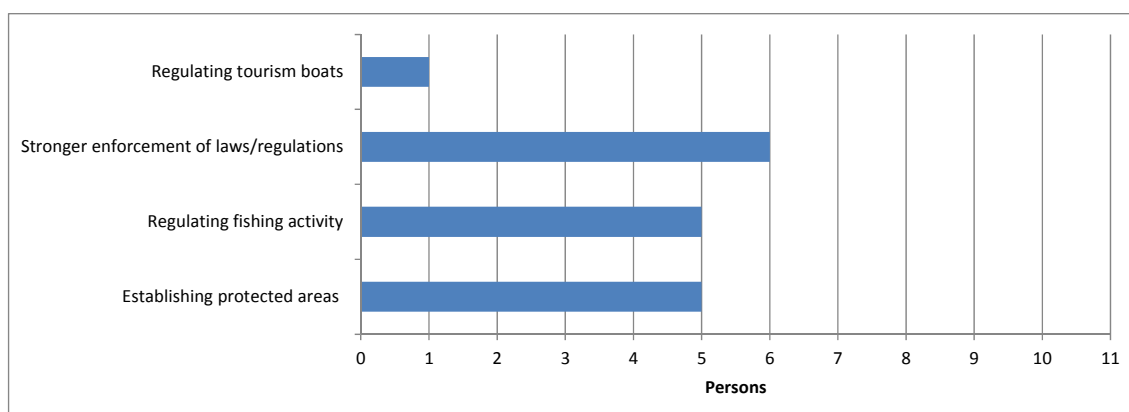


Figure 2 Measures for sustainable fisheries suggested by the fishermen

3.4. Measures for livelihood improvement

Figure 3 shows the measures for livelihood improvement suggested by the fishermen. Over half of the fishermen raised the possibility of establishing alternative income sources such as involvement in tourism. Aquaculture was also mentioned as a new potential income source. Other common suggestions were to improve the infrastructure such as landing site, storage and shade areas and ice factory.

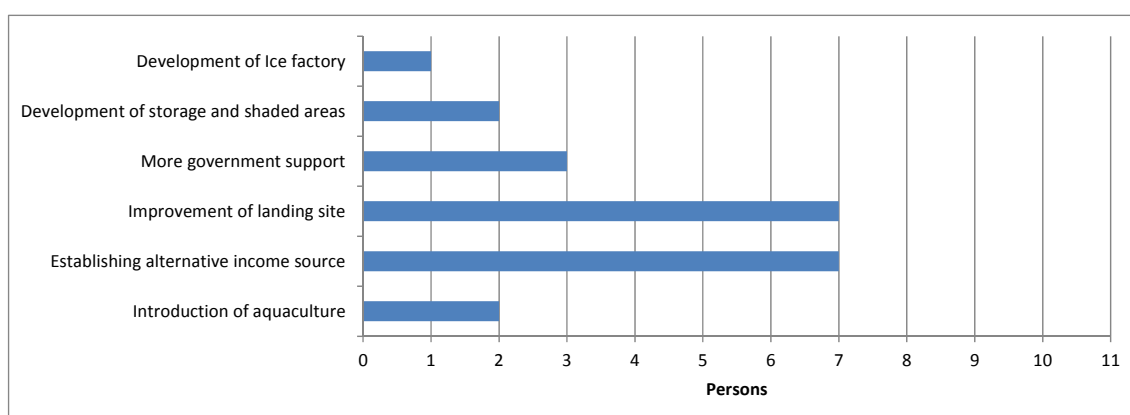


Figure 3 Measures for livelihood improvement suggested by the fishermen

4. Conclusion

Following are the main findings of the survey:

- Around half of the fishermen were experiencing decrease in fish catch/stock and income.
- Many of the fishermen mentioned the importance of stronger law/regulation enforcement and establishing MPAs to keep fisheries sustainable.
- Over half of the fishermen suggested for improving the boat landing sites as access to sea is now limited during low tide.
- Over half of the fishermen were keen to be involved in alternative income sources such as tourism for improving their livelihood.

Attachment 1. Questionnaire used in the fishermen interview survey

The Oman government is planning to develop “Marine Environment Conservation Strategy 2050 (hereinafter “Strategy 2050”)” with cooperation of the Japanese government (JICA), which aims to develop strategies and action plans for the conservation of marine environment through protection and sustainable use of marine environment resources covering upto the year 2050.

Fishery is a key industry in Oman, and development of a sustainable fishery strategy will be integral for the conservation of marine environment as well as for sustaining and improving the livelihood of fishermen. Such strategy can only be developed through consulting various stakeholders most importantly the local fishing communities. We would therefore appreciate very much if you could kindly answer the attached questionnaire.

Questionnaire

Name of interviewee: _____

Please fill in the following table regarding your family.

Name	Age	Sex	Relation to household head	Primary occupation	Secondary occupation	Monthly Income

Part 1: Current fishing activities

- What type of fish and other marine life do you mainly catch?

	Season...	Season...	Season...
Demersal fish			
Large pelagic fish			
Small pelagic fish			
other			

- What type of fishing methods do you use according to the season and types of fish?
- Which area do you usually fish? What are main landing sites
- Where and to whom do you sell the caught fishes?

Part 2: Current issues with fishing

- Do you face any issues with fishing? (e.g. decrease in fish catch, decrease in sell price, decrease in income, lack of equipment, high price equipment conflict with other water users) you may prioritize issues

- If there are any issues, what do you think are the causes? (e.g. overfishing, pollution, violating the regulation, using prohibited equipment) (define causes of each issue)

Part 3: Measures for sustainable fisheries and livelihood improvement

- What kind measures do you think is necessary for protecting and sustaining fish resources? (e.g. establishing protected areas, restricting fish catch, defining specific season, sizes and fishing equipment)
- What kind of measures do you think is necessary for improving the livelihood (i.e. income) of fishermen? (e.g. increasing the value of caught fish, introduction of aquaculture, finding alternative income sources such as tourism, providing markets, improving landing sites)

Appendix 4. Analysis of the Management Plan by IUCN, December 2011

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
Executive Summary						
Vision						
1. strengthen governmental and non-governmental institutions' capacities in eco-tourism	H	H	H	Supporting MECA for Resources Management by Monitoring Ecosystem	1. N 2. Partially Y, but only Questionnaire survey 3. N 4. N P/S is focusing on data/information collection for EBSA Screening.	View 1 ~ 4 will be fully covered, in addition, concept/example for sustainable fishery, resources management and financial sustainability will be focused in Fs/S.
2. promote long-term community and stakeholder involvement, consultation and partnership in eco-tourism development	H	H	H			
3. promote sustainable eco-tourism by capacity building and identifying economic and employment opportunities	H	H	H			
4. enhance the capacity to formulate and review policies and regulations	L	H	M			
Project Components						
1. assessment of site carrying capacity for eco-tourism activities	H	H	M	Ditto	N/A in P/S. Just referred to BK as one of the Pilot Project Sites	Project Components 1 ~ 3 will be fully covered, in addition, Pilot Project will be carried out in BK for the verification of the Draft-Strategy, a strategy different from one in MOT which is still not finalized.
2. socio-economic interventions and local community development planning	L	H	H			
3. ecotourism planning and management	H	M	H			
Management Plan						
1. institutional and governance arrangements	L	H	H	Ditto	Reviewing Management Plan Part One ~ Part Eleven	Management Plan 1 ~ 5 will be fully covered, in addition, Pilot Project will be carried out in BK for the verification of the Draft-Strategy. MECA's experience in Turtle Beach in Ra's Al Jinz and Qurm Nature Reserve will be great references to learn.
2. a framework for stakeholder and community participation in management	H	H	H			
3. community benefits and livelihoods associated with ecotourism	H	M	H			
4. ecotourism facilities, a zoning plan and guidance of carrying capacity	H	H	H			
5. the operational guidance necessary for the Bandar Al Khayran Public Ecotourism Area to achieve its vision	H	H	H			
1. Introduction						
<u>"turtles nest on the protected beaches"</u>						
	H	H	H	Supporting MECA for Resources Management by Monitoring Ecosystem	P/S is up-dating such nesting sites mentioned in old references such as Clarke Report, IUCN CZMP, etc. For example, Barr Al-Jissah (Shangri-La) before their construction, the hotel committed to preserve the turtle beach but they failed as we see now.	
<u>Vision for the Bandar Al Khayran Public Ecotourism Area</u>						
					<u>Sustainable Fishery</u> is also an essential	Sustainable Fishery shall be included.

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
“A rich and diverse natural and cultural environment used sustainably for ecotourism and by the Al Khayran community and respected by Omanis and visitors.”	H	H	H	Ditto	component to be included.	
<u>Map in Page-17</u>	H	H	L	Ditto	A small bay at the east of BK was once the construction yard for a large scale hotel development and the area is excluded but potential threat to the management plan.	
<u>1.2 Description of Bandar Al Khayran</u>	L	H	L	Ditto	Information on Flora, Fauna and habitat including turtles, dolphins and whales by 5 OES 2010 and 2010a can be utilized.	
<u>1.3 Cultural Heritage</u>	H	M	H	Supporting MECA for Resources Management by Monitoring Ecosystem	Information on Djinn (5OES 2010; HMR 2010) may be a bit sensitive or superstitious issue but should be seriously taken into consideration in this region.	
<u>1.4 Current and Potential Issues</u>	L	H	H	H	Prosopis juliflora should be eliminated. If it is very difficult to do so, MECA should allow local people to cut it down or allow them to utilize as raw materials for charcoal production. MAFW/SQU should assess the fish population and their spawning places to justify the necessity of Sustainable Fishing in BK.	
<u>1.5 The Bandar Al Khayran Master Plan</u>	H	N/A	N/A	N/A	The details of Draft Master Plan especially its zoning and zonation of infrastructure expected to be provided from MOT	
2 Framework and Principles for Ecotourism Development and Management in Bandar Al Khayran						
2.1 Planning Framework	H	N/A	N/A	N/A	Regarding Information	

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
that conserves the environment and sustains the well being of local people (Epler Wood et al. 1991). By Fennell and Dowling 2003: To contributes to biodiversity conservation, provides benefits to local communities, provides economic and social benefits, and has education and awareness components. 1. A focus on natural areas and local culture: 2. Environmental sustainability 3. Community stewardship and asset building 4. Biocultural approach 5. Interpretation and education 6. Cultural respect and sensitivity 7. Financial sustainability 8. Adaptive management					managed by sustainable manner. In addition to Financial Sustainability, the Governmental Policy of “In Country Value” should be seriously considered so that the revenue from Eco-tourism will not be taken away outside Oman by foreign investors and their local partners who are looking for quick money without thinking about the benefit of the local nationals in BK. Management with Adaptability and accountability are called adaptive management where monitoring is an essential part so that management policy can be rectified accordingly.	
2.3 Legal and Policy Framework 1. <u>Royal Decree 45/2007</u> 2. <u>Oman's Eighth Five-year Plan (2011- 2015)</u> 3. <u>2001 Oman National Biodiversity Strategy and Action Plan (MRMEWR 2001)</u> 4. <u>1986 Oman Coastal Zone Management Plan: Greater Capital Area (IUCN 1986)</u> 5. <u>National Heritage Protection Law (1980) Under Amendment</u> 6. <u>Royal Decree 114/2001 and Royal Decree 95/2005 Protection of Environment and to Abate Pollution</u> 7. <u>Royal Decree 6/80 Law on National Heritage Protection</u> 8. <u>Ministerial Decree 79/94 Regulations for Noise Pollution Control in Public Environment</u> 9. <u>Royal Decree 33/2002 The Law of Tourism</u> 10. <u>Royal Decree 101/1996 State Basic Law</u> 11. <u>Royal Decree 6/2003 Law of Nature Resources and Wildlife Conservation</u> 12. <u>Ministerial Decree 101/2002 Prohibition of Killing, Hunting, or Capturing of Wild Animals and Birds</u>					3. is under up-dating process.	

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
13. <u>Ministerial Decree 128/93 Ban on Cutting Green Trees</u> 14. <u>Royal Decree 34/74 Law of Marine Pollution Control</u> 15. <u>Royal Decree 53/81 Management of Critical Fishery and Support Habitats</u> 16. <u>Royal Decree 33/78 (prevents developments which may prevent public access to the areas of national scenic heritage, notably at Bandar Al Khayran)</u> 17. <u>Royal Decree 8/2003 Issuing Law of Grazing Lands and Animal Resources</u> 18. <u>National Coastal Zone Management, 1991</u> 19. <u>Ministerial Decree 20/90 (regarding the rules regulating and specifying coastal setbacks)</u> • <u>The Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution (1978) and the related Protocol for the Protection of the Marine Environment against Pollution from Land-Based Sources (1990)</u> • <u>United Nations Convention on Biological Diversity (1992)</u> • <u>The 2003 Convention for the Safeguarding of Intangible Cultural Heritage (CSICH)</u>						
3 Vision, Aim, Objectives						
3.1 <u>Vision</u>						
Local fishing related tours						The potential exists for fishing tours and this is discussed in more detail under ecotourism enterprises. (p.51)
Fish processing and value addition					Quality Control Centre of MAFW is checking the fish quality on quality of processed fish food.	Gather further information including a Bandar Al Khayran fishery profile particularly of high value products, learn about local fishing traditions, processing fish storage and food traditions. Interview with younger fishers and

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
						learn about their activities and aspirations(p.51)
commission a brief fisheries study is that addresses ecological, cultural, sustainable use, marketing and fisheries development issues						
Employment						Carry out an employment profile survey of the village residents including those that work in Muscat, and assess their interest in taking up business opportunities based on ecotourism(p.51)
Other training needs						
Water taxi						Seek support from Ministry for Fisheries Wealth, Coast Guard (a specialist division of the Royal Omani Police) and tour operators in gathering information and identifying client needs
the Visitors' and the Stewards' codes of conduct					Visitors will respect the landscape, the biodiversity, the heritage and behave in ethical ways that acknowledges the values and beliefs of the Al Khayran community	The Stewards of Bandar al Khayran will conduct their duties with respect to the local environment and the values embedded in Bandar al Khayran

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
Some of the most important biodiversity and other attributes of Bandar Al Khayran have been combined in a single map (Figure 16). The mangroves and the tern breeding island represent some of the most valuable habitat in the south and centre of Bandar Al Khayran. The coral reefs form the most valuable marine component. The eastern beaches represent actual or potential turtle breeding habitat.						
Zoning Marine environment - o General marine zone - o Anchorage zone - o No- anchorage zone (mooring only) - o Non-motorized access zone - o Beach zone ▪ Public access beach ▪ Tourism operator and public access ▪ Tourism operator and public access (no overnight camping for the public).						
Operational rules will further assist in						

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
protecting these values, through the setting of carrying capacities and through the regulation of activities in time (e.g. seasonal closure of camping on certain beaches to favor turtles).						
School visit						
Bandar Al Khayran has limited low tide access and low tide jetty has already been proposed for this location to meet the fisher’s needs. The area presents a great opportunity for visitors to link to and from the sea at low tide, enjoy the views and have a picnic. The easy access to the mangrove area presents a good opportunity for visitors to experience this habitat and learn about mangrove ecology.						
The use of moorings in Bandar Al Khayran is part of an integrated strategy to protect the coral communities of Bandar Al Khayran while allowing for people to visit and appreciate them. Correctly designed, installed and maintained moorings will prevent damage to coral communities arising from anchoring, assist in managing visitor numbers, improve safety and access, and increase public appreciation for the high value of coral communities and their vulnerability to physical damage.						Sixteen mooring buoys will be provided in Bandar Al Khayran (Table 21 and Figure 55). Private moorings will not be permitted. The moorings will be owned by the Ministry of Tourism/Omran although it is recommended that their installation be done in partnership (e.g. as a sub-contract) with the Oman Environment Society. Oman Environment Society has a moorings program and has the necessary experience. Installation should occur after consultation with dive operators and Bandar Al

Subject	MOT	MECA	MAFW	SQU	Action/comment in the preparatory Study (P/S) Y(Yes)/N(No)	Action in the full scale study (Fs/S)
	Expected Involvement: H(High), M(Medium), L(Low)					
	Especially Eco-tourism	Especially Resources Management	Especially Sustainable Fishery	Especially Monitoring Ecosystem		
						Khayran fishermen.
☐ Monitor at the scale of the ecosystem. Changes in an indicator within a management area may be caused by stressors beyond the area’s boundaries and confound the evaluation of the effectiveness of the area’s management - Monitoring programs should be designed so they are capable of detecting, with sufficient statistical power, a meaningful change when that change has occurred. Related to this: O Monitoring that is being done to assess management effectiveness should take a formal hypothesis-testing approach, by monitoring in sites that are being managed and in sites that are not being managed (i.e. the controls). Only with this approach will it be possible to state with certainty that the desired change has occurred as a result of the management interventionO Bio-physical indicators need to be monitored with sufficient frequency during the year so that the expected range of variation (e.g. due to seasonal influences) is coveredO Use research to improve the design of monitoring - Monitoring is most effective when it involves collaboration of local staff, specialists, and the community. Where knowledge and experience are lacking, build capacity.						

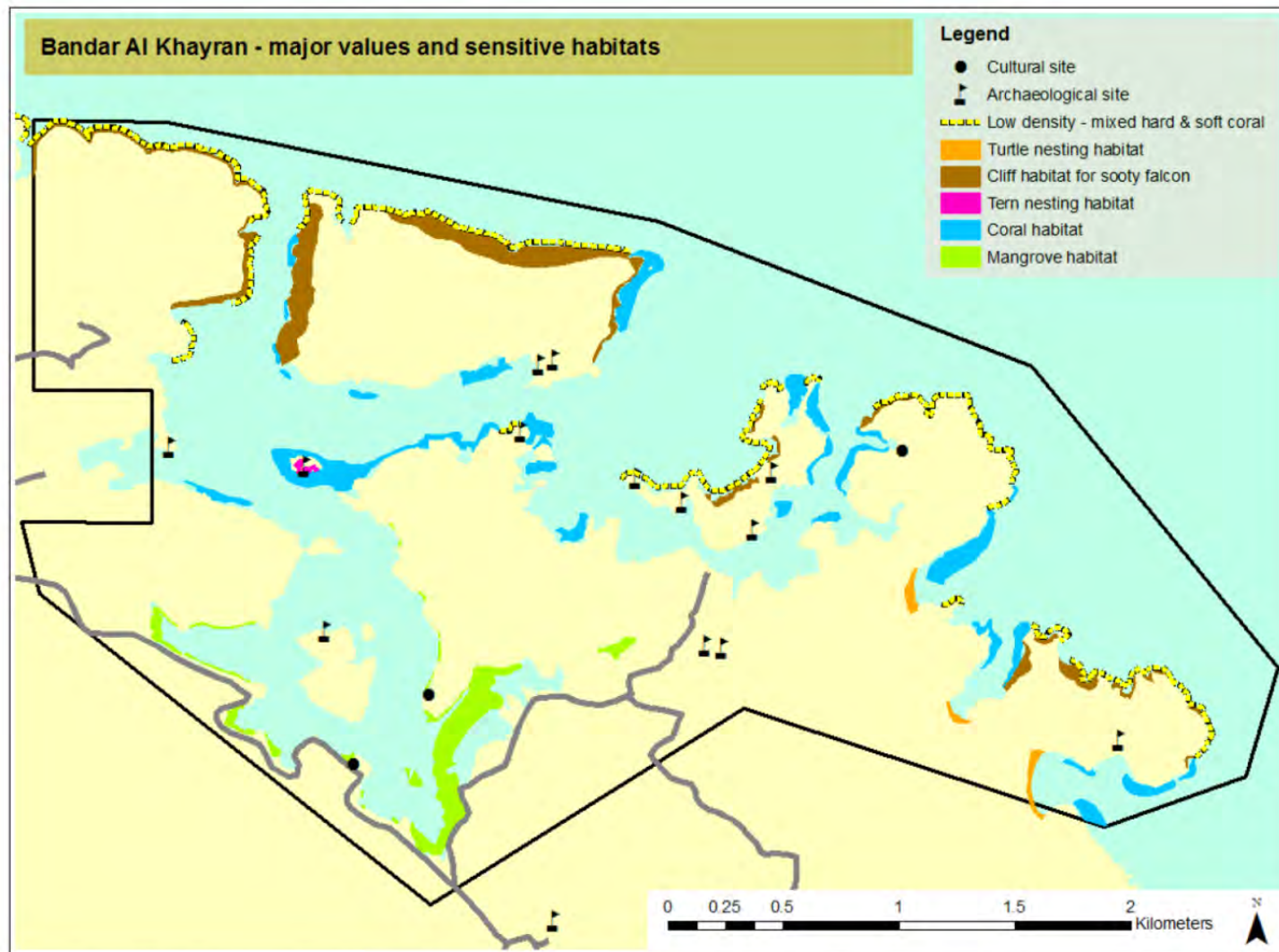


Figure 16. Spatial representation of some of the outstanding values of Bandar Al Khayran (input data on coral from Five Oceans LLC survey).

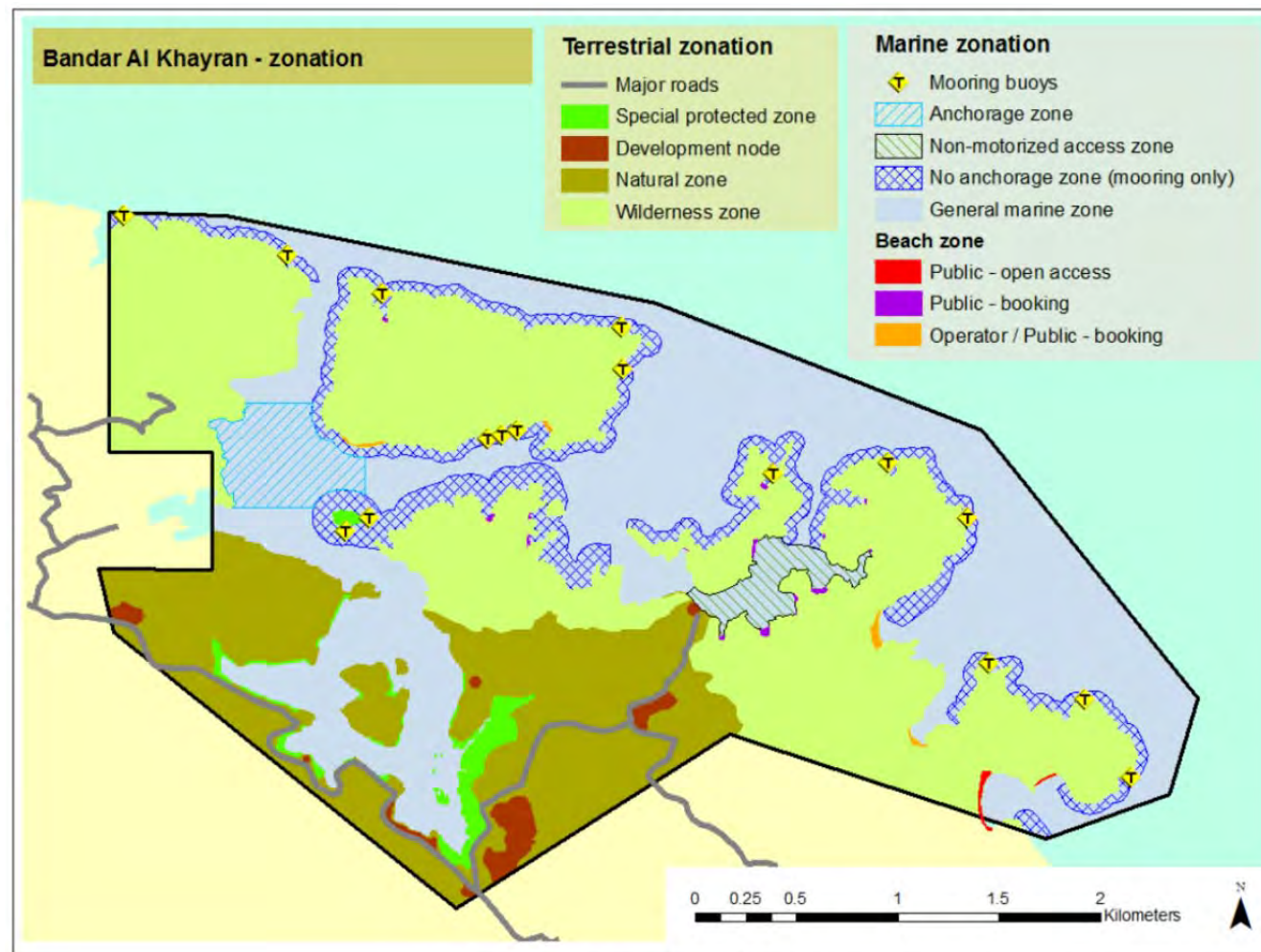


Figure 18. Zonation map of Bandar Al Khayran.

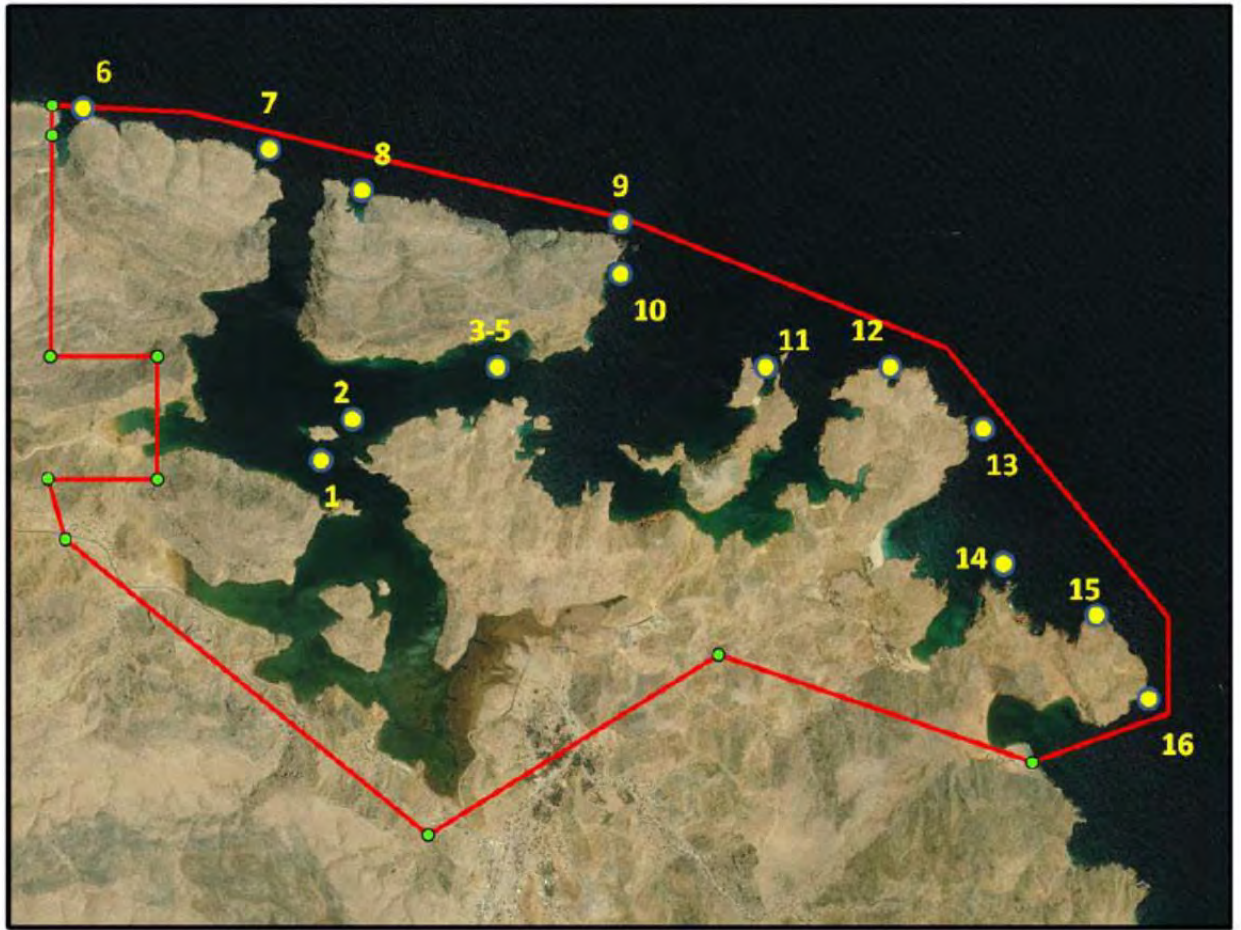


Figure 55. Positions of mooring buoys in Bandar Al Khayran.

Appendix 5. Participant List of the Workshop of Satellite Image Analysis

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Appendix 6. Regional Workshop

Programme of the Workshop

Workshop on Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman – Preparatory Survey for full scale project

17-19 September 2017; Muscat, Sultanate of Oman

Day 1 : Sunday, 17 September 2017		
Time	Programme	Speaker
08:30 – 09:00	Registration	
09 :00 – 09:30	Opening	- Eng. Suleman Al Akzami, MECA - Dr Hassan Mohammadi, ROPME - Mr. Hideyaki Yamamoto, Embassy of Japan - Mr. Hiroyuki Mori, JICA
09:30 – 09:45	Break	
09:45 -10:00	Outline of the preparatory survey and full scale project for marine conservation strategy in Oman	Mr. Yoichi Harada, JICA Expert Team
10:00 – 10:10	JICA's cooperation strategy in the region	Dr. Noriaki Sakaguchi, JICA
<i>Presentation on current status in Oman (20 min / speaker – 5 min Q & A)</i>		
10:10 – 10:35	Conservation of coastal ecosystem (coral reef & mangrove)	Mr. Badar Al Bulushi Ministry of Environment & climate affairs
10:35 – 11:00	A case study on eco-tourism planning in Bandar Al Khayran	Ministry of Tourism
11:00 – 11:10	Break	
11:10 – 11:35	Policy and measures on sustainable fisheries	Ministry of Agriculture & fishery Wealth
11:35 – 12:00	Coral reef significance in Oman coast and contribution of scientists for the conservation	Dr. Micheal Claereboudt Sultan Qaboos University
12:00 – 13:30	Lunch & Pray	
13:30 – 13:55	Study of Marine mammals & turtles stranding in Oman	Ms. Aida Al Jabri MECA
<i>Presentation on satellite image analysis (40 min / speaker – 10 min Q & A)</i>		
13:55 – 14:45	Application of remote sensing	Dr. Tatsuyuki Sagawa

	using satellite image on coastal mapping for coastal management	RESTEC
14:45 – 15:00	Break	
<i>Presentation on Japan’s experience and recommendations</i>		
15:00 – 16:00	Conservation of Marine biodiversity and ecosystem service-Several case studies in Japan and CBD, and some suggestion to Oman and other ROPME Sea Area	Dr. Yoshihisa Shirayama JAMSTEC
Day 2: Monday, 18 September 2017		
<i>Site visit</i>		
08:30 – 12 :00	Qurum Nature Reserve (near the hotel) and Khawr Al Sawadi Mangrove Transplanting Area (60km to the east from the hotel)	
12:00 – 13:30	Lunch in Sawadi	
13:30 – 14:30	Back to the hotel	
Day 3: Tuesday, 19 September 2017		
<i>Linkage to the EBM Strategy Working Group</i>		
08:30 - 09:00	Results of inventory survey and challenges	Dr. Simon Wilson 5 OES
09:00 - 10:30	Ecosystem assessment and gap analysis	Dr. David Medio 5 OES
10:30 - 10:45	Break	
10:45 - 11:30	Discussion (Towards WBM Strategy)	
<i>Towards the regional activities</i>		
11:30 - 12:00	Regional activities to be collaborated	AGEDI
12:00 – 13:00	Case study of habitat mapping based on remote sensing using satellite image and its application to the region	Dr. Tatsuyuki Sagawa RESTEC
13:00 – 14:30	Lunch & Pray	
14:30 – 15:00	Wrap – up of Oman case and its expansion to RSA	JICA Expert Team
15:30 - 15:30	Closing	JICA & MECA

LIST OF PARTICIPANTS (17-19 September 2017)

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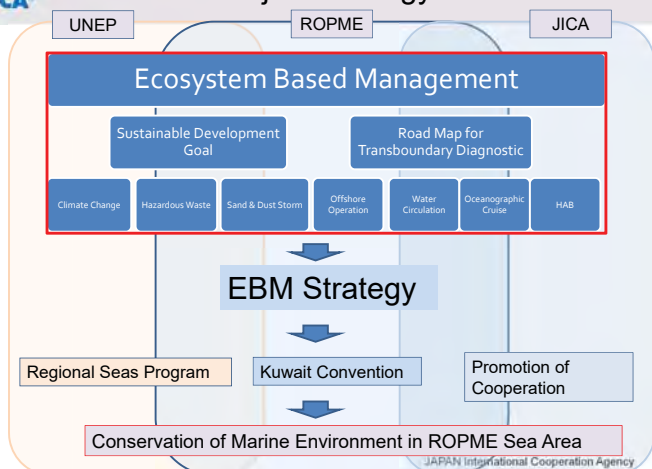
Outline of the preparatory survey and full scale project for marine conservation strategy in Oman

JAPAN International Cooperation Agency (JICA)

17 September, 2017
JICA Expert Team

ROPME-JICA Partnership Program Nov. 2015 – Oct. 2018

Project Strategy



3

Project Policy

- Introduction of **Experience** in Japan
- Project **Needs Findings** and Matching between Needs and Technology in Japan
- **Promoting** Technical Cooperation and Preparation of the Project

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Development of Marine Environment Conservation Strategy 2050 and Action Plans in the Sultanate of Oman

Cost-Sharing Technical Cooperation

Framework of the Five Year Project

	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Step 1: EBSA Screening	MECA (Biodiversity) to cover the rest of the territorial water of Oman	(Preparatory Survey) Demonstration of technical approach in Step 1, OJT for satellite image analysis Regional workshop for the EBM Strategy Establishment of pilot project strategy			
Step 2: Ecological classification based on key characteristics	Define key ecological features, e.g. important habitats, wildlife communities, etc. and a pilot project strategy				
Step 3: Qualitative and Quantitative analysis to identify potential MPAs		Preparatory Study Sep. 2016 – Mar. 2017 Critical review of MPAs (5 sites) and economic surveys in 5 (?) candidate MPAs and 2 to 3 sites (?) be selected for pilot actions. Planning of pilot activities.			
Step 4: Pilot activities to examine management techniques		Pilot activities on ecotourism (MOT) and sustainable fishing (MAFW) to be implemented in 2 to 3 sites (?) of the candidate MPAs.			
Final Stage: Complete the Strategy and Action Plan with lessons from the pilot activities		Develop a draft strategy and action plan (master plan) with relevant guidelines and manuals of identifying MPAs. General management guidelines (conservation strategy) to be prepared for the MPAs in the long list. More specific management and action plan be prepared for the MPAs in the short list. For those MPAs with pilot activities, the lessons from the experience will be reflected. Final Stage Symposium with ROPME to share experience with other GCC nations			

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Objective of the Preparatory Survey

- To understand the **present situation** of marine environment conservation in Oman,
- To establish an **implementation structure** for the full-scale project (the Project),
- To demonstrate **several activities** in the proposed TOR (e.g. EBSA screening, MPA selection),
- To establish **pilot project strategy** for the full-scale project, and
- To hold **regional workshop** for the common understandings towards the Ecosystem Based Management (EBM) Strategy .

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Outcomes of the Preparatory Survey Sep. 2016 – Mar. 2017

1. Interministerial Working Group

1. Interministerial Working Group

Member of WG	Major Role
Ministry of Environment and Climate Affairs (MECA)	Team leader Organize working group meetings and workshops Organize contribution of Governorate office Propose a concept of pilot project Provide available information for EBSA screening
Ministry of Agriculture and Fishery Wealth (MAFW)	Design data collection Propose sustainable fishing and a concept of pilot project Design sustainable fishing Provide available information for EBSA screening
Ministry of Tourism (MOT)	Design data collection Propose sustainable ecotourism and a concept of pilot project Provide available information for EBSA screening
Sultan Qaboos University (SQU)	Provide available information for EBSA screening Propose a concept of pilot project Support design of monitoring plan

2. Potential and challenges of EBSA expansion

EBSA candidates in Oman



Musandam Peninsula

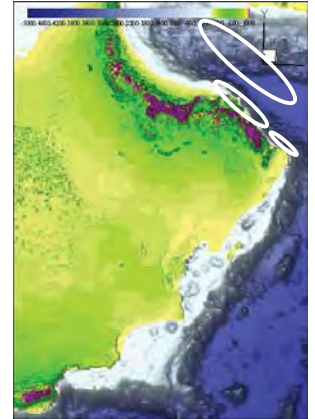
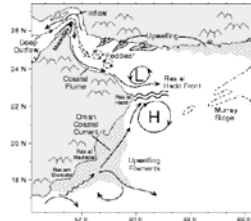
Daymaniyat Islands

Oman Arabian Sea

**Musandam Peninsula was considered that the EBSA criteria was not described due to data paucity and lack of analysis during the CBD workshop in April 2015 in Dubai.*

- **Oceanographical Uniqueness**
 - Topographical and geological characteristics
- **Ecological and Biological Significance**
 - Offshore
 - Migratory mammals and sea turtles
 - Birds
 - Coast: spawning and nursery ground
 - Khawr Mangrove
 - Coral reef
 - Tidal flat

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Appearance of cetaceans

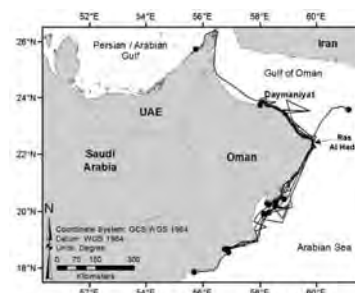
LEGEND	
• = single sightings and/or sightings in a single location,	
— = multiple sightings and/or a continuous distribution,	
? = unconfirmed records,	
= no-legend	
Whales& Dolphins	
A <i>Balaenoptera acutorostrata</i> (Minke whale)	LC
B <i>Balaenoptera borealis</i> (Sei whale)	EN
C <i>Balaenoptera edeni</i> (Bryde's whale)	DD
D <i>Balaenoptera musculus</i> (Blue whale)	EN
E <i>Balaenoptera physalus</i> (Fin whale)	EN
F <i>Megachasma hawaiiense</i> (Megachasma)	LC
G <i>Neophocaena phocaenoides</i> (Finless porpoise)	VU
H <i>Steno bredanensis</i> (Rough-toothed dolphin)	LC
I <i>Sousa chinensis</i> (Indo-Pacific humpbacked dolphin)	NT
J <i>Grampus griseus</i> (Risso's dolphin)	LC
K <i>Tursiops truncatus</i> (Common bottlenose dolphin)	LC
L <i>Stenella attenuata</i> (Spotted dolphin)	LC
M <i>Stenella longirostris</i> (Spinner dolphin)	DD
N <i>Stenella coeruleoalba</i> (Striped dolphin)	LC
O <i>Delphinus</i> sp. (Common dolphins)	LC
P <i>Peponocephala electra</i> (Melon whale)	LC
Q <i>Feresa attenuata</i> (Pygmy killer whale)	DD
R <i>Pseudorca crassidens</i> (False killer whale)	DD
S <i>Orcinus orca</i> (Killer whale)	DD
T <i>Globicephala macrorhynchus</i> (Short-finned pilot whale)	DD
U <i>Ziphius cavirostris</i> (Cuvier's beaked whale)	LC
V <i>Physeter macrocephalus</i> (Sperm whale)	VU
W <i>Kogia simus</i> (Dwarf sperm whale)	DD



Dutton, R. "The natural history of Oman: A Festschrift for Michael Gallagher." (2001), 96-96.
 Baldwin, Robert M., M. Gallagher, and K. Van Wassenhove. "A review of cetaceans from waters off the Arabian Peninsula." The natural history of Oman: A festschrift for Michael Gallagher (1999): 161-189, etc

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Sea turtle migration



Hawksbill turtle



Green turtle

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EBSA Candidate 2 – Muscat – Quryat -



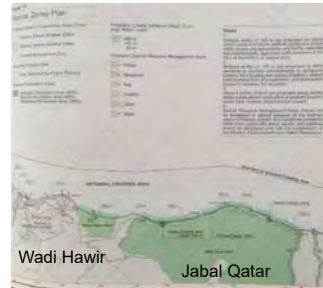
Coastal Zone Management Plan, IUCN 1986

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EBSA Candidate 3 - Quryat to Ras Al Hadd -

Special Zones Plan recommended in IUCN Report: National Nature Reserve



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Challenges: towards the full scale study

1. Studies in the coast of the Sea of Oman are necessary
2. Study on spawning and nursery ground might be necessary.
3. Evaluation of the function of khawrs as natural habitats and nursery might be important. Evaluation of whale feeding area has high potential on the wide MPA area.
4. Recent/ current actual data for habitat and oceanographic data are necessary.

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3. Concept of the Pilot Project for Marine Protected Area (MPA)

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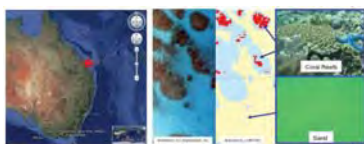


- Fishermen is suffering from decreasing fish catch.
- They keen to cooperate with the project.
- Tourism is welcomed.
- But, they require that they want to participate from the planning stage, based on the experience.

- **Key Concept**
 - Sustainable tourism and fishery → Conservation of marine environment and ecosystem services
 - Socio-economic approach
- **Important Assessment**
 - Biological and ecological assessment
 - Social assessment
 - Financial and economic assessment
 - Institutional and governance assessment
- **Prioritized Activities**
 - Criteria: For environment, ecosystem, fishery, community/ Feasibility in regulations, financial
 - Biological and oceanographical study
 - Supporting facilities: Walk board, Mooring buoy,
 - Monitoring: Environment, Development

4. Workshop on Satellite Image Analysis Technique

1. Visual interpretation
2. Radiometric correction
 - DN to TOA reflectance conversion
 - Atmospheric correction
 - Water column correction (DII and BRI)
3. Habitat mapping (Classification)
4. Accuracy Calculation



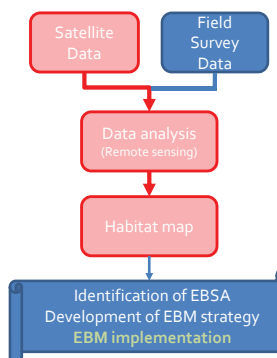
Source: RESTEC

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Trainee can supervise and coordinate the satellite image analysis

Implementation Stage



*Source: Haruchika Kamimura of RESTEC (Feb. 2017)

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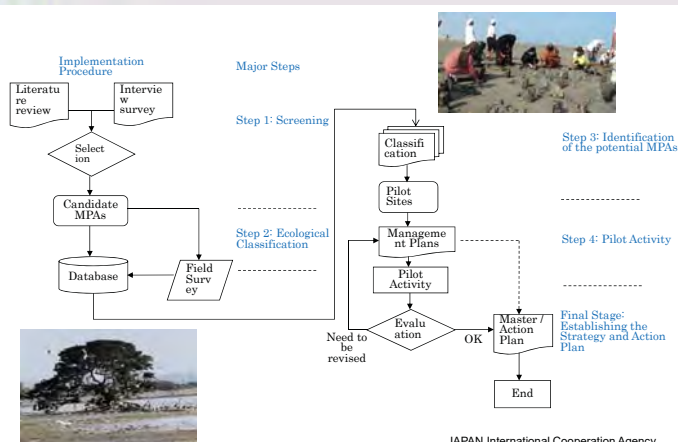
26

Item	Implementation	Supervising/Coordinating
Field Survey data	MECA, MAFW/MSC MOT, SQU	Participating in planning of field surveys Development of database
Satellite Data	Satellite Data provider	Selection of appropriate satellite data in the scale and species of EBSA.
Data analysis (Remote Sensing)	You assisted by JICA experts	You
Identification of EBSA	MECA, MAFW/MSC MOT, SQU	Working Group led by MECA
Development of EBM strategy	MECA, MAFW/MSC MOT, SQU	Working Group led by MECA

1. Interministerial Working Group effectively functioned to implement this survey.
2. Potential and challenges of EBSA expansion were clearly shown.
3. Concept on Pilot Project for MAP with socio-economic consideration was shared.
4. Satellite image analysis technique was trained among WG members, and its effectiveness on coastal habitat data collection was shared.

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Thank you very much

JICA's Cooperation for Conservation and Sustainable Management of Marine Biodiversity and Ecosystem

Noriaki Sakaguchi
Japan International Cooperation Agency

Workshop on Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman

17-19 September 2017; Muscat, Sultanate of Oman

Noriaki SAKAGUCHI
Japan International Cooperation Agency



Overview

1. International Commitment on Marine and Coastal Biodiversity Conservation and JICA's Cooperation Strategy in Nature Conservation
2. Cooperation for Coastal Biodiversity and Ecosystem Conservation by JICA
 - ROPME-JICA Partnership Program
 - Development of Marine Environment Conservation Strategy in Oman
 - Blue-CARE Project in Coral Triangle

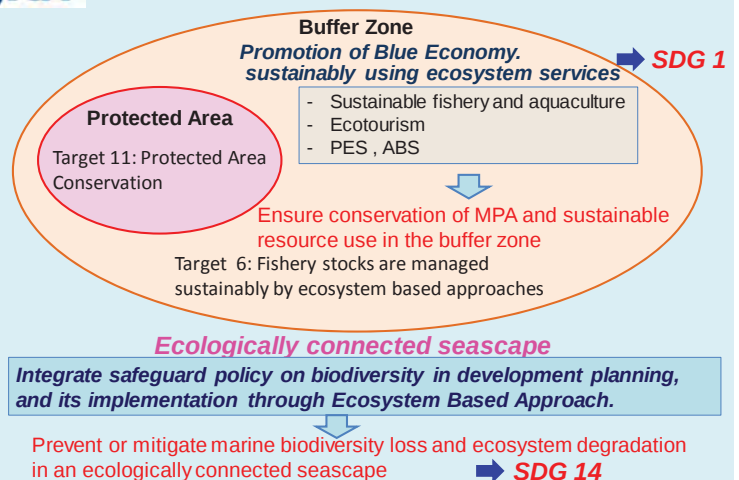
International Commitments on Marine and Coastal Biodiversity and Ecosystems

Marine and Coastal Biodiversity relevant Goals

SDGs	Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
CBD	Target 6: By 2020, all fish and invertebrate stocks and aquatic plants are managed sustainably and legally by ecosystem based approaches. The impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.
Aichi Targets	Target 10: By 2015, anthropogenic pressures on coral reefs and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized. Target 11: By 2020, 10 per cent of coastal and marine areas important for biodiversity and ecosystem services, are conserved through effectively managed and integrated into the wider seascapes



JICA's Approaches to Contribute to SDGs and Aichi Targets in an Ecologically Connected Seascape



JICA Cooperation for Coastal Environment Conservation in ROPME Sea Area



ROPME-JICA Partnership Program for Marine Ecosystem Conservation



ROPME-JICA Partnership Program 2015 ~ 2018

Objectives

- Strengthen collaboration between ROPME and JICA, and
- Facilitate to develop cost-share technical cooperation projects, through organizing workshops in ROPME region and Japan, collecting basic data on marine environment in ROPME member states.

Activities

- 1) ROPME Regional Seminars** (Co-organizing with ROPME and UNEP)
 - Discuss and develop **Ecosystem-based Management Strategy** of ROPME sea area,
 - Share Japanese experience and technology with ROPME member states (Training Workshop on Remote-Sensing and GIS in Oman, Jan, 2017)
- 2) Technical support for ROPME member states**
 - **Gather and analyze marine environment information** in ROPME member states and feedback to the members through workshops,
 - Develop **bilateral technical cooperation projects (Iran and Oman)**

Environment characteristics and Issues on ROPME Sea

Characteristics	Issues
Semi-enclosed sea: Since water-flow from ocean is restricted, ocean current circles the gulf for several years	- makes <u>self-purification function slow</u>. - <u>raises salinity concentration</u>
Water temperature variation is extreme: Highest seawater temperature	- <u>Red tide generation</u> due to activation of micro-organisms - <u>Coral bleaching</u>
A number of oil-related facilities Oil and gas facilities, pipe lines, tankers	- Oil spill
Reclamation	- Loss of <u>mangrove forests, Coral reefs and Seagrass beds</u> - Coastal <u>ecosystem degradation</u>
Land Based Pollution	- <u>Eutrophication</u> by land-based waste water - <u>Sedimentation</u> by erosion and soil run-off
Illegal fishing and over fishing	- <u>Decline of fishery resources</u> - Habitat destruction

Development of Marine Environment Conservation Strategy and Action Plans in Oman

Goal:

To develop Marine Environment Conservation Strategy and Action Plans through institutional collaboration of multiple stakeholders coordinated by the Inter-Ministerial Technical Committee (TC)

Basic Perspective

- 1) Integration of marine environment conservation and economic development
- 2) Fulfilment of Oman's international commitment (CBD: 10% of MPA)
- 3) Promotion of job opportunity

Project Approach

- Identify representative networks of MPAs through collecting scientific and sociological data and identification of EBSAs and candidate MPAs.
- Conduct a pilot activities on sustainable marine resource use, including ecotourism and sustainable fishery.

"Comprehensive Assessment and Conservation of Blue Carbon Ecosystem and Their Services in the Coral Triangle" (BlueCARES)

Joint project by Philippines, Indonesia and Japan from April 2017 to March 2022

Project Goal

aims at establishing and proposing 'Blue Carbon Strategy' as an effective scheme for enhancing local efforts to conserve coastal ecosystem and improve its resilience and thereby for contributing to mitigation of global warming.

Outputs

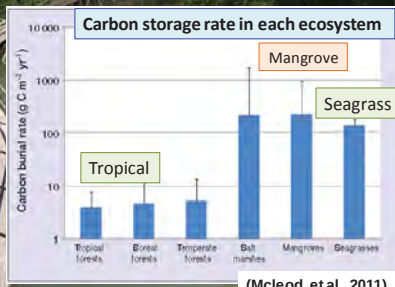
1. Integrated system of monitoring and modeling methodology on the blue carbon dynamics is developed
2. Blue carbon dynamics and associated ecosystem processes are elucidated, based on the monitoring and modeling methodology
3. Framework for effective conservation of blue carbon ecosystems is developed, based on comprehensive ecosystem service assessment
4. "Core-and-Network" System" is operationalized for nationwide monitoring, implementation of Blue Carbon Strategy, and capacity building

Importance of Blue Carbon in Climate Change Mitigation

- Total Mangrove Area in the world: 16.5 million ha
- South-East Asia: 5.1 million ha (33%). Indonesia and Philippines are top two in SE Asia.
- Mangrove ecosystem provides fishery resources, protecting shoreline from tsunami and rising sea level.
- Mangrove and Seagrass bed are also core ecosystems in carbon stock

Carbon stock under ground in mangrove forests/ha is 6 – 7 times higher than that in terrestrial tropical forests. (Donato et al. 2011).

Mangrove and seagrass conservation and sustainable use is effective for climate change mitigation.



Thank you very much for your attention!!





وزارة البيئة والمناخية
Ministry of Environment and Climate Affairs

Conservation of Coastal ecosystem (Coral Reef, Mangrove) in Sultanate Of Oman



Badar Al Bulushi
Head Of Environmental
Wetland
Ministry of Environment &
Climate Affairs



وزارة البيئة والمناخية
Ministry of Environment and Climate Affairs

Areas of Major Coral Reef growth in Sultanate of Oman



*Distribution of Corals
Sultanate of Oman*

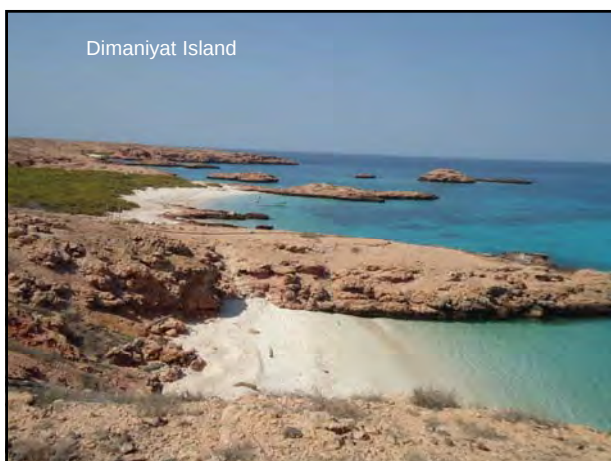
Muscat
Al Hamal
Marbat

These findings are not an authority on international boundaries.

■ Coral distribution around the Sultanate of Oman



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Ministry of Environment and Climate Affairs



Coral Reef

- The Coral Reef is a population of stony corals which continues to build on products own making .
- Coral Reef have a worldwide distribution in the Atlantic , Indian , Pacific Oceans .









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The Ecological importance of Coral Reef

- Coral Reef are also know to be good Nursery grounds for many fish As there is plenty of food available and plantey of refuge from predators .



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- Coral Reefs generally have specific requirements for :

- 1- Light
- 2- Temperature
- 3- Salinity
- 4- Oxygen



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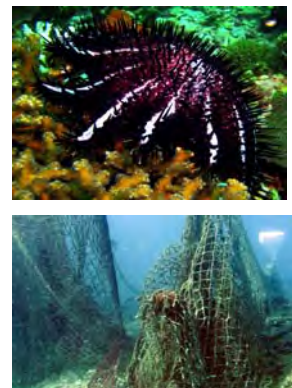
Threats to Coral Reef

- Careless boating , diving , snorkeling and touching reefs , stirring up sediment , collecting coral , Diseases and dropping anchors .
- Climate change : corals reef cannot survive if the water Temeperature is too high , Global warming has already led to increased of coral bleaching



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- Starfish – crown of thorns
- Pollution : Urban and industrial waste , Sewage , oil pollution , fishing Net.



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Marine Mammals



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Efforts of MECA in Management and Restoration of coral reef

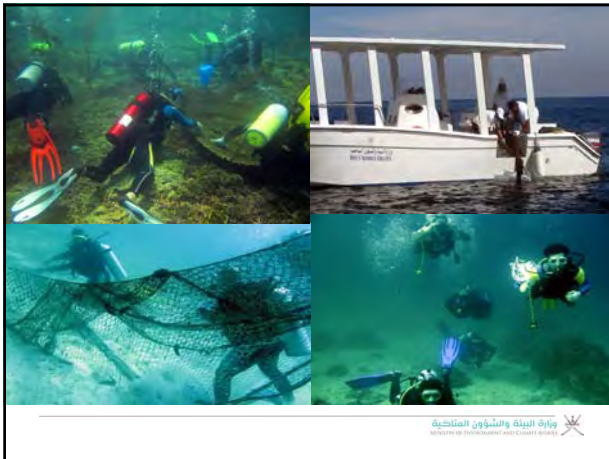


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Coral Reef clean up Campaigns



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Educate Locals

Diving rules & regulation



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Artificial Coral Reef (reef balls)

- Artificial reefs have been used in rehabilitation of damaged reefs the improvement of fisheries and the creation diving site .



وزارة البيئة والشؤون المناخية
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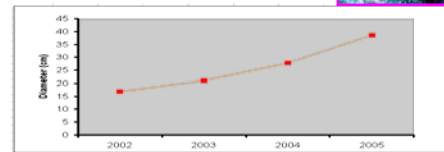


- Deployment of 40 Artificial reef balls structure since 1998 around Fahal Island .
- Data for Horizontal growth of colony shows good growth (25mm ¥ mo) in first month measured, then the same slowing of growth (6.3mm¥mo) over the winter months October to march .

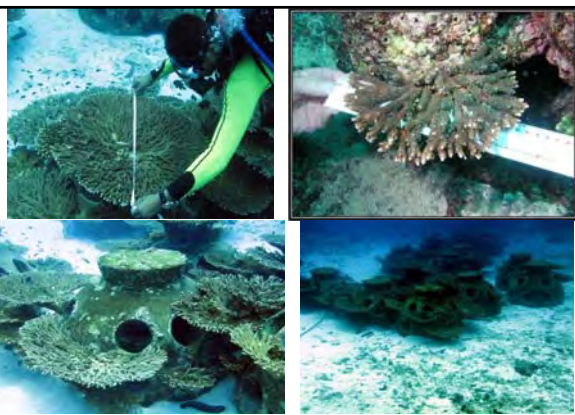


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Acropora arabensis (top colony S4, Fahal Island)



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وزارة البيئة والشؤون المناخية
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What is The Mangrove

Mangroves are subtropical/tropical trees that grow in sheltered coastal areas along the intertidal zone, where it is often muddy and regularly inundated by seawater. While most trees cannot survive in such environment due to high salinity and low-oxygen soil conditions, mangroves have developed various ways to grow in such stressful environment. Worldwide, there are over 100 species of mangrove, but only one species grow naturally in Oman, which is *Avicennia marina*.



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Major Mangrove forest in Oman

- 1. Shinas
- 2. Khawr Halmour
- 3. Qurm
- 4. Bandar Khayran
- 5. Quriyat
- 6. Sur
- 7. Khawr Jaramah
- 8. Mahawt Island
- 9. Salalah



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Benefits of Mangrove

- Protect the khawr from flooding and erosion .
- Using their Timber for building house,boats, fencing, paper.
- Mangrove leaves use us fodder for livestock.
- **Reduction of atmospheric Co2 levels by fixing Carbon.**



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- It is major spawning nursery and breeding habitat for commercial fishery species and prawns.
- Important site for habitat birds



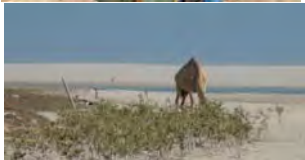
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Threats to mangrove ecosystem

- ☐ Coastal development .
- ☐ Wastewater Discharge .
- ☐ Dumping of waste .
- ☐ Grasing by Domestic animals , cutting
- ☐ Disease .





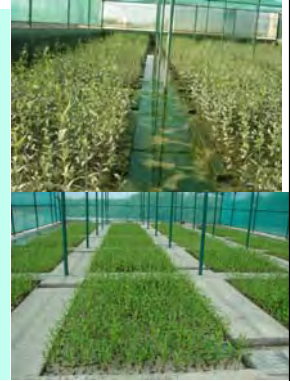
Efforts of MECA on conservation and Management of Mangrove forest

In December 2000 the MECA requested the government of **Japan** for a new mangrove project , the Japanese Government dispatch a scope of work Mission in January 2002 , based on agreement between Ministry and **JICA** .



وزارة البيئة والشؤون المناخية
Ministry of Environment and Climate Change

- In 2000 the first Nursery are established in QNR in Muscat which is one of the richest mangrove areas in Oman .
- In 2001 the ministry establish anther Tidal irrigation Nursery in QNR .
- May 2002 anew Nursery was establish in Khawr Al Batiah in Sur .
- July 2002 the last Nursery was established in Dhofar in khawr Al Qurm Al Kabeer .



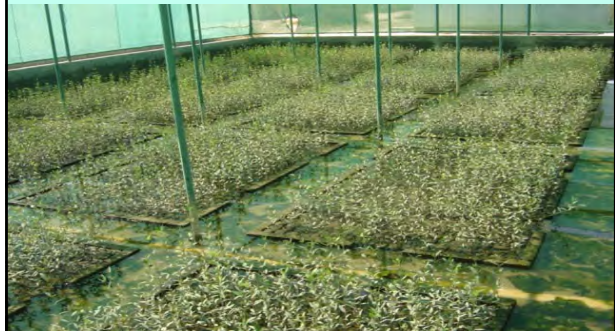
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Pump Irrigation



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Tidal Irrigation



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- ❖ After that seeds are planted in the plastic bags .
- ❖ After 15 days seed start growing normally and will take six month to fully grow and become suitable for Transplantation in Khawrs .



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Ministry of Environment, Water and Agriculture



—2018/4/12

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—2018/4/12

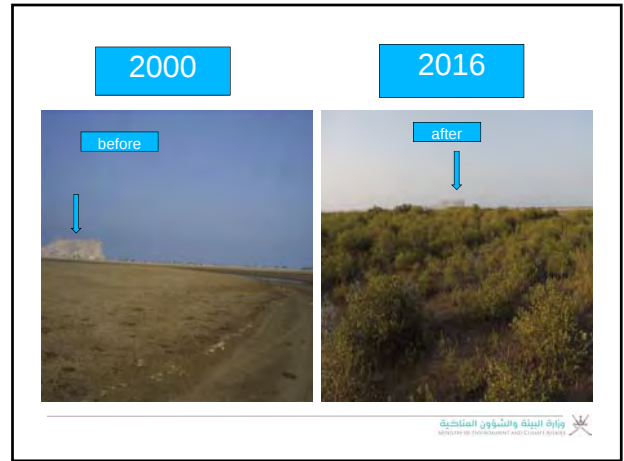
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Ministry of Environment, Water and Agriculture

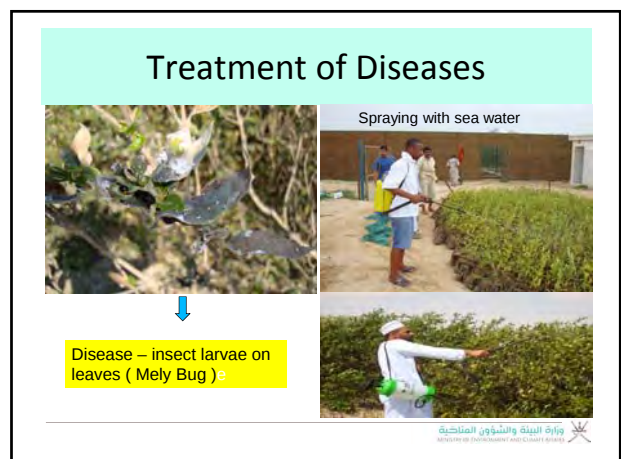
Monitoring Program



jica

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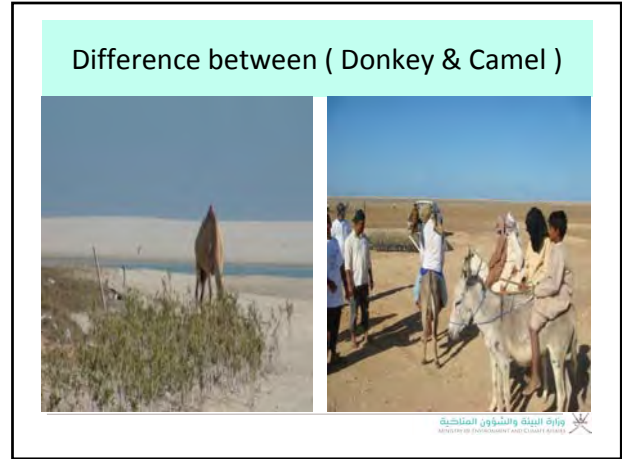


Table shows the planted Number of Seedling in each Governorate

NO	Governorate	Number
1	Musandam	3000
2	North Batinah	153.025
3	South Batinah	119.225
4	Muscat	5.400
5	South Sharquiya	163.675
6	Al Wusta	39.050
7	Dhofar	150.950
	Total	634.900



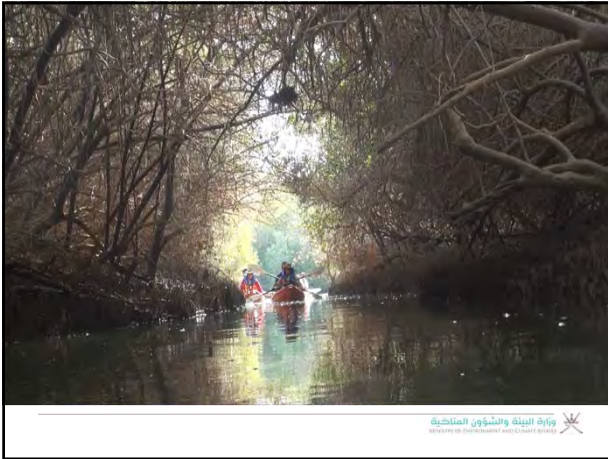




Image photographs of QEIC



Exhibition Hall



laboratory



Auditorium



Aquarium

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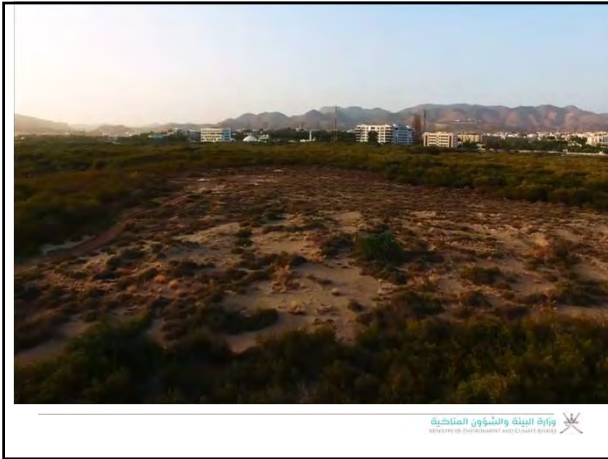
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Acknowledgments:

- 2010 - Socio Economic Baseline and Perception Study (HMR Environmental Engineering Consultants LLC).
- 2010 - Geological Survey (Sultan Qaboos University).
- 2011 - Environmental Baseline Survey Report with options for management planning (Five Oceans Environmental Services LLC).
- 2011 – Draft Management Plan (IUCN)



**Development of marine environment
A case study on ecotourism planning in
Bandar Al Khayran**

A CASE STUDY ON ECOTOURISM PLANNING IN

BANDAR AL KHAYRAN



Welcome

Other applicable legislation:

- National Heritage Protection Law (1980) Under Amendment Royal Decree 114/2001 and Royal Decree 95/2005 Protection of Environment and to Abate Pollution
- Royal Decree 6/80 Law on National Heritage Protection
- Ministerial Decree 79/94 Regulations for Noise Pollution Control in Public Environment
- Royal Decree 33/2002 The Law of Tourism
- Royal Decree 101/1996 State Basic Law
- Royal Decree 6/2003 Law of Nature Resources and Wildlife Conservation
- Ministerial Decree 101/2002 Prohibition of Killing, Hunting, or Capturing of Wild Animals and Birds
- Ministerial Decree 128/93 Ban on Cutting Green Trees
- Royal Decree 34/74 Law of Marine Pollution Control
- Royal Decree 53/81 Management of Critical Fishery and Support Habitats
- Royal Decree 33/78 (prevents developments which may prevent public access to the areas of national scenic heritage, notably at Bandar Al Khayran)
- Royal Decree 8/2003 Issuing Law of Grazing Lands and Animal Resources
- National Coastal Zone Management, 1991
- Ministerial Decree 20/90 (regarding the rules regulating and specifying coastal setbacks)

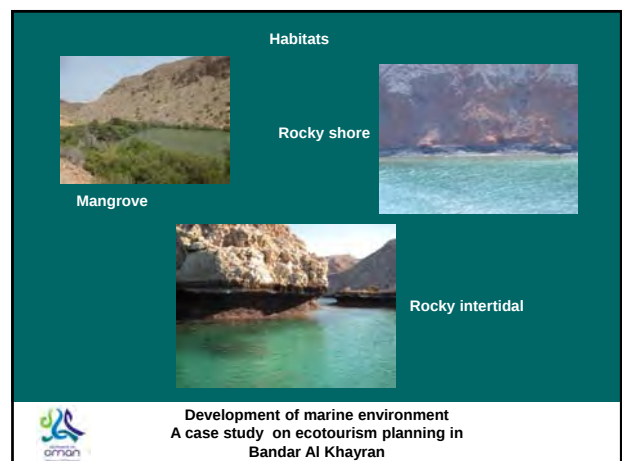
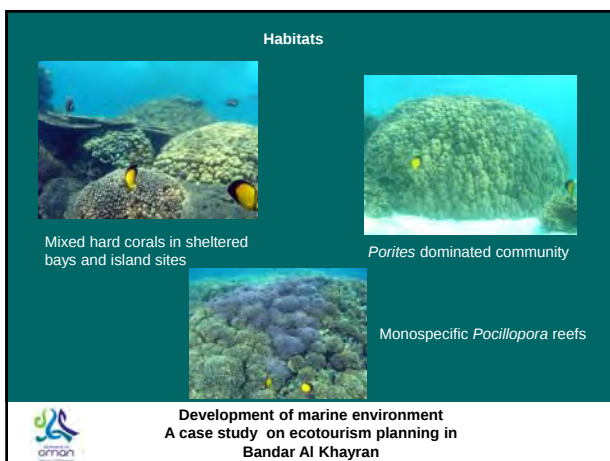
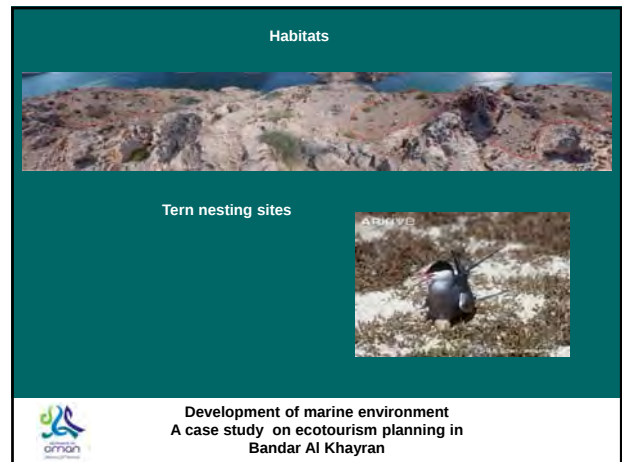
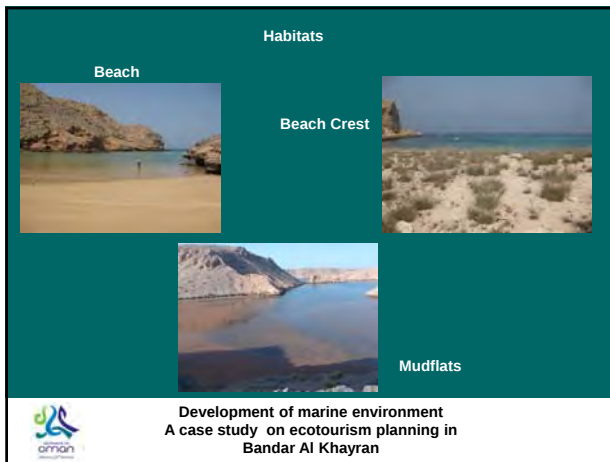


**Development of marine environment
A case study on ecotourism planning in
Bandar Al Khayran**

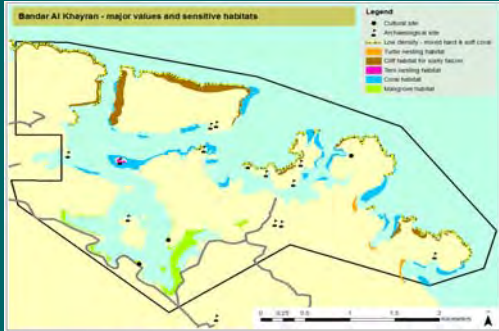
The diverse landscape of bandar Al khayran



**Development of marine environment
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Bandar Al Khayran**



Spatial representation of some outstanding values of Bander AL Khayran



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Habitats



Acropora dominated rocky slopes



Shallow water turbid community



Soft coral assemblages



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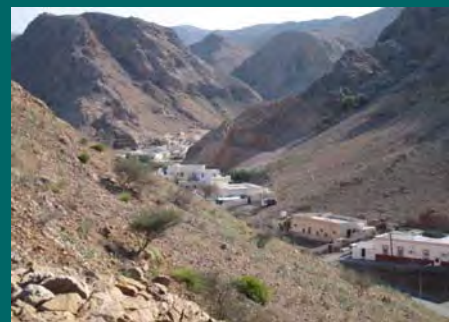
Utilities:

- Drinking water is sourced from the Al Khayran Desalination Plant and transported to the individual houses by water tankers;
- Sewerage from the households is collected in septic tank outside the housing unit;
- Muscat Municipality provides waste collection bins which are emptied daily;
- There is an absence of drainage system in settlements. Reportedly the area experiences flooding after rains from the nearby wadi;
- Each housing unit in the villages has a metered power supply from the Government;
- Healthcare facilities are unavailable within the village, the nearest Governmental Health Centre in Yiti; and,
- The nearest education facility is at Al Khayran and Yiti. However, there is an Islamic school in Al Khayran



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socio-economic and cultural profile of the local community



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Brief Profile. At the time of survey Khayran village;

- Total population of the study area is 879, Majority are Omani;
- Average family size of the surveyed households is 8 persons per household;
- Among the surveyed population majority (64%) of workers are employed in either private or government services, out of which 7% are also engaged in fishing as a second source of income;
- 17% of the surveyed population is solely dependent on fishing for living while 6% of population earns their living either from commercial activity or from social aids.



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Recreational dive sites



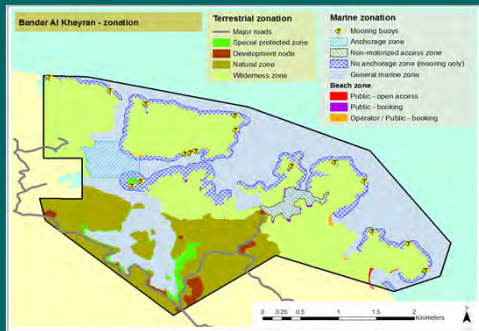
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Popular activities



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Zonation of Bander AL Khayran



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Da'an AL Furaisha ecotourism center



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Ecotourism facilities & allocation



Gateway picnic site & concept sketch



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Misbakh Al Mukharimiya Family Beach (Jetty for low tide access)

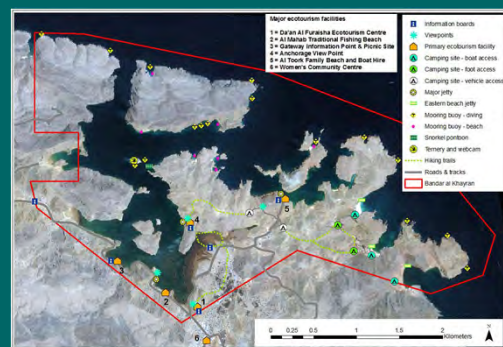
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شكرا
Thank you



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Ministry of Agriculture and Fisheries

Policy and Measure on Sustainable Fisheries

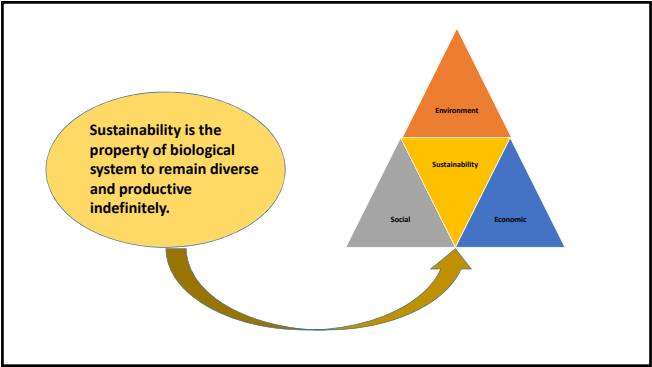
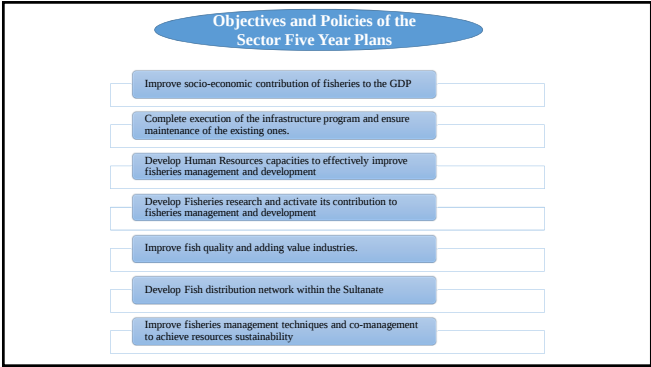
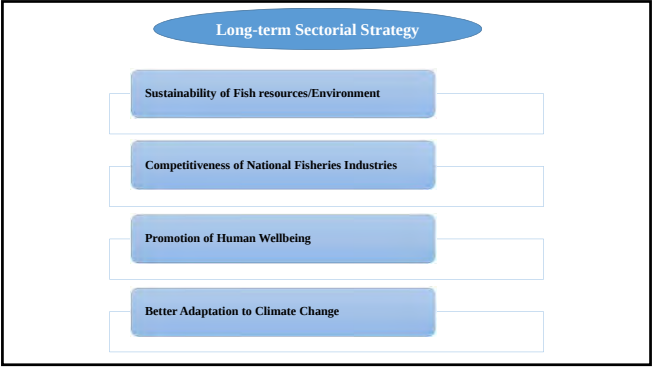
Dr. Hussain Al Mascati
Director of Fisheries Development and Management



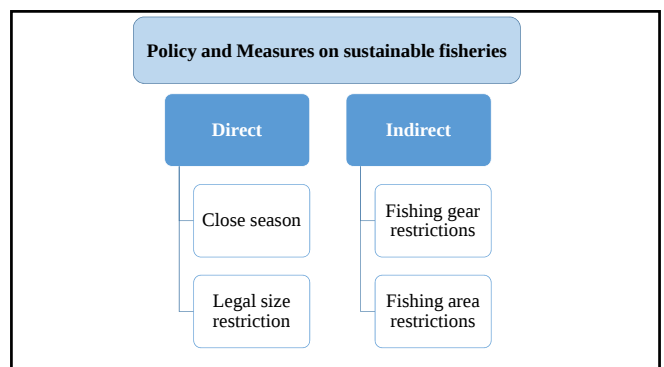
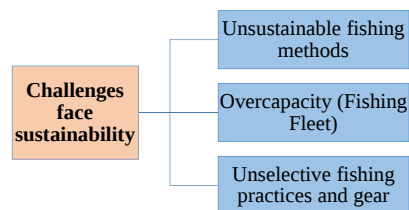
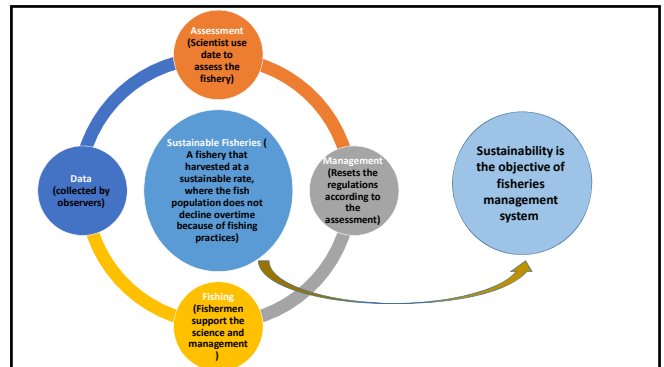
Current Status of Fisheries Sector		
Resources	Resources Management	Fleet
• Sea of Oman: limited expansion possibilities - management for sustainable use. • Arabian Sea: large potential – Management and Development Programs	• Resource Monitoring Programs. • Management Plans. • Control / Surveillance	• Artisanal Fleet (fiber glass boats and dhows) • Coastal Fleet • Commercial Fleet (longline)

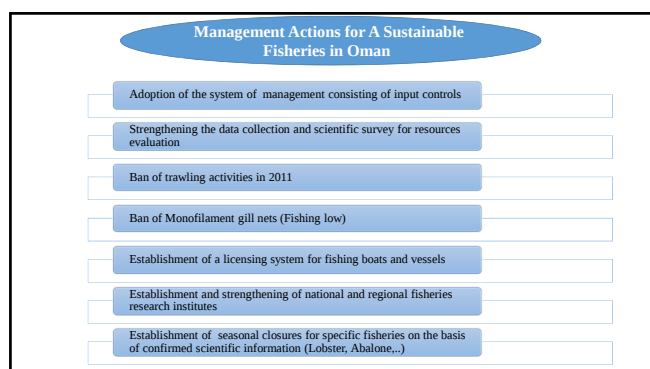
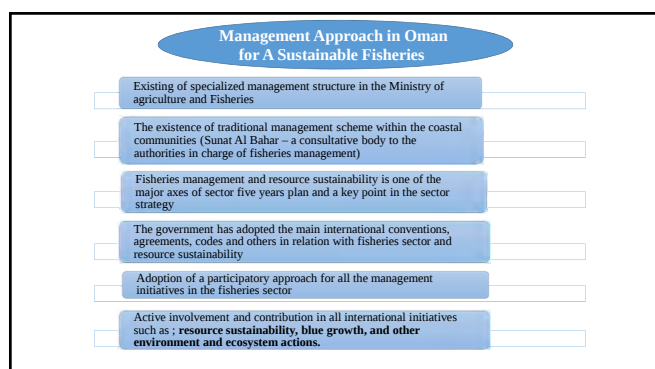
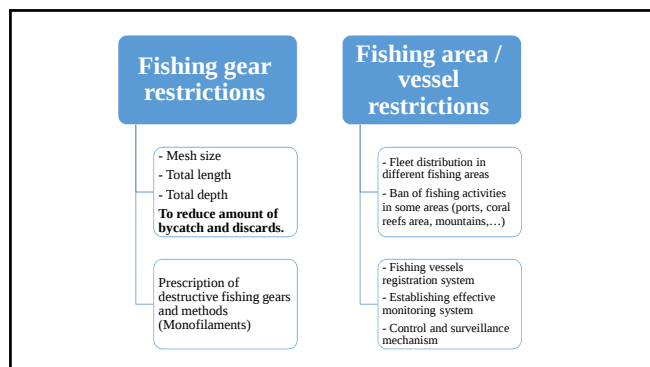
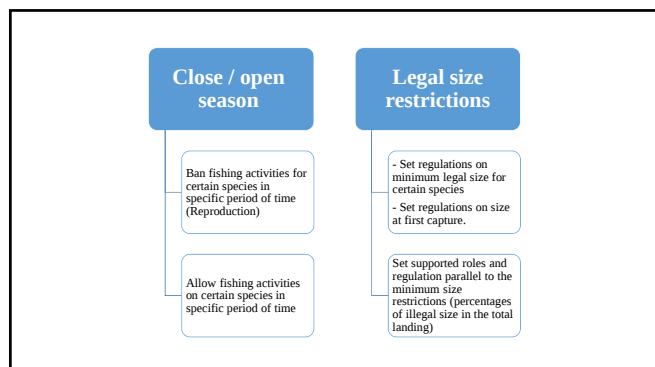
Current Status of Fisheries Sector		
Infrastructure	Fish Markets & Distribution	Aquaculture
• 23 ports constructed. • 2 ports in the final process of construction. • 4 Ports planned	• 59 fish markets. • More than 400 outlet • Wholesale Fish Market (Fulajj)	• Comprehensive development program (specific bylaw, investment promotions activities, sites identification

Strength and Opportunities	
Will to diversify economy, promote welfare and food security.	
High income and good average per capital GDP .	
Large potential and good productivity of fisheries	
Will to modernize fisheries and develop aquaculture	
Promising potential institutional capacities	
Relatively experienced and qualified private sector	
Most infrastructure (ports & markets) under rapid expansion	



Environmental Challenges	Economic Challenges	Social Challenges
• Stock status • Environmental changes • Climate change • On land activities impact	• Market change • Product quality • Profitability	• Effect on communities • Allocation of access privileges for fisheries





Management Actions for A Sustainable Fisheries in Oman	
Protection of sensitive period of the resources life cycles; spawning – recruitment	
Regulation of specific fishing gear parameters	
Regulation of fishing activities through a zoning system for each fleet category	
First Regional initiative to manage shared resources (GCC/Spanish mackerel)	
Promotion of artificial reefs in certain areas to enhance fish stocks, protect the habitats and the biodiversity	
Regulations of minimum legal size for specific resources (Lobster, Abalone, King fish)	
Promote Aquaculture projects	

Fisheries Management Programs / Projects (Sustainability)		
Monitoring, control & surveillance	Fisheries Research	Conservation and Management Plans
- Improve respect and compliance to national and international regulations and resolutions. - An important component in conservation and management of fisheries resources and their sustainability.	- Scientific Survey - Data collection scheme - Environment monitoring - Fish stock assessment - Regional cooperation research	- Sustainable use and long-term sustainability - Management and conservation strategies /sustainable levels / precautionary approach.



Coral reef **significance** along the coast of Oman and the **contribution of scientists** to their conservation

Michel Claereboudt

Coral Reef vs Reef Coral

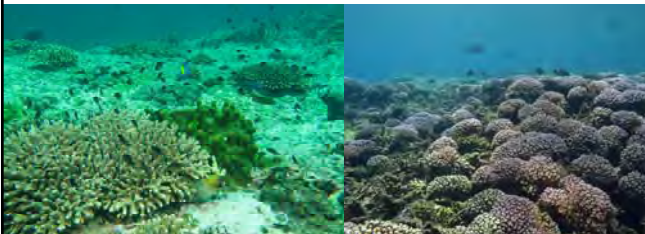


Reef Coral



Coral Reef

Coral Reef vs CoralCommunity



Coral Community

Coral Reef

Significance ?

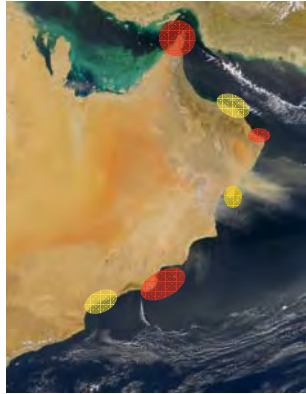
What is the value of coral reefs and coral communities in Oman ?

- Unique features and characteristics
- Contribution to wealth
- Contribution to coral survival in the world
- Potential value

Unique features and characteristics

Coral communities are rich and diverse

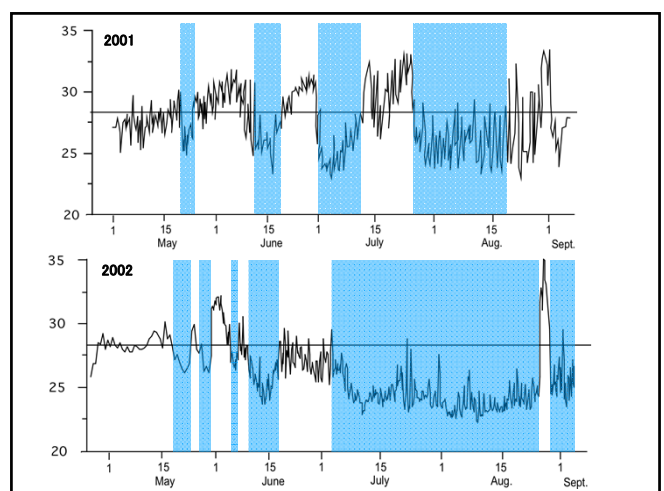
- 6 main areas of coral communities development
- 125 (N) –150 (S) species of reef building corals
- few true-reef

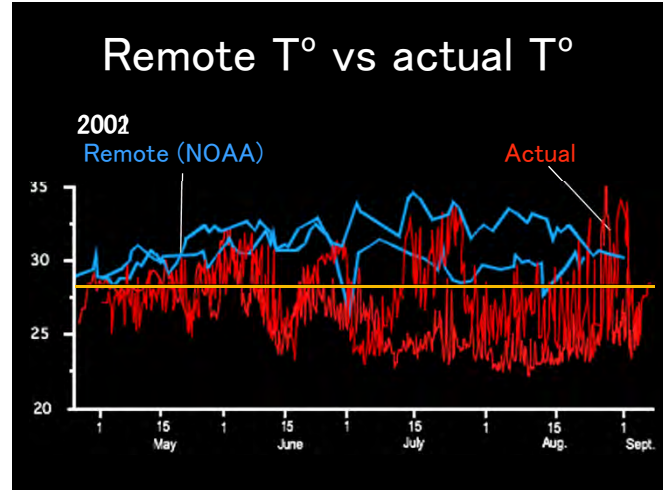
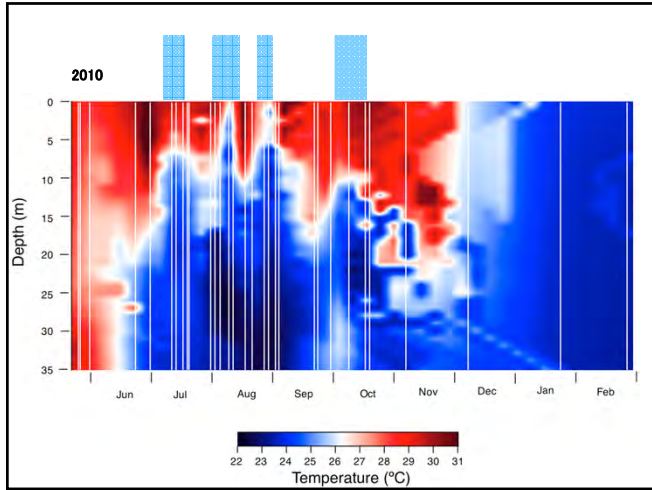


Unique features and characteristics

Coral communities are unique

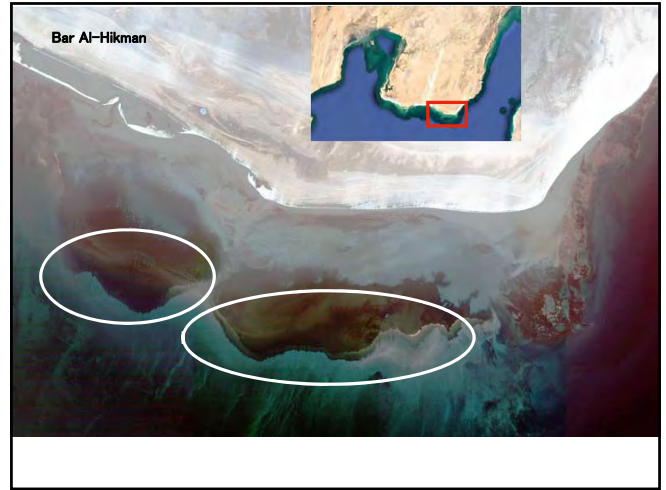
- Corals and seaweeds (In Dhofar)
- High temperature fluctuations (In Sea of Oman)
- High Nutrients environment (Everywhere)
- Monospecific coral communities/reef





Not always fatal syndrome





Unique features and characteristics

Coral communities are valuable

Grossly overestimated

- Published estimates: 50 km²
- Contribution to fisheries (high)
- Contribution to tourism
- Coastal protection, sand creation...

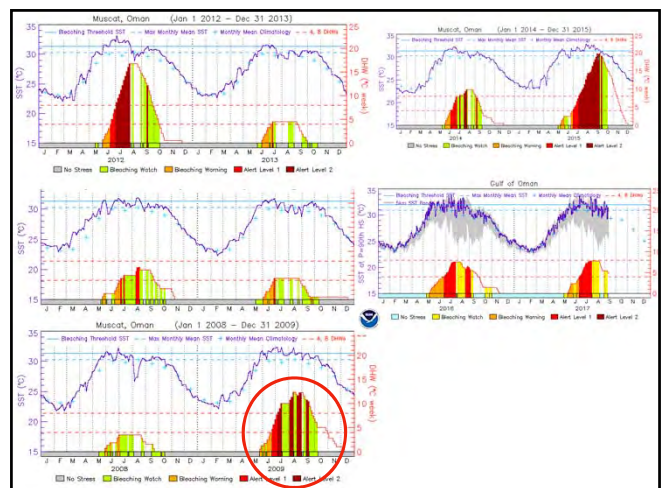
o valuation study ever on Omani reef communities

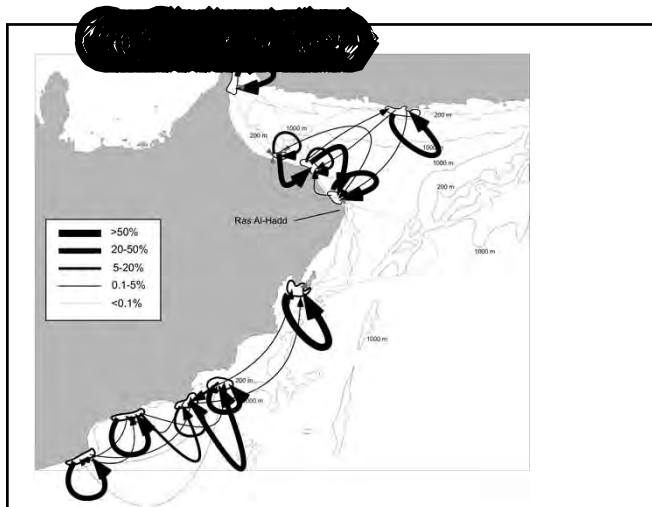
Unique features and characteristics

Coral communities are important regionally and internationally

- Around 5–10 % species are endemic or regional endemics
- High resistance to thermal stress
- Reservoir of genes, contribution to regional connectivity

Endemics

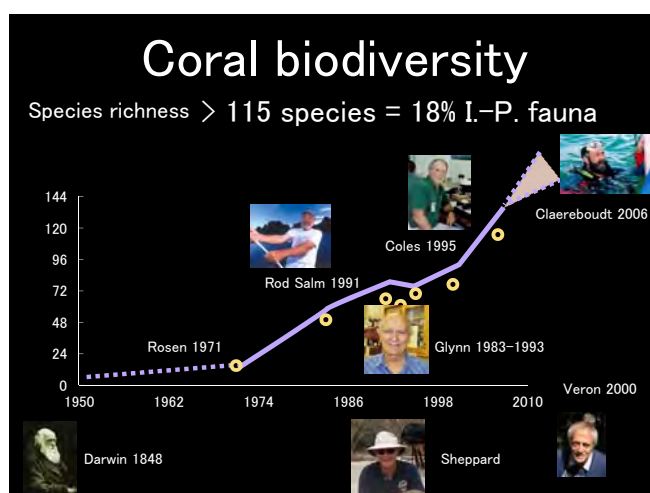




What is missing ?

- Survey and state of ALL coral communities (old data)
- Bio-diversity assessment region by region (Corals, octocorals, echinoderms, sponges, mollusks, etc.)
- Risk and resilience assessment of coral communities
- Monitoring program and action plan for known risks:
 - Acanthaster planci*
 - Bleaching and climate change
 - Development and sediment stress ?
 - Fishing practices
 - Diving practices
- Valuation of coral reef resources (\$, ¥, OR, €...)

Contributions of researchers to coral reef conservation



- Acanthaster as a coral controller (Peter Glynn)
- Temperature variation as a stressor (Steve Coles)
- Cyclone as major disturbances (Oliver Taylor)
- Fish communities in corals (John Burt, Jennifer McIlwain)
- Coral growth/upwelling (Tsuyoshi Watanabe)
- Coral growth, paleoclimate (Tudhope)

What can SQU do in collaboration with MECA ?

- Develop and carry out a rapid survey program for known and so far unknown coral communities
- Carry out Bio-diversity assessment region by region for some groups of organisms (Prioritization of groups necessary)
- Develop tools with MECA: vulnerability maps, health index, maximum diving capacity, maps, diversity measures,
- Provide training in specialized area
- Develop and initiate monitoring/mitigation programs for choosen risks:
 - *Acanthaster planci*
 - Bleaching and climate change
 - Coastal development and sediment stress , marine debris,
 - Fishing practices
 - Diving practices
- Carry out valuation study of coral reef resources (\$, ¥, OR, €...)

Research and development have a cost

- Finding funding partners within and outside Oman
- Piggy-backing on existing international programs
- Request assistance to meet international agreements and commitments (ROPME, IUCN, UNESCO, etc.)
- Join forces for coupled funding opportunities in and out Oman

وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Stranding of Marine Mammals

Aida Al Jabri
Marine Environment Specialist

Content:

- Introduction
- Important of Marine Mammals
- Species of Whales and Dolphins
- Arabian Humpback Whale
- Risks and Threats
- Marine Mammals Stranding Studies
- Response for Stranding
- Efforts to Protect Cetacean
- Conclusion

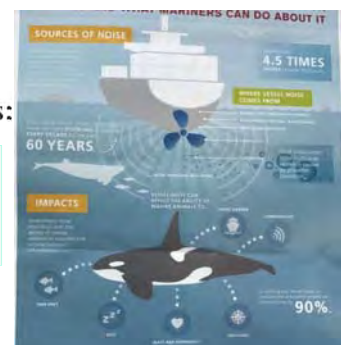
Introduction:

- Oman has a coast line more than 3,165 km.
- There are 21 species of whales and dolphins.

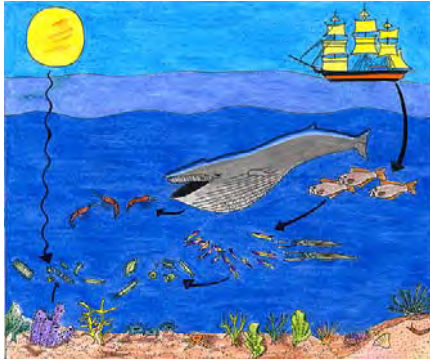


Importance of Marine Mammals:

- An indicator of the health ecosystem of marine environment.



- Help to maintain a stable food chain.



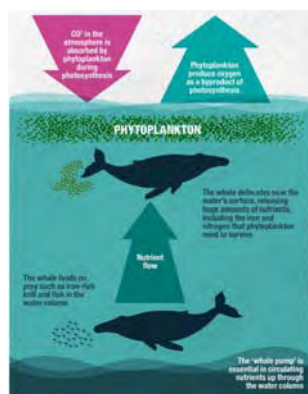
وزارة البيئة والمياه والزراعة
MINISTRY OF ENVIRONMENT AND CLIMATE

- Whales and dolphins are used as a hero in some famous movies.



وزارة البيئة والمياه والزراعة
MINISTRY OF ENVIRONMENT AND CLIMATE

- Whale's droppings play a major role in absorbing carbon.



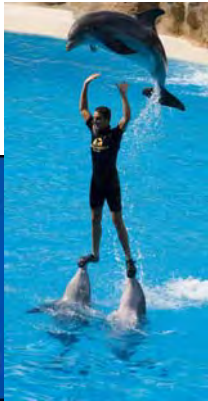
وزارة البيئة والمياه والزراعة
MINISTRY OF ENVIRONMENT AND CLIMATE

- Dolphins play as a health police.



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MINISTRY OF ENVIRONMENT AND CLIMATE

- Interact with human and defend them from shark attacks.



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- Tourism attractions



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Species of Whales and Dolphins:

- Baleen whales: **Blue Whale**
In Arab Sea and Oman Sea



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Brayd's Whale Abundance in the Oman Sea



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Humpback Whale
In the Arab Sea and Oman Sea



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• **Toothed Whales and Dolphins:**
Sperm Whale
In the deep of the Arab Sea and Oman Sea



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Dwarf Sperm Whale
In the deep of the Arab Sea and Oman Sea



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False Killer Whale
In the deep of the Arab Sea and Oman Sea



وزارة البيئة والمياه والزراعة
Ministry of Environment, Water and Climate Affairs

Indo-pacific Common Bottlenose Dolphin
In the Arab Sea and Arabian Peninsula



وزارة البيئة والشؤون المناخية
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Killer Whale

In the deep of the Arab Sea, Oman Sea and Arabian Peninsula



وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Melon headed Whale
In the Arab Sea



وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Common Bottlenose Dolphin
In the Arab Sea and Oman Sea



وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Striped Dolphin

In the deep of the Arab Sea, Oman Sea and Arabian Peninsula



وزارة البيئة والمناخ
Ministry of Environment and Climate Change

Koviar hooked nose Whale

In the Arab Sea and Oman Sea



وزارة البيئة والمناخ
Ministry of Environment and Climate Change

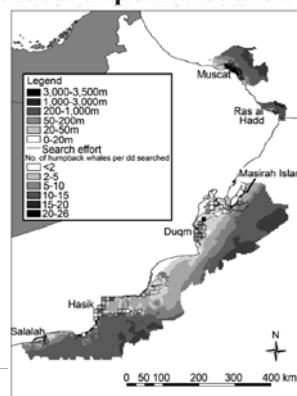
Long beaked common Dolphin

In the deep of the Arab Sea, Oman Sea and Arabian



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Ministry of Environment and Climate Change

Arabian Humpback Whale:



وزارة البيئة والمناخ
Ministry of Environment and Climate Change



Risks and Threats:

Fishing nets



Disturbance from cruise or tourism vessels or swimming with



Marine pollution



Marine Mammals Stranding Studies:

- Considered as one of the indicators on the health of marine environment.
- Marine mammals are considered as endangered species.
- May discover unknown species or not observed previously.

Response for Marine Mammals Stranding:







• Setup Hotline Number and Published



Please report any wildlife violation,
stranded and dead turtles or any
marine mammals to:

24696333

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@mecaoman /mecaoman mecaoman

وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

- Laws and Regulations

✓ Update of existing royal decree (6/2013) law on Nature Reserves and Wildlife Conservation

✓ Established executive government regulations for the management of whale and dolphin tourism activities

- Training

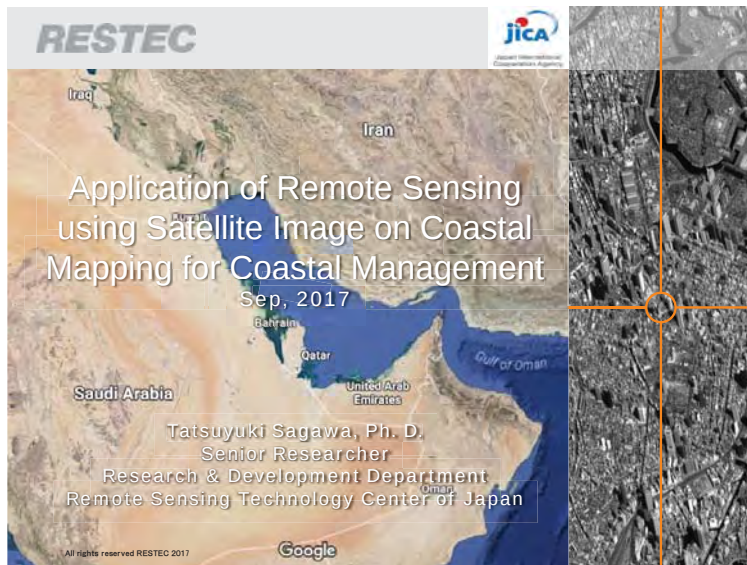


Conclusion:

“The conservation of the marine environment is not limited to myself or the Ministry of the Environment and Climate Affairs, but all people must work to preserve it, and its wealth. Marine environment is a treasure God has given us, and this blessing must be preserved.”



Thank you



Outline

- Introduction to coastal habitat monitoring
- Remote Sensing Training in Oman
 - What kinds of knowledge are required?

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2

Introduction to coastal habitat distribution

Coastal habitats such as seagrass beds, coral reefs, mangroves and tidal flats are important for many marine organisms.

- Nursery for many marine organisms.
- High primary production.
- Trap sediments and nutrients.
- Tropical seagrasses are foods for dugongs, manatees and turtles.
- Seagrass obscures CO₂ and supplies oxygen.
- Coral reefs are natural protective barriers from the waves generated by hurricanes and typhoons.

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Introduction to coastal habitat distribution

- Human Impacts
 - Direct impacts from coastal development and dredging activities.
 - Water pollution.
 - Over fishing leading to ecosystem destruction.
 - Global effects by climate changes
- Global damage and loss in coastal habitats
 - Seagrass
 - 29% of total area (51,000km²/177,000km²) was lost between 1879-2006 (Waycott, M. et al, 2009, PNAS).
 - Coral Reefs
 - 32.8% are in categories with elevated risk of extinction (Carpenter, K.E., et al, 2008, Science).
 - Mangrove
 - 20% of total area (36,000km²) was lost between 1980-2005 (ISME, 2013).

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Bleaching in coral reefs Lost of seaweed beds

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Introduction to coastal habitat distribution

- Monitoring & Conservation
 - Monitoring and conservation of coastal habitats are important for sustainable use of coastal marine resources.
- EBSA
 - Ecologically or Biologically Significant Marine Areas (EBSAs) are special areas in the ocean that serve important purposes to support the healthy functioning of oceans and the many services that it provides.
- Scientific criteria for EBSAs (adopted in COP 9)
 - Uniqueness or Rarity
 - Special importance for life history stages of species
 - Importance for threatened, endangered or declining species and/or habitats
 - Vulnerability, Fragility, Sensitivity, or Slow recovery
 - Biological Productivity
 - Biological Diversity
 - Naturalness
- Coastal habitats
 - There are also EBSAs in coastal habitats and EBSAs screening should be conducted for monitoring and conservation plans.

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Introduction to coastal habitat distribution

- How we map underwater habitat distribution?



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Introduction to coastal habitat distribution

- Snorkeling or Scuba Diving?
 - We can survey only a few points per one day.



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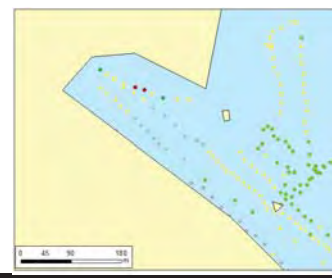
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Introduction to coastal habitat distribution

- Glass Box or Aquatic Video Camera observation?
 - We can survey many points per one day.
 - But we can survey only a few bays.



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Introduction to coastal habitat distribution

- Remote Sensing using Satellite Image
 - We can obtain large area data at once.



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Introduction to coastal habitat distribution

- Remote Sensing using Satellite Image
 - Satellite remote sensing is suitable for monitoring because satellite revisit the same place at same intervals.



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Coastal Remote Sensing

- What kinds of knowledge and skill we need for coastal remote sensing?
- Coastal remote sensing requires knowledge about the satellite image analysis algorithm and GIS operation skills.
- Programing skills also necessary for advanced image processing.



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Remote Sensing Training in Oman, Feb 2017

- Contents
 - Introduction to Optical Remote Sensing (Basic Course)
 - Remote Sensing for Coastal Management (advanced Course)
 - Introduction of a cutting edge tool (Google Earth Engine)



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Handbook

- Remote sensing handbook for tropical coastal management (UNESCO)
<http://www.unesco.org/csi/pub/source/rs.htm>



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Tool

- Bilko / UNESCO (Free)
<http://www.noc.soton.ac.uk/bilko/index.php>



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Lessons

- Bilko / 10 Lessons for Coastal Management



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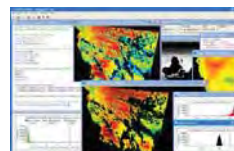
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Lessons

- Objective
 - Understanding the algorithm and the process of coastal remote sensing.
- For your works
 - You can study by yourself even after our lesson following with text books.
 - You can conduct remote sensing analysis on your preferable GIS (not only Bilko) based on the learned knowledge.

Study on Bilko lesson kit



Apply to your work



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Lessons

- Lesson using Bilko
 - Visual interpretation (lesson 1)
 - Radiometric correction
 - DN to TOA reflectance conversion (lesson 4)
 - Atmospheric correction(lesson 4)
 - Water column correction (DII) (lesson 7)
 - Habitat mapping (Classification) (lesson 8)

BILKO Module 7 Lesson 1

Visual interpretation

(Extracted from the text)

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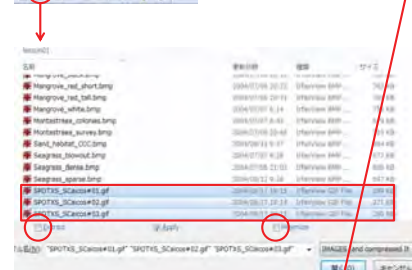
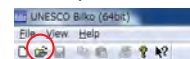
Study Area



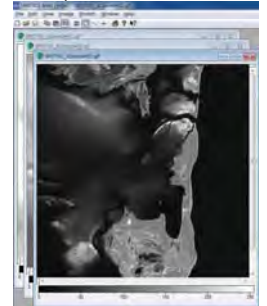
Lesson 1 Visual interpretation

(1) Open SPOT XS data

Click 'Open'



3 files open

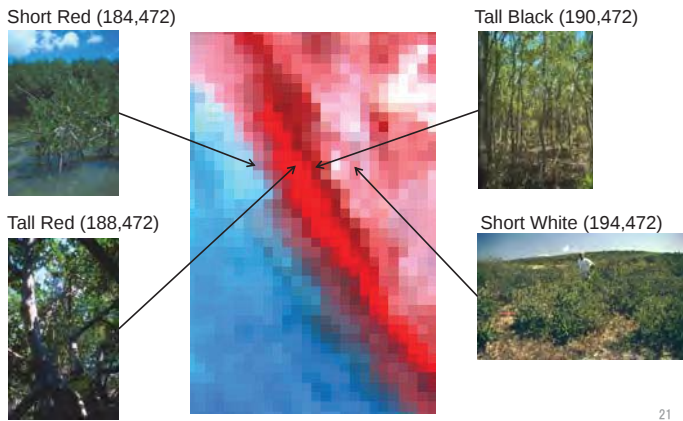


- Select 3 files with the <Ctrl> key held down
- Uncheck 'Extract' and 'Minimize'

20

Lesson 1 Visual interpretation

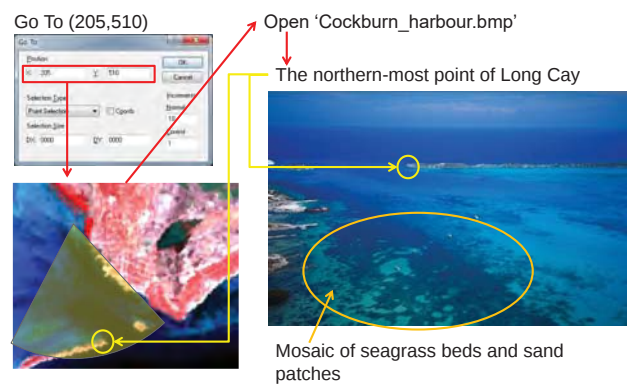
(10) Identification of mangrove habitats



21

Lesson 1 Visual interpretation

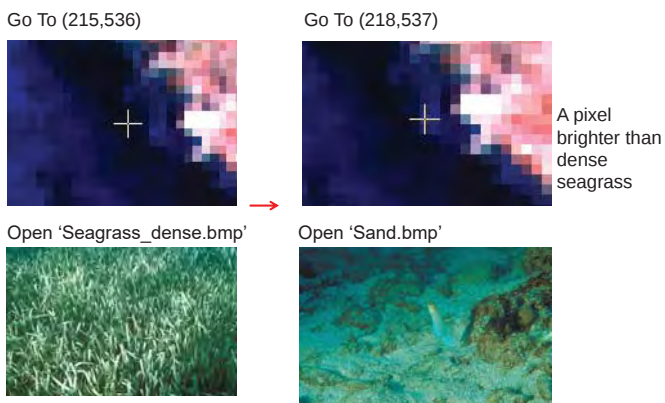
(11) An aerial photo of Cockburn harbor



22

Lesson 1 Visual interpretation

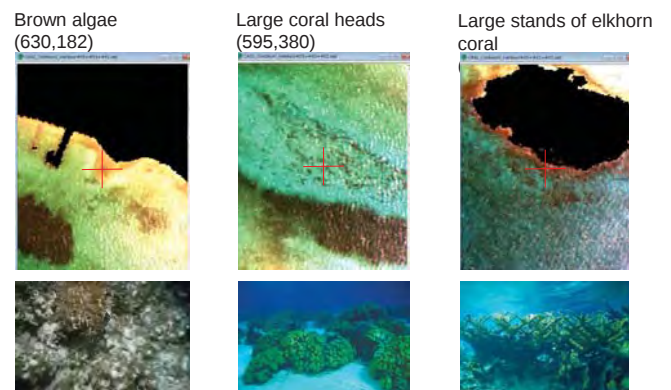
(12) Dense seagrass / Sand habitat



23

Lesson 1 Visual interpretation

(15) Visual interpretation of CASI imagery

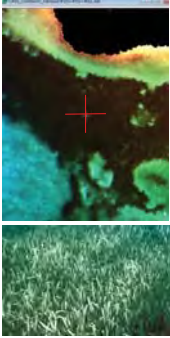


24

Lesson 1 Visual interpretation

(15) Visual interpretation of CASI imagery

Dense seagrass
(416,176)



Sparse seagrass
(531,264)



Seagrass "blowout"
(426,230)



25

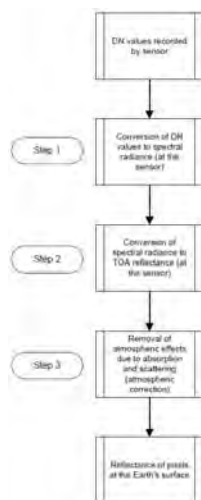
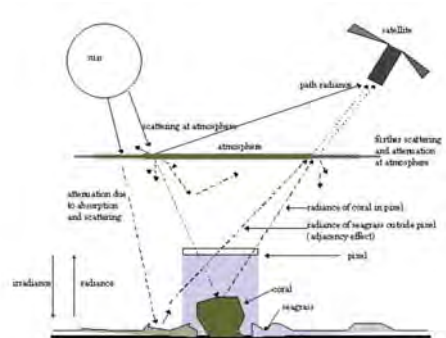
BILKO Module 7 Lesson 4

Radiometric correction

(Extracted from the text)

26

Concepts and process of radiometric correction



27

Lesson 4 Radiometric correction

(14) Complete the formula for step2 and run

Enter the value of d (Answer 4.4)

const d = 0.997683;

Enter the value of ESUN (Answer 4.6.)

const ESUN = [105.7, 182.9, 155.2];

Enter type and description

set output [2.0];
set output stacked "radiatTM_Nov_Reflectance_TOA";
set output description "TOA reflectances";

Enter statement that carries out Equation 4.3.

for i = 1, 3
pi = TM_Band[i] * d^2 / (ESUN[i] * cos[pi / 180 * (90 + @1.SUN_ELEVATION)]);

$$\rho_{s[TOA]} = \frac{\pi L_s d^2}{ESUN_s \cos(SZ)}$$



Copy formula and paste it to the stack of radiance images

28

Lesson 4 Radiometric correction

(24) Calculate average absolute (DN)

Calculate absolute differences

Habitat	Depth	Nov TMO	Jun TMO	Difference
Deep Water	314	317	317	0
Sand in very shallow water	317	317	317	0
Mangrove	446	317	317	0
Deep coral reef	210	317	317	0
Seagrass	210	317	317	0

Calculate average DN and average absolute difference

Habitat	Nov TMO	Jun TMO	Difference
Deep Water	19	17	2
Sand in very shallow water	37	37	0
Mangrove	35	31	4
Deep coral reef	19	19	0
Seagrass	16	24	8

Average

Answer 4.10

$$11.2 / 39.6 * 100 = \underline{28.28\%}$$

29

Lesson 4 Radiometric correction

(25) Calculate average absolute (SR)

Calculate absolute differences of surface reflectance

Habitat	Nov TMO	Jun TMO	Difference
Deep Water	0.0009	0.0005	0.0004
Sand in very shallow water	0.0453	0.0448	0.0005
Mangrove	0.0406	0.0417	0.0011
Deep coral reef	0.0008	0.0004	0.0004
Seagrass	0.0165	0.0192	0.0027
Mean		0.0052	0.0009

Answer 4.11

$$0.0009 / 0.0052 * 100 = \underline{1.10\%} (< 28.28\%)$$

30

BILKO Module 7 Lesson 7

Water Column Correction

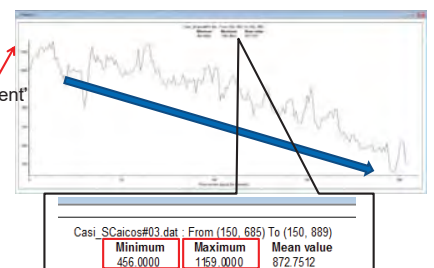
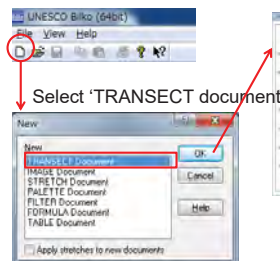
(Compensating for variable water depth)

(Extracted from the text)

Lesson 7 Compensating for variable water depth

(3) Inspect the transect

Click 'New'



Answer 7.1.

Max=1159, Min=456

Difference=1159-456=703 → Difference/Max =

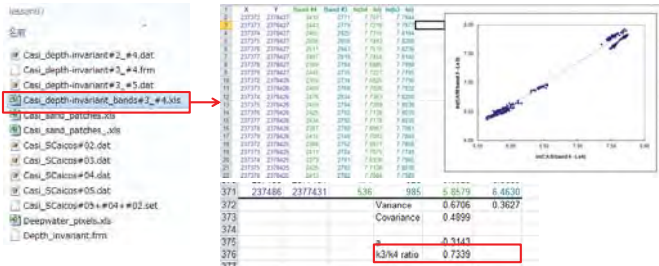
60.7%

31

32

(17) The results from a larger dataset

Open 'Casi_depth-invariant_bands#3_#4'



Use this value for the next section

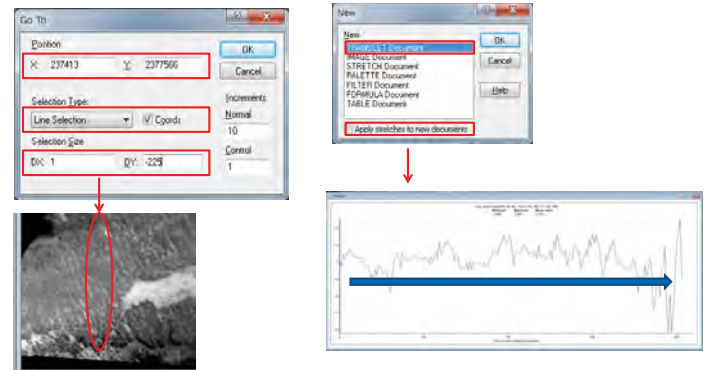
33

Lesson 7 Compensating for variable water depth

(22) Re-examine transect

Edit > Go To...

File > New... > TRANSECT document

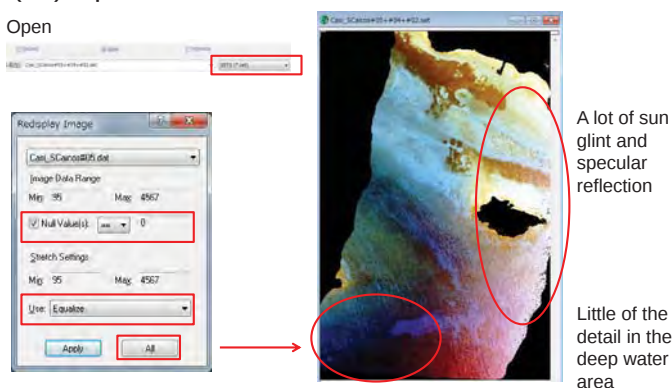


34

Lesson 7 Compensating for variable water depth

(26) Open the set of raw CASI data

Open



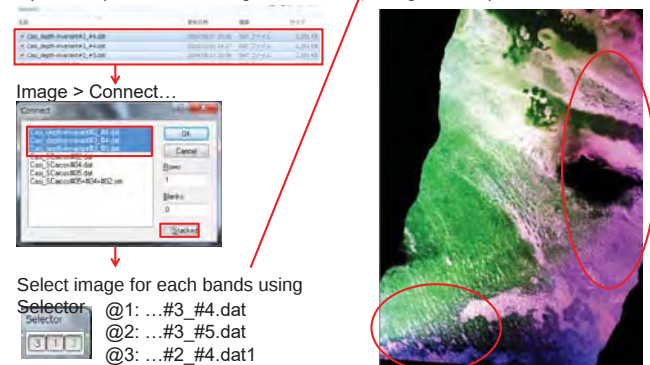
35

Lesson 7 Compensating for variable water depth

(26) Composite of depth-invariant index images

Open 3 depth-invariant images

Image > Composite



36

BILKO Module 7 Lesson 8

Simple supervised classification

(Extracted from the text)

Lesson 8 Simple supervised classification

(2) Use the Selector toolbar

Images connected as tiles



Depth...#1_#3.da Depth...#2_#3.da Landsat...#05.gif
Selector toolbar



@1 : LandsatTM_Caicos#05.gif (Red)
@2 : Depth-invariant_LandsatTM#1_#3.dat (Green)
@3 : Depth-invariant_LandsatTM#2_#3.dat (Blue)

37

38

Lesson 8 Simple supervised classification

(5) Save and inspect the land mask

Save the land mask
as 'Landmask_lesson8.gif'

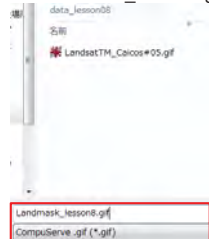
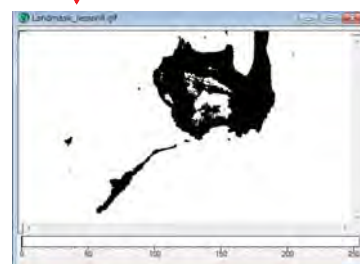
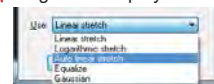


Image > Redisplay...



39

Lesson 8 Simple supervised classification

(9) Setup the field survey data

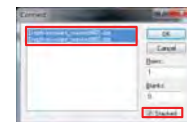
Open 'Habitats_Lesson8.xls'

GPS Coordinates	TH1_x1	TH1_y1	TH1_x2	TH1_y2	Habitat
1	227117	227880	4.889	5.974	dense vegetation
2	227144	227828	5.955	5.954	dense vegetation
3	227553	227205	4.889	5.974	dense vegetation
4	228544	227847	4.466	5.234	dense vegetation
5	228572	227824	4.911	5.234	dense vegetation
6	228496	227827	4.461	5.955	dense vegetation
7	242181	227806	4.461	5.954	dense vegetation
8	242181	227806	4.461	5.954	dense vegetation
9	242181	227806	4.461	5.954	dense vegetation
10	242181	227806	4.461	5.954	dense vegetation
11	242181	227806	4.461	5.954	dense vegetation
12	242181	227806	4.461	5.954	dense vegetation
13	242181	227806	4.461	5.954	dense vegetation
14	242181	227806	4.461	5.954	dense vegetation
15	242181	227806	4.461	5.954	dense vegetation
16	242181	227806	4.461	5.954	dense vegetation
17	242181	227806	4.461	5.954	dense vegetation
18	242181	227806	4.461	5.954	dense vegetation
19	242181	227806	4.461	5.954	dense vegetation
20	242181	227806	4.461	5.954	dense vegetation
21	242181	227806	4.461	5.954	dense vegetation
22	242181	227806	4.461	5.954	dense vegetation
23	242181	227806	4.461	5.954	dense vegetation
24	242181	227806	4.461	5.954	dense vegetation
25	242181	227806	4.461	5.954	dense vegetation
26	242181	227806	4.461	5.954	dense vegetation
27	242181	227806	4.461	5.954	dense vegetation
28	242181	227806	4.461	5.954	dense vegetation
29	242181	227806	4.461	5.954	dense vegetation
30	242181	227806	4.461	5.954	dense vegetation
31	242181	227806	4.461	5.954	dense vegetation
32	242181	227806	4.461	5.954	dense vegetation
33	242181	227806	4.461	5.954	dense vegetation
34	242181	227806	4.461	5.954	dense vegetation
35	242181	227806	4.461	5.954	dense vegetation
36	242181	227806	4.461	5.954	dense vegetation
37	242181	227806	4.461	5.954	dense vegetation
38	242181	227806	4.461	5.954	dense vegetation
39	242181	227806	4.461	5.954	dense vegetation
40	242181	227806	4.461	5.954	dense vegetation
41	242181	227806	4.461	5.954	dense vegetation
42	242181	227806	4.461	5.954	dense vegetation
43	242181	227806	4.461	5.954	dense vegetation
44	242181	227806	4.461	5.954	dense vegetation
45	242181	227806	4.461	5.954	dense vegetation
46	242181	227806	4.461	5.954	dense vegetation
47	242181	227806	4.461	5.954	dense vegetation
48	242181	227806	4.461	5.954	dense vegetation
49	242181	227806	4.461	5.954	dense vegetation
50	242181	227806	4.461	5.954	dense vegetation
51	242181	227806	4.461	5.954	dense vegetation
52	242181	227806	4.461	5.954	dense vegetation
53	242181	227806	4.461	5.954	dense vegetation
54	242181	227806	4.461	5.954	dense vegetation
55	242181	227806	4.461	5.954	dense vegetation
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63	242181	227806	4.461	5.954	dense vegetation
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87	242181	227806	4.461	5.954	dense vegetation
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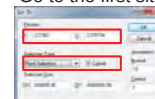
Fill the missing values from masked images

Open masked images

and connect them as a stack



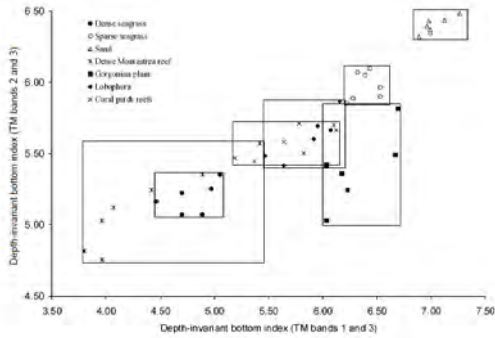
Go to the first site (237382,2378154)



40

Lesson 8 Simple supervised classification

(12) Distribution of the habitats in a 2D "feature space"



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Lesson 8 Simple supervised classification

(16) Formula to classify - boundaries

Open 'Classification1.frm'

Boundaries are defined

```
# Dense seagrass class boundaries
CONST DenSeagMin1 = 4.46 ; CONST DenSeagMax1 = 5.05 ;
CONST DenSeagMin2 = 5.07 ; CONST DenSeagMax2 = 5.35 ;

# Sparse seagrass class boundaries
CONST SpSeagMin1 = 6.22 ; CONST SpSeagMax1 = 6.53 ;
CONST SpSeagMin2 = 5.86 ; CONST SpSeagMax2 = 6.10 ;

# Sand class boundaries
CONST SandMin1 = 6.89 ; CONST SandMax1 = 7.26 ;
CONST SandMin2 = 6.32 ; CONST SandMax2 = 6.48 ;

# Lobophora dominated algal area and coral patch reef class boundaries
CONST LobCoralMin1 = 5.19 ; CONST LobCoralMax1 = 6.16 ;
CONST LobCoralMin2 = 5.42 ; CONST LobCoralMax2 = 5.87 ;

# Dense Montastraea reef class boundaries
CONST MontMin1 = 3.80 ; CONST MontMax1 = 4.42 ;
CONST MontMin2 = 4.76 ; CONST MontMax2 = 5.25 ;

# Gorgonian plain class boundaries
CONST GorgMin1 = 6.03 ; CONST GorgMax1 = 6.69 ;
CONST GorgMin2 = 6.03 ; CONST GorgMax2 = 5.50 ;
```

Table 8.4. Maximum and minimum reflectances in depth-invariant bottom index images for 6 major marine habitats, using box-classifiers illustrated in Figure 8.2. Changes are in bold type.

Habitat class	TM bands #1-3 depth-invariant		TM bands #2-3 depth-invariant	
	Minimum	Maximum	Minimum	Maximum
Dense seagrass	4.46	5.05	5.07	5.35
Sparse seagrass	6.22	6.53	5.86	6.10
Sand	6.89	7.26	6.32	6.48
Dense Montastraea reef	3.80	4.42	4.76	5.25
Gorgonian plain	6.03	6.69	5.03	5.50

See Table 8.3

42

Lesson 8 Simple supervised classification

(17) Formula to classify - classifiers

IF ... ELSE statement for each habitat

```
C# Sand box-classifier
IF ( (Q1 >= SandMin1) AND (Q1 <= SandMax1) AND (Q2 >= SandMin2) AND (Q2 <= SandMax2) ) 32 ELSE 0 ;

# Sparse seagrass box-classifier
IF ( (Q1 >= SpSeagMin1) AND (Q1 <= SpSeagMax1) AND (Q2 >= SpSeagMin2) AND (Q2 <= SpSeagMax2) ) 16 ELSE 0 ;

# Gorgonian plain box-classifier
IF ( (Q1 >= GorgMin1) AND (Q1 <= GorgMax1) AND (Q2 >= GorgMin2) AND (Q2 <= GorgMax2) ) 8 ELSE 0 ;

# Lobophora dominated algal areas and coral patch reef box-classifier
IF ( (Q1 >= LobCoralMin1) AND (Q1 <= LobCoralMax1) AND (Q2 >= LobCoralMin2) AND (Q2 <= LobCoralMax2) ) 4 ELSE 0 ;

# Dense seagrass box-classifier
IF ( (Q1 >= DenSeagMin1) AND (Q1 <= DenSeagMax1) AND (Q2 >= DenSeagMin2) AND (Q2 <= DenSeagMax2) ) 2 ELSE 0 ;

# Dense Montastraea reef box-classifier
IF ( (Q1 >= MontMin1) AND (Q1 <= MontMax1) AND (Q2 >= MontMin2) AND (Q2 <= MontMax2) ) 1 ELSE 0 ;
```

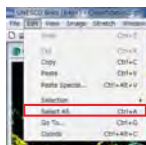
Habitat class	Pixel value	Palette colour
Classified in more than one class (misclassified)	Not values below	Grey
Sand	32	Yellow
Sparse seagrass	16	Pale green
Gorgonian plain	8	Magenta
Lobophora dominated algal areas and coral patch reefs	4	Cyan
Dense seagrass	2	Dark green
Dense Montastraea reef	1	Khaki
Land or not classified in any class	0	Black

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Lesson 8 Simple supervised classification

(23) Median smoothing filter

Edit > Select All



Set filter sizes

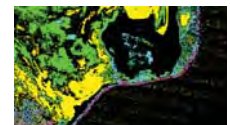
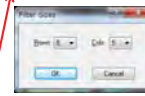
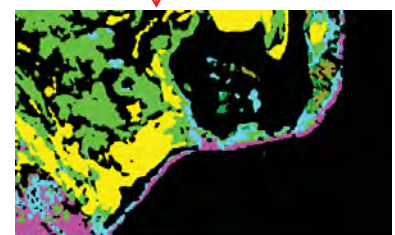
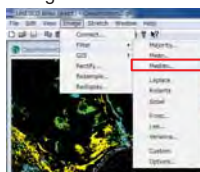


Image > Filter > Median...



Smoothed classification image

44

Lesson using QGIS

- Lesson using Bilko
 - Efficient tool for understanding process of coastal mapping.
 - Software interface is old but you can also apply the method using other software for practical use.
- Additional practice using QGIS
 - Compensation for Bilko lesson
 - Accuracy calculation and other water column correction technique.
 - Self practice
 - Repeat any lessons to deepen your understanding
 - Practice using satellite image in Oman

RESTEC

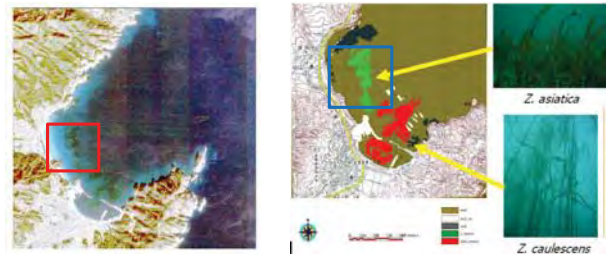
Remote Sensing Technology Center of Japan

All rights reserved RESTEC 2011

45

Satellite data

- Sample data for lesson



Seagrass Map (Sagawa et al., 2010)

RESTEC

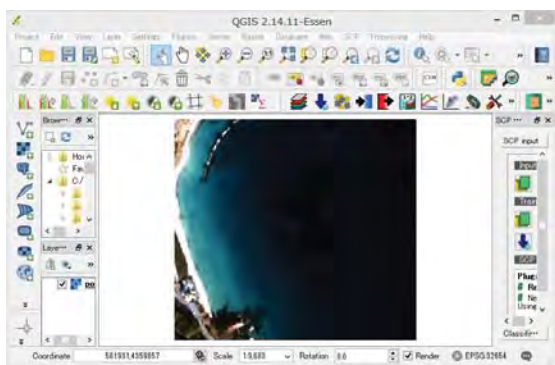
Remote Sensing Technology Center of Japan

All rights reserved RESTEC 2011

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Sample image

- Sample data for lesson



Band1: blue
Band2: green
Band3:red
Band4: near infrared

RESTEC

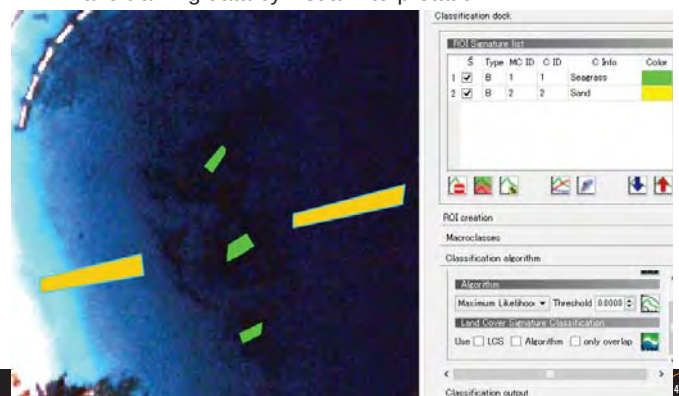
Remote Sensing Technology Center of Japan

All rights reserved RESTEC 2011

47

Supervised classification by QGIS

- Try to classify image into sand and seagrass.
- Make training data by visual interpretation



RESTEC

Remote Sensing Technology Center of Japan

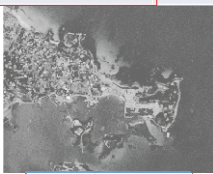
All rights reserved RESTEC 2011

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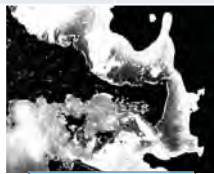
water column correction

•Try to conduct water column correction to improve the mapping accuracy

Methods	Required data	Appropriate water types (JWT)
DII (depth in-variant index: Lyzenga, 1981) We learned in Bilko lesson	Training data for sandy bottom with viable depth	I - II (High transparency water)
BRI (bottom surface reflectance index: Sagawa <i>et al.</i> , 2010) We will do in this lesson	Training data / bathymetry data	I- III (JWT III is bit turbid water)

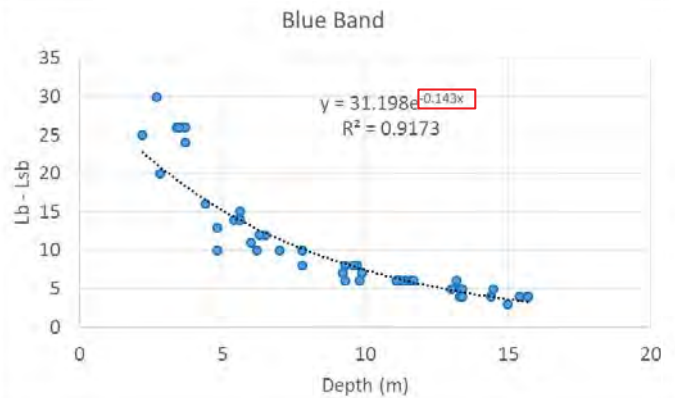


Blue band image



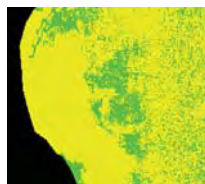
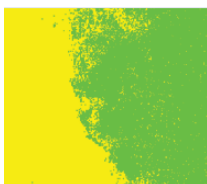
BRI (Blue band)

water column correction: Getting regression coefficients



Mapping Results

Method	1	2
Water column correction	-	BRI
Classification	Maximum Likelihood	Maximum Likelihood
Overall Accuracy (%)	67.5	86.6



Summary

- What we did in the lesson
 - Visual interpretation
 - Radiometric correction
 - DN to TOA reflectance conversion
 - Atmospheric correction
 - Water column correction (DII and BRI)
 - Habitat mapping (Classification)
 - Accuracy Calculation

Summary

How we should conduct Image analysis in practice?

- 1 Calculation by a calculator or making programs
 - Calculator of QGIS or formula in Bilko in our lesson
 - Programs: C, Python, R, IDL, ...
- 2 Use option in GIS or existing program
 - Commercial GIS such as ENVI or EARDAS Imagine has options for some corrections and classification
 - 6s model for atmospheric correction
 - There is no tool for water column correction
- 3 Purchase of corrected products
 - Landsat: TOA reflectance or surface reflectance products are available
 - Remote sensing organizations (e.g. RESTEC) provide corrected products or habitat maps

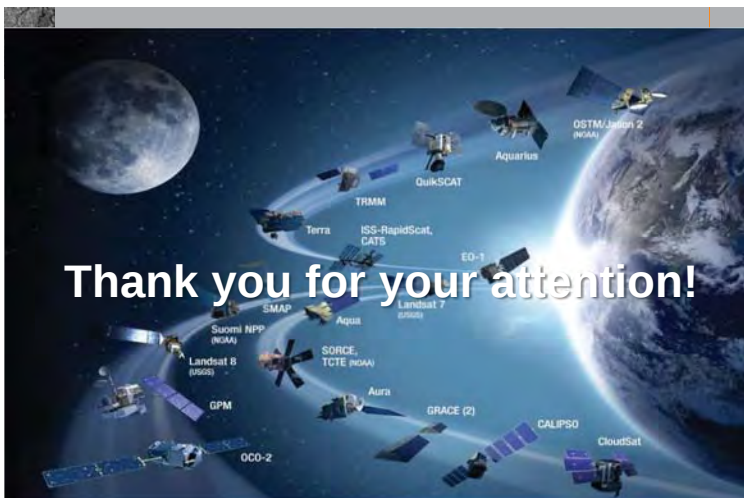
Summary

Remote sensing is useful technology.

I hope you will have proper knowledge and will use remote sensing for coastal mapping and management in your region of interest.



Thank you for your attention!



NASA's fleet. Image credit: NASA



Conservation of Marine biodiversity and ecosystem service

Several case studies in Japan and CBD, and some suggestion to Oman case

Yoshihisa SHIRAYAMA
Japan Agency for Marine-Earth
Science and Technology

Contents

- Recent Actions of Ministry of Environment Japan for Marine Biodiversity Conservation
- Recent Actions of Ministry of Industry and Trade Japan for Marine Biodiversity Conservation
- Some notes on Oman Biodiversity

Why biodiversity

3

- Status of Marine Environment reflects marine biodiversity
- Marine biodiversity is the essential for good ecosystem services
 - Fisheries
 - Environment friendly tourism
 - Stability of ecosystem function
 - Genetic resources
- Needs strategic action for biodiversity conservation

Marine Biodiversity Conservation Strategy March 2011



- Ministry of Environment Japan 2011

Outline of the strategy

- Background
- Objectives
- Biodiversity in the ocean and its ecosystem services
- Fundamentals
- Development of Measures

Background

- This Strategy is formulated by the Ministry of the Environment in Japan
- Responding to increasing public awareness on marine biodiversity
- On the basis of the “**National Biodiversity Strategy (2010)**” under the “Basic Act on Biodiversity”
- On the basis of the “Basic Act on Ocean Policy” and “**Basic Plan on Ocean Policy**”

Objectives

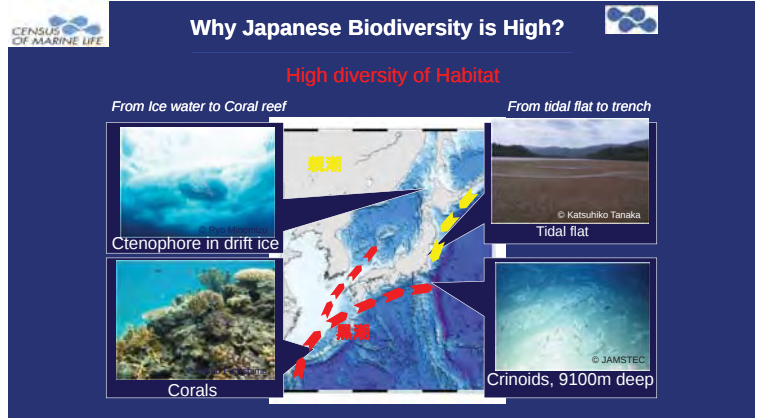
- The Strategy aims to **protect the biodiversity** to support the sound structure and function of marine ecosystems
- Also to **use ecological services** of the ocean, or its blessings, in a **sustainable manner**.
- The Strategy provides **a basic view and direction of measures** for conservation and sustainable use of the marine biodiversity.

Biodiversity in the ocean and its ecosystem services

- - Marine biodiversity supports our survival and daily life. -
- **Rich biodiversity in Japanese water**
- **Rich and sound ecosystem supported by biodiversity provide “ecosystem service”**
- **Biodiversity is deteriorated, and ecosystem services are degraded by human activities.**

Rich biodiversity in Japanese water

- World largest biodiversity based on the study of Census of Marine Life
 - Large EEZ
 - Various climate zones, several warm & cold currents, numerous islands, and complicated coastlines & bottom topography (ex., trenches, sea mounts) create diverse marine environments with a variety of ecosystems (ex., seaweed beds, tidal flats, coral reefs, brackish water).
 - Long history of biodiversity study



Rich Ecosystem Service

- Spiritual comfort
- Clean water
- Stabilization of climate
- Circulation of nutrients
- Food supply (ex., seafood)
- Genetic resources (ex., medicine)
- Recreation (ex., diving and shellfish gathering)

Fundamentals (1/2)

- Recognition of the importance of marine biodiversity on the basis of scientific data.
- Integrated management of the sea (the land and coastal zone)
- Measure the characteristics of marine areas within jurisdiction of Japan and factors influencing on them
- Effective measures to utilize local knowledge and technology

Fundamentals (2/2)

- **Marine Protected Areas** as one of the effective means for conservation of the biodiversity.
- **Definition** of marine protected area
- *Marine areas **designated and managed** by law or other effective means, in consideration of use modalities, **aimed at the conservation of marine biodiversity** supporting the sound structure and function of marine ecosystems and **ensuring the sustainable use** of marine ecosystem services.*

Development of Measures

1. Improvement of **baseline information**
2. **Identification of factors** influencing the marine biodiversity to implement measures to reduce their impacts
3. Implementation of measures appropriate to **characteristics of individual areas**
4. Improvement of **Marine Protected Areas** and enhancement of their **networking**
5. Facilitation of the **public acceptance** and involvement of various entities

Aichi Target 11 of CBD

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- By 2020, at least 17 per cent of terrestrial and inland water, and **10 per cent of coastal and marine areas**, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Ocean Conference and SDGs



Existing MPAs in Japan

<Protection of Natural Scenery>

- National Parks, Quasi-National Parks, Prefectural Natural Parks (Natural Parks Law)
- Natural Coastal Protected Zone (Law Concerning Special Measures for Conservation of the Environment of the Seto Inland Sea)

63 Marine Parks in Japan

MoEJ



Existing MPAs in Japan

<Protection of Natural Environment or Habitat>

- Nature Conservation Area (The Nature Conservation Law)
- Wildlife Protection Area (Wildlife Protection and Hunting Law)
- Natural Habitat Conservation Areas (Law for the Conservation of Endangered Species of Wild Fauna and Flora)
- Natural Monument (Law for Protection of Cultural Properties)

Existing MPAs in Japan

<Protection and Cultivation of Fishery Resources>

- Protected Water Surface (Fisheries Resource Protection Law)
- Coastal Fishery Resources Development Area, Designated Marine Area (The Law Relating to the Promotion of Marine Fishery Resources Development)
- Designated Marine Areas designated by Prefectures and Fishery Associations (Fisheries Law, Fishery Resources Conservation Law, Fishery Cooperative Act)
- Common Fishery Right Area (Fisheries Law)

Existing MPAs (Summary)

- Total Area = 8.3 % of territorial waters + EEZ
- Area does matter, but improving the level of management in the existing MPAs is also important
- Challenge for the near future: Expanding the MPAs through the existing legislations to meet the Aichi Target 11

CBD and Marine Protected Area (MPA)

- In COP9 (2008 at Bonn), EBSA concept was introduced.
- Decision COP IX/20 (Marine and coastal biodiversity: 14. Designing network of MPAs)
 - Adopts **the scientific criteria**, as contained in annex I to the present decision, for identifying ecologically or biologically significant marine areas in need of protection, and **the scientific guidance**, contained in annex II to the present decision, for designing representative networks of marine protected areas, as recommended by the Expert Workshop on Ecological Criteria and Biogeographic Classification Systems for Marine Areas in Need of Protection

Scientific Criteria for identifying ecologically or biologically significant marine areas (EBSA)

- Uniqueness or rarity
- Special importance for life history stages
- Importance for threatened, endangered or declining species and/or habitats
- Vulnerability, fragility, sensitivity or slow recovery
- Biological productivity
- Biological diversity
- Naturalness

Two additional Annexes

24

- Annex II
SCIENTIFIC GUIDANCE FOR SELECTING AREAS TO ESTABLISH A REPRESENTATIVE NETWORK OF MARINE PROTECTED AREAS
- Annex III
FOUR INITIAL STEPS TO BE CONSIDERED IN THE DEVELOPMENT OF REPRESENTATIVE NETWORKS OF MARINE PROTECTED AREAS:

Selecting of EBSA is key

- Japanese EBSA selection activities of MOE
 - 2011 Scientific Committee was established
 - 2011-2012 Collection of existing basic data
 - In collaboration with marine biodiversity strategic **science research program**
 - 2012-2013 Selection of EBSA using computer program
 - 2013 Expert review
 - 2014 Final draft completed

List of data set collected by each research unit

team	Habitats	Data amount
1	regional biodiversity in Asia	1,896,739
2	kelp forest and seaweed beds	23,504
3	seagrass beds	2,509
4	coral reef	18,904
5	plankton communities in pelagic water	82,539
6	deep-sea chemosynthesis-based communities	43,360
total		2,067,555

Since 2011, the project collected over 2067,555 records, and studied to establish the protocol to select ecologically and biologically significant area (EBSA). These results are adopted as expert opinion onto the committee for the important marine area in Japan, and will be contribute to achieve the Aichi Target and adopted as the baseline data of discussion on the International Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

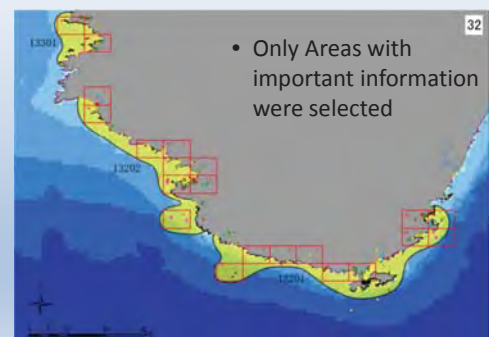
26

Analysis of coastal area



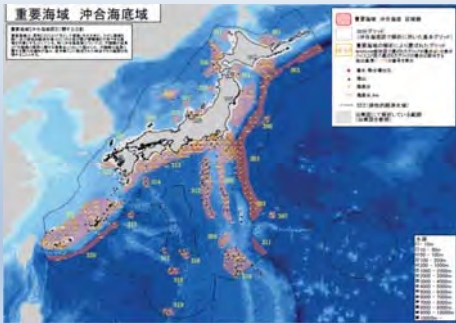
Coastal area were divided into 77 subareas

Analysis of subareas



- Only Areas with important information were selected

Selected EBSA (off shore bottom area)



Goal of Environmental Protection

30

- ✓ Prevent Irreversible Impact on Biodiversity and Ecosystem Service.
- ✓ Avoid extinction of unique species

Goal of Environmental Protection

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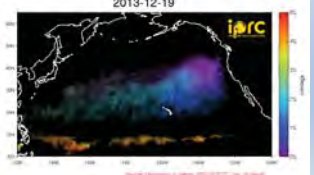
- ✓ Prevent Irreversible Impact on Biodiversity and Ecosystem Service.
- ✓ Avoid extinction of unique species
- ✓ Limit impact to small area, and avoid large scale impact

Tsunami Debris

32



- Nikolai Maximenk



Goal of Environmental Protection

33

- ✓ Prevent Irreversible Impact on Biodiversity and Ecosystem Service.
 - ✓ Avoid extinction of unique species
 - ✓ Limit impact to small area, and avoid large scale impact
- ✓ Plan, Do, Check, Act (PDCA) Cycle is essential for Adaptive Management.
- ✓ Precautious Approach is NOT a concept denying "Do" under presence of ambiguities.
- ✓ Best planning and Adaptive Management are required.

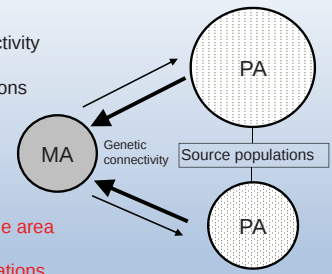
Strategy of biodiversity preservation

34

- Confirm genetic connectivity between areas
- Protect source populations

- Loss of biodiversity of the area will be minimized
- Recolonization of populations is expected in a mined area

The mt DNA sequences were analyzed to date for 15 species



International Seabed Authority is responsible for management of mining activity in high seas. It uses APEI (Area of Particular Environmental Interest) as protected area.



Ecosystem Based Management

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- Proper management of EBSA: MPA
- Not fully detailed scientific data: Adaptive management
- Partial management is not enough: Ecosystem Based Management
-

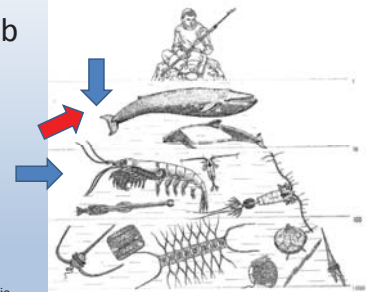
Elton's ecosystem concept

(Source: Scientific American)

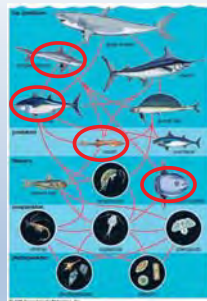


Food Web

(Source: Scientific American)



Food Web is complicated



Tagging of Pacific Pelagics (TOPP)



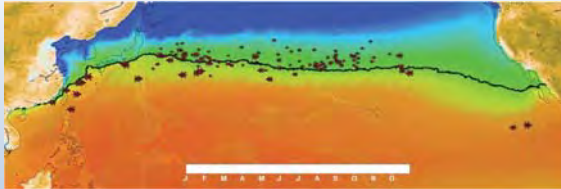
An Animal's Eye View of its Ecosystem

As a tagged salmon shark cruises along the ocean's surface its tag communicates with satellites overhead, allowing the scientists to follow its migrations on a day-by-day basis.

Photo courtesy of NOAA



Loggerhead turtle tracks



- Loggerhead turtle tracks remapped to a single calendar year
- Climatological SST field, contour at 18.5°C for reference

Jeffery Polovina, NOAA, CoML USNC IOOS Workshop

Summary

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- Baseline data is essential for conservation of marine biodiversity
- Marine protected area does not mean “non-touch” area, but well managed area with sustainable use
- Supporting sustainable use by local people is key for good management of protected area
- Utilization of new technologies enhances efficient conservation

Some suggestions to Oman marine biodiversity conservation

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- Baseline data of marine biodiversity are not enough
- Utilization of remote sensing e.g. Helicopter, Satellite will enhance collection of data
- Database is essential to handle marine biodiversity data
- Identify hotspots, and threats on them, e.g. pollution.
- Enhance PDCA cycle circulation

Oman Strategy submitted to CBD

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Distribution of data in OBIS

45



Data points of green turtle in Oman EEZ

46

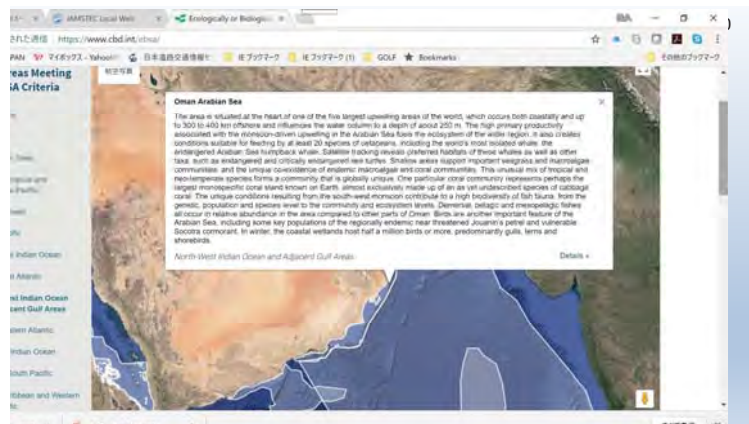


Steps for marine biodiversity conservation

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- 1: collection of baseline data for coastal zones
 - 2: Analyze data and extract EBSAs
 - 3: Registration of selected EBSAs to MPA
-
- 1: Capacity building of marine scientists for off-shore observation
 - 2: Survey of off-shore marine biodiversity within EEZ of Oman





Seto Inland Sea (Osaka Bay) management

- Serious Eutrophication problem
- Harmful Algal Bloom
- Negative impacts on Fisheries
- Especially Aquaculture
- Regulation of Nutrient Inflow
 - Concentration
 - Total Quantity
- Recovery of environment
- Too Strict Regulation?

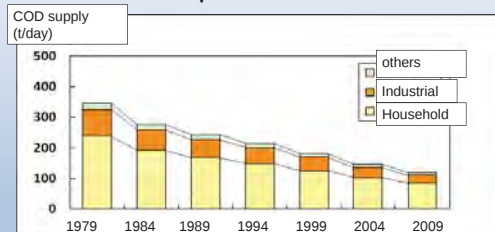


Hypoxia damages biodiversity



Source: Osaka Bay Environment Clearing House

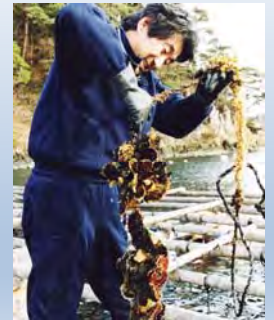
Recent progress of controlling eutrophication



Source: Osaka Bay Environment Clearing House

The Sea is longing for the Forest

- Oyster Farmer Mr. Hatakeyama founded NGO
- It is planting trees on the mountain of watershed
- The wide leaves plant species seems important
- Probably increase Iron concentration
- Reduces HAB
- Getting popular throughout Japan



His aquaculture is very successful



Photo: Y. Shirayama

He planted trees in the watershed



Forest he planted is still young

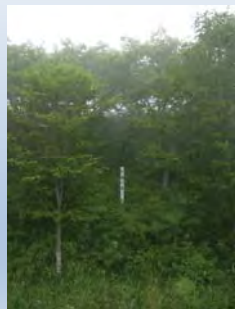


Photo: Y. Shirayama

Communication with local community



Summary

- In the large scale management, top down approach is necessary.
- In the small scale case, bottom up approach is more effective, detailed, flexible, and cost saving for government.
- For the success of EBM, PDCA cycle is indispensable.
- Involvement of diverse stakeholders should be pursued.
- Dialogue and mutual understanding among stakeholders leads to the success.

Japan Agency for Marine-Earth Science and Technology

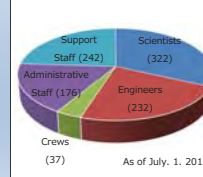
Leaderships

President: Dr. Asahiko Taira
Executive Director: Dr. Yoshihisa Shirayama
Executive Director: Dr. Wataru Azuma
Executive Director: Mr. Motoshi Shinozaki

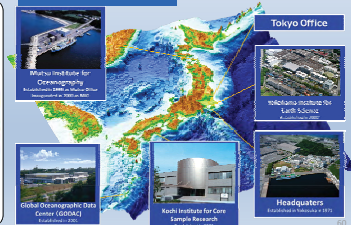


Personnel

Total: 1,009 employees



JAMSTEC Sites





Vessels/Manned Submersible

GT: Gross tonnage

R/V HAKUHOMARU GT 3,991 t Multipurpose research vessel with long-term cruise	R/V MIRAI GT 8,687 t Large vessel able to perform observation over wide areas	DN CHIKYU GT 56,752 t Drilling vessel with world-class scientific drilling capacity
R/V YOKOSUKA GT 4,439 t Support vessel for "SHINKAI6500"	R/V SHINSEIMARU GT 1,629 t Operation from 2013 Multipurpose R/V focusing on the survey off the coast of Tohoku region	Shinkai6500 Deep Submergence Vehicle World-class manned submersible
R/V KAIREI GT 4,517 t Surveys the structure of sub-bottoms mainly with MCS	R/V KAIMEI G 5,747t Multipurpose research vessel for wide-area seabed research	

Oman Ophiolite Drilling Project



Deciphering the signature of fluid/rock reaction in the lower oceanic crust: The Oman ophiolite analogue

Deeply from 2020 program starting beginning on 1 October 2021

Samples are analyzed on board Chikyu

- Omani young trainees were also invited



- (Source: Oman Drilling Project)

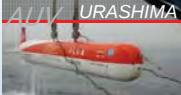
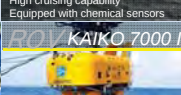
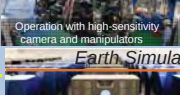
Just finished yesterday



- (Source: Oman Drilling Project)

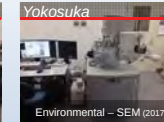
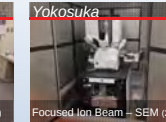
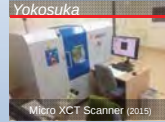
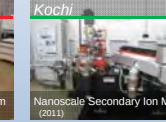
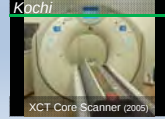
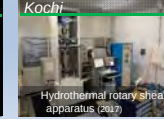


Unmanned Underwater Vehicles/Supercomputers

 AUV URASHIMA Large AUV capable of long-distance dives	 AUV YUMEIRUKA High-performance motion control advanced acoustic observatory	 AUV JINBEI High cruising capability Equipped with chemical sensors
 AUV OTOHIME Working AUV equipped with manipulators	 HYPER-DOLPHIN Operation with high-sensitivity camera and manipulators	 ROV KAIKO 7000 II Capable of diving up to a maximum depth of 7,000 m
 ROV KAIKO Mk-IV ROV for heavy-duty work launched in 2013	 Earth Simulator •5120 Processor nodes(20,480 cores) •Peak Performance:1.3PFLOPS	 UV2000 •256 CPU socket(2,560 cores) •Peak Performance:49.152TFLOPS



Major Lab facilities / Instruments

 Yokosuka Triton Plus ICP Mass (2015)	 Yokosuka Environmental - SEM (2017)	 Yokosuka Focused Ion Beam - SEM (2017)
 Yokosuka Micro XCT Scanner (2015)	 Yokosuka Hydrothermal Reactor System (2016)	 Kochi Nanoscale Secondary Ion Mass (2011)
 Kochi XCT Core Scanner (2005)	 Kochi Hydrothermal rotary shear apparatus (2017)	 Mitsui Seawater Pre-processing System (1998)

Thank you for your attention



Photo: Y. Shirayama



Baseline Data Collection

ROPME EBM Workshop



Simon Wilson,
Five Oceans Environmental Services LLC



19 September 2017

Crowne Plaza, Muscat

Baseline Data Collection for ROPME EBM Strategy

Definition of 'Baseline' and Scope

ROPME Sea Area

Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, UAE.

Environment & Fisheries Sectors

(but also other related sectors including Agriculture, Oil & Gas, Energy, Shipping, Coastal Planning & Construction, Ports, Tourism)

Part 1: Legislation

National and International

Part 2: Organisations & Activities

Directory of organisations, structure, points of contact, information and data holdings

Part 3: Policy, Data and EBM Case Studies

And gap analysis at regional level

Part 4: Mapping

National and International



Baseline Data Collection for ROPME EBM Strategy

Part 1: Legislation

Iran Example



Law	Item	Environmental Management	Fisheries and Aquaculture	Agriculture	Offshore Oil and Gas	Energy and Utilities	Navigation and Shipping	Coastal Planning & Construction
1	Game and Fishing Law (1967 amend 1996)	*	*			*		*
2	Game Laws & Regulations 1970-71	*	*					*
3	Law concerning the Exploitation and Protection of Aquatic Resources of Islamic Republic of Iran (1976)	*	*					*
4	5th Five-Year Economic, Social and Cultural Development Plan, Article 187 (2010-2015, extended for 2016)							*
5	The Protection and Exploitation of Natural Aquatic Resources Law 1995	*	*					
6	The Executive Regulations of Conservation and Utilization of Aquatic Resources in the Islamic Republic of Iran (1999)	*	*					
7	Temporary Regulations for the catching of fish, shrimp and other sea animals in the Persian Gulf, the Sea of Oman and all rivers of southern parts of Iran (1973)	*	*					

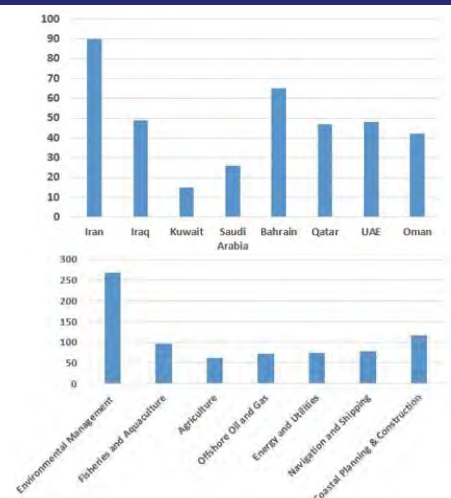
Baseline Data Collection for ROPME EBM Strategy

Part 1: Legislation

RSA Overview



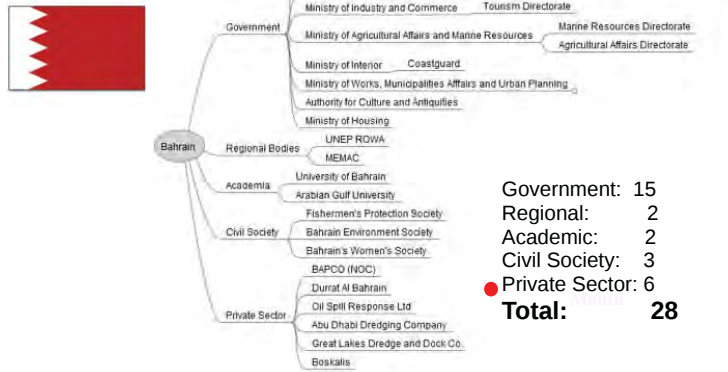
Total pieces of legislation: 382



Baseline Data Collection for ROPME EBM Strategy

Part 2: Organisations

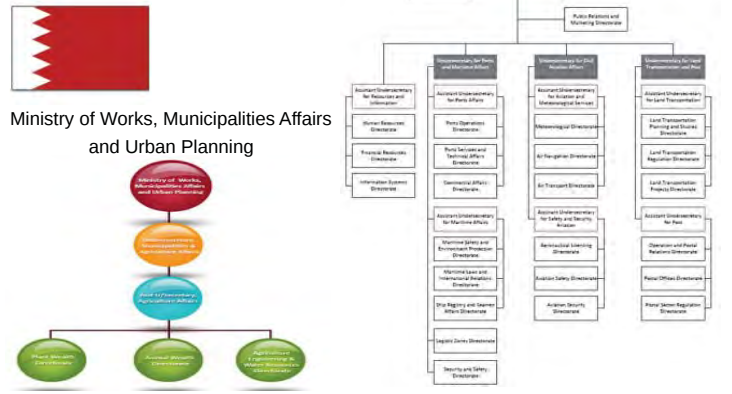
Bahrain Example



Baseline Data Collection for ROPME EBM Strategy

Part 2: Organisations

Bahrain Example



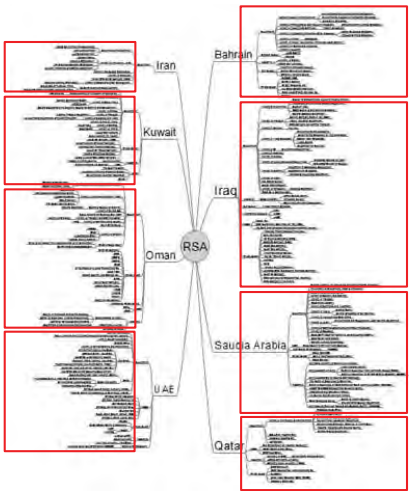
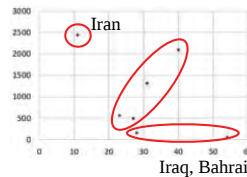
Baseline Data Collection for ROPME EBM Strategy

Part 2: Organisations

Total: 245

Ratio Coastline to No Organisations

- Iraq, Bahrain
- Kuwait, Saudi, Oman, UAE
- Iran



Baseline Data Collection for ROPME EBM Strategy

Part 3: Policies, Data, EBM Case Studies

For Key Concerned Government Departments
Policies as *interpreted* by practice (NB generally no written policies)
Expected or known data types only (NB no attempt to obtain or QA data)

Country	Policy	Data	Completion
Iran	N	N	0%
Iraq	Y	Y	100%
Kuwait	N	N	0%
Saudi Arabia	N	N	0%
Bahrain	Y	Y	100%
Qatar	N	N	0%
UAE	Y*	Y*	50%
Oman	Y*	Y*	50%

Baseline Data Collection for ROPME EBM Strategy

Part 3: Policies, Data, EBM Case Studies

EBM Case Studies

Ref.	Details	Description
2	Pilot Project on Water Buffalos Project Elements - Observational field trip - Implementation of a pilot farm - Knowledge sharing exercises Main Stakeholders - Nature Iraq - Italian Ministry for the Environment, Land and Sea	Background: Water Buffalo are arguably synonymous with the Mesopotamian Marshes, even being used as an indicator for marsh restoration (they population number were greatly reduced because of the draining prior to 2003 and have subsequently begun to increase again). However, one suggestion is that over reliance of local farmers on water buffalo is having an adverse effect on the marshland. This suggestion was made primarily in association with the Central Marshes that were under consideration for National Park designation. Aim: "This pilot project aimed at describing buffalo distribution as well as its possible impacts on the National Park "core area" ... and to identify constraints and opportunities for a sustainable integrated development approach to improve [farming efficiency]." Main Activities: The project involved the implementation of a 'pilot farm' where research was performed with in parallel with the monitoring of the production and health of the buffalo allowing the collection of data to identify best practice techniques. The project will then use this information to: teach locals how to manage their farm buffalos; teach locals the right way to collect, store and sell milk; teach locals the right way to improve the health of the buffalos; implement scientific research related to the buffalos. Project Details: - Date: 2007-2008 - Location: Central Marshes to the north of Chubayish City in Thi Qar province. - Further details available from: - The New Eden Project – Executive Summary 2003 – 2013 Activities – Section D: Number 10 http://www.natureiraq.org/uploads/5/2/2/9/52291579/report_new_eden.pdf

Baseline Data Collection for ROPME EBM Strategy

Part 3: Policies, Data, EBM Case Studies

EBM Case Studies (so far 20 studies)

Country	Case Studies	EBM?
Iran	-	-
Iraq	- Management Plan for Hawizeh Marsh - Pilot Project for Water Buffalos - Pilot Project for Fish Cages - Darbendikhan Lake Restoration Project - Empowering Iraq's First National Park - Key Biodiversity Areas Program - USAID Inma Agribusiness Program - Management Planning for Iraqi Marshlands - Canada-Iraq Marshlands Initiative	Y
Kuwait	KOC Artificial Reef Project	?
Saudi Arabia	-	-

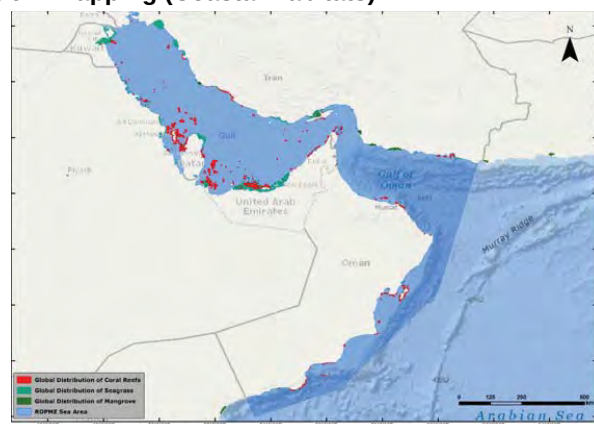
Baseline Data Collection for ROPME EBM Strategy

Part 3: Policies, Data, EBM Case Studies

Country	Case Studies	EBM?
Bahrain	Environmental Management Plan for Najwat and Hayr Bul Thamah, Hayr Shtayyeh and Hayr Bu Am'mah (Northern Oysterbeds)	Y
Qatar	- National Dugong Conservation Strategy - Qatar Whale Shark Project - Mangrove Compensation and Restoration	?
UAE	-	?
Oman	- Mangrove Restoration, Rehabilitation and Outreach - Managing Loggerhead Turtles on Masirah Island - Eco-Tourism Planning, Bandar Khayran - FAD Pilot Project - Artificial Reef Enhancing Small Scale Fisheries, Al Batinah - Turtle By-Catch Study, Gulf of Masirah	Y

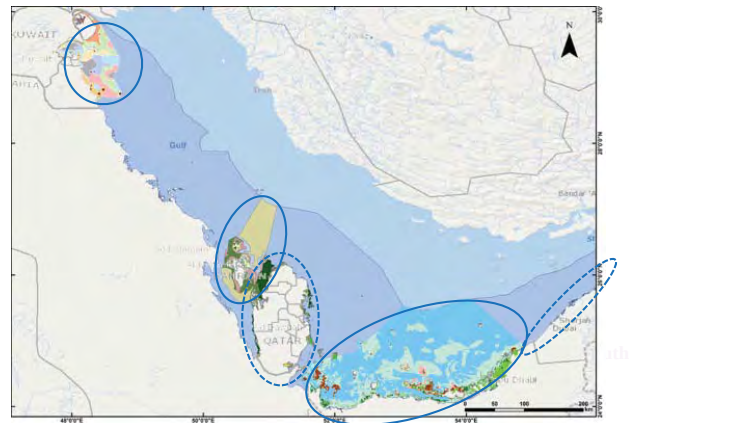
Baseline Data Collection for ROPME EBM Strategy

Part 4: Mapping (Coastal Habitats)



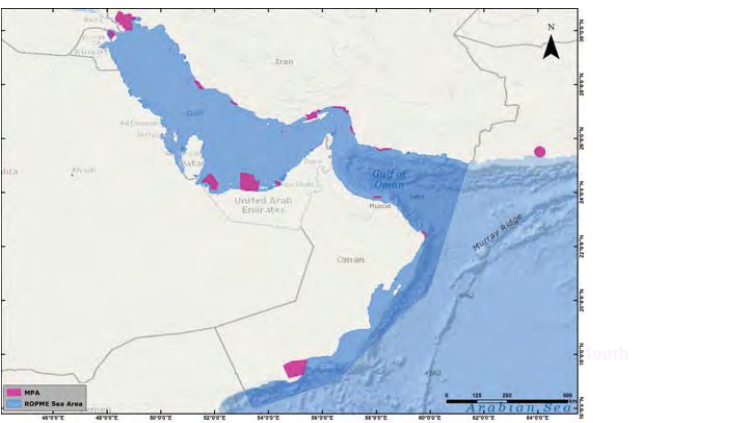
Baseline Data Collection for ROPME EBM Strategy

Part 4: Mapping (National Habitat Mapping)



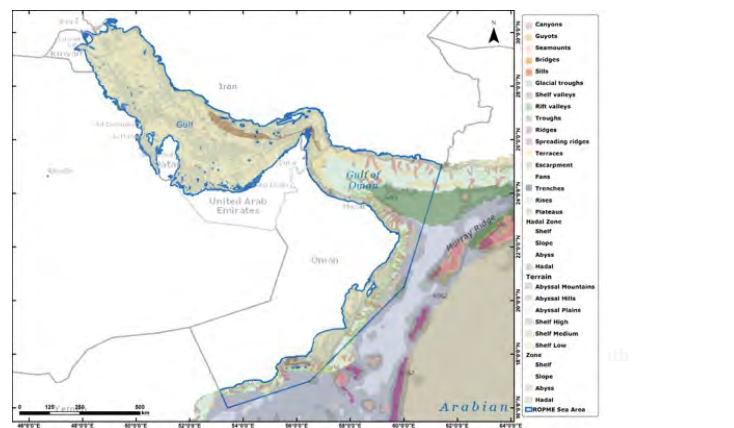
Baseline Data Collection for ROPME EBM Strategy

Part 4: Mapping (Marine Protected Areas)



Baseline Data Collection for ROPME EBM Strategy

Part 4: Mapping (Benthic Geomorphology)



Baseline Data Collection for ROPME EBM Strategy

Key Findings and Observations from Baseline Study

1. Most countries lack shallow water habitat mapping
 - Harmonised classification system
 - Coordination on updates (out of date, especially corals)
2. Most countries fall well short of 10% Aichi target
 - Analysis to design network
3. Legislation well developed
 - Need for harmonisation?
 - Assessment of monitoring and enforcement capability, practice & procedures
4. Long-list of Stakeholders
 - Stakeholder engagement will be a challenge; needs careful management
 - Need to prioritise list to manage engagement
 - Gaps in stakeholder mapping (Iran?), and need to verify details
 - Process for maintaining central directory needs to be developed

Key Findings and Observations

5. CZMP and Marine Spatial Planning
- Some old, some recent; Scope of CZM varies between countries
 - Marine spatial planning generally not well developed
 - Maritime Domain Awareness emerging in some countries
6. Deep Sea Environments understudied
- Outer RSA
 - Important for marine wildlife & fisheries
7. High value species include migratory
- Turtles, marine mammals, many commercially important fish species, sharks
 - Seasonal
8. Data
- Generally no standard formats (exception EAD GIS Schema)
 - Tends not to be shared outside of Ministry
 - Transition to data orientated governance (e-Government)
 - Massive data mining and QA exercise required

Mouth

Key Findings and Observations

9. Gaps in Information
- Policy not written
 - Access to data
 - Support needed in Saudi Arabia and Iran
10. Bilateral Cooperation
- Qatar UAE Coral Research
 - Turtle Research and Conservation Planning (EWS-WWF)
 - Others?

Mouth

Discussion points:

- Feedback from NFPs on content of Parts 1 & 2
- Support from Iran and Saudi on Part 3
- Where are the perceived gaps





EBM Strategy - Ecosystem Assessment

ROPME EBM Workshop



David Medio,
Five Oceans Environmental Services LLC



19 September 2017

Crowne Plaza, Muscat

Ecosystem Approach to Managing ROPME Sea Area

Overview

ROPME Sea Area

Iran, Iraq, Kuwait, Saudi Arabia, Bahrain, Qatar, UAE, Oman.

ROPME has been managing the shared body of water for 40 yrs

Agreement for integrated management approach MoU with UNEP for Ecosystem Based Management Strategy

Working Group (UNEP, ROPME and JICA) charged with developing Strategy

WG Work Plan: Scoping Study (identify issues), Inventory (existing data, policies) and this EA.

Mouth

Ecosystem Approach to Managing ROPME Sea Area

Cont.

Ecosystem approach crucial for Strategy, namely:

- How the overall ecosystem functions
- Ecosystem services the ecosystem delivers
- How communities and economies depend on marine and coastal services
- Identify impacts from activities and uses

Mouth

Ecosystem Approach to Managing ROPME Sea Area

Features of Ecosystem Based Management

Interconnectedness and interdependent nature of ecosystem components

Well-being of humans and natural environment linked and so is long term sustainability

Despite this widely held knowledge, difficult to put EBM into practice

Mouth

Ecosystem Approach to Managing ROPME Sea Area

Ecosystem Assessment Report: Key Issues

‘Problems exist in our marine environment...must be effectively addressed and remedied via ‘collective actions” (SOMER, 2013).

EA benefited from SOMER and over 200 reports, papers, UN studies, data from other regional efforts

The EBM, despite difficulties and constraints, need not be prohibitively demanding or complex

A unique opportunity for this most challenging part of the world!

Ecosystem Approach to Managing ROPME Sea Area

EA: Key Beneficiaries

ROPME countries’ policy makers
National Statutory and Non-Statutory Regulators

Key political figures
NGO - national and international

Governmental Organisations
Industry sectors: energy, manufacturing, fisheries, tourism etc.
Academic and research institutions

Local, regional and international Institutions
UN and other International Organisations

Anyone with an interest - direct or indirect - with the marine environment

Ecosystem Approach to Managing ROPME Sea Area

EA Report

- 1 Introduction: objectives, study area, challenges
- 2 State of the RSA: evidence based
- 3 Regulatory Framework: reflecting key differences across members
- 4 Socio-economic activities and interactions with marine environment
- 5 Outline of Stakeholders, Communities and Sectors of RSA
- 6 Ecosystem Services: status, need for reliable valuations
- 7 Synthesis of the RSA: a regional and global perspective
- 8 Key management recommendations: a way forward to support the EBM Strategy

Ecosystem Approach to Managing ROPME Sea Area

Introduction: Key Findings and Issues

Acceptance of interconnectedness between human and natural environment.

Our limited ability - as humans - to think holistically.

RSA striking differences: natural, economic, social, political and more

Data: gaps, differences in availability, need for greater sharing
Objective is clear: common understanding and shared way forward
Sources - >200 reports, papers, UN and Government reports.

Opportunity not hindrance to develop EBM Strategy

Ecosystem Approach to Managing ROPME Sea Area

State of the RSA: A General Consensus

Unprecedented growth in population and wealth = major environmental repercussions, both visible (e.g. habitat removal), less visible (e.g. fisheries loss, pollutants)

Energy use (carbon footprints) reflected in environmental costs

Water and food security: major issues.

Fisheries - only renewable source of protein - is threatened. Artificial alternatives not a magical cure.

Direct links to climate change (sea level rise, coastal erosion, SST), evident effects on key habitats (reefs)

The unsustainable essence of these processes is clear.

Ecosystem Approach to Managing ROPME Sea Area

RSA Regulatory Framework

Kuwait Convention and its Protocols

National Regulators

Regional Organisations: ROPME, GCC, CAMRE, RECOFI & many more

International agreements, treaties and conventions:

CBD, UNCLOS, RAMSAR, IMO, CITES

= High level of overlap

Well-developed, concerted and integrated environmental regulatory set up

State of RSA reflects need for improved coordination and collaboration.

Ecosystem Approach to Managing ROPME Sea Area

Socio-economic Interactions and Environment

Energy, fisheries, tourism, coastal development, industry: all interact with marine environment and its services.

Impacts identified and quantified but ONLY sectorially; little communication amongst sectors. Piecemeal approach.

Few, well assessed, reported examples with sustainable eco/env balance (coastal projects in Qatar and Kuwait reported).

These interactions must be viewed holistically as impacts on ecosystem functionality and resilience are regional in context and magnitude.

Use of better tools: SEA, MZP, ICZM: policies not project!

Ecosystem Approach to Managing ROPME Sea Area

Stakeholder Engagement: A Long Way to Go

Report presents outline in ROPME countries, NOT how to develop Stakeholder Engagement Plan (SEP)

EA:

identified roles of and relevance of stakeholders in RSA

determined how current scenario has shaped these roles

highlighted better managed RSA to positively influence Stakeholder roles and relevance

EBM Strategy SEP to develop tools (safety nets (social and economic), training, capacity building) to protect livelihoods. Collaboration at all stages of EBM development and implementation, between regulators, developers, experts, long term planning and guaranteed funding

Ecosystem Approach to Managing ROPME Sea Area

Ecosystem Services

Ecosystem Service Valuations (ESV) complex and very location and habitat specific.

EA not developing methods or valuations but outlined relevance, urgency for RSA specific ESV at EBM phase

Examples shown (based on extrapolations) are key stepping stone.

Bahrain: excessive value but the right approach.

Iran island reefs: reflects value of eco-tourism approach and renewable resource use.

UAE Blue Carbon Demonstrations: merit and monetary value of carbon storage as a tool.

Key recommendations to develop RSA specific ESV methods.

Ecosystem Approach to Managing ROPME Sea Area

Chapter 7: What has Gone Wrong?

Development lead cause of marine degradation.

Local, project specific approach is norm

Limited application of evidence based science

Significant, very variable data, has limited sharing

Attempts to develop new approaches but Business as usual persists (SOMER etc).

Inadequate tools (EIA rather than ESIA, SEA etc.)

Limited stakeholder engagement, limited public consultation (*a fait accompli* approach).

Geo-politics, water and food security, significant inequality play part too.

Ecosystem Approach to Managing ROPME Sea Area

Key Recommendations for EBM Strategy

Successful management will need multitude of interventions, many outside of Env sector

- common understanding of threats
- shared vision of importance of habitats, resources and services
- develop acceptance of flexible boundaries
- marine environment knowns none

Crucially: people's behaviour, understanding and relating to the marine env is the single most important item. Ownership means responsibility and a positive outcome.

Ecosystem Approach to Managing ROPME Sea Area

Key Recommendations for EBM Strategy (2)

- Greater public consultation
 - Stakeholder Engagement Plans
 - Capacity Building
 - Legal framework strengthening
 - Enhance ROPME leadership role in implementation
 - Enhance research and centres of excellence also through new partnerships with ROPME members
 - Robust, efficient and genuine (latest) data sharing
- Introduction of improved assessment tools (ESIA, SEA, MSP etc)

Ecosystem Approach to Managing ROPME Sea Area

Key Recommendations for EBM Strategy (3)

- Lessons from other regional bodies
- Trans-boundary approach to Conservation
- Monitoring Programmes: developed and funded
- Learn from 'good projects' in RSA
- Develop RSA specific ESV
- Enhance agricultural efforts for greater food security (salt tolerant crops)
- Water security: integrated water management
- Promote Eco-tourism
- Blue Carbon Economy - an excellent start and model
- Improve understanding of fisheries, water and food security needs

Ecosystem Approach to Managing ROPME Sea Area

One Last Word:

Developing an EBM strategy depends on each nation accepting full, rather than proportional responsibility, for the entire RSA. The specific tools to achieve this are a detail. What matters is the ultimate objective of an effective and efficient regional collaboration. The legacy you might leave the global community would be significant and unprecedented.

Mouth

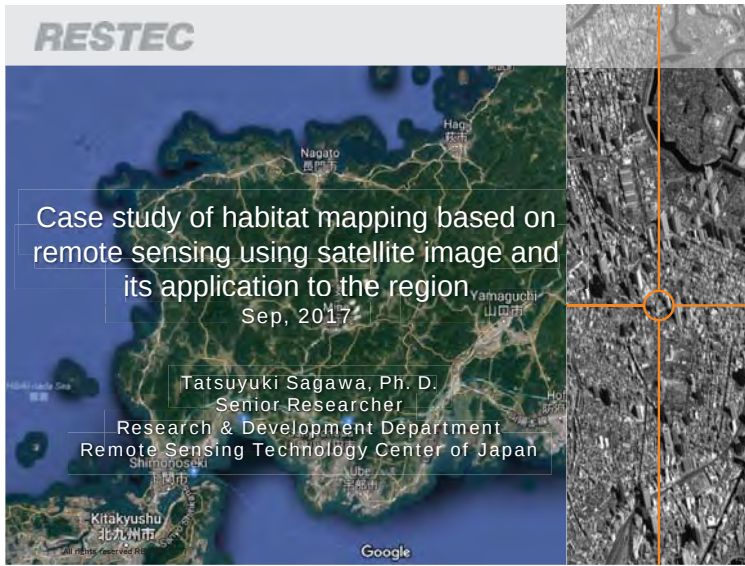


Case study of habitat mapping based on remote sensing using satellite image and its application to the region

Sep, 2017

Tatsuyuki Sagawa, Ph. D.
Senior Researcher

Research & Development Department
Remote Sensing Technology Center of Japan



Activities in Coastal Habitat Monitoring

Activities in RESTEC

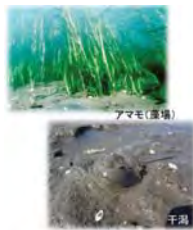
- FY2011: Seagrass and seaweed beds mapping using satellite image (JAXA).
- FY2012: Seagrass and seaweed beds monitoring project of entire the Japanese coast (Fisheries Agency).
- FY2013: Research about seagrass and seaweed beds monitoring with high spatial resolution satellite image (Watanabe Memorial Foundation for the advancement of New technology).
- FY2014-FY2017: Seagrass/seaweed beds and tidal flat mapping in Seto Inland Sea (Ministry of Environment).
- FY2013-2017: Researches in coastal mapping (RESTEC). Seagrass, seaweed, tidal flat, coral reef and bathymetry mapping methods by remote sensing. Collaboration studies with Tokyo University.

Capacity building & Education

- JICA, WESTPAC (UNESCO/IOC Sub-Commission for Western Pacific), Tokyo University, Kitazato University

Background of the Seto Inland Sea Project

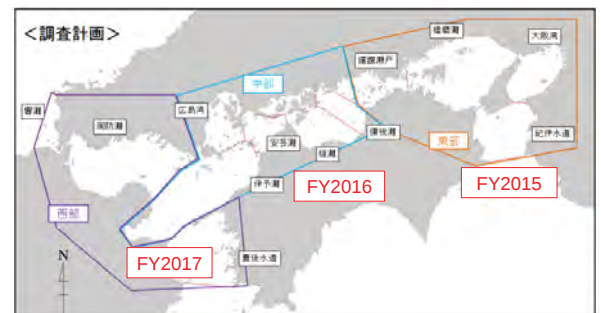
- Seto Inland Sea lies between the Japanese main islands of Honshu, Shikoku and Kyushu.
- In February 2015, a fundamental government plan for environmental conservation of Seto Inland Sea was modified and promotion of activities for conservation of sound coastal habitats was added which included seagrass beds, seaweed beds and tidal flats.
- To understand the current distribution and area of the Set Inland Sea coastal habitats objectively and quantitatively, the research has been conducted from FY 2015 by using satellite remote sensing technology.



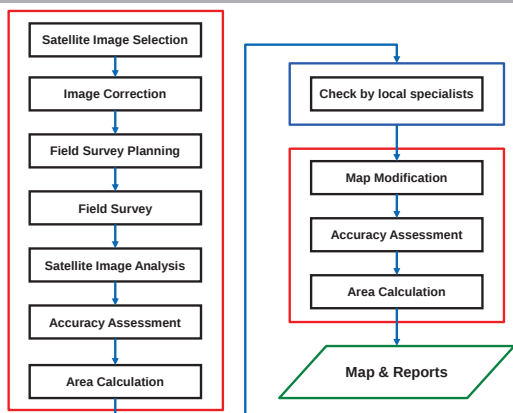
< HP Ministry of the Environment >

Outline of the project

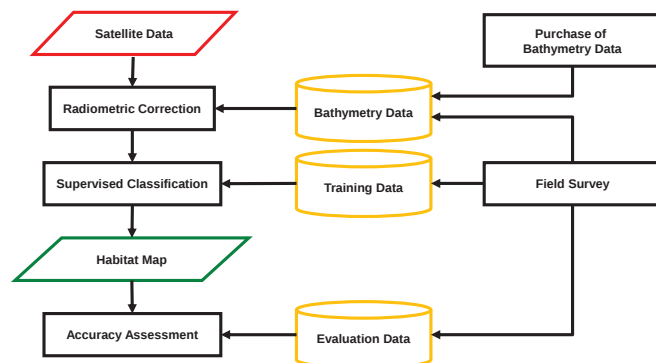
- Project term: FY2015-2017
- Objective: Mapping seagrass, seaweed, tidal flats and calculation of area.



Project Flow



Satellite image analysis and required data



RESTEC

Remote Sensing Technology Center of Japan

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5

RESTEC

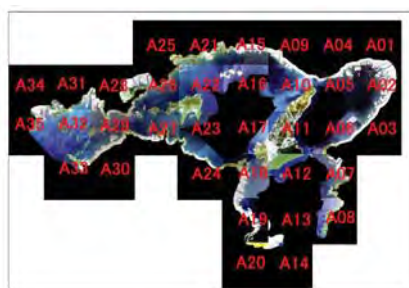
Remote Sensing Technology Center of Japan

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6

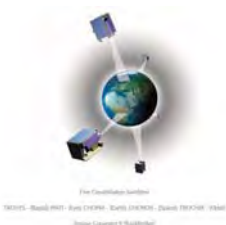
Satellite image data

- Satellite: RapidEye
- Selected term: data observed within 3 years, growing season, cloud free, low turbidity
- AOI(Area of Interest): approx. 7,000 km²



FY 27 Area

Satellite Sensor: RapidEye
Bands: 5 bands in visible and near infrared wavelength
Spatial resolution: 6.5 m
Pixel size: 5 m



Satellite data for coastal habitat mapping

- High spatial resolution is required for habitat mapping
- Observation width is also important for large scale mapping

Satellite Sensor	LANDSAT-8 (OLI/Multi)	SPOT6/7 (Multi)	RapidEye (Multi)	IKONOS (Multi)	WorldView-2/3 (Multi)
Bands	8(Visible 4, Near-infrared 1, SWIR 3)	4(Visible 3, Near-infrared 1)	5(Visible 4, Near-infrared 1)	4(Visible 3, Near-infrared 1)	8(Visible6, Near-infrared 2)
Spatial Resolution (Pixel Size)	30 m	8 m	6.5 m	4 m	1.84 m / 1.24 m (2 m)
Dynamic Range	12 bit	12 bit	12 bit	11 bit	11 bit
Observation width	1,400 km	60 km	77 km	11 km	16 km
Launched year	2013/02	2012/09 (SPOT-6) 2014/06 (SPOT-7)	2008/8	1999/9	2009/10
Price	Free				

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Broad-Scale Mapping

Macro-Scale Mapping

Satellite data for coastal habitat mapping

- Following Images are obtained over the Oura bay in Japan. Seaweed beds distribute on artificial reefs at the center of the images (red square area).



WorldView-2	Rapid Eye	Landsat-8
Spatial Resolution: 1.84 m Pixel Resolution: 2 m Acquisition Date: Jan/2011	Spatial Resolution: 6.5 m Pixel Resolution: 5 m Acquisition Date: Dec/2011	Spatial Resolution: 30 m Pixel Resolution: 30 m Acquisition Date: 2016

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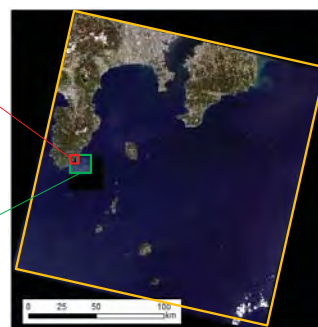
9

Satellite data for coastal habitat mapping

WorldView-2:
Minimum
purchase area
25km²

RapidEye:
Minimum
purchase area
500km²

Landsat-8: 1 tile
≈ 40,000km²



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Satellite data for coastal habitat mapping

Selection conditions

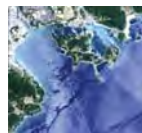
– Cloud Cover

- Select cloudless images along the coast
- < 20%



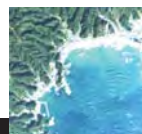
– Wave

- Select images with no or weak wave on sea surface



– Transparency

- Select high transparency images



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Field Survey

Field Survey areas

- 20 areas are selected.



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Field Survey

- Objective of field survey
 - Obtaining training data for satellite image analysis
 - Obtaining evaluation data for accuracy assessment
- Collected data
 - Surface types for classification in target area with accurate position data. UNESCO handbook* recommends 80 sites data for each class (30 for analysis and 50 for accuracy assessment) .
 - Depth data with accurate position for bathymetry analysis.
- Method
 - Aquatic video camera was used to collect surface type information and an echo sounder was used for bathymetry measurement. Observation was conducted using small survey boat equipped with GPS to collect accurate position.



*Remote sensing handbook for tropical coastal management, A.J. Edwards (eds), Paris: UNESCO.

Examples of seaweed and seagrass images

Examples of data



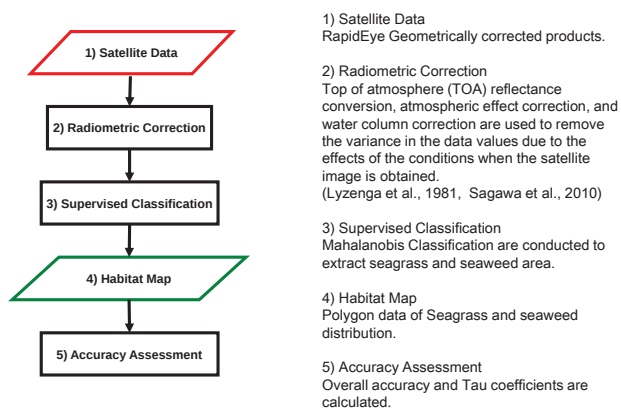
● Seaweed ● Seagrass ● Sand Each point has depth data

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Satellite Image analysis (Seagrass and seaweed area mapping)



Results: Mapping Examples

- A map showing the habitats of Yuasa, Wakayama prefecture



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Results: Total Area

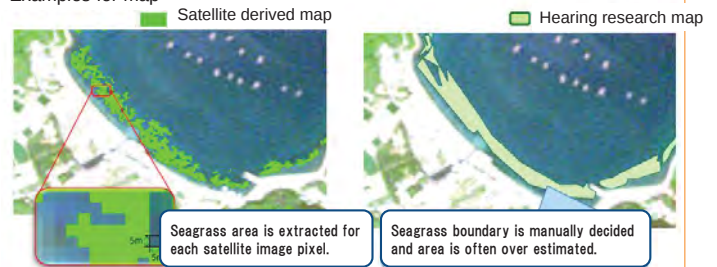
- East part of Seto Inland Sea area was mapped in FY2015.

Area name	Seagrass/seaweed (ha)	Tidal flat (ha)
海域	岸地面積 (ha)	干潟面積 (ha)
紀伊水道	和歌山県	185
	兵庫県	358
	徳島県	257
	計	800
大阪湾	和歌山県	44
	大阪府	97
	兵庫県	195
	計	335
播磨灘	兵庫県	289
	岡山県	510
	香川県	583
	徳島県	13
	計	1,395
備讃瀬戸 ※	岡山県	846
	香川県	543
	計	1,389
Total	3,920	1,023

Difference from previous research

- It is difficult to compare a satellite derived map with a hearing research map (previous map).
- Continuous update of a habitat map by satellite remote sensing is important for monitoring and conservation.

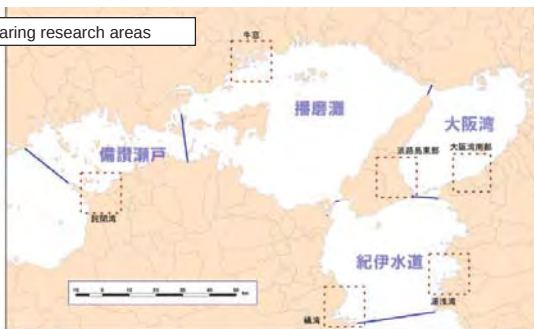
Examples for map



Difference from previous research

- Hearing research was also conducted in 6 areas to compare with previous maps.
- Seagrass/seaweed area increased 40 % and Tidal flat area increased 4 %.

Hearing research areas

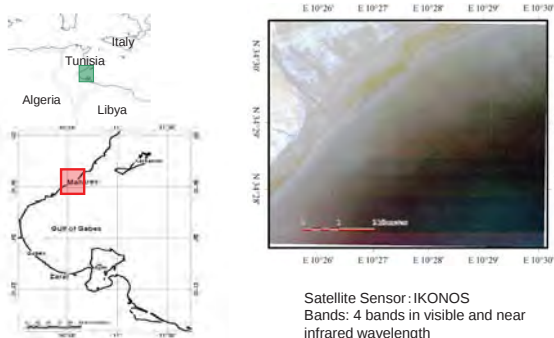


Summary of East part of Seto Inland Sea Project

- Habitat maps were created by satellite remote sensing for the East part of Seto Inland Sea. Overall Accuracies over 80% for both seagrass/seaweed map and tidal flat map.
- Seagrass/seaweed area was 3,920 ha and tidal flat area was 1,023 ha.
- Seagrass/seaweed area increased 40 % and tidal flat area increased 4 % based on hearing research.
- Continuous update of habitat map by satellite remote sensing will permit us to monitor habitat distribution quantitatively and accurately.

Mapping Examples

- Examples for seagrass mapping in Tunisia (JICA project, 2005)
- Study site and satellite data



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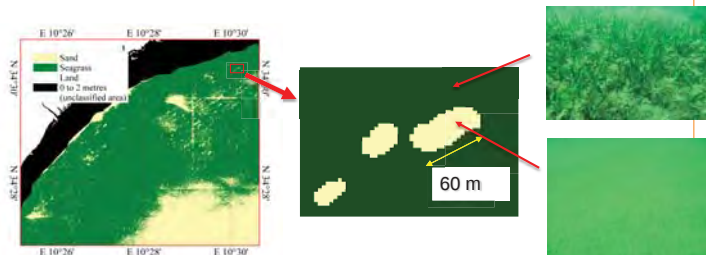
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Mapping Examples

- Examples for seagrass mapping in Tunisia (JICA project, 2005)
- Seagrass map and detection of damages



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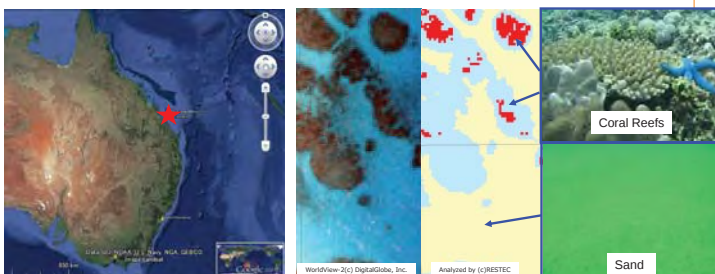
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Mapping Examples

- Examples for coral reefs mapping (RESTEC research, 2016)
- Site: Heron / Australia
- Satellite Sensor: WorldView-2
- Field data: Refer to the reference of Goodman et al. (2013)



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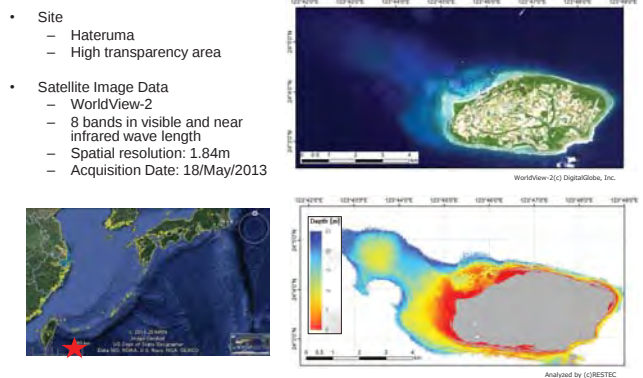
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Mapping Examples

- Examples for bathymetry mapping (Japan Hydrographic Association, 2015)



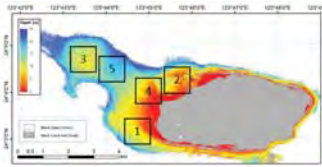
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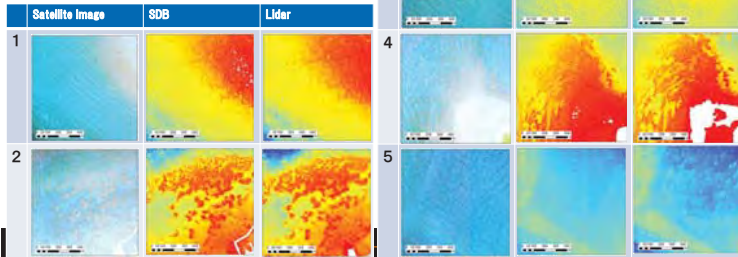
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Mapping Examples



Satellite derived bathymetry (SDB) VS Lidar bathymetry



Practice in Oman



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Sample location (Bandar Al Khairan)



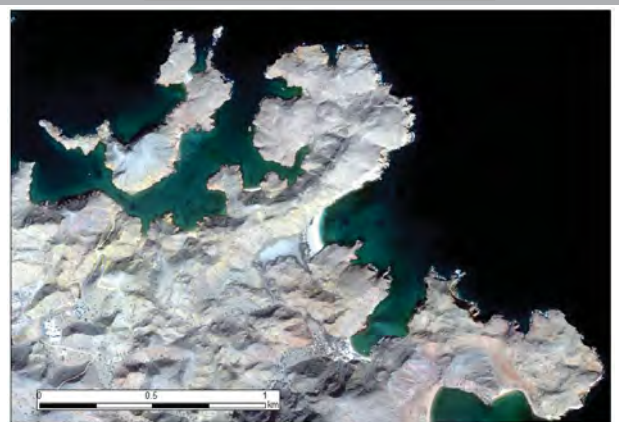
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WorldView-3 in Oman



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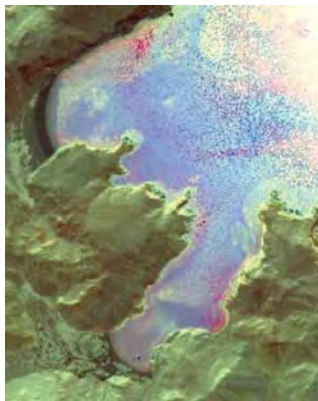
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water column correction: DII



True Color



DII composite

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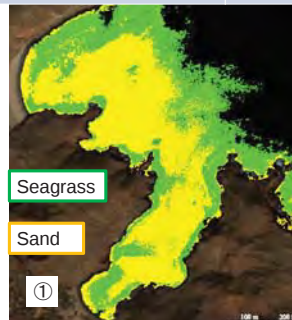
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Classification results

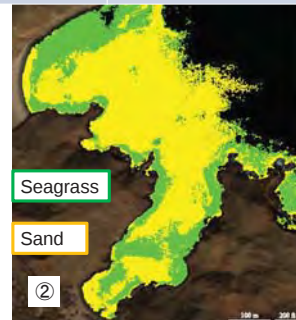
Method	1	2
Water column correction	-	DII
Classification	Maximum Likelihood	Maximum Likelihood
Overall Accuracy (%)	78.0	94.6



Seagrass

Sand

①



Seagrass

Sand

②

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Site Visit



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Field information



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Field information



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Field information



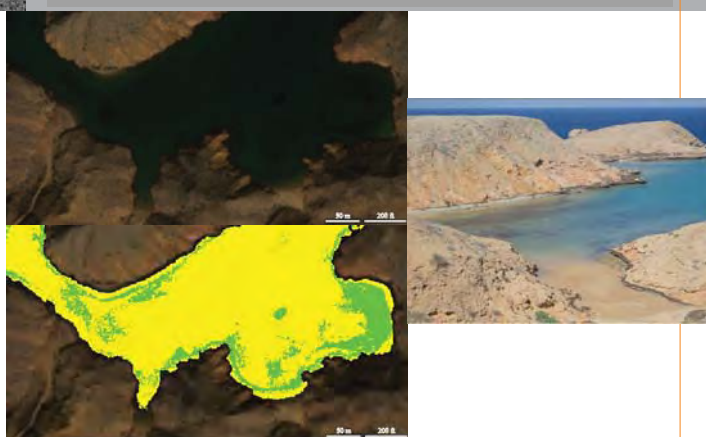
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Classification result & Field information



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Field information



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Field information



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Introduction of New Technology

- Cloud Data Base & Cloud Machine
 - Google and Amazon have cloud satellite image data base.
 - Google has almost 1 petabyte of Landsat data in 29 years.
 - Remote sensing analysis based on cloud database and cloud machine will be standard in near future.



Google Earth Engine (GEE)



Application Example of GEE
(GLOBAL FISHING WATCH)

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Landsat-8 on Google Earth Engine



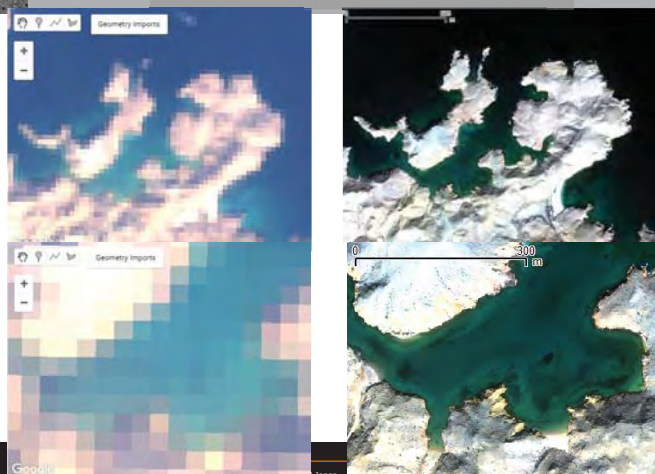
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Landsat-8 VS WorldView-3



Google

Japan

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Landsat-8 VS WorldView-3



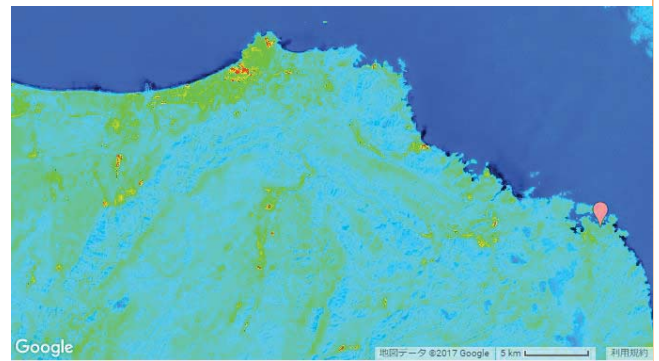
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NDVI of Landsat-8



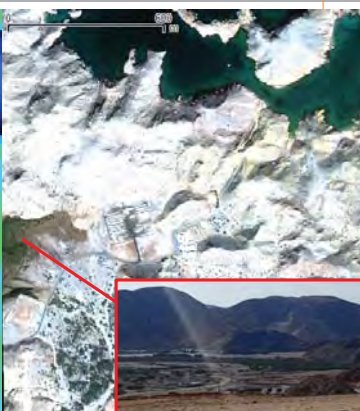
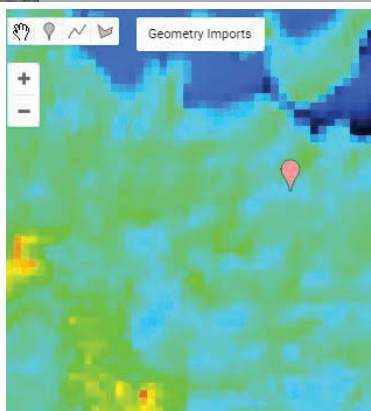
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NDVI of Landsat-8



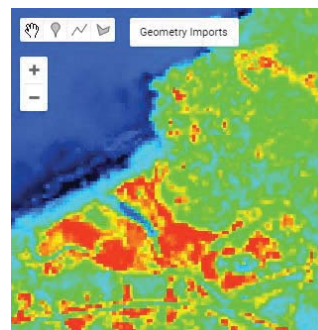
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NDVI of Landsat-8 (QURUM)



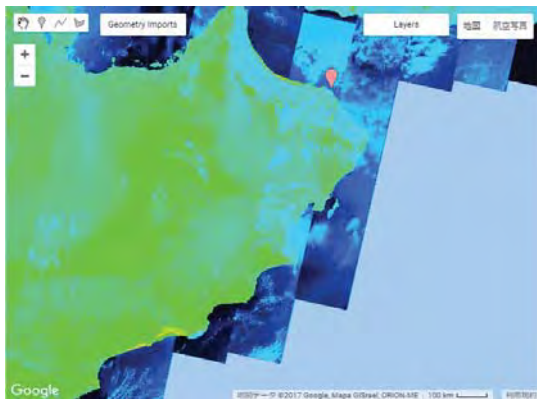
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NDVI of Landsat-8



Suggestion to the mapping project

- Satellite Image
 - High resolution images such as WorldView-3 or RapidEye are recommended for accurate mapping. But analysis using such images requires much cost. Free satellite images such as Landsat-8 or Sentinel-2 are also used in habitat mapping researches.
- Training Data
 - It is desirable to obtain training data set for each satellite image but it requires much effort. Visual interpretation is also useful for data compensation.
- Bathymetry Data
 - Water column correction by bottom reflectance Index using bathymetry data is recommended for improving mapping accuracy.
- Analysis Tool
 - ENVI, ArcGIS or IMAGINE are useful commercial software packages.
 - Free tools such as QGIS, Bilko or programming by C, Java, R or Python are also useful.

RESTEC contribution

- Coastal Habitat Mapping Products
 - RESTEC is ready to provide mapping products.
 - Field survey data also required depends on mapping quality.
- Standardization of the mapping method
 - RESTEC is very experienced with coastal habitat mapping and can give valuable expertise input from the point of view of remote sensing technology.
- Software Development
 - RESTEC has own coastal analysis software (CMOBAH). CMOBAH has developed to support for our daily tasks which includes many general analysis functions. We could give support for developing suitable analysis software for ROPME purpose using our technology.
- Capacity Building
 - RESTEC could support capacity building about remote sensing technology of coastal mapping.

Thank you for your attention!

17 CBD COP13

Report on the Side Event on CBD COP 13

(December 15th 2016, Cancun Mexico)

December, 2016

JICA Study Team

1. Outline of the Side Event

During CBD COP13, JICA held a side event in cooperation with ROPME and UNEP.

The outline of the side event is as follows:

Date: 15th December 2016.

Time: 18:15-19:30

Venue: The Moon Palace Hotel, Cancun, Mexico

Universal Building Main Floor, Contact Group 6 Meeting Room

Number of audience: 35

2. Background, Objectives and Programme

Background, objectives and programme are described in Appendix 1.

3. Summary of the Programme

Major discussions of each programme are summarized in Table 1.

Table 1 Summary of the discussions

Programme	Major discussions
Opening words by JICA Concept of the side event on the ecosystem approach in ROPME Sea Area	• Partnership programme between JICA and ROPME was introduced. • Cooperation between UNEP and JICA was also emphasized.
Word from ROPME (Introduction of prepared document by ROPME Secretariat)	• Concept of EBM Strategy and its approach were introduced by a prepared document.
Presentation UNEP support to the development of a ROPME Ecosystem Based Management Strategy	• UNEP's support on the ecosystem approach to the regional seas based on the SDGs was introduced. • Multi-sectoral cooperation approach was introduced. • Technical input by UNEP and JICA to EBM Strategy of ROPME was explained.
Presentation Challenges and practices for coral conservation based on the ecosystem approach in Kuwait	• Kuwait's challenge on coral conservation was introduced. • Importance of improvement of legislation system and environmental education to tackle the challenge was emphasized.
Presentation Conservation of coastal ecosystem (Coral	• Oman's challenge on coral and mangrove conservation was introduced.

Programme	Major discussions
Reef, Mangrove) in Sultanate of Oman	• Plan of mangrove environmental information centre, cooperated by JICA, was introduced.
Q & A	• Methodology of mangrove plantation to apply Philippine's environment was discussed. • Countermeasures on crown-of-thorns were discussed. • Objective of the EBM Strategy was questioned.
Panel discussion Harmonization of the regional strategy and national approaches for the ecosystem approach in the ROPME Sea Area and how to contribute to Aichi Biodiversity Target	• JICA's cooperation policy to the ROPME EBM Strategy was discussed. • Common challenges in the RSA, realized in the Tokyo Seminar (October 2016) were introduced. • And the approach to the EBM Strategy based on the common challenges, in cooperation with three (3) international organization, ROPME, UNEP and JICA, was emphasised.

4. Conclusion

(1) General overview

Although the number of audience was expected small, since the date of the side event was almost end of the period of the conference and the time was at night, about 35 audience (75% of the room capacity) participated. And enthusiastic questions regarding ecosystem management to adapt to own country were raised.

The ideas of ecosystem based management seemed to have impressed and thus, the purpose of the side event, to introduce the JICA's cooperation on EBM Strategy, is considered as achieved.

(2) Challenges for the next international event

Based on the experience of the side event this time, several challenges listed below, for the next event if necessary, were realized.

- The earlier timing of the side event through the entire conference period the better, because the number of audience is considered greater.
- The earlier time of the day the better, because the audience has energy to participate and listen to the event seriously.
- Providing goods (e.g. Sticker, bag, pen, etc.) and catering (e.g. Beverage, light meal) shall be seriously considered to attract the audience.
- Flyer (the simpler the better) shall be distributed as much as possible before the side event, using the opportunity of other side events and conference party meetings.

END

Side Event at the CBD COP 13

Coordinated by Japan International Cooperation Agency (JICA)

Ecosystem Approach in the ROPME Sea Area

(15 December 2016, Cancun, Mexico)

1. Background and Objectives

The ROPME (Regional Organization for Protect of Marine Environment) consisting of 8 member countries, Kingdom of Bahrain, Islamic Republic of Iran, Republic of Iraq, State of Kuwait, Sultanate of Oman, State of Qatar, Kingdom of Saudi Arabia and United Arab Emirates, and the ROPME Sea Area (RSA) is located in subtropical zone surrounded by arid land masses. It has a rich marine biodiversity, including mangroves, seagrasses, and coral reefs. Mangroves and coral reefs of the RSA provide habitats for hundreds of marine species. Underpinned by the biodiversity, the ecosystems provide people in the region with their essential services, including provision of desalinated water, fisheries, aquaculture, minerals, recreation and tourism.

However, the fragile ecosystems in the RSA are exposed to numerous natural and anthropogenic stresses derived mainly from climate change, dust storms, pollution, overfishing and intensive coastal reclamation.

At CBD COP9, Parties adopted the scientific criteria for identifying ecologically or biologically significant marine areas in need of protection in open-ocean waters and deep-sea habitats (EBSA) (decision IX/20). Further, following decisions XI/7 and XII/22, regional workshops to facilitate the description of areas that meet EBSA criteria have been organized, including in the North-West Indian Ocean and Adjacent Gulf Areas.

Parties, other Governments and competent intergovernmental organizations have been encouraged to cooperate collectively to identify and adopt appropriate measures for conservation and sustainable use in relation to EBSAs (decision X/29).

Under such circumstances, JICA has started a partnership program with ROPME in 2015 to cope with marine environmental challenges in the RSA through promotion of regional cooperation among ROPME member states.

With the involvement of UNEP as a “Triangular Co-operation”, ROPME, UNEP and JICA are now jointly working on the development of the regional Ecosystem Based Management (EBM) Strategy.

Thus, we would like to share the approach to developing the EBM Strategy in the RSA, and the practical actions against regional and national challenges. After presentation of the outline of JICA's activities and ROPME's targets of the EBM strategy, regional and national challenges of marine ecosystem will be introduced by ROPME member states. Finally, a panel discussion on the cross sectoral approaches and contribute to Aichi Biodiversity Target (e.g. Target 10: minimization of multiple anthropogenic pressures on marine coastal ecosystems in the RSA) will be conducted with joining an expert of UNEP.

2. Date and Venue

Date: 15 December, Thursday, 2016

Time: 18:15-19:30

Venue: Contact Group 6 Meeting Room, Universal Building main floor.

3. Programme (time allocation should be considered)

Time	Contents
18:15-18:20 5 min.	1. Concept of the side event on the ecosystem approach in ROPME Sea Area By <u>Ms. Kanako ADACHI</u> , Japan International Cooperation Agency (JICA)
18:20-18:25 5 min.	2. Introduction of ROPME and EBM Strategy (Document distribution)
18:25-18:35 10 min.	3. United Nations Environment Programme support to the development of a ROPME Ecosystem-based Management Strategy By Mr. Takehiro Nakamura, United Nations Environment Programme (UNEP)
18:35-18:45 10 min.	4. Challenges and practices for coral conservation based on the ecosystem approach in Kuwait By Dr. Fahad Alajmi, Environment Public Authority (EPA) State of Kuwait
18:45-18:55 10 min.	5. Conservation of Coastal ecosystem (Coral Reef, Mangrove) in Sultanate of Oman By <u>Mr. Badar Al-Bulushi</u> , Ministry of Environment and Climate Affairs Sultanate of Oman
18:55-19:30 35 min.	6. Q & A Panel discussion on harmonization of the regional strategy and national approaches for the ecosystem approach in ROPME Sea Area and how to contribute to Aichi Biodiversity Target ✧ Chair/Facilitator: Mr. Takehiro Nakamura, UNEP ➤ Mr. Noriaki Sakaguchi, Senior Advisor, Japan International Cooperation Agency (JICA) ➤ All the speakers
75 min.	Total

Convention on Biological Diversity (CBD) Home
Page News



Local Time
(Japan Standard
Time)

17:12

Tue, 10 Jan

VIDEO ON DEMAND [play_circle_outline](#) | [Back to home](#)

Ecosystem Approach in the ROPME Sea Area

COP13-COPMOP8-COPMOP2
CANCÚN, MÉXICO 2016

INTEGRANDO LA BIODIVERSIDAD PARA EL BIENESTAR
CONVENIO SOBRE LA DIVERSIDAD BIOLÓGICA



CLICK TO PLAY VIDEO

On floor

Ecosystem Approach in the ROPME Sea Area

No documents
available

2016-12-15

We would like to share the approach to developing the EBM Strategy in the RSA, and the practical actions against regional and national challenges. After presentation of the outline of JICA's activities and ROPME's targets of the EBM strategy, regional and national challenges of marine ecosystem will be introduced by ROPME member states. Finally, a panel discussion on the cross sectoral approaches and contribution to Aichi Biodiversity Target 10 (i.e. Minimization of multiple anthropogenic pressures on marine coastal ecosystems in the RSA) will be conducted with joining an expert of UNEP.

CBD page: <https://www.cbd.int/side-events/2102>

For more information, please visit: <https://www.cbd.int/conferences/2016>

International Institute Sustainable Development
(IISD) Home Page News

Ecosystem Approach in the Regional Organization for the Protection of the Marine Environment (ROPME) Sea Area

Presented by ROPME, Japan International Cooperation Agency (JICA) and UN Environment

This event, moderated by **Takehiro Nakamura**, UN Environment, discussed the ROPME Sea Area strategy for ecosystem-based management (EBM).

Kanako Adachi, JICA, identified numerous threats to the marine biodiversity of the ROPME Sea Area and highlighted the 2014 ROPME/JICA Memorandum of Understanding to promote data collection surveys in member states, hold international seminars and regional workshops to promote ecosystem protection, and support bilateral technical cooperation.

Nakamura described EBM as a strategy for integrated management of land, water and living resources to ensure sustainable delivery of ecosystem services in an equitable way, stressing that it involves multiple sectors in relation to the marine and coastal environment. He emphasized that the ROPME/EBM strategy involves: marine ecosystems assessments; the provision of technical advice and guidance on the strategy development process; and alignment with Sustainable Development Goal (SDG) implementation.

Fahad Al-Ajmi, Environment Public Authority (EPA), Kuwait, discussed challenges and practices for coral conservation in Kuwait, including overfishing, recreational diving and coral bleaching caused by climate change. He stressed that the JICA/ROPME partnership will promote the conservation of the marine environment by: designating organizations to manage the marine environment; suggesting amendments to related policies to protect fragile coastal habitats; and linking organizations at the national and regional seas level to implement the EBM strategy.

Badar Al-Bulushi, Ministry of Environment and Climate Affairs, Oman, noted efforts undertaken by his ministry in managing and restoring coral reefs and mangrove areas, including: cleaning campaigns; educating locals; establishing diving rules and regulations; establishing nurseries to rehabilitate mangroves; collaborating with schools; developing monitoring programmes; and building a mangrove information center.

Noriaki Sakaguchi, JICA, highlighted the importance of the JICA collaboration with ROPME in collecting data to support the development of EBM strategies. He also shared experiences of coral restoration projects in Japan with the participation of government agencies, fishermen and farmers.

Yoichi Harada, JICA, identified four common challenges in the ROPME region, which the EBM strategy aims to address: sharing of marine data; environmental awareness raising; development of sustainable aquaculture techniques; and the formation of a uniform environmental monitoring system.

In discussion, participants raised, *inter alia*, the role of establishing ecologically or biologically significant marine areas for restoring coral reefs and mangroves in the ROPME Sea Area; mangrove restoration technologies; impacts of climate change on the marine environment; and methods to control the crown of thorn starfish.



(L-R): **Badar Al-Bulushi**, Ministry of Environment and Climate Affairs, Oman; **Takehiro Nakamura**, UN Environment; **Fahad Al-Ajmi**, EPA, Kuwait; **Noriaki Sakaguchi**, JICA; and **Yoichi Harada**, JICA



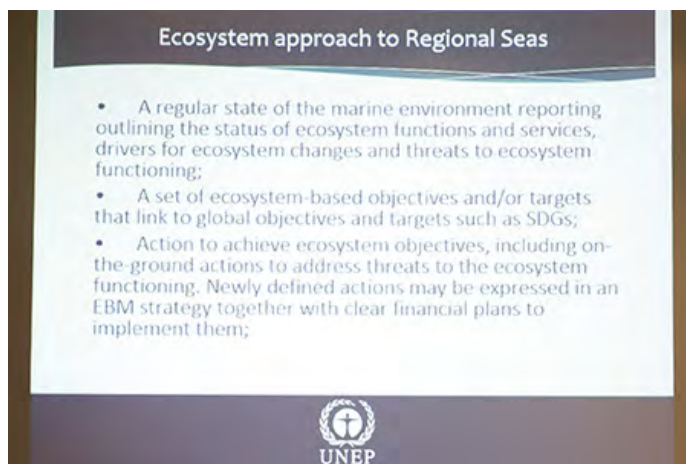
A slide from **Badar Al-Bulushi's** presentation



Badar Al-Bulushi, Ministry of Environment and Climate Affairs, Oman, noted that coastal development, wastewater discharge and grazing by domestic animals were among the threats to Oman's mangroves.



Takehiro Nakamura, UN Environment, noted that mainstreaming biodiversity in the management of the ROPME Sea Area requires a set of ecosystem-based targets that link to global objectives and targets such as the SDGs.



A slide from **Takehiro Nakamura's** presentation



Noriaki Sakaguchi, JICA, noted that coral reef restoration and management requires the participation of farmers, as sedimentation is a leading threat of reef degradation in Japan.



Fahad Al-Ajmi, EPA, Kuwait, said there is no one solution to coral reef degradation, noting it depends on the key drivers affecting the reef.



Participants during the event

Contact:

Kanako Adachi (Coordinator) | Adachi.Kanako@jica.go.jp

More Information:

<https://www.jica.go.jp/english/>



Regional EBM Strategy for ROPME Sea Area

Hassan Awad

Marine Environment Expert, ROPME

- ROPME Sea Area

The ROPME Sea Area is located in subtropical zone surrounded by arid land masses. It has a rich biodiversity including mangroves, seagrass, and coral reefs. Mangroves and coral reefs of RSA provide living space for hundreds of marine species. RSA is also rich in marine plants where four species of seagrass and 232 species of seaweeds are identified. Underpinned by the biodiversity, the ecosystems provide essential services to maintain human well-being in the region such as provisioning of desalinated water. In addition, the ecosystems support fisheries, aquaculture, minerals, shelters to marine biota /migratory fish and birds, recreation and tourism.

However, the fragile ecosystems are exposed to numerous natural and anthropogenic stresses derived mainly from climate change, dust storms, pollution, overfishing and intensive coastal reclamation.

In response to the concerns degradation of RSA shared among countries, the eight governments of the region (Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates) adopted the Kuwait Convention and Action Plan in 1978. The Regional Organization for the Protection of the Marine Environment (ROPME) was established in the following year. Since then ROPME is serving as the nerve centre for implementation of the Convention.

- ROPME Regional EBM Strategy

Based on Decision CM16/7 of the 16th ROPME Council, which stressed the importance of an integrated management stating “*Promotion of Ecosystem Based Management Approach as a Road Map towards the sustainability of the marine environment, its resources and its services, in partnership*”, the ROPME Secretariat has been promoting the implementation of the Ecosystem Based

Management (EBM) in the region. In recognition that long-term sustainability of the ROPME Sea Area (RSA) requires an integrated management, the ROPME Secretariat proposed to develop a Regional Ecosystem Based Management (EBM) Strategy.

In developing the ROPME EBM Strategy, it is crucial to consider current development in international targets with regards to oceans and seas. Of particular importance to the development of ROPME EBM Strategy would be following the most relevant SDG-14, “*Conserve and sustainably use the oceans, seas and marine resources for sustainable development*” Sustainable Development Goals (SDGs) as well as the Aichi Biodiversity Targets.

- Objective of the ROPME EBM Strategy

The objective is to develop a Regional Ecosystem-Based Management (EBM) Strategy. This region-wide EBM Strategy will set a common vision and catalyse policy coherence based on ecosystem-based approaches across sectors in ROPME Sea Area.

Within the framework of this strategy ROPME will contribute towards evidence on best practices for the management and restoration of ecosystem services in RSA for decision making, particularly towards the realization of sustainable development goals.

Implementation Mechanism

To start launching the EBM Strategy for the Region, a workshop entitled “Toward the Development of a Regional Ecosystem Based Management (EBM) Strategy for ROPME Sea Area” was held in April 2015 in Dubai, UAE in order to explore opportunities and processes for the development of a regional strategy, identifying gaps of existing policies and mechanisms. At the workshop, the representatives of Member States agreed to form a Regional Working Group for the development of the Strategy.

Subsequently, the First Working Group Meeting was held in October 2016, back to back with the First ROPME-Japan International Cooperation Agency (JICA) Seminar. During this meeting, scope and terms of reference (ToR) of the Working Group have been adopted as follow:

Scope

The Working Group will prepare a draft Regional EBM Strategy for the ROPME Sea Area to be submitted to the ROPME Council.

Membership

Each of the eight Member States will nominate members to the working group. Each Member State may designate two representatives one from environment sector and one from fisheries sector.

In addition, inter-disciplinary experts will be suggested by the Working Group or by the ROPME Secretariat to provide specific inputs.

All members will participate in the Working Group with an equal footing.

Activities

The Working Group, in relation to the development of a Regional EBM Strategy will:

1. Collect and compile information on relevant national and regional policies, plans and projects relevant to development of a future Regional EBM Strategy with particular attention to relevant EBM national and regional sectoral policies and strategies whenever possible. Initially, environment and fisheries sectors will be the focus with future participation of other sectors.
2. Identify gaps in the existing national and regional mechanisms in developing an integrated ecosystem-based and cross sectoral strategy and methods to address the gaps;
3. Prepare with the support of the ROPME Secretariat, an outline of the Regional EBM Strategy to be discussed among relevant stakeholders;
4. Conduct a consultation on the draft outline with relevant stakeholders;
5. Prepare the first draft of the Regional EBM Strategy incorporating inputs from stakeholders;

6. Prepare a proposal on potential monitoring of the Strategy and its implementation mechanisms;
7. Form a Scientific Review subgroup for the Regional EBM Strategy to review monitoring of the Strategy and its implementation mechanisms;
8. Conduct a wider public consultation on the Regional EBM Strategy in respective countries involving local authorities, academia, private sectors and non-governmental organizations;
9. Finalize the Regional EBM Strategy document to be submitted to the ROPME Ministerial Council Meeting for consideration and adoption.

Coordination and Secretariat support

-) The ROPME Secretariat shall assign a coordinator for the Regional EBM Strategy.
-) The ROPME Secretariat will function as the secretariat for the Working Group. Within the available resources, the secretariat will provide administrative and secretariat services.
-) The ROPME Secretariat will ensure that ROPME has enough resources for the Working Group.

Proposed Work Plan

In cooperation with UNEP and JICA, the development of Regional EBM Strategy for RSA will be conducted through four phases as described below:

Phase	Activity
	) Preparation of three reports on: - Inventory of existing policies, activities, projects and institutions relevant to EBM based on information provided by the countries; - Scoping study, which will identify elements for the EBM Strategy; - Ecosystem assessment and valuation in the RSA) Draft an outline of the Strategy

Phase I	) Preparation of national report on existing policies and activities related to the EBM Strategy) Organization of national inter-ministerial committees for the EBM Strategy in each Member State) Identification and analysis of stakeholders, individuals, organizations and agencies across sectors.) Identify common goals, interests and objectives
Phase II	) Organization of a training for the working group members on communication methods to facilitate the process) Organization of brainstorming meetings with decision makers on Ecosystem-Based Management.) Organization of a Regional multi-stakeholders workshop on EBM to agree on approaches for the development of an Regional EBM Strategy) Preparation of region wide assessment of state-of-the-art in the management of RSA ecosystem with identification of management gaps) Preparation of an outline for strategy (strategic framework) to be reviewed by key stakeholders) Organization of multi-stakeholders meetings to agree on a strategic framework Wider stakeholder consultation in the region (such as online-public consultation)) Establishment of a module for EBM in the ROPME integrated Information System (RIIS) for the network of professionals in the region
Phase III	) Preparation draft of the EBM Strategy) Conduct rounds of stakeholders to review the draft of the EBM Strategy) Finalization of the Regional EBM Strategy document) Submission of the EBM Strategy to the ROPME Council for adoption

Phase IV	) Development of monitoring and follow-up scheme) Application of Regional EBM Strategy) Implementation of operational strategy, follow up and monitoring.) Develop the institutional reform if needed
----------	---

Expected Outcomes/Outputs

Outcomes

-) Building capacity of national stakeholders in EBM for management of ecosystem.
-) Identify barriers, difficulties in the implementation of ecosystem approach
-) Adaptation of UNEP concept of ecosystem approach; develop regional concept and approach for ROPME Sea area
-) Provoke institutional changes in management of environment based on the Regional EBM Strategy.
-) Improve the monitoring programme guided by the Regional EBM Strategy
-) Paving the road for national replication of EBM
-) Promote a regional replication of application of ecosystem approach in other working regional organizations.

Outputs

-) A scoping study analyzing existing EBM mechanisms, policies and activities as well as their gaps in ROPME area.
-) A strategic framework for Regional EBM Strategy
-) Final Regional EBM Strategy document
-) Final workshop reports

Sea Area

United Nations Environment Programme
support to the development of a ROPME
Ecosystem-based Management Strategy

Takehiro Nakamura
Chief, Marine and Coastal Ecosystems
Unit, UNEP



Regional Seas Conventions and Action Plans

Established in 1974; 146 countries; 18 Regional Seas Conventions and Action Plans, 7 administered by UNEP

Provide a legally binding framework to protect the marine environment at the regional level

Governed by member states

Main objectives are to address the degradation of oceans and seas through the sustainable use and management of the marine environment

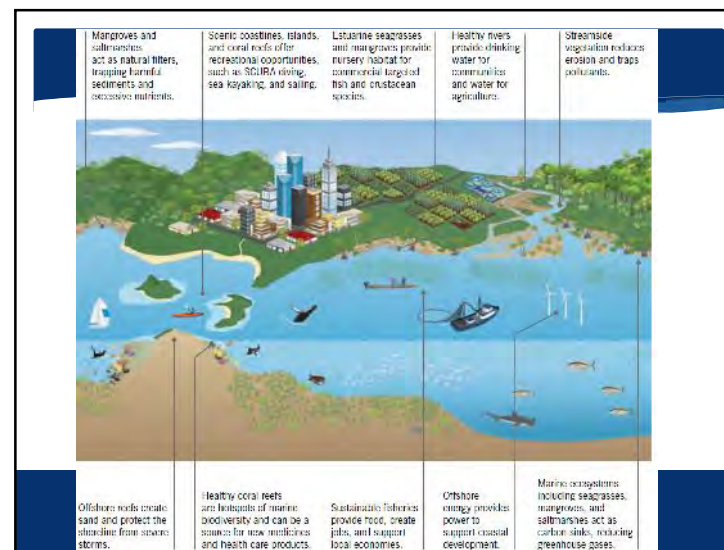
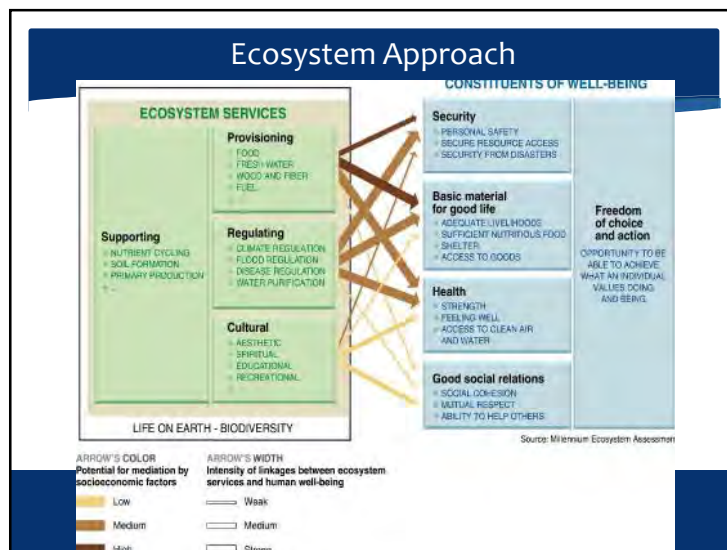
Promotes the implementation of cross cutting policies fostering transboundary cooperation amongst countries



Ecosystem Approach to Regional Seas

- Ecosystem approach – a conceptual framework incorporating human activities at sustainable levels as an accepted element of ecosystem functioning; a strategy for the integrated management of land, water and living resources that provides sustainable delivery of ecosystem services in an equitable way.
- Ecosystem services – the benefits human populations derive, directly or indirectly from ecosystem functions.
- Ecosystem approach to Regional Seas – incorporating the ecosystem approach to Regional Seas mechanisms





Incorporating Ecosystem Approach



Current programme

- ↓ Ecosystem-based assessment (ecosystem-based indicators, etc.)
- Valuation of ecosystem services, cost-benefit analysis
- Use of economic instruments (PES, conservation trust fund, etc.)
- Use of policy instruments (coastal law, EIA, SEA, etc.)
- Stakeholder engagement (ecosystem based trade-off analysis, etc.)
- Integrated planning and management tools (MPA, MSP, ecosystem restoration, etc.)
- Climate change proofing (blue carbon, Ecosystem-based Adaptation)
- Action Programming (Strategic Action Programme, national action programmes)
- ↓ Prompting sectoral change (fisheries, tourism, navigation, etc.)
- Monitoring and Evaluation

Integrated, ecosystem-based programme

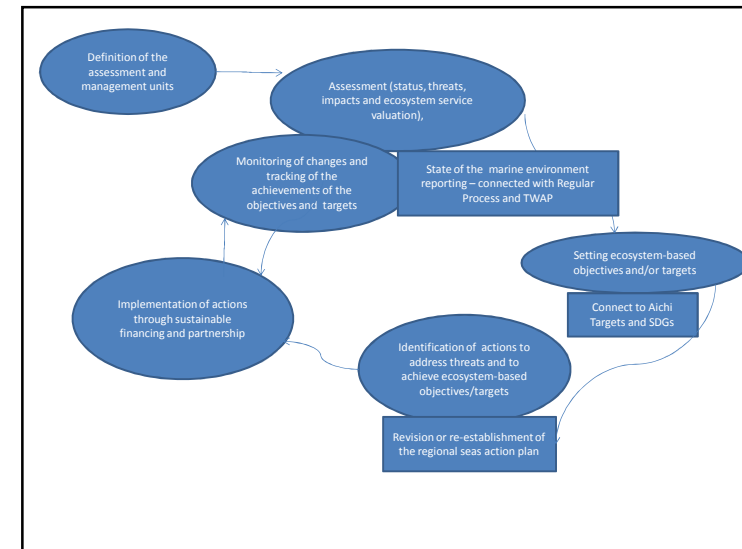
Ecosystem approach to Regional Seas

- A regular state of the marine environment reporting outlining the status of ecosystem functions and services, drivers for ecosystem changes and threats to ecosystem functioning;
- A set of ecosystem-based objectives and/or targets that link to global objectives and targets such as SDGs;
- Action to achieve ecosystem objectives, including on-the-ground actions to address threats to the ecosystem functioning. Newly defined actions may be expressed in an EBM strategy together with clear financial plans to implement them;



Ecosystem approach to Regional Seas

- Establishment of a regionally relevant and integrated system of monitoring of changes in ecosystem quality and functions based on selected sets of environmental and socio-economic indicators possibly linked with global indicators such as SDG indicators; This system tracks the status of achieving the ecosystem based objectives/targets through an agreed set of indicators; and
- Sectors that have impacts on the ecosystem functions will be addressed and partnerships with these sectors may be developed.



Sustainable Development Goals

- “Transforming Our World: The 2030 Agenda for Sustainable Development” was adopted in September 2015.
- New agenda for sustainable development: 17 Sustainable Development Goals with 169 associated targets.
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Any ROPME EBM Objectives and/or Targets should be aligned with SDGs.



ROPME EBM Strategy

- ROPME member States decided to develop an Ecosystem-based Management Strategy. UN Environment Programme and Japan International Cooperation Agency support this initiative.
- A multiple sectoral cooperation approach and as the first step to work closely with the fishery sector, particularly RECOFI (Regional Commission on Fisheries).
- ROPME Working Group on EBM strategy – UNEP and JICA provide technical input



Ongoing work

- Inventory of existing national and regional policies and activities
- Marine ecosystems assessment
- Scoping study of the ROPME EBM strategy
- UNEP providing technical advice, technical information/data and guidance on the strategy development process;
- UNEP endeavours to ensure alignment of this process with the SDG implementation processes.



www.unep.org





Challenges and practices for coral conservation based on the ecosystem approach in Kuwait

Dr. Fahad Alajmi






Introduction

- The state of Kuwait resides in a very harsh region.
- Water temperature raises and plummets during different seasons.
- The environmental variability are outside the range of typical tropical reefs with Temperatures reaching 31°C and the salinity is generally 40 ppt.

- # Introduction
- The state of Kuwait resides in a very harsh region.
 - Water temperature raises and plummets during different seasons.
 - The environmental variability are outside the range of typical tropical reefs with Temperatures reaching 31°C and the salinity is generally 40 ppt.

Yet we have
Coral Reefs

المنطقة المرجانية
Filinging Reef
المنطقة المرجانية
Patch Reef

المنطقة المرجانية
Coral Reef Areas

Source: IFA, Kuwait
This map was developed by the author. All information
provided herein may be subject to change without notice.
No warranty is made by the author. No liability shall be
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Environmental Information Center of Kuwait
www.emisk.kw

Conservation efforts



Coral transplantation



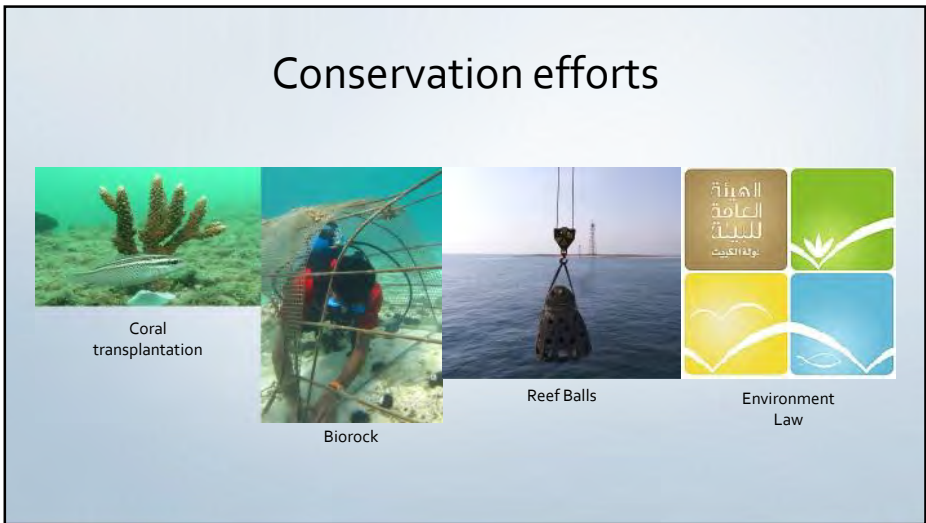
Biorock



Reef Balls



Environment Law



Conservation efforts



Coral transplantation



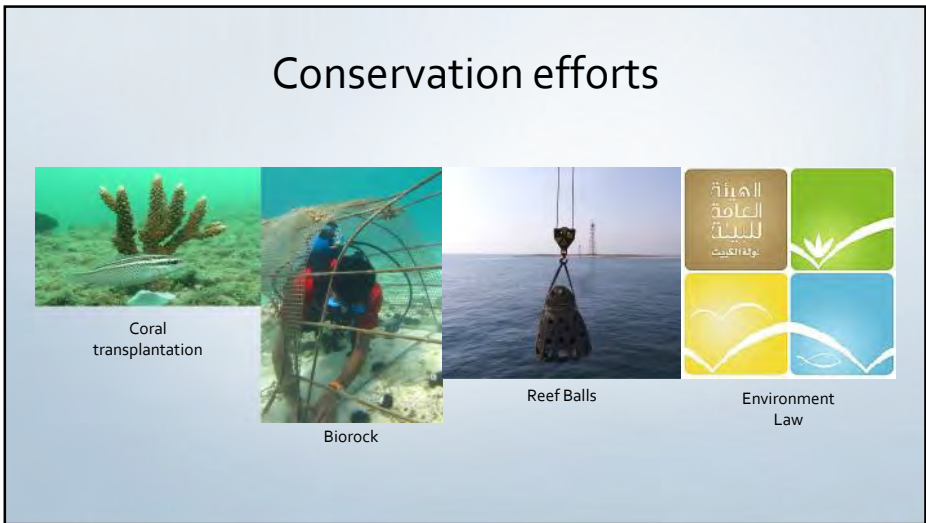
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Reef Balls



Environment Law



Conservation efforts



Coral transplantation



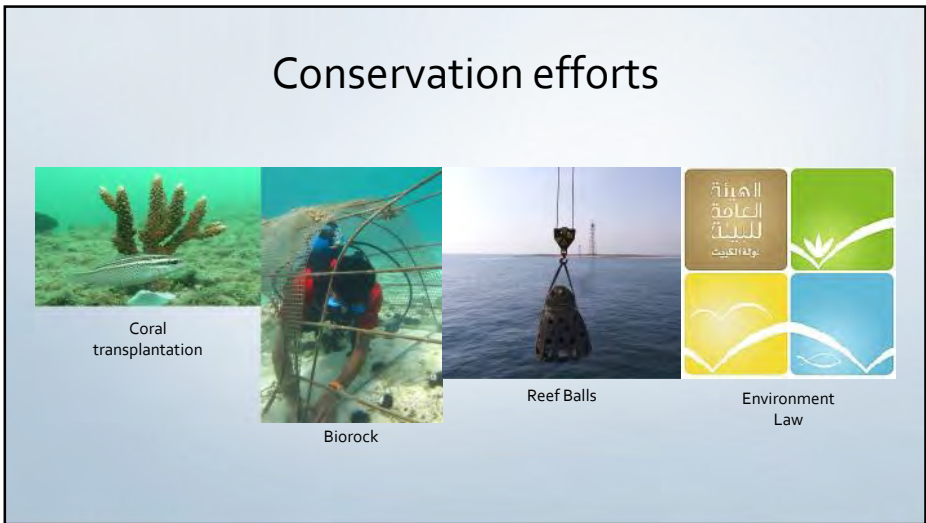
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Reef Balls



Environment Law



Conservation efforts



Coral transplantation



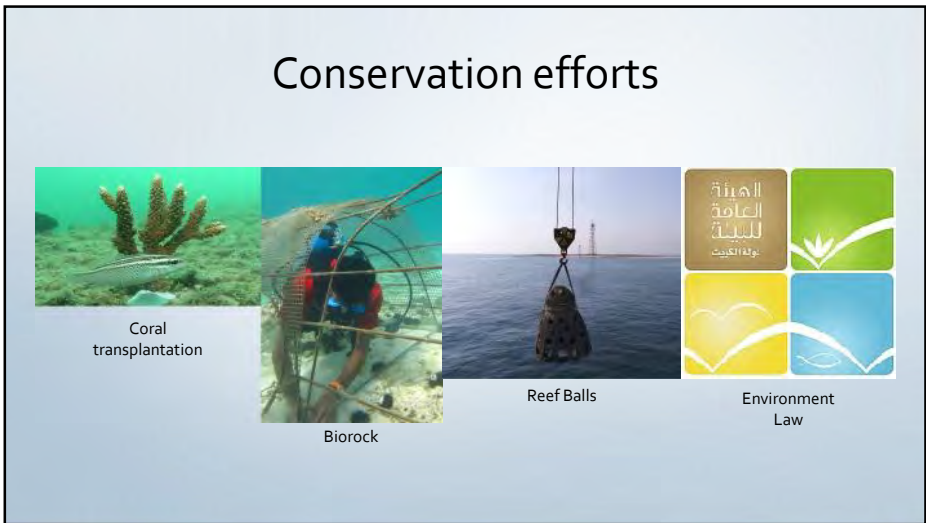
Biorock



Reef Balls



Environment Law



Conservation efforts



Coral transplantation



Biorock



Reef Balls



Environment Law

Existing and Future Challenges



Fishing.
Recreational Diving.
Navigation.
Defense (Coast Guard).
Research.
Climate Change (Bleaching).

Existing and Future Challenges



Legislations.
Politics.
Public Perception.
Economy.
Development.

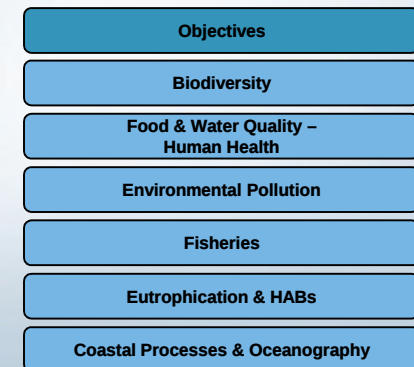
Current Practices

National Plan for
Marine Environmental
Management



Current Practices

National Plan for
Marine Environmental
Management



Current Practices



Future

- Identify resources and services provided by the marine environment.
- Designating organizations to manage sectors of the marine environment based on the EBM strategy.
- Identifying gaps within the EBM strategy and overlapping organizational sectors.
- Amending related policies and procedures to provide protection to fragile and degraded habitats.
- Linking all organizations to implement the EBM strategy on national level then RSA level.

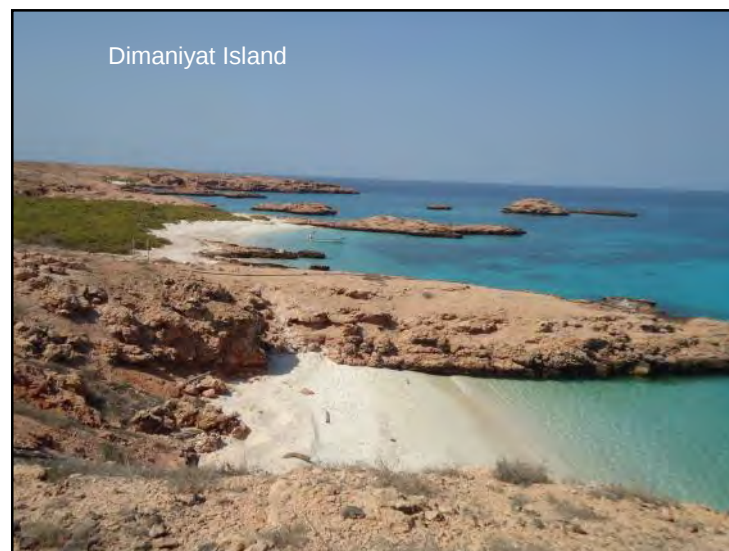
Thank You



Conservation of Coastal ecosystem (Coral Reef, Mangrove) in Sultanate Of Oman

Badar Al Bulushi
Head Of Environmental Wetland
Ministry of Environment & climate Affairs

Areas of Major Coral Reef growth in Sultanate of Oman



Coral Reef

- The Coral Reef is apopulations of stony corals which continues to build on products own making .
- Coral Reef have a worldwide distribution in the Atlantic , Indian , pacific Oceans .

The Ecological importance of Coral Reef

- Coral Reef are also know to be good Nursery grounds for many fish As there is plenty of food available and plantey of refuge from predators .



- Coral Reefs generally have specific requirements for :

- 1- Light
- 2- Temperature
- 3- Salinity
- 4- Oxygen

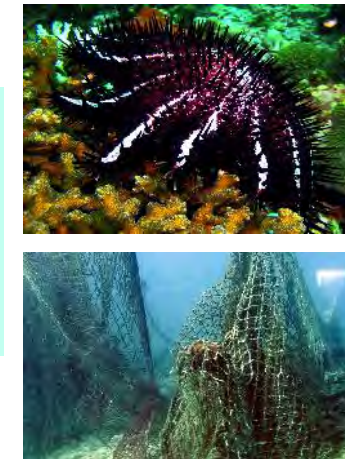


Threats to Coral Reef

- Careless boating , diving , snorkeling and touching reefs , stirring up sediment , collecting coral , Diseases and dropping anchors .
- Climate change : corals reef cannot survive if the water Temeperature is too high , Global warming has already led to increased of coral bleaching



- Starfish – crown of thorns
- Pollution : Urban and industrial waste , Sewage , oil pollution , fishing Net.



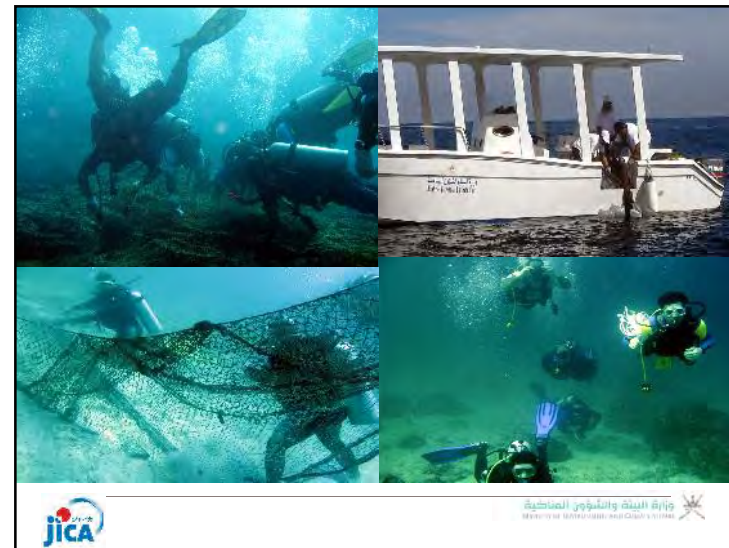
Also Marine Mammals



Efforts of MECA in Management and Restoration of coral reef



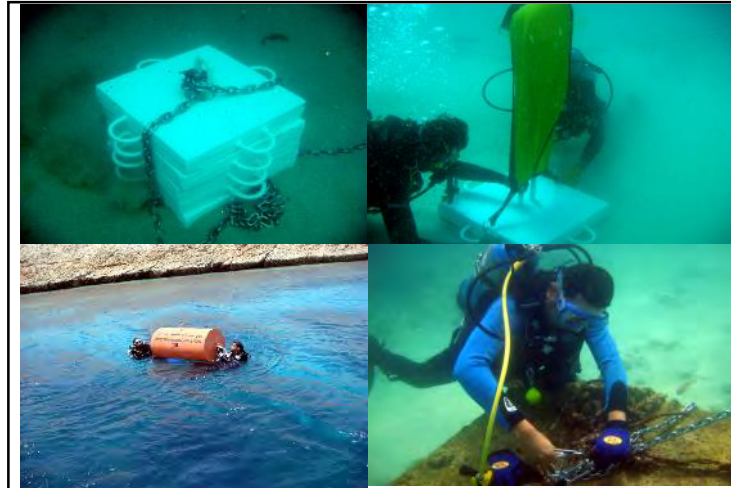
Coral Reef clean up Campaigns



Mooring Buoys



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Ministry of Environment & Climate Affairs

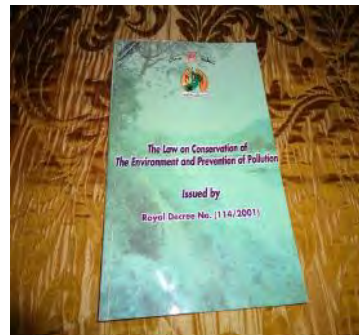


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Ministry of Environment & Climate Affairs

Educate Locals



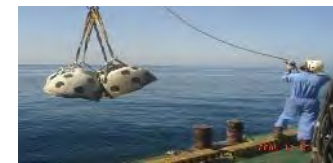
Diving rules & regulation



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Ministry of Environment & Climate Affairs

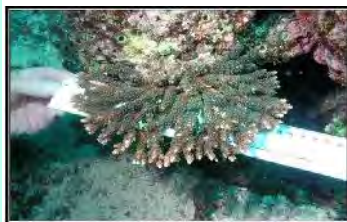
Artificial Coral Reef (reef balls)

- Artificial reefs have been used in rehabilitation of damaged reefs the improvement of fisheries and the creation diving site .



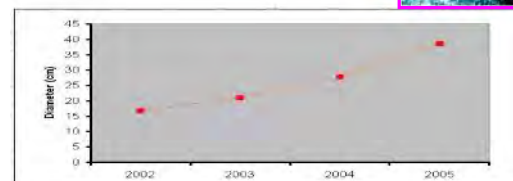
وزارة البيئة والمناخ
Ministry of Environment & Climate Affairs

- Deployment of 40 Artificial reef balls structure since 1998 around Fahal Island .
- Data for Horizontal growth of colony shows good growth (25mm $\pm$ mo) in first month measured, then the same slowing of growth (6.3mm $\pm$ mo) over the winter months October to march .



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Ministry of Environment and Urban Planning

Acropora arabensis (top colony S4, Fahal Island)



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Ministry of Environment and Urban Planning



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Ministry of Environment and Urban Planning



What is The Mangrove

Mangroves are subtropical/tropical trees that grow in sheltered coastal areas along the intertidal zone, where it is often muddy and regularly inundated by seawater. While most trees cannot survive in such environment due to high salinity and low-oxygen soil conditions, mangroves have developed various ways to grow in such stressful environment. Worldwide, there are over 100 species of mangrove, but only one species grow naturally in Oman, which is *Avicennia marina*.



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Major Mangrove forest in Oman

- 1. Shinas
- 2. Khawr Halmour
- 3. Qurm
- 4. Bandar Khayran
- 5. Quriyat
- 6. Sur
- 7. Khawr Jaramah
- 8. Mahawt Island
- 9. Salalah



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Benefits of Mangrove

- Protect the khawr from flooding and erosion .
- Using their Timber for building house, boats, fencing, paper.
- Mangrove leaves use us fodder for livestock.
- **Reduction of atmospheric Co2 levels by fixing Carbon.**



وزارة البيئة والمناخ
Ministry of Environment and Climate Affairs

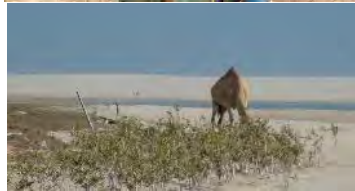
- It is major spawning nursery and breeding habitat for commercial fishery species and prawns.
- Important site for habitat birds



وزارة البيئة والمناخ
Ministry of Environment and Climate Affairs

Threats to mangrove ecosystem

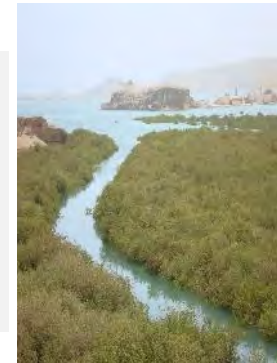
- ❑ Coastal development .
- ❑ Wastewater Discharge .
- ❑ Dumping of waste .
- ❑ Grasing by Domestic animals , cutting
- ❑ Disease .



وزارة البيئة والتغير المناخي
Ministry of Environment and Climate Change

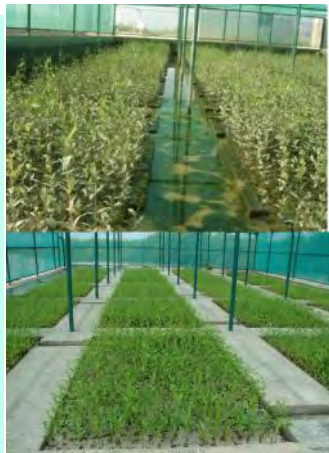
Efforts of MECA on conservation and Management of Mangrove forest

In December 2000 the MECA requested the government of **Japan** for a new mangrove project , the Japanese Government dispatch a scope of work Mission in January 2002 , based on agreement between Ministry and Jica .



وزارة البيئة والتغير المناخي
Ministry of Environment and Climate Change

- In 2000 the first Nursery are established in QNR in Muscat which is one of the richest mangrove areas in Oman .
- In 2001 the ministry establish anther Tidal irrigation Mursery in QNR .
- May 2002 anew Nursery was establish in Khawr Al Batiah in Sur .
- July 2002 the last Nursery was established in Dhofar in khawr Al Qurm Al Kabeer .



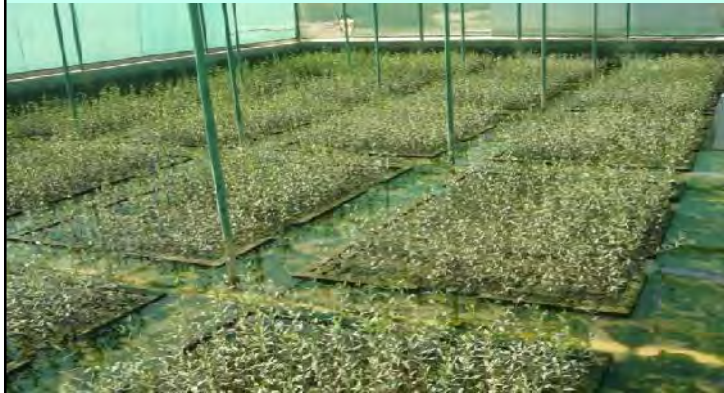
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Pump Irrigation



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Tidal Irrigation



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Muscat



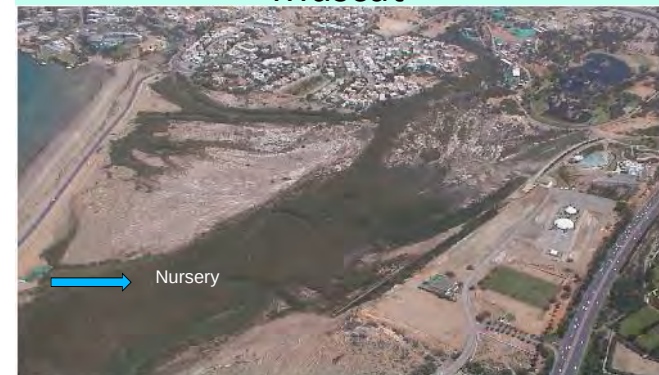
Sur

Salalah



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Ministry of Environment and Climate Change

An Aerial photograph of QNR in Muscat



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Ministry of Environment and Climate Change

Seed Collection in QNR



وزارة البيئة والتخطيط العمراني
Ministry of Environment and Urban Planning

- ❖ After that seeds are planted in the plastic bags .
- ❖ After 15 days seed start growing normally and will take six month to fully grow and become suitable for Transplantation in Khawrs .



وزارة البيئة والتخطيط العمراني
Ministry of Environment and Urban Planning

2000

Sawadi project



2016



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Ministry of Environment and Urban Planning



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Ministry of Environment and Urban Planning

Monitoring Program



Omani women fishing in Mangrove forest in Mahot Island



Participation of Omani Womens Association



Environmental Education Program in Mangrove Forest



Treatment of Diseases



Disease – insect larvae on leaves (Mely Bug)

Spraying with sea water



وزارة البيئة والتشجير
Ministry of Environment and Greenery

Qurm Environmental Information center project

- QEIC project is under implementation through good Technical cooperation with **JICA**.



وزارة البيئة والتشجير
Ministry of Environment and Greenery



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Image photographs of QEIC



Exhibition Hall



laboratory



Auditorium



Aquarium



وزارة البيئة والتشجير
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