Appendix 5 Report of Regional Workshop (Kuwait) held by JICA

REGIONAL ORGANIZATION
FOR THE PROTECTION OF
THE MARINE ENVIRONMENT
KUWAIT

Dist.: RESTRICTED
ROPME/WG-179/2
Original: ENGLISH
17 September 2019

Workshop on Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area
Kuwait, 16-17 September 2019

REPORT OF THE WORKSHOP

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1. INTRODUCTION

This introduction is a brief account of JICA work undertaken under the ROPME-JICA Partnership Programme. JICA has held several joint-workshops with ROPME, providing Japanese experts to the regional workshops organized by ROPME as well as cooperating with the Ecosystem Based Management (EBM) Strategy Working Group activities. EBM is addressed under the MOU since November 2015 between ROPME and the United Nations Environment Programme (UN Environment).

The Workshop on Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman – Preparatory Survey for full-scale Project, hosted by the Ministry of Environment and Climate Affairs in September 2017 was the first one organized by JICA under this Partnership Programme in the Region. Besides, two workshops held in Tokyo during October 2016 and December 2018 provided some good opportunities to share the experiences on the conservation of the marine environment and the ecosystem with ROPME Member States. Furthermore, JICA in cooperation with the ROPME Secretariat and the Member States has accumulated a valuable amount of knowledge in the Region through organizing the above workshops and participating in several Regional Task Force meetings.

Since the beginning of this Partnership Programme, JICA has prioritized to contribute to the development of the EBM Strategy in the Region. As such, JICA has been focusing on sharing the technologies and experiences of conservation and rehabilitation of coastal habitats, with a desire to contribute to the conservation and improvement of the marine environment and ecosystem services, such as the fishery resource conservation. On the other hand, through the activities mentioned above, JICA has considered that the coastal habitat conservation and rehabilitation would be the common key aspect for the three prioritized Strategic Directions of ROPME, i.e. EBM, the Marine Biodiversity and the Marine Climate Change.

2. AIM OF THE WORKSHOP

This Workshop aims at sharing some '**practical** and **multi-beneficial**' technologies and experiences on marine coastal habitat conservation and rehabilitation, with a view to contribute to the development and implementation of the Action Plans for relevant ROPME Strategic Directions, and finally to establish a network of Initiatives and Institutions as a bridgehead for future sustainable cooperation.

It is expected that the practical techniques and know-how exchanged at the Workshop will contribute to the development of these Action Plans. For example, habitat conservation and restoration would contribute to the environment sector (biodiversity, ecosystem services, etc.) and the fishery sector (fishery resources, aquaculture, etc.), and also to address SDG14 and Climate Change: blue carbon, etc.

3. ATTENDANCE

Delegates from the ROPME Member States were the main participating beneficiaries of the Workshop. ROPME Secretariat, UN Environment, The Embassy of Japan and JICA also participated as well as provided resource persons. A complete list of participants is attached to this Report as ***Annex-I*** and the Workshop Programme is attached to this Report as ***Annex-II*.**

4. OPENING OF THE WORKSHOP

The Workshop began at 08:30 Hours on Monday, 16 September 2019 and brief summaries of the remarks made at the Opening Session are given below:

Welcome Remarks – *Dr. Jasem Al Besharah, Acting Executive Secretary, ROPME*

I have the honour to welcome His Excellency the Ambassador of Japan and the delegates to the Workshop. The Workshop was prepared and formulated by an active cooperation between ROPME and JICA over a long period of time. The theme of the Workshop mainly relates to Ecosystem-Based Management (EBM), which is an important strategic direction of ROPME Programme Activities.

This is the first major Workshop to be held in this headquarters premises of ROPME. I think it is inevitable to commemorate H.E. the late Dr. Abdul Rahman Al-Awadi's passing as he was the main architect of this facility. He was instrumental in ROPME's establishment and running the Organization for over 40 years. He established ROPME in the international domain of environmental monitoring and management. He was very keen to have this workshop in this premises. He was keen to participate with all of us even in the preparation of this workshop. But it is unfortunate he is no more with us. We continue to tread in his exemplary footsteps in ROPME's Regional and International strides on environmental management.

I thank everyone responsible for the excellent preparations leading to the Workshop. I appreciate the diversity of experts present at the Workshop and particularly the larger presence of Japanese experts. I particularly extend a warm welcome to the women participants, whose involvement, I feel, is central to the principle of environmental conservation.

I wish the Workshop a great success and look forward to very useful proceedings.

The full text of the Statement of Dr. Jasem Al Besharah, Acting Executive Secretary of ROPME is attached as ***Annex-III*** to the Report.

Opening Remarks from ROPME – *Dr. Hassan Mohammadi, Coordinator of ROPME*

I take this opportunity to welcome the representatives of the Member States, participants and resource persons to the Workshop, being organized by JICA in cooperation with ROPME. I extend a very warm welcome to H.E. the Ambassador of Japan, experts from UNEP and other Organizations.

The theme of the Workshop is of high priority to all the Member States of the Region. The reason for such a priority is because there are many coastal manipulations in the ROPME Sea Area that have wreaked catastrophic impacts on the functioning of the ecosystems by fragmenting and obliterating them. Gigantic megastructures have been established, regardless of the fragility of the marine environment and the environmental impacts have been immense and alarming.

There are a number of examples of environmental duress in the Region, such as the increasing number of cyclonic storms, airborne dust, HABs, reducing biodiversity, etc. About 200 of our marine species are listed under various categories of vulnerability in the IUCN Red List of threatened species. According to a recent publication, over 70% of our coastal habitats in the Inner RSA may become unsuitable for the existing biodiversity by the turn of the century. We are losing our valuable habitats for marine turtles, dugongs and such important indicator species, causing their migration to elsewhere. Many species that survived since late Jurassic era in the Region are now under existential threat.

Climate change has rendered RSA as one of the most critical hotspots on the world map. In our response, we need to increase our mitigation and adaptation capacities to address the challenge of climate change. In this regard, we have to apply strict regulatory measures as provided for in the ROPME Biodiversity Protocol, as one of the most important measures to sustain our environment. We should concern ourselves with conservation of mangrove, coral, seagrass and such other important ecosystems that could help us tide over the climate change impacts.

We are very happy to have a group of important and learned experts on this matter in the Workshop today. We have internationally renowned experts on mangroves, corals, blue carbon, eelgrass plantations and it would be very beneficial to learn from the Japanese expertise on the objectives as related to the Workshop.

In short, we have to conserve our species and habitats through integrated and holistic approaches. Temporary measures may provide short term solutions but will not suffice in the long run. We should increase collective efforts to apply our Protocols and the principles of ICAM and EBM to the goals of environmental conservation and restoration. The task is massive and we need concerted Regional efforts. We at ROPME are seized of this significant perspective of challenge and are working towards establishing the Biodiversity Protocol as one of the most important instruments for environmental action. In an inter-related manner, we have developed five important strategic directions through a number of deliberations involving the Member States, international experts and Working Groups, out of which the EBM, Biodiversity and climate change are very relevant to the theme of this Workshop.

Today's Workshop is a good step forward in the direction of meeting up with the most critical environmental challenges of the Region. I once again appreciate all your participation and your gesture to join hands in the efforts leading to best practices and appropriate actions.

Guest of Honour Remarks – *H.E. Mr. Takashi Ashiki, Ambassador of Japan*

H.E. Mr. Takashi Ashiki delivered the Guest of Honour Remarks in Arabic, which is given as ***Annex-IV*** to this Report. Following is a short Statement delivered by H.E. the Ambassador in English:

It is a great pleasure to be here today to attend the opening of ROPME-JICA Workshop on "Coastal Habitat Conservation and Rehabilitation in ROPME Sea Area".

This year's Workshop is the fourth in a planned series of joint workshops under the Partnership Programme, which was carried out in November 2015, in activation of the MoU signed between ROPME and JICA in the Field of Marine Environment Protection.

I am very delighted to see Japan and ROPME Members working together to adopt the best practices and multi-beneficial technologies on marine coastal habitat conservation and rehabilitation.

I hope both sides will make good use of this cooperation to achieve the best interest and build on its outcomes to enhance their relations.

Opening Remarks from JICA – *Ms. Wakana Hirata, JICA*

It is such an honour to be a part of today's Workshop, being organized by JICA in cooperation with ROPME. I thank you all for the participation in these new premises of ROPME Secretariat. Unfortunately, the current arrangements between JICA and ROPME under which this Workshop has been made possible will complete its term in October this year, but the key point is to continue the good effects of this partnership into future. Support from all stakeholders and resource persons to this end will be highly appreciated. I thank UNEP, AGEDI, KISR, ROPME, MECA-Oman, ISME, Port and Harbour Institute of Japan and others for all the cooperation in making this event happen. I strongly hope to continue this network and I hope to seek feedback upon completion of this Workshop.

I thank Dr. Mohammadi, Dr. *Moufaddal* and the ROPME staff for standing in support, realizing this important Workshop.

5. ORGANIZATION OF WORK

Coordinator of ROPME, keeping with the tradition of ROPME Technical Meetings, highlighted the importance of electing a Chairman for the Workshop from the Member States and proposed the name of Mr. Badar Al Bulushi, Ministry of Environment and Climate Affairs, Sultanate of Oman as the Workshop Chairman. Mr. Al Bulushi was unanimously accepted as the Workshop Chairman. Dr. Sudarshana Ramaraju of ROPME was entrusted with the duties of Rapporteur for the Workshop.

Mr. Bulushi kindly accepted to be the Chair and introduced the Programme The House adopted the Programme in consensus, initiating the technical proceedings.

6. SESSION 1: WORKSHOP ORIENTATION

The copies of presentations made by the Resource Persons and the Member States are given under **Annex-V** to this Report in the order in which the Programme Deliberations occurred. However, short summaries are presented below for ready reference:

6.1 Background, reflection on the past activities, purpose and expected outcomes – *Mr. Yoichi Harada, JICA Study Team*

This Workshop is the last programme activities under ROPME-JICA Partnership Programme, signed on 14 November 2014. The main objective of the Partnership Project was to help develop sustainable marine environmental management understanding in the RSA in line with the ROPME Strategic Directions. The wider intention was to share knowledge and experience and promote Regional as well as bilateral cooperation.

During the first 3 years between 2016 and 2018, we did country surveys by interviews, except in I.R.Iran and Iraq, unfortunately. However, I.R.Iran was involved in another project of JICA to prepare a master plan on environment and through that project, we obtained information to bridge the gap.

We also conducted baseline studies, such as an inventory of stakeholders, legislation, policies, and data gaps in the countries of the Region, in respect of environment. A preparatory study on a master plan for the coastal area management in Oman, for example, yielded essential literature, identification of important areas and allowed us to conduct a workshop for satellite image analysis as well as an International Workshop on EBM strategy.

We conducted International Workshops in October 2016, December 2018 and September 2017. We also participated/conducted in the Regional Workshops conducted by ROPME, GEOMAR, CEFAS, UNEP etc., on related topics about the Region. Further, we supported with matching efforts between needs and techniques such as oil spill detection, construction of aquaculture infrastructure etc.. Broadly, we work on wastewater management, monitoring of environment, data management, ecosystem dynamics, marine litter, spawning grounds, aquaculture, fishery and sandstorms in the Region.

As for EBM, with ROPME in the centre of action, UNEP and JICA cooperate and help bring out a strategy towards the conservation of marine environment in the RSA.

With this background of a number of years of interaction and experience in the Region in the field of environment, we are now conducting ROPME-JICA workshop in Kuwait. This Workshop aspires to share practical and multi-beneficial technologies and experiences and reflection an important strategic direction to establish a Regional network for sustainable cooperation. We need to have an exchange of information for building a mutually beneficial framework of action.

Discussion

Chairman - Is there any plan to continue this cooperation beyond October?

ROPME Coordinator – This aspect is under discussion. Both sides have had a positive feeling about the activities that have been so far completed. If a good arrangement emerges from these efforts, it will be let known to all the stakeholders.

JICA – We believe in the strength of this cooperation and we desire to continue with the arrangement.

6.2 Overview of the current status of the coastal habitat and prioritized issues in RSA – *Dr. Subra Madhavapeddi and Dr. Wahid Mohamed Moufaddal, ROPME Secretariat*

Dr. Subra Madhavapeddi

RSA has 8 Member States and there are three distinct zones within its geographic coverage, namely Inner RSA, Middle RSA and Outer RSA. ROPME possesses State of the Art infrastructure to receive synoptic data of the Region, such as a satellite data receiving station for MODIS and Information system to cater to the integrated needs of data for the Region.

RSA has several habitats, such as mangroves, corals, seagrasses, mud flats, salt marshes, sabkhas, and macroalgal beds and a variety of biodiversity including a large diversity of fish communities. It also has a broad genetic and biological diversity, in spite of the small geographic space. As for the overall current status, these ecosystems are known to exert important roles such as preventing erosion and stabilizing the sediments in order to provide valuable ecological and economic functions and services. Climatically, the RSA is a unique area with a completely segregated environment compared to the Arabian Sea. The unique features of the region are that it has high salinity, limited water exchange and large seasonal fluctuations in temperature.

Coral reefs of the region are under stress due to high salinity, increasing temperature and sediments. Coral cover and diversity are decreasing due to bleaching events that have become very chronic. Mangroves are mainly located in the southern coasts of the I-RSA. And due to several megastructures, the density of mangroves may have also come down significantly. Kuwait and Iraq, due to their own microclimatic uniqueness within the RSA, do not have naturally occurring mangroves. Seagrass beds along with the mangroves are amongst the most productive coastal ecosystems in the marine environment and are very rich in biodiversity. In our Region, Green Turtles and Dugongs inhabit this habitat. Salt marsh is a vegetated intertidal habitat dominated by halophytes and occupies the upper intertidal zone. In our region, they are found in the inner RSA. Sabkha is a rare and unique habitat, a very big one of which is found in the coast of Oman in the outer RSA. Besides, much of the southern shoreline of the RSA contains sabkha environment. Mudflats do bear macro-benthic assemblages, which provide significant contribution to the development of fishery. Our Region has many extensive stretches of mudflats. Macroalgal beds are set on hard substrates and sustain a large biodiversity from micro to macro organisms.

Prioritized issues in the RSA have focused on implementing the EBM strategy, adopt SDGs and activate an integrated information system for servicing these. We need to map the coastal habitats in further detail and incorporate EBM based environmental governance actions.

Coastal habitat conservation and rehabilitation is important for three priority areas of our Strategic Directions, namely Climate Change, Biodiversity and EBM.

Dr. Wahid Mohamed Moufaddal

Harnessing Remote Sensing (RS) information for coastal habitats conservation and restoration is an important scientific aspect of high relevance.

Remote Sensing is a modern technique with which we can view the habitats in higher periodic frequency and resolution. ROPME has been pursuing this from a long time. Not only imaging, RS can yield very important ocean parameters too for a detailed and intensive study. It helps in mapping, time series studies and measurements for understanding oceanographic processes. For the conservation and restoration of coastal habitats, we need an integrated remote sensing strategy including different bio-optical platforms. As of now, we can measure ocean colour, SST, surface roughness, surface slope and also study geomorphology, depth, underwater features, currents and water quality. With these, mapping, visual assessment, change detection, impact assessment will all be possible, helping in devising management planning through identification of conservation criteria and delineation of management boundaries.

Besides the above conceptual renderings, I offer some visual examples of the application of remote sensing for the monitoring of coastal habitat conservation and restoration efforts, especially in terms of mapping, imaging and derivation of oceanographic parameters. There are also several public domain internet resources such as NOAA coral reef watch, which yields real time information about increasing temperature and its effects on coral reef habitats in our Region. In conclusion, satellite data can help in providing detailed information for studying the state of the environment and frequent changes that occur in respect of environmental parameters. As such, it will help in designing a management strategy, because periodical monitoring is very much necessary and is possible. For a large Region like ours where most habitats are of trans-boundary in nature, remote sensing can prove to be an important source of vital importance.

Discussion

Chairman – Are all that data of satellites you showed, freely available for the Member States? We want to know how to go ahead and make use of this important ROPME facility

Dr. *Moufaddal* – ROPME has been providing to Member States the satellite data that it acquires in some value added manner, whenever necessary. However, there are a number of public domain links from where you can get the data also for your applications

Iraq - Dr. *Madhavapeddi* did not mention about the salt marshes being in Iraq in his presentation. We do have two major sites of brackish water that are salt marshes in Khor Abdulla, Al Zubair as well as in a few other places. They are nominated as protected areas. This may be noted.

Bahrain - Can RS help in finding out dredging activities and their impacts in the sea?

Dr. *Moufaddal* – Yes, this is possible. I even showed an example in my presentation. Dredging can be implied from the observations on coastal development and reclamation through time series monitoring of the sites.

Bahrain – If there are violations of regulations on the coastal area, can we detect them and monitor them using remote sensing?

Dr. *Moufaddal* – Yes, we can. These things are possible once we know of the times during which these violations may have happened. We could go back into the archives and bring out information.

Iraq – Chairman asked about cooperation of ROPME with Member States on remote sensing data distribution. I must mention that as far as Iraq is concerned, the Ministry of Environment has been in touch with MEMAC and is securing needed information.

ROPME Coordinator – MEMAC receives satellite images obtained at the ROPME satellite station, particularly those relating to oil spills for dissemination to NFPs, Regional Oil Spill Response Officers and all those concerned with oil spill and contingency planning. As for Bahrain's question of detecting violations, complete monitoring of even discharges is possible and has been amply demonstrated.

Kuwait – What is the methodology used for calibrating the information obtained from satellites since they are of low in resolution? Also, we should have quantitative information of the coastal marine habitat features, such as changes in area, etc. apart from the coarse qualitative information.

Dr. *Moufaddal* – What I presented are only some case studies. We do refine our methodologies of interpretation using field information. However, our coverage and satellites are for regional assessment in nature and the satellites we harness are not for mapping purposes. Ours are meant for deriving physico-chemical parameters, with a very nominal mapping ability. For mapping, you have to go beyond ROPME to the high resolution sources. We focus only on regional monitoring. If and when a need arises for us to go beyond this purpose, then we may go to other sources like Landsat to secure appropriate information.

Mr. Nakamura, UNEP–Japanese Space Agency (JAXA) has a number of satellites of radar and high resolution. The Region can secure JAXA data, which is a good possibility. By the way, what is the proactive action ROPME takes in the dissemination of satellite data, for ex. if HABs is happening, are you sending out alerts? Does ROPME send the data pro-actively regardless of a Member State asking for it?

Dr. *Moufaddal* – The moment we have an emergency and we have acquired satellite data of relevance, we do contact the National Focal Point of that State and send the information with annotation of our findings. We also seek feedback from the State, so that we can improve upon our interpretations. Some States do send us the results of their real time investigations and also append field images. This helps in refining our alerts in an iterative manner.

Chairman - ROPME is doing a good job. Sometimes, we get alerts from ROPME even on weekends and when we return to work after the weekend to attend to them, the red tide situation will have changed.

Dr. Al Hazeem - We have a published paper on coral reef monitoring in KISR using the recent satellite data, which gives very valuable information on both methodology as well as the state of the ecosystem.

7. SESSION 2: INTERNATIONAL BACKGROUND ON COASTAL HABITAT CONSERVATION

7.1 Policies and strategies on the conservation and restoration of the coastal and marine ecosystems – *Mr. Takehiro Nakamura, UN Environment*

This Workshop is very timely as the UNGA is considering ecosystem restoration scenarios and what we deliberate could provide some inputs to that process. Over the next decade, UN Environment is also focusing on ecosystem functions and processes. So, this is a very opportunistic time for the Region to be considering what we are deliberating upon.

Ecosystems are systems that include biotic and abiotic elements in interaction. Ecosystem approach is a conceptual framework, incorporating human intervention. Ecosystem Services are basically drawn from that coupling. So, how to manage the human activities in ecosystem is a question of primary importance. In EBM studies and efforts, we have developed a wider understanding on the core elements of ecosystem management and how to go about it.

CBD and Aichi Targets, SDG 14 under the Agenda 2030, Convention on Migratory Species, Convention on the International Trade in Endangered Species of Wild Flora and Fauna and Ramsar Convention on Wetlands are some of the Multilateral Environmental Agreements of high international importance in this regard. Biodiversity Strategy and EBM Strategy are actually harmonized, so that an understanding of sustainable development is yielded from them. Under UNCCC, policies on nationally determined contributions and adaptation are included and nationally appropriate mitigation action is synthesized.

ROPME has been playing a lead Regional role on these matters for decades. It has brought out the State of the Marine Environment Report frequently, summarizing the ecosystem status, functions and services in the Region.

SDG 14 directly applies to our objectives of today. Studying the current trend of the status of coastal habitats is very important in this regard. UNEP is preparing a report on this to be presented in 2020. We will develop a workshop on this in this region through UNEP-ROWA to facilitate the process.

As for national marine and ecosystem strategies or policies, national ICZM, national marine spatial planning and their collective National Action Plans to support the Regional Seas Programme are important. Unfortunately, there is no global mechanism to coordinate national strategy/policy development on the marine ecosystems.

Many countries are moving forward in establishing National Ocean Policy and Strategy. Some examples are included in an UNESCO-IOC publication recently, so that they can form an important reference for the use of the ocean resources and space within the national jurisdictions.

The roadmap to incorporate ecosystem approach should include an evaluation of the ecosystem services, use of economic instruments, policy instruments, engagement of stakeholders, integrated planning tools and ensuring of climate change proofing. We will need to identify sectoral changes and monitor as well as evaluate on a timely basis the integrated and ecosystem based programmes. From EBM towards an integrated ocean policy, we need to adopt marine spatial planning, strategic environmental assessment, environmental impact assessment, sustainable blue economy, climate change mitigation and again, monitor and evaluate the systems on a regular basis. There are a number of indicators in this regard, which the countries can utilize and benefit from. RSA is a very important area in this direction and ROPME's role in coordinating these is of very vital significance.

7.2 Managing the impacts of development on coastal ecosystems in the West Asia Region – *Ms. Etaf Chehade, West Asia Office, UN Environment*

In the past 20 years, 40% of our coastline in the Region has been developed. And a lot of pressure on biological systems has come to stay because of these developmental forces. There is a whole matrix of factors in this regard. Therefore, without good planning and careful consideration of the ecosystem function, we cannot conserve the resources or services. That necessitates an integrated strategy of monitoring, management and governance if we are to be effective.

I wish to elaborate upon a case study project on GCC dredging and reclamation, as an appropriate example for this Workshop. It covers 6 countries of the Region. There is now a general manual, guidelines for good practices and we want to conduct a workshop to highlight these. There are a number of important outputs from the project like meetings, RS analysis, developing hydrodynamic models and finally a consultative process with the key stakeholders. With these experiences, we intend to help the process of conserving the sensitive habitats that might get obliterated by dredging and reclamation. Because RSA has a unique biophysical environment and we need to be careful in integrating policies and efforts.

Discussion

Dr. Al Hazeem – My thought is that as part of the responsibility of UNEP on dredging sites, rules for compensation should be developed, because we lose very important habitats that cannot be recovered. There should be a framework for claims and compensation when dredging obliterates sensitive habitats.

Chairman – Using ROPME platform, could UNEP please extend the project to I.R.Iran and Iraq also and widen the process?

Ms. Chehade, UNEP ROWA – We just started this project with the help of GCC. We are still gathering information. We will reach out gradually to all of you here, so that we could develop comprehensive guidelines and manuals of common usage in the Region. We are still going to individual countries and gathering information. We may soon have a workshop to review what we have done and then get everyone onboard. We want one overall manual and guideline, followed by specific guidelines and manuals for each.

Mr. Nakamura, UNEP – We should enlarge on the project, taking into consideration the points raised here, including the compensation clauses. We have to integrate all national, regional and international efforts on this.

Ms. Chehade, UNEP ROWA –Compensation may not be a total justice because you will have lost a sensitive habitat beyond conservation and possibilities of restoration.

Bahrain – Is there a guideline from UNEP how to estimate the damage? How to convert the damage into money? I gather the World Bank has a document on this.

Ms. Chehade, UNEP ROWA – We do have guidelines for evaluation of ecosystems. We do have a manual. We could share with you.

ROPME Coordinator – The task of addressing compensation is a difficult one. We cannot properly value how much is the ecosystem loss because the habitat, life cycle, migratory significance, etc. are involved and it is so difficult to evaluate them in monetary terms and compensate them. World Bank methodology is oversimplified and not comprehensive. In the Region, we have many guidelines but they are piece meal in nature and need to be integrated and viewed holistically. For offshore impacts, ROPME has developed guidelines. For biodiversity, a part of the Draft Regional Biodiversity Protocol is engaged with assessing damages. We have ROPME guidelines for ICAM as well. But none of them may be holistic enough to use and compensate for losses of sensitive environments. So, the Region must work towards developing holistic guidelines. ROPME will support UNEP to come up with an appropriate effort in this regard.

Dr. Al Hazeem – I am aware of at least three case studies that deal with the damage and losses to coral reefs. They are from Japan, Kuwait and California. In Japan, recreation of corals in another area was taken as the basis for calculating the compensation.

Ms. Glavan – May be we should consider blue carbon component while taking into consideration the compensation scenario. We should also include the costs of maintenance of channels used for mangrove plantation, monitoring and stabilizing the systems etc.

8. SESSION 3: PRIORITIZED ISSUES AMONG THE MEMBER STATES

8.1 Overview of the tools for the marine environment and coastal habitat conservation shared in the ROPME-JICA Partnership Programme - *Mr. Satoshi Sasakura, JICA Study Team*

A number of technologies for coastal habitat conservation and rehabilitation have been shared in the ROPME-JICA Partnership Programme. Amongst other things, bio-symbiotic structures, eelgrass bed restoration, sediment improvement by sand capping, coral restoration and fishery sector approach are presented here, in line with the objectives of this Workshop.

There is a recent conceptual shift in the environmental management policies, as exemplified in the Seto Inland Sea. Changes from passive conservation methods, such as the total pollution control to active conservation methods in line with

EBM, ICAM and Sato-umi are included under the adaptive management techniques. Some examples of restoration of habitats near Osaka International Airport were also similar and they used a gentle slope structure in order to develop seaweed beds. Bio-symbiotic sea walls are another way of restoration of habitats, where seed traps are added with red soil and the ecosystems are energized. In the example of transplanting eelgrass, planting, seeding and control are managed meticulously after the surface was damaged by reclamation. Eelgrass *Zostera marina* is extensively used for replantation at places and the technology is well established and documented. In sand capping technology, sand is used to cover areas that are dredged. This is found to have increased benthic population. In coral restoration, ceramic devices are used for coral larvae settlement. This technology too has been established in coral hatcheries.

Habitat restoration efforts have to take into account the importance of ecosystem network approach where the shallows are to be maintained for larvae, sand for the young and deep mud for the adults. In Japan, Fishermen cooperatives do restore eelgrass beds to enhance fishery yield. There are also examples of using oyster shells to improve the habitat characteristics of the sea bottom environment.

As far as fishery is concerned, habitat restoration should take into account the life stages of the fish, for example, the importance of spawning grounds and forage grounds. Identification of spawning ground can be done through DNA approach or through bio tagging.

While these are the techniques that are established and available, it remains to be seen how to apply these technologies and experiences to develop and implement the habitat conservation and rehabilitation efforts in the ROPME Region.

8.2 Current status and national priority on the coastal habitat conservation and rehabilitation from technical perspective – *ROPME Member States*

8.2.1. Bahrain

Did not make a presentation.

8.2.2. Islamic Republic of Iran

We all know that the coastal region is very sensitive and vulnerable to pressures of pollutants and such. In I.R.Iran, there are 2 distinct groups within the coastal area. 1. Biologically sensitive - mangroves, corals etc. 2. Physically sensitive - beaches, shores, estuaries, etc. Both of these types are widely distributed on the coast of Iran. We also have sensitive sea turtle habitats along the northern coast of Middle RSA. Coral reef habitats are recorded around Kish Island and other islands, and we have prepared maps of all these with the help of JICA. Sea grass maps on our coastline as well as mangroves are also mapped meticulously. 97% of mangroves on the coast of Iran consist of Avicen*nia marina* and the rest is *Rhizophora* mucronata. Under the blue carbon initiative, we have been restoring mangrove habitats. Results of our efforts will be published in due course of time.

As for the national priority, we have about 19 marine protected areas managed by the DoE. That accounts for 2 to 3 percent of our coastline. We are preparing an atlas of sensitive habitats and we will develop a National Action Plan with stakeholder approach. We are applying EBM principles and are attempting to reduce marine debris as well as negative impacts of other pressures.

8.2.3 Republic of Iraq

We have a narrow coastline of 58 km and we receive a large amount of fresh water and sediments from the delta region, which comes with a huge amount of nutrients. So, this is a very productive area and a spawning and nursery ground for Penaeid shrimp. High turbidity loaded with nutrients and highly seasonally variable temperature are features of our coastline.These factors limit our vegetation to halophilic ones, but the area is rich in biodiversity.

The most important habitats are the delta and the coral reef zones. The coral reef area is nominated as a national protected area.

Infrastructure projects should lessen the pollution and we should also tackle the process of erosion on the coastline, in order to conserve our coastal habitats and rehabilitate them. We have also prepared a national oil spill contingency plan in cooperation with JICA in a comprehensive manner. We have listed and included the minefields on the coastline for removal within our National Plan of Action.

Discussion

Dr. Al Hazeem – I wonder if the corals you find on Iraqi coast are reefs or just individual colonies

Iraq – Because of the estuary, coral reef formation is very difficult on our coast. We have corals just at about 8 km from the coast of Kuwait

8.2.4 State of Kuwait

We have established mangrove plantations of *Avicennia marina*, which is the common species in the Region. It is often thought that Kuwait does not have naturally occurring mangroves. But, there are records that grey mangroves existed in 1940s in Kuwait. So we thought of introducing this again in Kuwait. We initiated the experiment in Al-Jahra Nature Reserve, securing the plants from Salalah in Oman. In August 2018, we began preparing the seedling by incubating the seeds. Then they were transported to the reserve. By September 2019, we had them growing over a couple of feet in length. We have just started this process and we have many plants still in nursery. We will continue our efforts in this direction.

Another restoration programme is about corals. We thought of repairing the fragmented status of corals in Kuwait by initiating restoration activities. We signed with National Parks Board of Singapore and had a workshop with them to understand the expertise and skills required for the task.In the next stage after the Workshop, we have assembled a national team dedicated for coral reef monitoring and rehabilitation. We are providing necessary training and are performing a reef check. We will continue on the work eventually.

Discussion

ROPME Coordinator – Sub species of mangroves in different regions of RSA are known to be different, even though the species is the same. Once Kuwait wanted by bring a species of mangroves from Florida but we had apprehension of that becoming invasive species. We still have a concern if the species available in Oman is suitable in Kuwait and whether it will not become invasive here, as this may not be a natural habitat for that species.

Dr. Al Hazeem – We had a publication in 1999, where we recorded the existence of the same species in the Region. And the currents from Mid RSA to Inner RSA is likely to bring the same seeds and so, it may not be a case of invasive species. There are evidences that same species once lived in both the areas, but then gradually Kuwait lost it out.

Dr. Baba – Don't bring different species from newer waters. But species from the Region is ok for transplantation. Yet, do experiment first and don't proceed on a large scale. You may consider bringing from nearby areas like India or east of Africa

ROPME Coordinator – It is advisable to carry out a pilot study at first to prove that the species being transplanted will not turn invasive. We need not go that far to India or Africa, looking for transplantable samples.Even what we bring from Salalah too should undergo a pilot study as a safeguard measure.

***Ms.* Glavan** – In our Region, so many micro environmental conditions determine the looks of the mangroves. So, same species may look different in different micro climates in the same Region. Micro nuances make differences in appearance of the same species.

Chairman – Some genetic studies are being carried out to determine the similarity or dissimilarity between the same species mangroves between Muscat and Salalah. *Avicennia marina* is a species that requires high salinity. So, succeeding in Kuwait transplantations is a challenge. But as you have seen, the seedlings have already passed a winter and survived. That gives a hope that the transplantation may survive.

8.2.5 Sultanate of Oman

Coral reef conservation is in focus in Oman. We have about 5 major coral reef growing areas on the coast of our country. Our corals are also under severe pressure due to fishermen boat anchoring, sedimentation, coral collections, pollution, diseases, diving, careless boating etc. apart from the major influence of climate change. We have also a problem of Crown of Thorns, which devour on corals. Experts say that these starfishes can be killed by injecting vinegar. But we chose to remove them by way of diving and picking them up by hand. It is estimated that one adult Crown of Thorns Starfish can eat 5 sq. meters of coralline area in one week. Their high population could be devastating to the coral population.

MECA has a coral reef clean-up campaign all along the coast. Divers, navy and experts take part in it along with others. We have installed mooring buoys in places, to guide the divers. We use educational tools for locals and have established diving rules and many framework regulations. We have been using reef balls to create artificial reefs. We have deployed 40 artificial reef balls since 1998 and the growth of the colonies has been impressive in the winter months. We have a well-established coral reef monitoring programme including periodic measurements of the size of the colonies.

Discussion

ROPME Coordinator – Does the Crown of Thorns first eat the soft corals and then destroy the hard substrate? How does an artificial reef compare with the natural reef in species colonization and distribution?

Dr. Al Hazeem – In 1999, ROPME asked us to review coral reef status. We recorded the immense effect of Crown of Thorns. They do devour on soft tissues first. It is better to pick them up and use as manure instead of killing them with toxin or injections. As for the comparison between the artificial reefs and natural reefs, we don't have such extensive and comparable spread of both yet in our waters.

8.2.6 State of Qatar

Did not make a presentation

8.2.7 Kingdom of Saudi Arabia

We have two coastal areas. RSA is on the east coast while the Red Sea is to the west. We have extensive coral reefs in the Red Sea Area though the mangroves, seagrass beds, wetlands and fishery grounds are predominantly on the ROPME Sea Area. More than 200 species of corals are in Saudi Arabia, mostly in Red Sea. 2 species of mangroves are also found in our waters – *Avicennia marina* and *Rhizophora mucronata*. Salt marshes are mostly in RSA, as well as seagrass beds. These are damaged to some extent. For mangroves, there have been replantation efforts in the RSA coast and we are still progressing on the project.

The main developmental activities are from oil industry, maritime transportation, residential development, dredging, pollution, debris, etc. Management response has been in terms of temporary actions. A technical committee of 8 agencies has been formed to address the issue of environmental degradation. Guidelines and procedures for coordinating the stakeholders for a collective action have been formulated. Impact assessment for all developmental projects is a prerequisite in Saudi Arabia. GAMEP is very active in preparing actions and implementation plans.

8.2.8 United Arab Emirates

In the UAE, we focus on coral reef monitoring, artificial corals and garden plantation of mangroves. We have planted over 273,210 mangrove seedlings in UAE. 20,000 coral fragments were transplanted in our coastal waters. 2,805 artificial reefs have been established. We are focusing more on 4 species of corals. In Fujairah cultured coral reef garden area, we are trying to cover 300,000 sq. meters using 1.5 million coral reef colonies. We have established a GIS portal at the Ministry of Climate Change and Environment, where the status of work can be iteratively studied. The portal also shows location of mangroves, density, etc.

8.3. Developing a State of the Marine Environment Report (SOMER) for Kuwait – D*r. Brett Lyons, Centre for Environment Fisheries and Aquaculture Science (CEFAS), UK*

We have developed a general framework for the national plan for marine environmental management in Kuwait. We have conducted a series of baseline surveys, reassessing the priorities and establishing strategic goals.

With EPA, our vision is to protect, preserve and restore marine environments according to Law 42 of Kuwait on environmental protection. Biodiversity, water quality, fishery, commercial activities, eutrophication are all bits and pieces of the environmental matrix in management. Our vision has a strategic goal, achieved through management objectives, indicators, targets and standards. Our draft strategic goals for Kuwait is elaborate and it dovetails into the SDGs too, particularly to prevent extinction of threatened and vulnerable species.

SOMER for Kuwait is an initial coordinated review and assessment of Kuwait marine environment in 600 pages. It details how marine resources have been affected by a range of natural and human pressures. The reporting framework involves all the priority areas mentioned earlier. In terms of the thematic assessment process, we have conducted assessment of available data across all thematic areas, harmonizing the availability and quality of the data and their temporal distribution. From that, we evolve the status and future trajectory of the environmental units, such as habitats and biodiversity.

On biodiversity, we have set out strategic goals and have key findings in the SOMER. Indicator outcomes are listed in a matrix. Clear quantitative estimates of the loss of corals, for example, have been brought out. We have also referred to and collated a number of local research studies in preparing the SOMER. A huge decline in coral reef area is indicated.

Commercial fishery is on the decline too in Kuwait. Food and water quality for human health too is found to be declining. Within this study, microbial water quality has been mapped along the coastline of Kuwait. Eutrophication and HABs instances have increased due to nutrient pools as found in published documents on the Region. Environmental pollution studies are available in a large volume of research carried out in the region. It is well recorded that the oxygen levels are declining in these waters. A number of indicators have been found in the realm of ecotoxicology too. The SOMER also assesses coastal processes and we have found decrease in the river flows through the delta.

In conclusion, major concerns are around food and water quality for human health, eutrophication, biodiversity, coastal processes and commercial fisheries. Trajectories for future status are predicted to decline for all themes except for environmental pollution.

Discussion

ROPME Coordinator – What is the coverage area of the study? Are your reports ready?

Dr. Lyons – Coverage is limited by availability of references and information. So, some areas may not be fully represented, for example, Sulabikhat is a gap in information. Main reports are now under review at EPA. Soon in a month, it should be available online.

Mr. Nakamura, UNEP – When you prepared the indicators for SOMER, did you focus on actual environmental threats? We are also interested in the menace of plastics in the sea.

Dr. Lyons – We have elaborated on environmental drivers and stresses. However, the main focus is on the outcome of these pressures. We have also highlighted marine litter as a main issue but we do not have many quantitative estimates of that.

9. SESSION 4: BLUE CARBON AS THE MULTI-BENEFICIAL APPROACH

9.1 Blue carbon and its actual cases of application – *Mr. Takehiro Nakamura, UN Environment*

UNEP began the blue carbon concept in 2009. We then worked with different partners and began applying it to different areas in the world, gaining experience.

Blue carbon approach is also termed as blue forest approach very often. We initially started with mangroves and seagrass but in this region, sabkha is also a very important contributor of blue carbon. Blue carbon systems do provide many ecosystem services.

Blue carbon is actually carbon stored, sequestered or released from vegetated coastal ecosystems. Over millennia, carbon is stored in sediments beneath the ecosystems. There is a wide variety of blue carbon ecosystems in the world. In 2013, a supplement to the 2006 guidelines for National Green House Gas Inventories of IPCC was prepared in respect of wetlands. In fact, the blue carbon activities are aimed at achieving climate change mitigation benefits as well as biodiversity benefits.

Blue carbon ecosystems do provide a wide variety of economic values. On a global scale, 124.8 trillion US$ is estimated to be the blue carbon value accrual.

With regards to mangroves, UNEP has brought out a report on their importance to people and has elaborated upon mangrove ecosystem services and values, including blue carbon pathway in nature. Carbon financing, inclusion in the national policies, conservation agreements and other mechanisms are suggested in the pathway. UNEP along with IUCN, WWF, The Nature Conservancy, GRID-Arendal and a few other agencies has brought out ‘blue carbon nationally determined contributions (NDCs)’ and has suggested mitigation and adaptation measures for climate change. The NDCs have listed a number of ecosystem services of mangroves from carbon sequestration to food to energy resources. There are instances where mangrove honey products have also been developed. This is a prime example of community forestry in the mangrove areas.

In the realm of blue carbon in ROPME Region NDCs, some countries have been very active like Saudi Arabia, Bahrain etc., which have been developing mangroves, seagrass beds and such other ecosystems.

Blue carbon projects not only contribute to climate change mitigation, but also address climate adaptation requirements. They help in sustainable development. Carbon benefits can bring climate change related financing and blend with conservation financing. Blue carbon projects contribute to UNFCC national obligations and to CBD. Blue carbon ecosystems are extremely high in economic value as well as for the conservation of ecosystems and sustainable development.

We also have established guiding principles for delivering coastal wetland projects. GEF too has a commendable funding of over 4.5 mill US$, through UNEP towards this goal.

Some good examples of blue carbon projects are Mikoko Pamoja in Kenya, where 107 hectares have come under a project for blue forests, led by Kenya Marine Fisheries Research Institute. This project has provided jobs, livelihood support in terms of ecotourism, community services in terms of education, water and sanitation in addition to increasing the mangrove reforestation.

Blue carbon financing options are available under UNFCCC and through Conservation financing in the international domain. Reducing emissions, Green Climate Fund, Least Developed Country Fund, Voluntary Carbon Market, Blue Fund, Debt for Nature Swap, payment for ecosystem financing, conservation taxes and national park entry and conservation trust funds are a few examples of the wide variety of funding opportunities that are available in this regard.

Discussion

ROPME Coordinator – Ecosystem health depends also on the quality of mangroves, their density of growth etc., and is not just indicated in the area coverage. By the way, how serious are the international funding mechanisms, that you mentioned, in terms of financial provisions. How much total funding is available with UNEP for these? Is the funding proportional to aspirations and expectations?

Mr. Nakamura, UNEP – There is a financial mechanism available in the world, which can be harvested. UNEP does not have dedicated funds for this, but there are other funding mechanisms that can be accessed. UNEP helps countries in accessing this finance.

Bahrain – Mainly in our region, there are 2 types of mangroves, *Avicennia* and *Rhizophora*. Which one of these is the best suited for carbon sequestration?

Mr. Nakamura, UNEP – This depends on the geographical situation. This needs to be studied specifically. Proper restoration of mangroves and proper management are necessary to effectively sequester carbon.

ROPME Coordinator – I.R.Iran has demonstrated that *Rhizophora* is 3 times more effective in carbon sequestration than *Avicennia*.

Dr. Al Hazeem – UNEP may consider hiring an attorney to deal with carbon funding matters.

9.2 Integrated approaches to conservation and management of coastal ecosystems providing multi-benefits for people - *Dr. Noriaki Sakaguchi, JICA*

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) global assessment on biodiversity and ecosystem services, which was prepared in May 2019 says 1 million species are at the risk of extinction, half the live coral cover is already lost since 1870s, seagrass beds have decreased by 10% during 1970 to 2000, 33 percent fish stocks are classified as overexploited and more than 55% of ocean area is subject to industrial fishing. It says there are direct drivers like fishing, climate change etc. in this regard and indirect drivers like population growth, global economy growing by 4 times in the past 50 years and international trade growing to 10 times are also reasons for these consequences.

2020 Aichi biodiversity targets and SDGs cannot be met by current trajectories of global efforts in conservation and environmental restoration. Goals for 2030 can only be achieved if we have large scale transformational changes including economy, polity and environmental management.

In order to foster transformative changes, collaborative implementation of priority governance interventions, targeting key points of intervention are necessary.

As for multi benefits of coastal ecosystems, we need to target services that support regulations, culture, etc. Actually, carbon sequestration underground in mangroves is much higher than that of terrestrial forests. Additionally, mangroves and coral reefs can reduce disaster risks. We know that these coupled systems can provide multiple services. So, we need to optimize available ecosystem services by developing a relationship between ecosystem conditions and the utilization of availability of resources.

JICA has established cooperation for conservation of mangroves with the Indonesian Government since 1992, through a number of projects, rehabilitating different sizes of coastal parcels through a number of sequential projects. JICA also has developed mangrove environmental information center in cooperation with the Government of Oman.

For future, we propose cooperation in sustainable coastal ecosystem management in ROPME Region, by collaborating with ROPME and building mutual benefit mechanism between its Member States, using EBM strategy, remote sensing, GIS and providing data and information amongst constituents. This can harness the leadership available in different countries in different skills and experience, through a sharing mechanism on the platform of ROPME.

Discussion

ROPME Coordinator – Can JICA do some practical project in our Region like they did in Indonesia, say for the plantation of mangroves? If JICA can do some large scale practical work, ROPME could also extend support. Can JICA bring, for example, financing for a large scale mangrove plantation along with high end experts?

JICA – We can bring multi benefits of experience developed in various projects and different regions to help out in this Region.

ROPME Coordinator - We need a good cooperation between ROPME and JICA since cost sharing with ROPME Member States has not been encouraging. We prefer to develop a cooperation between JICA and ROPME in areas which our Member States are now carrying out work on their own. We need something more in terms of substantial support.

JICA – We have been cooperating with ROPME and also with other Regions. You are developing strategic directions. We can discuss with you how best we can contribute to your strategic directions.

Chairman – JICA could think of mangrove restoration in the ROPME Region, by transplanting mangroves in the 8 countries of the Region. JICA could consider signing such an MoU. And of course, it could bring technical support. Member States do have nurseries but JICA can consider transplanting through funding in the Region with ROPME cooperation.

JICA – We could discuss these details in due course.

9.3 Roles of blue carbon ecosystems in climate change measures and blue infrastructure - *Dr. Tomohiro Kuwae, Port and Airport Research Institute, Japan*

I would like to present the latest advances in blue carbon science and climate change adaptations.

There has been an exponential growth in the developments of blue carbon science and its linking to the policies of environmental management. I have published a book on blue carbon in shallow coastal ecosystems through Springer in September 2018. The book envisages to fill the current gaps in the blue carbon science. I have made a comparison of the potential ecosystems and their CO2 gas exchange capacities. It is found that the blue carbon systems have 8 times uptake rates of carbon in comparison to other carbon sequestering systems. In terms of sequestering capacities, mangroves are most efficient, followed by tidal marshes, seagrass meadows, macroalgal beds, tidal flats, coral reefs and estuaries. The last four are basically, potential blue carbon ecosystems. Macroalgal beds have the potential of being the biggest carbon sequestering system because their global occurrence is wide.

The forthcoming IPCC special report has a chapter on changing ocean, marine ecosystems and dependent communities, in which information about blue carbon science is mentioned. Macroalgal blue carbon also appears among the top 10 questions asked of world blue carbon scientists. That indicates the emergence of importance of macroalgal blue carbon science in the world. .

I am pleased to show you in my presentation a number of maps of blue carbon ecosystems in the world including the ROPME Sea Area.

The blue carbon science also requires a clear understanding of the relationship between the quantities and quality of blue carbon sequestration in respect of the different ecosystems in specific areas. In Japan, the first estimate of blue carbon sink potential says we will have 2 to 5 million tons of CO2 per year in 2030. Such an understanding is necessary in every specific area. Out of this potential, macroalgal beds have over half of the carbon sink potential.

Amongst all options of direct air CO2 capture, the blue carbon initiative is the most effective, as per my present studies and research. But we also need to understand how sea level rise, climate change and coastal management efforts affect the carbon removal rates in the blue carbon ecosystems. In general, benefits exceed the cost of restoration of blue carbon systems. Having said that, it is to be observed that the costs of restoring marine blue carbon systems like mangroves is quite high in comparison to terrestrial systems. However, the cost benefit ratio may offset this concern.

Discussion

Mr. Nakamura, UNEP – As for the cost benefit analysis, does the benefit include other collateral elements or just carbon benefits?

Mr. Kuwae – The estimate did not include carbon benefits and so it is actually an underestimate of the benefits.

Dr. Madhavapeddi – Between microbial and macro algal mats, which is more beneficial?

Mr. Kuwae – It depends. Generally, macro algal mats have other benefits like acting as fishing grounds.

ROPME Coordinator – I am encouraged that Ports and Harbour Institute is interested in blue carbon science. We can also consider engaging with Ports and Harbour Institute along with JICA for the benefit of our Region

9.4 Blue Forests of the Arabian Peninsula: Update on activities and findings – Ms. Jane C. Glavan, Arabian Blue Forests Working Group *(ABFWG)*

While the efforts of conservation are many, it is to be noted that it takes a long time for these forests to come into full size. In order to facilitate collective action, Arabian Blue Forests Working Group (ABFWG) was established in the Region on 20 March 2019. The jurisdiction of the Group is all the way from the southern coast of Yemen to Inner RSA. There are a number of institutional members for the Group. Emirates Nature – WWF is active on conservation activities in the Emirates. In Bahrain, the University and the Government are doing an impressive amount of work. In Fujairah, Whale and Dolphin Research is making a number of efforts on blue carbon related activities through their whale and dolphin watch activities in addition to mangrove restoration and management.

ROPME with its remote sensing programme is a good facilitator of synoptic data and information collection, collation and distribution.

AGEDI is also very active in the domain through a number of projects such as Dubai water quality towards amenity services valuation, UAE oceanic blue carbon project and UAE Mangrove annual carbon sequestration project.

ABFWG provides services in 3D modeling, scenario development and 360 degree tours of the environment to provide a good oversight to help in decision making. The Working Group actually is a facilitator of networking to share best practices, prepare integrated analysis and publications, knowledge-based opinion while also acting as a clearing house of experts. The principles of the groups are open access and voluntary service. We are not a funding body. As for our structure, we are governed by a Secretariat. The Secretariat interfaces with international organizations, entities and initiatives. The Working Group includes AGEDI, ROPME, WWF, Emirates Nature, ARAMCO, PERSGA and other entities, comprising of Government, Regional and nongovernmental Organizations.

Discussion

ROPME Coordinator – I thank AGEDI, you and your Working Group for this good initiative in our Region. Also, the title 'blue forests' is symbolic to our mostly desertic environment. ROPME will support this initiative. We request JICA to take note while preparing programme activities for ROPME Sea Area that there is a great potential in this kind of professional togetherness in the Region.

10. SESSION 5: PRACTICAL ACTIVITIES FOR THE REGIONAL NETWORK

10.1 Our ongoing mangrove activities focused on SDGs – *Dr. Shigeyuki Baba, Professor Emeritus of University of Ryukyus, Japan, International Society for Mangrove Ecosystems (ISME)*

ISME as a society founded in 1990 through an international cooperation of people of common interest to collect, evaluate and disseminate information on mangrove ecosystems for the conservation and rational management as well as their sustainable utilization. It has 44 institutional members, 1200 individual members coming from 94 countries/regions. ISME has completed a number of projects around the world since its inception. It has also brought out a World Atlas on Mangroves in 1997, through the funding obtained from ITTO, US Department of State and Government of Spain. ISME is now updating the World Atlas of Mangroves. ISME also has a portal for data and information it has collected and collated from around the world. It needs cooperation from all countries gathered here for updating the Atlas.

We now have a number of mangrove afforestation projects in the world, which work in relation to SDGs. We have a running afforestation project in Gujarat, India involving a local community. 300,000 *Avicennia* seedlings are produced annually in the project. Every year, 3 million seeds are collected. These plantations have gradually turned into havens of biodiversity, attracting and sustaining a wide variety of flora and fauna. And community involvement brings in employment. In the Republic of Kiribati, ISME has been implementing a mangrove rehabilitation project since 2004. This is also developing in line with SDGs and adaptation to climate change. This also has community involvement. In Sabah, Malaysia, ISME is replanting degraded mangrove forests, in cooperation with Sabah Forestry Department in 23 project sites. Associated with this project is an effort of rehabilitation of abandoned fish ponds too. The project works with volunteers, school children and the Government.

The essence of habitat conservation and restoration is the involvement of community, reflected in the essence of SDGs. I impress upon the Organizations here to keep this in consideration while exerting efforts of conservation. Similarly, it is necessary to communicate with the local community and create awareness as well as confidence in your efforts. Also, while building cooperation amongst the institutions in a conservation project, it is important to encourage each partner in order to keep a level of high motivation. In all, community participation and mutual encouragement are very necessary for a successful implementation of environmental conservation and rehabilitation projects. Besides, appropriate human resource development, securing proper financial provisions and exchanging or sharing necessary information are also of high significance.

Discussion

ROPME Coordinator – I greatly appreciate the idea of engagement of local community, which you so clearly demonstrated in your examples. That factor is a vital key to long term success and gender equality.

10.2 Case study: Mangrove conservation in Oman and its relevance to the Region – *Mr. Bader Al Bulushi, Ministry of Environment and Climate Affairs, Sultanate of Oman*

The presentation focuses on conservation efforts of mangroves in the Sultanate of Oman. In Oman, at least 9 areas including 13 sites in all are identified as predominant mangrove ecosystems on the coast, in addition to many smaller ones. They have been naturally occurring mangrove sites and are established over 100s of years. They have been providing a number of ecosystem services that are integrated into the cultural and social life styles of people. They also protect the soil from erosion and protect the hinterland from storms.

In 2002, we began cooperation with JICA to restore and conserve mangroves on the coast of Oman. In Muscat, we have conserved mangroves in the heart of the city. This presentation explains in detail how the nurseries are maintained, how water from the lagoons and tides are brought in and how the nursery structure is built and maintained. In the efforts of conservation and especially replanting and restoration activities, the time cycle of the species in different geographies is to be considered. For example, the flowering of mangroves in Muscat is in July, while it is January in Salalah.

In this presentation, I will also show in great detail each step followed in Oman in collecting the seeds, treating them, germinating them in nurseries, growing the saplings, transplanting in designated sites and monitoring and caring for them in time. I also elaborated upon the education, awareness, eco-tourism and motivation programmes conducted for the young and general public in support of conservation. Student exchange programmes are also a part of this conservation effort.

Oman also was associated in a transplantation project in Kuwait since 2014 in Al-Jahra area, bringing seeds from Oman. Similarly, Oman has assisted Bahrain too. Oman also cooperates with Basra University in Iraq and a researcher from Iraq is presently hosted in Oman for exchange of knowledge and skills.

Discussion

ROPME Coordinator – I appreciate your motivating work. What is the reason for the different sizes in the sites of mangrove conservation in Oman? And what is contributing to the success rate in the conservation efforts?

Mr.Al Bulushi – We normally check soil and water quality before selecting whether the site is suitable for mangrove transformation. In some areas like Musandam, there are no lagoons or low lying soil areas and so the geography is limited. Whereas in Salalah, there are wide low lying areas in addition to very conducive weather. So, these factors do influence the success rate and the size of available restorable sites.

Kuwait – Is the seeding process based on spacing idea obtained from scientific research?

Mr. Al Bulushi – In many countries the seeds are just scattered in sites and it has worked reasonably well. But we have seeded based on observational experience on space needed for individual mangrove plant to grow.

JICA – Do you have a monitoring programme for mangroves? Do you have indicators? How does it go?

Mr.Al Bulushi – We have frequent monitoring campaigns and we have a meticulously prepared log of parameters that we collect from each site to understand how the environment as well as the plantation is performing.

Kuwait – We cooperate with KISR and study all our sites continuously. And we constantly keep a scientific oversight about the programme of mangrove conservation. We have carried out our restoration work through a rigorous scientific protocol right from the site selection to plantation. And it is not that the project works as a matter of chance; it is actually a scientific cause and effect kind of situation.

10.3 Kuwait's coral reefs restorations – *Dr. Shaker H. Al Hazeem, Kuwait Institute for Scientific Research (KISR)*

The key factor in any conservation and restoration effort is to take into consideration the historical data of the region and model the programme accordingly.

As for the coral reefs of Kuwait, we do have an assessment of the history of coral reef occurrence in our waters through published records, dating back to 1985. Our restoration plan has permanent transect sites and a scientifically based activity plan.

Because of high sedimentation from the delta, most of Kuwait waters is not congenial for coral growth. However, there are pockets that are suitable for the growth of coral reefs. We have about 35 coral species in Kuwait, 29 of which do build reefs. We have published a book on corals and coral reef fishes of Kuwait.

We found no significant decrease in corals due to coral bleaching till 2015. However in the present, we have a significant bleaching and coral grazing problem. Fishing nets too have disrupted the growth of reefs. So, we have a plan of restoration and rehabilitation, mainly through asexual and sexual coral propagation. We have an infrastructure for lab based nursery for coral larvae, which then gets transferred to the site for larval seeding.

Monitoring the reef is also done by way of high spatial resolution satellite images and GIS techniques. Using high resolution images, we do carry out time series comparison. We find that between 2006 and now, there is a big change in area coverage. We have lost over 79,000 sq. meters of coral coverage between 2006 and 2017. We have also been using drones for our studies. We have recently published a paper on these investigations.

Discussion

JICA – Our experience is that after coral seeding, only 5 percent settlement success was recorded in some areas. Hope your success rate will be better than ours.

Dr. Al Hazeem – We do have difficulty in restoration project because of high human interference due to tourism, movement of private boats and anchors. Our sites are not as virgin as Japanese sites could have been. However, consider using Calcium Carbonate based substrates for higher success.

ROPME Coordinator – How high resolution images can be trusted for deeper corals? And as for bleaching, we are of an understanding that we had about 8 percent of world coral distribution in the world in 2008. It may have changed in the recent times. What is your opinion on the coverage?

Mr. Al Saffar – Using high resolution imaging, we used 18 transect lines to study the corals in Kuwaiti waters. I would normally select a site and go to the exact location by GPS. Then integrate the satellite data with the transect data from the field. We then develop a refined method, which increases our confidence in the information. We could also use drones fitted with multi-spectral radiometers during low tide to capture a better images.

ROPME Coordinator – Could we use such information for mangroves as well effectively?

Mr. Al Saffar – We could use drones to collect information on mangroves as well to estimate density and volume of the trees. We could do 3D modeling of the distribution. Then we could integrate water quality information as well.

Dr. Al Hazeem – As for bleaching, we do have an extreme environment. We only have 35 species of corals unlike 300 species that they have in Australia. Most impacted coral species in our waters is *Acropora*, which is very sensitive to stress. No significant difference in the coral density was recorded between 2005 and 2015. The difference is from a later period. We need to find the most affected area and then begin the restoration efforts.

Chairman – In Oman, we have small patches of bleaching but in years, we find them coming back to life. May be the genetic stock is not destroyed at all, though apparently the population is reduced. Does it happen here in Kuwait too?

Dr. Al Hazeem – Bleached corals have the potential to recover. Their resilience depends on the incidence of continued stress.

I.R.Iran – Excessive bleaching happens almost every 5 years in our Sea Area and sometimes it is cumulative or incremental. So, is it reasonable to restore them at all, since it takes so much of expenditure?

Dr. Al Hazeem – Restoration brings in resistance to change as we have seen in many areas of the world. So, it is important to intervene and help in recover. Hopefully, there will also be some curation measure discovered in future for the bleaching events.

11. CLOSING DISCUSSIONS

Chairman – What is the opinion of the Member states on the future of cooperation and networking in the Region, now that we have come to the concluding stage of this Workshop?

JICA – We have been carrying out project activities in the Region and this Workshop has been a part of that endeavour. We have found several keywords like database, data sharing, restoration etc. ROPME Coordinator has mentioned that he is looking forward to continuing the Regional activities through mutual cooperation. If participants have a clear idea of which kind of activities should be pursued, JICA and ROPME could consider those.

KISR – It is a good idea to think about Regional scale activities. But we have to have historical data on each location before developing a practical work on restoration by integrating this information.

***Ms.* Glavan** – The Region lacks some foundational data necessary to do the work. For example, we may not have a detailed Regional habitat map. Things like those gaps, in a cross boundary manner, should be bridged. Regional blue carbon map and such holistic data is needed as a primary effort.

Kuwait – We need cooperation between National and Regional institutions through ROPME.

Bahrain – As JICA says, we need to strengthen activities on the keywords and include seagrass plantation too among the keywords.

Kuwait – Workshops in which we get into small groups and brainstorm to come out with collective ideas is important. Having presentations is good but more discussion is necessary to put ideas together. Additionally, we need some practical experience through the Workshops also.

I.R.Iran – We should have sub-committees for each restoration discipline to work out technical details.

ROPME Coordinator - ROPME is establishing Technical Support Groups for each of the priority domains. One for blue carbon will be established to cover that domain. That is our approach. We cannot have sub committees for each sub discipline. That will be difficult to manage. But through Technical Support Groups, we are documenting everything possible. We are preparing evidence reports, for example. We should see the resources available, financials, etc. and then proceed with activities. We are preparing an evidence report for corals. We might do for mangroves if resources and priorities permit. Perhaps a blue carbon report might be our preferred choice to hold a broad based coverage of a number of ecosystems. We are approaching the issue in this manner. We will also have modules for each discipline on the ROPME Integrated Information System. That will help in networking and exchange of information.

12. CLOSING OF THE WORKSHOP

Dr. Hassan Mohammadi, ROPME Coordinator expressed happiness that the Workshop was very useful. He reaffirmed that the stakeholders of this endeavour will work more extensively on the subject. He also mentioned that more meetings are scheduled in due course for each emerging discipline and that ROPME is engaging top notch experts in order to secure appropriate technical support. He thanked the Member States, JICA, UNEP, CEFAS, KISR, AGEDI and every participant of the Workshop for bringing this kind of initiative into fruition. He also thanked the Chairman and Rapporteur for the help in conducting and recording the deliberations.

Dr. Noriaki Sakaguchi of JICA thanked ROPME, the Member States and the participants for a very useful deliberation. He requested the participants to please update JICA about their activities and suggest how JICA could help. He hoped to keep this discussion moving. He particularly thanked Dr. Mohammadi and Dr. Moufaddal of ROPME for cooperation and opening ROPME’s synoptic information and facilities for everyone.He hoped to continue and strengthen the cooperation.

Mr. Badar Al Bulushi, Chairman of the Workshop thanked ROPME, JICA, UNEP, ISME, KISR and other organizations that supported this event. He expressed happiness that the participants networked with each other and requested ROPME to circulate the information to participants, along with the Workshop Report.

The Workshop closed at 12:30 Hours.

ANNEX - I

LIST OF PARTICIPANTS

(Omitted)

ANNEX - II

PROGRAMME

Programme

Day 1: Monday, 16 September, 2019		
Time	**Programme**	**Speaker**
08:30 - 09:00	Registration	
Opening Session		
09:00 - 09:40	Welcome Remarks Opening Remarks from ROPME Guest of Honour Remarks Opening Remarks from JICA	– Dr. Jasem Al Besharah, Acting Executive Secretary, ROPME – Dr. Hassan Mohammadi, Coordinator of ROPME – H.E. Mr. Takashi Ashiki, Ambassador of Japan – Ms. Wakana Hirata, JICA
09:40 - 10:00	Break	
Organization of work		
10:00 - 10:05	- Election of Workshop Chairman and Rapporteur	
Session 1: Workshop orientation		
10:05 - 10:25	Background, reflection on the past activities, purpose and expected outcomes	Mr. Yoichi Harada, JICA Study Team
10:25 - 11:00	Overview of the current status of the coastal habitat and prioritized issues in RSA	Dr. Wahid Mohamed Moufaddal, Dr. Subra Madhavapeddi, ROPME Secretariat
11:00 – 11:20	Break	
Session 2: International background on coastal habitat conservation		
11:20 - 11:50	Policies and strategies on the conservation and restoration of the coastal and marine ecosystems	Mr. Takehiro Nakamura, UN Environment
11:50 - 12:20	Managing the impacts of development on coastal ecosystems in the West Asia Region	Ms. Etaf Chehade, West Asia Office, UN Environment
12:20- 12:40	Discussion: the direction and outcomes of the workshop	Chaired by ROPME Secretariat and JICA Study Team
12:40 - 14:00	Prayer and Lunch	
Session 3: Prioritized issues among the Member States		
14:00 - 14:30	Overview of the tools for the marine environment and coastal habitat conservation shared in the ROPME-JICA Partnership Programme	Mr. Satoshi Sasakura, JICA Study Team

14:30 - 16:10 (including short breaks)	Current status and national priority on the coastal habitat conservation and rehabilitation from technical perspective	ROPME Member States (ca. 10 minutes for each Member State)
16:10 - 16:30	Developing a State of the Marine Environment Report (SOMER) for Kuwait	Dr. Brett Lyons, Centre for Environment Fisheries & Aquaculture Science, UK
16:30 - 17:00	Discussion: Differences and similarities on the prioritized issues and necessary approaches to address them	Moderated by the Workshop Chairman

Day 2: Tuesday, 17 September 2019		
08:30 – 08:40	Recap of the proceedings of Day 1	Workshop Chairman
Session 4: Blue carbon as the multi-beneficial approach		
08:40 - 09:00	Blue carbon and its actual cases of application	Mr. Takehiro Nakamura, UN Environment
09:00 – 09:20	Integrated approaches to conservation and management of coastal ecosystems providing multi-benefits for people	Dr. Noriaki Sakaguchi, JICA
09:20 – 09:40	Roles of blue carbon ecosystems in climate change measures and blue infrastructure	Dr. Tomohiro Kuwae, Port and Airport Research Institute, Japan
09:40 - 10:00	Blue Forests of the Arabian Peninsula: Update on activities and findings	Ms.Jane C. Glavan, Arabian Blue Forests Working Group (ABFWG)
10:00 – 10:30	Discussion: Potential approaches to the blue carbon in the region	Plenary (Chaired by Member States)
10:30 - 11:00	Break	
Session 5: Practical activities for the Regional network		
11:00 - 11:30	Our ongoing mangrove activities focused on SDGs	Dr. Shigeyuki Baba, Professor Emeritus of University of the Ryukyus, Japan, International Society for Mangrove Ecosystems
11:30 - 11:50	Case study: Mangrove conservation in Oman and its relevance to the Region	Mr. Badar Al Bulushi, Ministry of Environment and Climate Affairs, Sultanate of Oman
11:50- 12:10	Kuwait's coral reefs restorations	Dr. Shaker H. Al Hazeem, Kuwait Institute for Scientific Research (KISR)
12:10-12:40	Short presentations on habitat conservation and rehabilitation from participants	Participants (5 minutes for each person)
12:40-13:30	Discussion and wrap-up: networking, future collaboration	Plenary moderated by the Workshop Chairman
13:30	Closing of the Workshop	ROPME and JICA
14:00	Lunch	

ANNEX - III

STATEMENT OF DR. JASEM AL BESHARAH, ACTING EXECUTIVE SECRETARY OF ROPME

ROPME-JICA Workshop

Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area

16 -17 September 2019, ROPME Secretariat, State of Kuwait

Statement of Dr. Jasem Al Besharah,
Acting Executive Secretary, ROPME

Your Excellency Mr. Takashi ASHIKI, the Ambassador of Japan to the State of Kuwait,

Distinguished Participants from the ROPME Member States,

Ms. Wakana HIRATA and respected JICA Participants,

Representatives of UN Environment,

Esteemed Resources Persons,

Honoured Guests, Colleagues, Ladies and Gentlemen,

It gives me great honour to welcome you all to this important Workshop on "Coastal Habitat Conservation and Rehabilitation in ROPME Sea Area". It is a privilege to have such a gathering here today being the first major technical event held in the new premises of ROPME Secretariat.

The theme of this Workshop is addressing one of the most pressing environmental challenges of our Region. We are witnessing a continued degradation of environment and biodiversity in the name of economic development in the ROPME Sea Area. The task is massive and requires a concerted Regional response to better protect and restore our degraded ecosystems. ROPME has been working with a large number of concerned Regional and International entities and has accumulated a long experience on this matter over the past four decades. In the background of these efforts and vision, ROPME entered into a Partnership Programme with the Japan International Cooperation Agency (JICA) in November 2014. Under this Partnership Programme, several Workshops have been conducted to contribute to strengthening the Regional technical capacity.

Today's Workshop is the last one under the present framework of ROPME-JICA Partnership Programme. We hope and expect that the outcome of this Workshop could become another important step in the direction of our shared objective in judicious environmental management. It is also hoped that the current dialogue of environmental conservation and rehabilitation would be attentively pursued by all the stakeholders for the years to come.

Ladies and Gentlemen,

I am pleased that we are joining hands in thinking about the best practices of environmental management that we should adopt. At the same time, I feel saddened that H.E. Dr. Abdul Rahman Al-Awadi, who lead this Organization from the front for over 40 years, passed away some two months ago, in the course of preparations of this Workshop. As the Executive Secretary of ROPME since its inception, Dr. Al-Awadi was a prominent figure in the domain of environment. He was very keen to participate in this Workshop and interact with all of you. His demise is deeply regrettable but his legacy remains an inspiration. We will continue to follow in his pioneering footsteps. We hope to build on his good work in maintaining and strengthening a lasting Regional cooperation for the protection and enhancement of the Environment.

Ladies and Gentlemen,

I wish you all a very successful and fruitful Workshop. My administration will ensure that your participation and stay are comfortable and enjoyable. I once again express my deep gratitude for the dignitaries and guests who have honoured us today with their graceful presence. And I thank you all for your trust in us and hope that this Workshop will strengthen our collective resolve to protect the marine environment of the ROPME Sea Area.

Thank you.

ANNEX - IV

GUEST OF HONOUR REMARKS DELIVERED IN ARABIC BY H.E. MR. TAKASHI ASHIKI, THE AMBASSADOR OF JAPAN

كلِمة سعادة السيد تاكاشي أشيكي سفير اليابان إلى دولة الكويت

ورشة العمل المشتركة بين "المنظمة الاقليمية لحماية البيئة البحرية" و "وكالة اليابان للتعاون الدولي"

السلام عليكم
الدكتور/ جاسم بشارة – القائم بأعمال الأمين التنفيذي للمنظمة الاقليمية لحماية البيئة البحرية
الدكتور/ حسن محمدي - مُنَسِق المنظمة الاقليمية لحماية البيئة البحرية
الدكتور / نورياكي ساكاجوتشي – كبير مُستشاري وكالة اليابان للتعاون الدولي
السيدات والسادة،،،

في البداية، أودُ أن أُعرِب عن خالِص التعازي في وفاة **الدكتور عبدالرحمن العوضي**، الأمين التنفيذي للمنظمة الإقليمية لحماية البيئة البحرية، الذي وافته المنية في يوليو الماضي. كما أُعبِر عن عظيم التقدير والإحترام لإنجازات الراحل باعتباره الأب الروحي للمنظمة وأبرز المُدافعين عن البيئة البحرية في المنطقة لما يقرُب من أربعة عُقود.

لقد علِمتُ أن الفقيد هو من قام بتوقيع مُذكِرة التفاهُم بين المنظمة الإقليمية لحماية البيئة البحرية ووكالة اليابان للتعاون الدولي في مجال حماية البيئة البحرية في الثاني من نوفمبر عام 2014. وأن برنامج الشراكة بين "المنظمة" و"جايكا" قد تم تفعيله في نوفمبر 2015.

كما أنتهز الفرصة لتهنئة الدكتور جاسم بشارة بمناسبة تعيينه قائماً بأعمال الأمين التنفيذي للمنظمة متمنياً له كل التوفيق.

بموجب برنامج الشراكة، تم عقد ثلاث ورش عمل مشتركة بين المنظمة وجايكا ركزت على النظام البيئي للبيئة البحرية والساحلية، منها مرتين في طوكيو ومرة في عُمان، مما يجعل ورشة العمل الحالية هي الثانية التي تعقد في هذه المنطقة.

سوف تُختتم أنشطة برنامج الشراكة في شهر أكتوبر، وأتمنى أن يتم الحفاظ على شبكة العلاقات التي تم بنائها من خلال هذه الأنشطة في المستقبل. وحيثُ أن مذكرة التفاهم ما زالت سارية لعدم وجود تاريخ انتهاء لها، أتوقع أن يتم البدء في برنامج تعاون جديد في المستقبل القريب.

ونحنُ في سفارة اليابان نرغب في المساهمة في اغتنام هذه الفرصة للبناء على هذا التعاون المشترك لتوثيق أواصِر التعاون بين اليابان وأعضاء المنظمة من خلال مشاركة خبراتنا الطويلة في مجال المحافظة على البيئة بصفة عامة والبيئة البحرية بصفة خاصة.

شكرا لحُسنِ استماعِكُم...

ANNEX - V

COPIES OF PRESENTATIONS MADE BY THE RESOURCE PERSONS AND THE MEMBER STATES

Background, reflection on the past activities, purpose and expected outcomes

Mr. Yoichi Harada, JICA Study Team

ROPME-JICA Workshop

Workshop Orientation
- Background, reflection on the past activities, purpose and expected outcomes-

JAPAN International Cooperation Agency (JICA)

JICA Study Team

ROPME-JICA Partnership Program

Objective of the Program

MOU has been signed on November 2014

For the Sustainable Marine Environmental Management in ROPME Sea Area in line with the ROPME's Strategy

- Sharing knowledge and experience on Management of Marine Environment between ROPME, Member States and Japan for future cooperation.
- Promoting regional/bilateral cooperation among ROPME Member States and Japan.

JAPAN International Cooperation Agency 3

Interview Survey (2016 - 2018)

Country	Organization
Bahrain	Ministry of Climate Change & Environment National Mariculture Center Supreme council of Environment
Iraq	Marine Science Center / Marine Science Center
Kuwait	Environmental Public Authority Kuwait Institute of Science and Research
Oman	Ministry of Environment and Climate Affairs Ministry of Tourism Ministry of Agriculture and Fishery Wealth Sultan Qaboos University
UAE	Ministry of Climate Change and Environment Environmental Agency, Abu Dhabi Dubai Municipality Abu Dhabi Global Environmental Data Initiative (AGEDI)

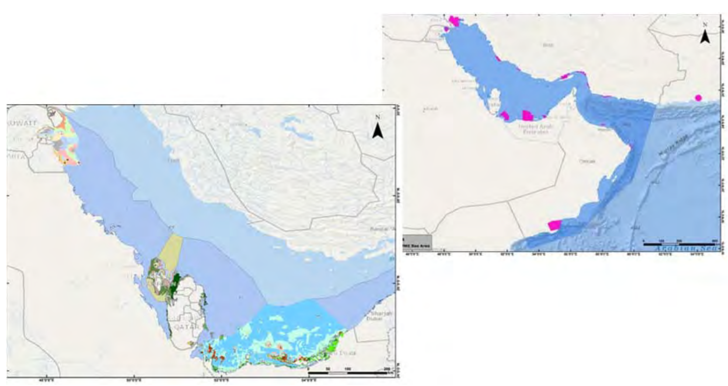
JAPAN International Cooperation Agency 4

Interview Survey (2016 - 2018)

Country	Organization
Qatar	Ministry of Municipality and Environment
Saudi Arabia	Ministry of Climate Change & Environment National Mariculture Center Supreme council of Environment
Iran	
International Organization	UNEP ROWA Convention on Migratory Species (CMS)

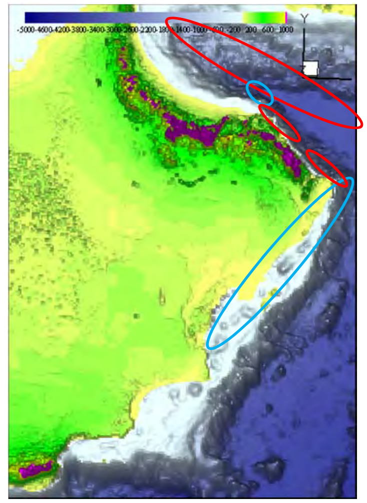
Baseline Study

- Inventory study
  Stake holder directory, Environmental Legislation, Policies, Data Source and EBM Case Studies
- Gaps analysis
  Data gap



Preparatory Study on Master Plan for Coastal Area Management in Oman

- Literature study
- Identification of important area
- Designing of pilot study
- Workshop for satellite image analysis
- International workshop on EBM Strategy



International Workshop

- First workshop in Japan: October 2016
  ROPME-JICA Workshop
  EBM Startegy Working Group Meeting (ROPME-UNEP)
- Sencond workshop in Japan: December 2018
  ROPME-JICA Workshop
  Regional Task Force Meeting on Marine Biodiversity Strategy (ROPME)

- Workshop in Oman: September 2017
  Wrapup Workshop of a Cost Sharing Preliminary Project in Oman (Oman-JICA)
  Workshop on Communicaton Tools for Working Group on EBM Strategy (ROPME-UNEP)

Regional Workshop

- April 2016 (ROPME, UNEP)
  Towards the Development of an Ecosystem Based Management (EBM) Strategy for ROPME Sea Area
- September 2016 (NFP-UAE, JICA, GEOMAR University of Birmingham)
  Scientific Committee Meeting on Monitoring and Assessment of Sand and Dust Storms in ROPME Sea Area
- October 2016 (ROPME, UNEP, JICA)
  First EBM Strategy Working Group meeting to prepare work plan.

Regional Workshop

- April 2017 (ROPME, CEFAS)
  Meeting of the Regional Task Force on Marine Climate Change Dimensions
- January 2018 (ROPME, CEFAS)
  Meeting of the Regional Task Force on Eutrophication and HABs in ROPME Sea Area
- January 2019 (ROPME, CEFAS)
  Meeting of the Regional Task Force on Marine Climate Change Dimensions (2)

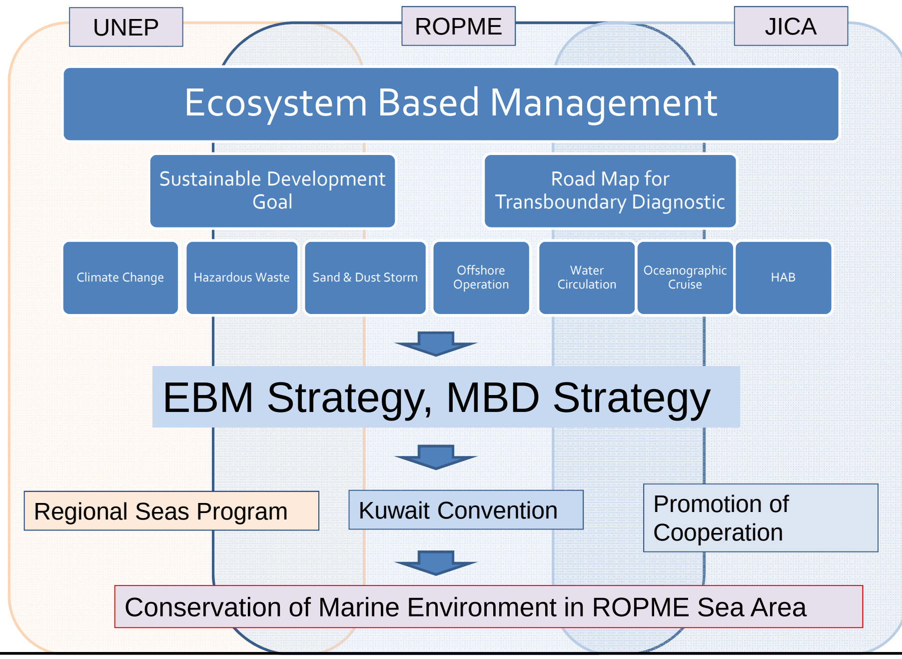
Support on Matching between Needs and Technique

- Oil spill/discharge detection using the technique of satellite image analysis
- Funding from Japanese organization on technical study in Kuwait
- Consultation on aquaculture in Bahrain
- Discussion on marine environment in Saudi Arabia

Keywords in the Region

- Wastewater management
- Monitoring program (ecosystem, water)
- Data management / Data sharing
- Ecosystem conservation
- Marine litter (micro plastics)
- Spawning ground
- Aquaculture management
- Fishery resource management
- Sandstorm

Project Strategy



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ROPME-JICA workshop in Kuwait

Objectives

Regarding conservation and rehabilitation of coastal habitat；

- To share practical and multi-beneficial technologies and experiences
- To share a view of strategic direction
- To establish a network for sustainable cooperation

Expected outcomes

Regarding conservation and rehabilitation of coastal habitat；

- Network would be active for exchange information in the region
- Practical techniques and know-how would contribute to the establishment of regional action plan

Overview of the current status of the coastal habitat and prioritized issues in RSA

Dr. Subra Madhavapeddi, ROPME Secretariat

Regional Organization for the Protection of the Marine Environment (ROPME) - Japan International Cooperation Agency (JICA)

1

Workshop on

Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area

Dr. Subra Madhavapeddi
ROPME Secretariat, State of Kuwait

16 - 17 September 2019

2

Overview of the current status of the coastal habitat and prioritized issues in ROPME Sea Area (RSA)

ROPME Sea Area (RSA)

3

- **Eight Member States:**

Bahrain, I.R. Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the **United Arab Emirates**

- **Three Distinct Areas**:

The **i-RSA** (inner RSA)
The **m-RSA**(middle RSA)
The **o-RSA** (outer RSA)

ROPME Sea Area from Space

4

Current Status

5

ROPME Sea Area (RSA) is located in the subtropical zone

The RSA as a whole is home to habitats such as coral reefs, mangrove strands, seagrass beds, and mud and sand flats, supports a wide and varied fish community

The RSA is endowed with valuable natural resources and a great biodiversity of plant and animal species

The wetlands, waterfowl, mangroves, fish, marine mammals, turtles, corals and other forms of life are treasures of the region. Its dugong population is second in global importance only to Australia's

From an ecological perspective, the ecosystems of the RSA contribute to the maintenance of genetic and biological diversity in the marine environment

Current Status

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The RSA ecosystems exert important roles such as preventing erosion and stabilizing sediments and provide valuable ecological and economic functions as they form feeding and nursery grounds for a variety of commercially important marine organisms including fish, crustaceans and molluscs

Average annual precipitation in the RSA area is reported 152 mm and is limited almost entirely to the winter months

Extreme seasonal temperatures and salinity fluctuations select for species with high tolerance or adaptability to such short-term changes

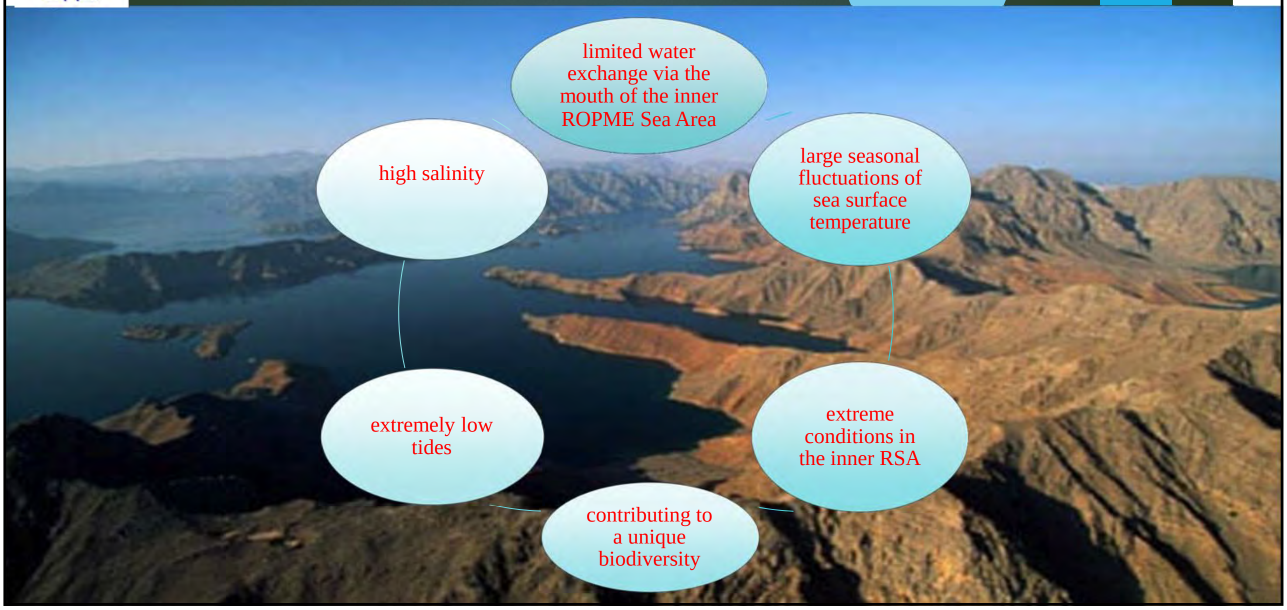
There is also a seasonal pattern in the surface water temperatures in the RSA region. The widest temperature range occurs in the north-western part of the area (15-35ºC)

Climatic effects are strongly influenced by prevailing winds from the east to the north-west

Winds from the north can also cause a dramatic temperature drop in shallow waters, resulting in mortality of flora and fauna

Exclusive & Unique Habitat

7



Coastal and Marine Habitats of RSA

8

- Coral Reefs
- Mangroves
- Seagrass Beds
- Salt Marshes
- Sabkhas
- Mudflats
- Macroalgal Beds

9

Coastal and Marine Habitats of RSA

Coral Reefs

Despite significant differences within the three parts of the **RSA** the overall distribution and diversity in most of the RSA is relatively low compare to much of the Indian Ocean

This is largely due to the harsh environmental conditions where, especially in the **i-RSA,** temperature extremes above and/or below usual coral tolerance limits, high salinities and suspended sediments, limited suitable substratum and significant competition (e.g. macro algae) have made coral reef development a major challenge

Having said this, coral cover and diversity can vary considerably even within the same country no matter how small

Hence, most of **Bahrain** and **Kuwait** have mean cover values between 5-10%, parts of **Qatar** and the **UAE** and possibly **Iran** have mean cover values between 5% in coral poor areas to well over 50% in their richer and more pristine sites

10

Coastal and Marine Habitats of RSA

Coral Reefs

Hard coral diversity varies notably across the **RSA** with as few as 7 species recently identified in Iraq, 26 in Qatar, 28 in Bahrain, 29 in Kuwait, 43 in the UAE and 44 in Iran

Overall, values show about 70 species for the **i-RSA** as a whole, there are possibly as many as 120 species in the Oman Sea and increased taxonomic effort is likely to lead more species being identified for the region, especially Iran as a whole and parts of **o-RSA**

A **thin coral** reef framework is typical of much of Saudi Arabia, Bahrain and Iran., although Iran's total reef extent and coral diversity may be the highest in the **RSA**

Saudi Arabia, despite the extreme physical conditions, reefs on much of its coast increasingly so from the border with Qatar

11

Coastal and Marine Habitats of RSA

Coral Reefs

In the **i-RSA & o-RSA, Qatar** and the **UAE** show significant **fringing reefs** especially around offshore islands and, **Abu Dhabi,** extensive and diverse coral communities have been recorded

In **Kuwaiti** waters, further north, much reduced coral development has been recorded mostly in the form of **patch and platform reefs** in and around the islands of Kubbar, Qaro, and Umm Al-Maradem with varying levels of cover and diversity. Very recent surveys have found to be the first ever recorded **hard corals** in **Iraqi** waters

The **Omani** coast shows four distinct areas of coral growth: the Musandam Peninsula, adjacent to the Strait of Hormuz, with **pristine reefs** possibly anywhere in the **RSA** with large areas exceeding 80% cover

12

Coastal and Marine Habitats of RSA:

Coral Reefs

Other key areas of coral growth include those in the **m-RSA** of **Oman** (Dayamaniyat Islands, the capital area of **Muscat,** and Sharqiyah to Ras al Hadd) and, in the **o-RSA** of **Oman,** Barr al Hikman, Masirah Island and the Mirbat Peninsula

Conditions in the **i-RSA,** with temperature extremes (15-36^0 C), salinity ranges (average of 43 ppt but upto 70-80 ppt in **Gulf of Salwa**) and some of the highest suspended sediments in the world, have led to significant research focused on **hard coral** species and their ability to survive such extremes

There is now widespread recognition these reefs provide a significant, and arguably unique, opportunity for science in that they could serve as a model for the rest of the world's reefs

The assumption is that if significant range of coral species are capable of acclimating to such naturally extreme conditions, reefs elsewhere could to a certain extent continue under future climate change scenarios

Coastal and Marine Habitats of RSA

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Coral Reefs

The conservation and protection of some of the RSA reefs as well as ensuring good water quality and controlling coastal development and other detrimental activities, are therefore essential to safeguard these unique ecosystems

Developing a regional strategy could, crucially play a key role not just for reefs in this region, but globally, making this a valuable opportunity to demonstrate that an **ecosystem based approach** could provide benefits well beyond the geographical setting concerned

Coastal and Marine Habitats of RSA

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Coastal and Marine Habitats of RSA

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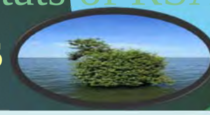
Mangroves



In terms of geographical distribution, dense expanses of mangroves are mostly located in southern shores of the **i-RSA,** particularly coastal areas of the **UAE, Saudi Arabia, eastern Qatar, NE & SE coasts of Oman**

Avicennia marina occurs naturally in **Omani** waters where they typically reach 5 – 6m in height and as much as 10 m in the **o-RSA,** as opposed to 1 - 2 m in parts of the **i-RSA**

Some of the old growth trees of the Emirate of Ras al Khaimah and Dubai can reach 10m and mangroves at Khor Kalba in the Emirate of Sharjah are believed to be some of the oldest stands

Coastal and Marine Habitats of RSA

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Mangroves

Omani mangroves are typically found at Northern Batinah, Muscat, Sur, Mahout in the Gulf of Masirah, and Dhofar

These communities, in addition to faunal assemblages of fish (>100 species), crabs, shrimps, and various shells and clams, also support 3 species of turtle, 4 species of mammals, and over 200 bird species, such as cormorants, herons, egrets, spoonbills, flamingos, and many waders, gulls and terns

Mahout and Bar Al Hikman of **Omani** mangroves are home to internationally important concentrations of shorebirds, notably crab plovers, sand plovers, dunlins and redshank

Coastal and Marine Habitats of RSA

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Mangroves

There are considerable differences between countries of the **i-RSA,** with the **UAE** home to over 14,000 ha compared with only 31 ha in **Bahrain**

The largest mangrove forests appear to be those found in **Iran** with over 15,000 ha located between the Oman Sea and the Mond Protected Area

Interestingly **Iran** also hosts the species *Rhizophora mucronata* near Sirik, in the Strait of Hormuz where it covers about 20 ha.

One of the largest mangrove stands, 9000 ha, is located at Qeshm Island in the Strait of Hormuz

No naturally occurring mangroves are recorded from **Kuwait** and extreme NE coasts of **Saudi Arabia** because of the cold winter temperatures and occasional frosts

No mangroves are found in **Iraq**

Coastal and Marine Habitats of RSA

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Coastal and Marine Habitats of RSA

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Seagrass Beds

Seagrass beds are, with mangroves, amongst the most productive coastal ecosystems in the marine environment and cover large areas of shallow water habitats (less than 15 m deep) throughout the **ROPME Sea Area**

This ecosystem is an important habitat for many fishes, shrimp, and oysters.

Seagrass beds provide a main source of food for the endangered green turtle and, in the **i-RSA,** for dugongs, which rely exclusively on seagrass beds for their sustenance

Hence, in the **i-RSA,** seagrass beds are known to host almost 10% of all faunal taxa recorded in the **i-RSA**

Coastal and Marine Habitats of RSA

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Seagrass Beds

Extensive seagrass beds are found along much of the **Iranian** waters along the Chabahar coastline, and the shores of Lengeh, Bostaneh and Bushehr

Three euryhaline seagrass species *Halodule uninervis*, *Halophila ovalis*, and *Halophila stipulacea* (of a total 50 species worldwide) recorded in much of the **RSA**

Many parts of **Oman,** in addition to three species of seagrasses found throughout the **i-RSA,** have also recorded occasional beds of the larger species *Syringodium isoetifolium* and *Thalassodendron ciliatum*

Highest biomass of *Halodule* species has been recorded in intertidal zones of Masirah channel in **Oman**

Coastal and Marine Habitats of RSA

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Coastal and Marine Habitats of RSA

22

Salt Marsh

Salt marsh is a vegetated intertidal habitat dominated by halophytes (salt loving plants)

Salt marshes occupy the upper intertidal zone, at a higher elevation than the zone occupied by mangroves

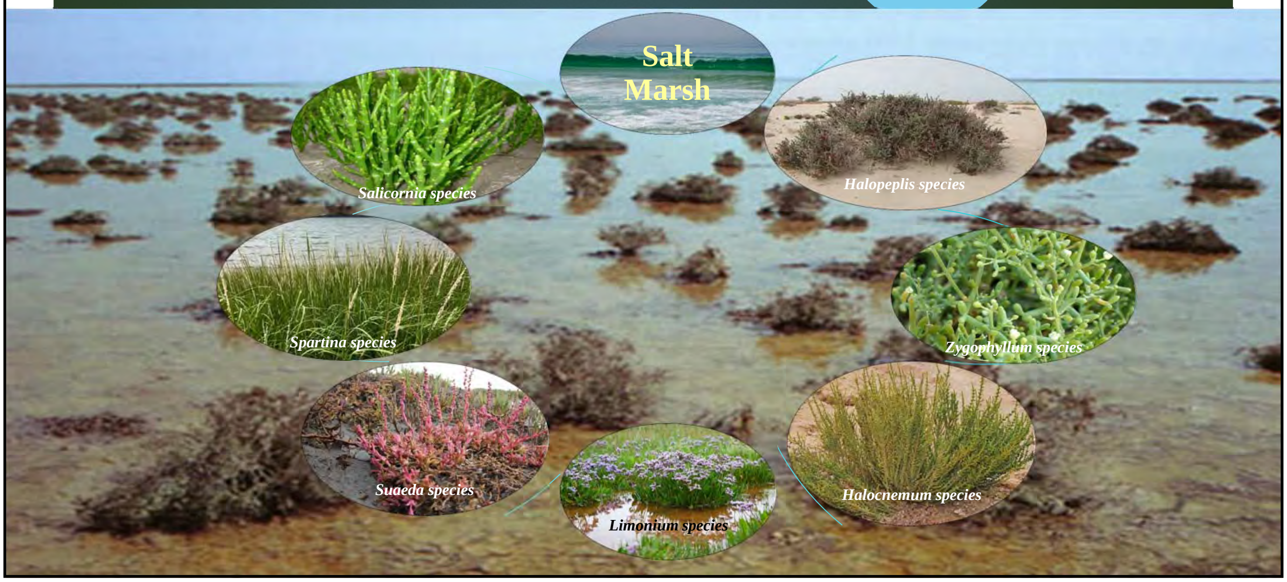
Plants forming salt marsh communities in the **ROPME Sea Area** include *Suaeda, Limonium, Halopeplis, Zygophyllum, Salicornia* etc.

Salt marshes provide a number of ecosystem services including **supporting biodiversity** (particularly plants, birds and crustaceans), **removal and tapping of fine sediments, carbon sequestration** and **trophic contributions** to marine food webs

Salt marshes in the ROPME Sea Area found around Tarut Bay in **Saudi Arabia, Abu Dhabi,** Al Khor in **Qatar,** areas of **Bahrain** and **Kuwait,** and low lying coastal areas in **Iran**

Coastal and Marine Habitats of RSA

23



Coastal and Marine Habitats of RSA

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Sabkha

Sabkha are evaporative basins where saline ground water is drawn to the surface through capillary action which creates a sub-soil salinity gradient in which gypsum and salt precipitate sequentially

Barr Al Hikman, an extensive coastal sabkha in **Oman (o-RSA)** may be wet (active) or dry (historical) depending on climate and water recharge rates

Depending on soil and ground water conditions may be colonized by halophytic plants or devoid of plant life

However the surface and few centimeters are often colonized by **microbial mats** containing cyanobacteria (Blue green algae). Blue green algal communities in the ROPME Sea Area mainly represented by *Microcoleus, Oscillatoria, Rivularia, Acetabularia, Calothrix, Lyngbya, Spirulina* species etc.

Much of the southern shore line of the **ROPME Sea Area** contains sabkha environments, e.g. areas of Al Gharbia in **UAE,** and paleolake beds of inter-dune areas in Liwa Oasis, **UAE**

Coastal and Marine Habitats of RSA

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Coastal and Marine Habitats of RSA

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Mudflats

The most widespread **benthic habitats** in the **ROPME Sea Area** are muddy substrates which, at least in the case of its' inner part, extend from the intertidal zone to its maximum depths

They are crucial for **macro-benthic assemblages** which, through their high secondary productivity, make a significant contribution to fisheries and overall marine productivity as well as providing key feeding and roosting grounds for important shorebird populations

Extensive mudflat habitats are located in the **NW ROPME Sea Area** in the proximity of the Shatt Al Arab delta

In **Iran** intertidal mudflats are located in Kolahi, Jask, Sirk and Qeshm Island

Mudflats make up a major part of the coastal areas of **Kuwait**

Mudflats are also found in **NE Bahrain**

In the **UAE** there are extensive mudflats in the emirates of Ras Al Khaimah, Umm Al Quwain to the east of Dubai and Abu Dhabi

Coastal and Marine Habitats of RSA

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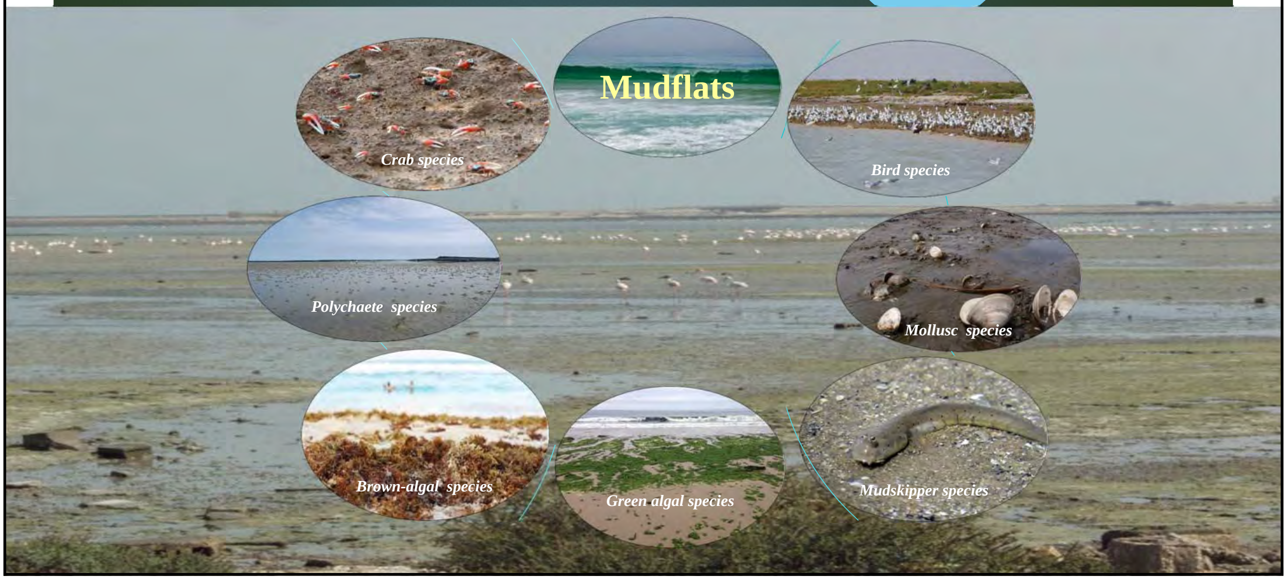

Coastal and Marine Habitats of RSA

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Macroalgal Beds

- **Macro-algal beds** which occur throughout much of the **RSA,** tend to dominate several areas of hard substrate
- These beds are a vital settlement site and nursery area for various **fish** species, **shrimp** and **oyster** spat
- Such macro algal communities house several herbivores including commercially important **abalone, rabbitfish, parrotfish,** and the **green turtle** etc.
- The limiting factor for the distribution of macro-algal beds is extreme summer conditions hence their seasonal prevalence between October and May in the **ROPME Sea Area**
- Macro-algal beds are represented by ***Ulva, Enteromorpha, Sargassum, Cystoseira, Padina*** and ***Colpomenia*** species etc.
- Macro-algal beds are more prevalent in **Omani** waters where, filamentous greens and small browns tend to grow as "**algal lawn**"
- Dense sub-tidal beds of seaweed develop along the **o-RSA** coast during the post-monsoon until January
- The variety in seaweed beds in **Omani** waters is reflected by the occurrence of as many as 232 taxa

Coastal and Marine Habitats of RSA

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Prioritized issues in the ROPME Sea Area

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Formulation of an EBM (Ecosystem Based Management) Strategy for the RSA (ROPME Sea Area)

To Implement the EBM Strategy in the RSA

The EBM Strategy will set a clear regional ecological objectives and associated targets and indicators. The EBM Strategy to share the technologies and experiences of Conservation and Rehabilitation of coastal habitats

To Adopt the Sustainable Development Goals (SDGs) in the RSA

The EBM Strategy should be consistent with the 2030 Agenda and the Sustainable Development Goals (SDGs), so that the EBM Strategy will serve as a regional implementation strategy for the **ROPME Sea Area**

To Activate the Integrated Information System in the RSA

Recognizing the need for enhanced data and information sharing, existing data should be collected and gaps should be identified. ROPME Integrated Information System (RIIS) that would allow proper management of the existing data and information

Prioritized issues in the ROPME Sea Area

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Formulation of an EBM (Ecosystem Based Management) Strategy for the RSA (ROPME Sea Area)

To Extend and Strengthen the Marine Protected Area's (MPA) Network and Management in the RSA

The MPA network in the RSA is a significant tool by which the region's marine and coastal biodiversity is conserved and therefore should be extended, strengthened and maintained to ensure delivery of this major objective. Several aspects of the existing MPA network need to be assessed and if necessary improved

To Develop an Ecological Monitoring Network Throughout the RSA

The purpose of an ecological monitoring network is to enable adaptive management to be implemented, i.e., the effectiveness of a stated EBM objective should be measured using a sensitive key performance indicator allowing modifications in the action to be made to improve its effectiveness in meeting the stated objective

Prioritized issues in the ROPME Sea Area

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Formulation of an EBM (Ecosystem Based Management) Strategy for the RSA (ROPME Sea Area)

To Carry Out Coastal Habitat Mapping in the RSA

The exercise of coastal habitat mapping has greatest value, if it is based on imagery acquired within 12 months of each other in order to capture a representative snapshot of a discrete period. Ideally image analysis should be done using the same algorithms using the same software to minimize inconsistencies in the processing of the data.

To Incorporate EBM Governance Aspects in the RSA

To develop a state of the art, relevant and meaningful EBM program essential aspects of program governance should be incorporated into the design of the program.

Prioritized issues in the ROPME Sea Area

Formulation of an EBM (Ecosystem Based Management) Strategy for the RSA (ROPME Sea Area)

Finally to consider the Coastal Habitat Conservation, the **Rehabilitation** would be the common key aspect for the three prioritized Strategic Directions of the **ROPME,** i.e. **EBM,** the **Marine Biodiversity** and the **Marine Climate Change**

Harnessing Remote Sensing for Coastal Habitats Conservation and Rehabilitation

Dr. Wahid Mohamed Moufaddal, ROPME Secretariat

The Regional Organization for the Protection
of the Marine Environment (ROPME)

Harnessing Remote Sensing for Coastal Habitats Conservation and Rehabilitation

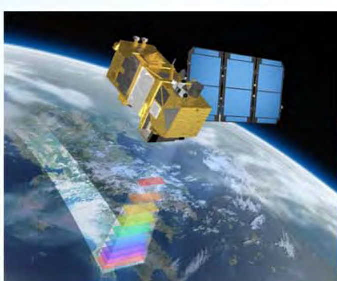
Wahid Moufaddal (Ph.D)

Remote Sensing Expert, ROPME

ROPME-JICA Workshop on Coastal Habitat Conservation & Rehabilitation in ROPME Sea Area

16-17 September 2019, ROPME Secretariat, Kuwait

Coastal & Marine Environments from Space



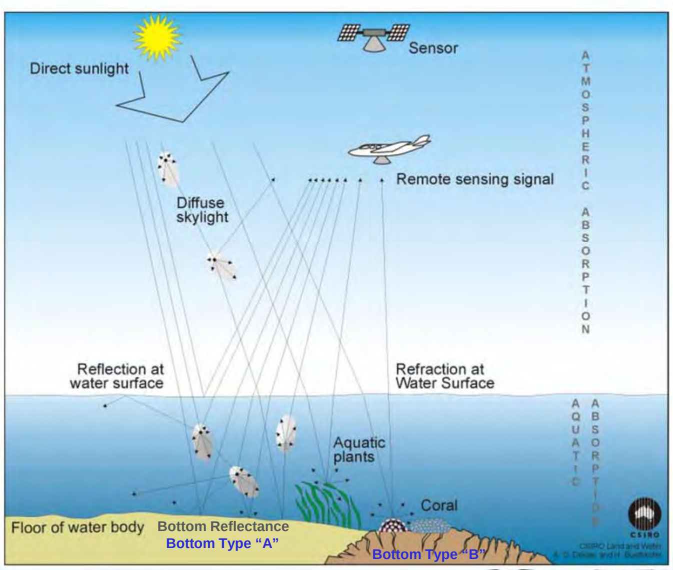
Coastal Water Quality from Space

Water colour = water reflectance

➔ Identification / quantification of the coloured water constituents

= non-algal particules, CDOM, Chla (+ phyto. species)

Concept of Remote Sensing & Satellite Oceanography (Optical Remote Sensing)



Parameters that Can Be Measured From Space?

- **Four types of primary ocean measurements can be made from remote sensing depending on the part of the Electromagnetic Spectrum being used**. They are:
  - **Ocean Colour**
  - **Sea Surface Temperature (SST)**
  - **Sea Surface Roughness**
  - **Sea Surface Slope/Sea Surface Height**

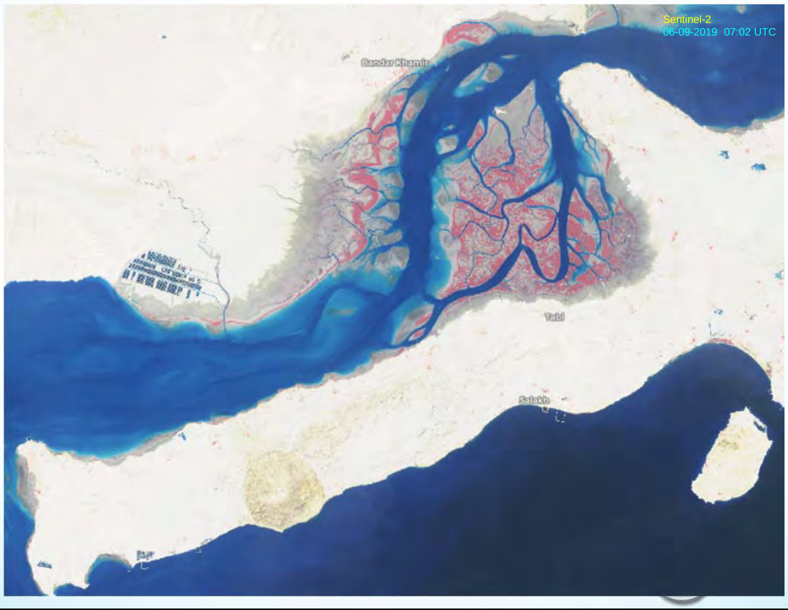
- **Satellites can also detect:**
  - **geomorphology**
  - **water depth,**
  - **what is beneath water**
  - **what covers sea bottom**
  - **large-scale circulation, currents,**
  - **river outflow and water quality**.

Most common remote sensing applications for coastal habitats conservation & rehabilitation

- ✓ **Visual assessment**
- ✓ **Geomorphologic mapping**
- ✓ **Change detection of natural habitats**
- ✓ **Assessment impacts of human activities on coastal habitats and environments**
- ✓ **Background to management planning**
- ✓ **Identification of conservation criteria**
- ✓ **Delineation of management boundaries**

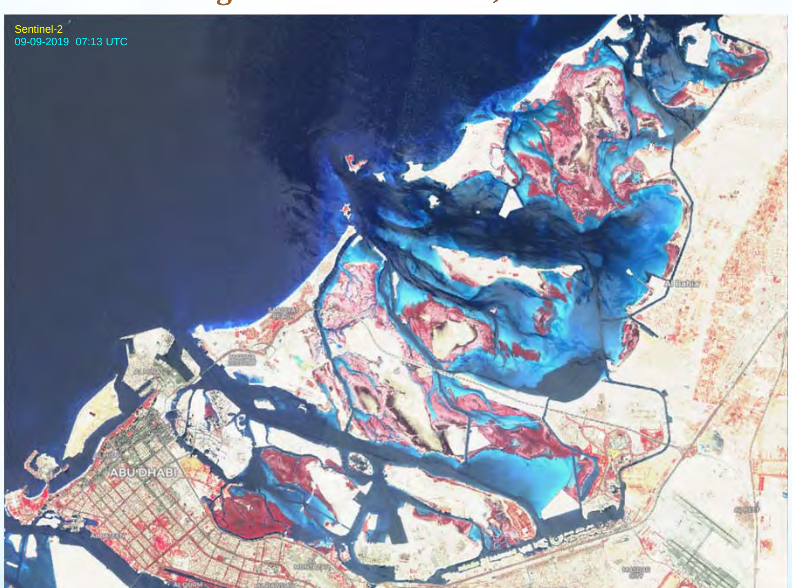
Visual Interpretation of Satellite Images

Qeshm Island Mangrove



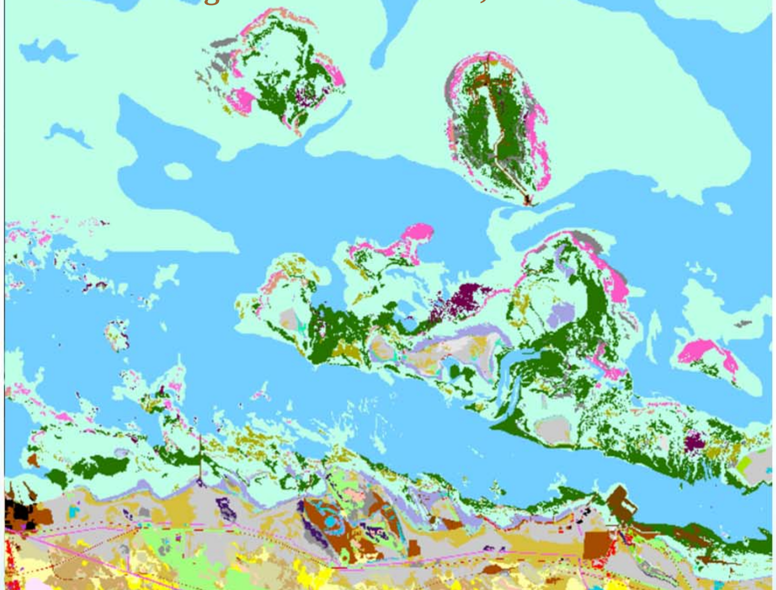
Direct satellite observation of coastal habitats

Mangrove National Park, Abu Dhabi



Satellite mapping of coastal natural habitats

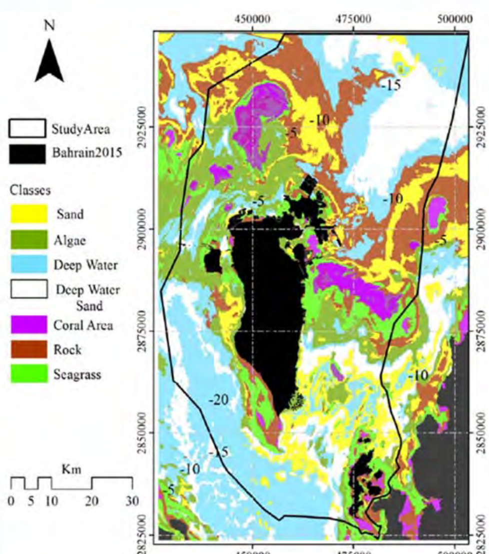
Mangrove National Park, Abu Dhabi



Source: Online Coastal Atlas of Abu Dhabi, http://coastalatlas.ead.ae/

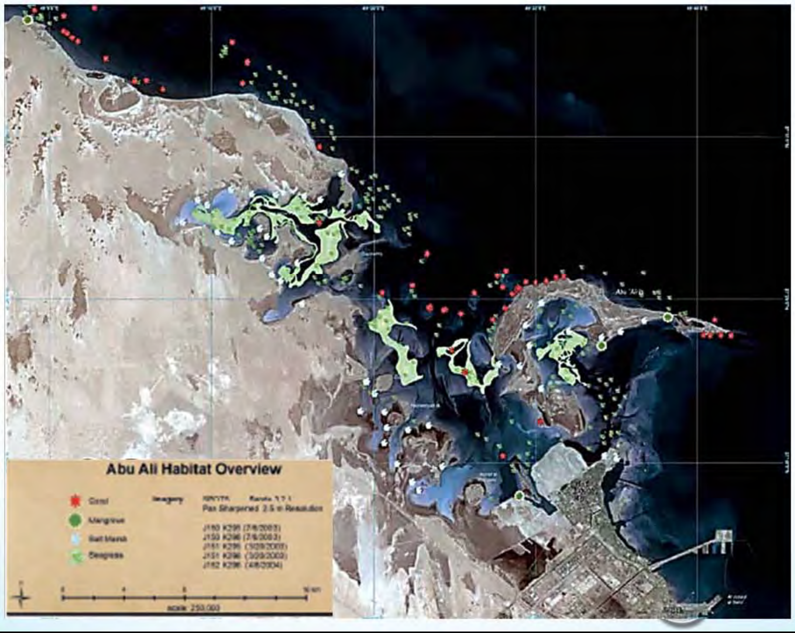
Satellite mapping & classification of benthic habitats

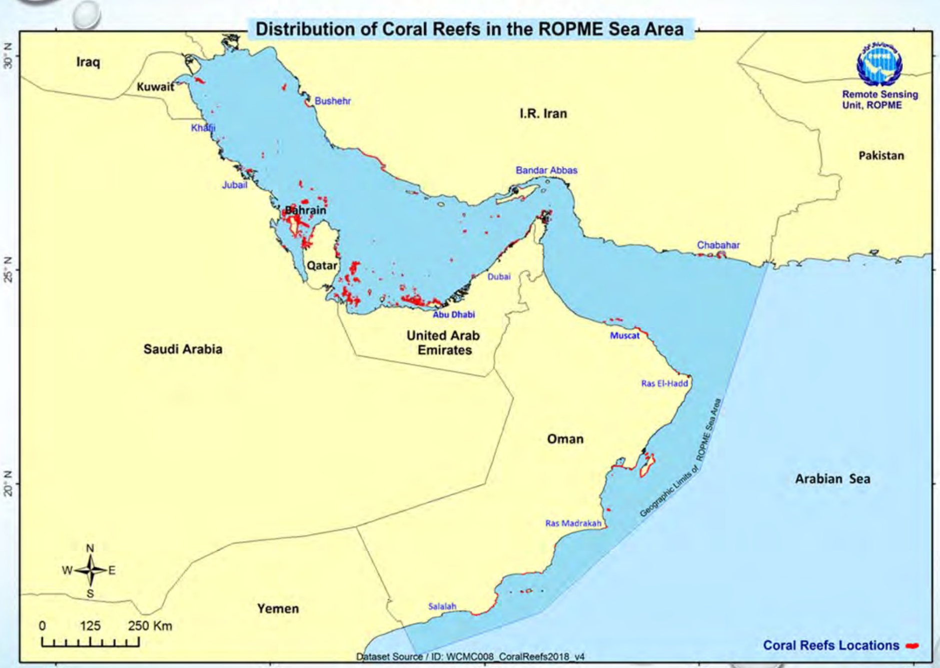
Bahrain Marine Area

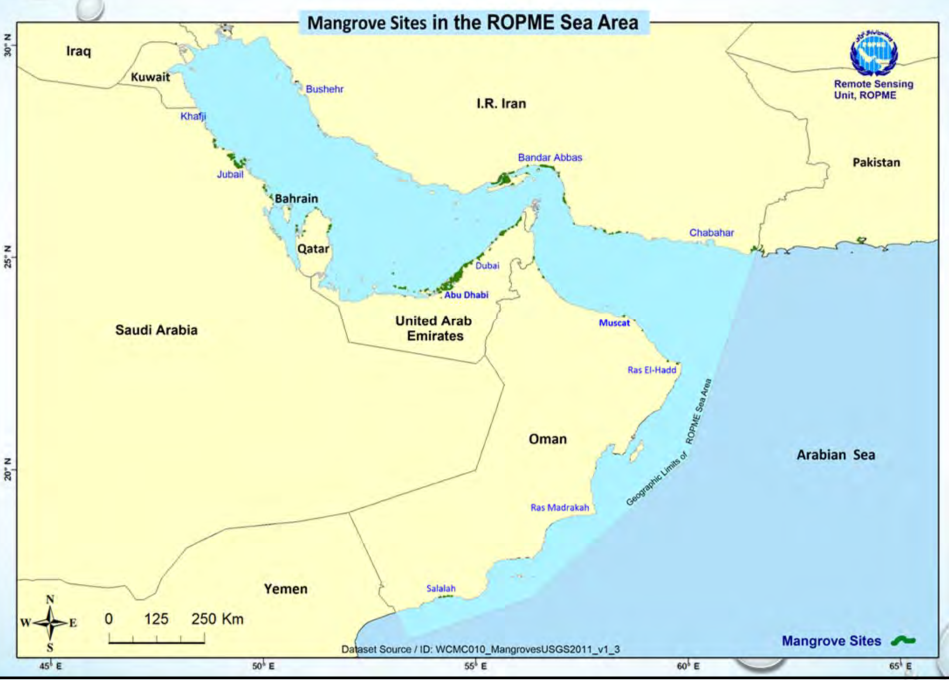


Benthic habitat classification of Bahrain marine area derived from Landsat-8 imagery. Source: *Al-Jenaid et al 2017.*

Satellite mapping of benthic habitats
Abu Ali (eastern coast), KSA



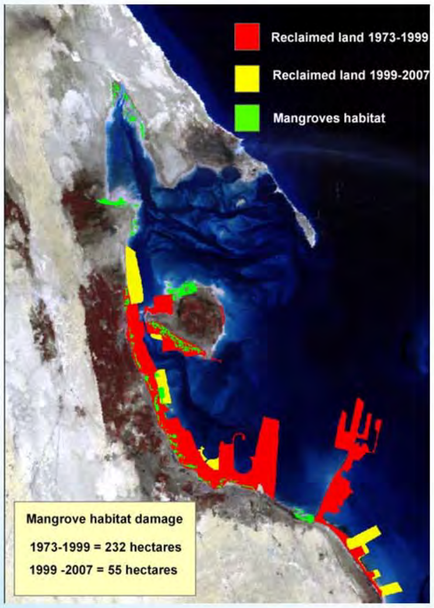




Assessment impacts of coastal development & land reclamation on benthic habitats

Monitoring impacts of coastal development on benthic habitats

Example: Mangroves of Tarut Bay



About 287 hectares have been lost during the period from 1973 to 2007 (46%)

Source: Krishnakumar et al. (2010)

Journal of Earth Science and Engineering 2 (2012) 602-612

Application of Remote Sensing for Mangrove Mapping: A Case Study of Al-Dhakira, the State of Qatar

Perumal Balakrishnan

Department of Biological and Environmental Sciences, Qatar University, Doha 200922, Qatar

Received: September 15, 2012 / Accepted: October 10, 2012 / Published: October 20, 2012.

Fig. 3 Landsat TM-false color composite image, 1985.

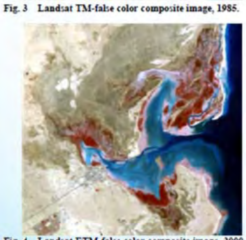


Fig. 4 Landsat ETM-false color composite image, 2000.

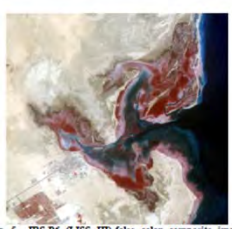


Fig. 5 IRS-P6 (LISS III)-false color composite image, 2008.

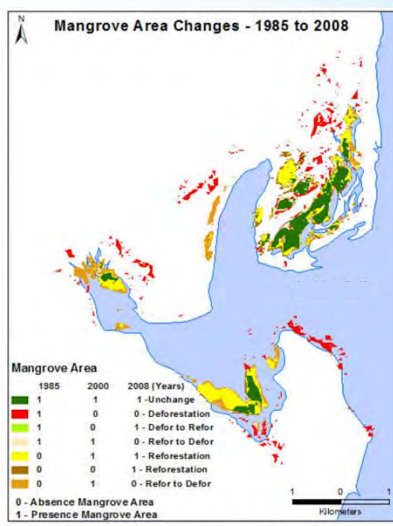
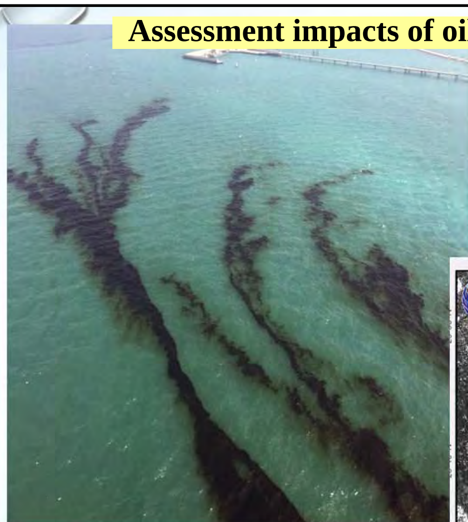


Fig. 9 Mangrove area changes from 1985 to 2008.

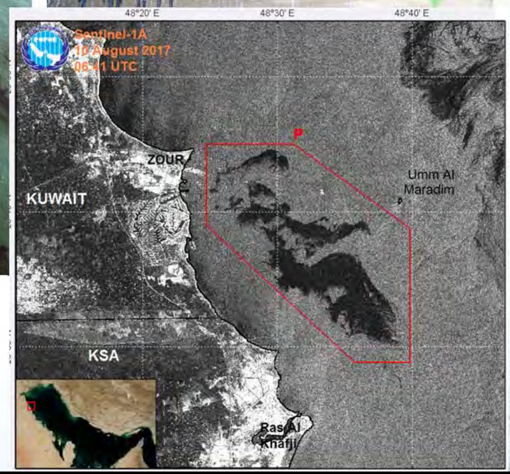
Table 4 Temporal changes of mangrove area.

Year	Area (ha)	Area (%)	Changes (%)
1985	213.77	29.15	0.00
2000	291.94	39.82	10.66
2008	227.51	31.03	-8.79

Assessment impacts of oil spills on benthic habitats

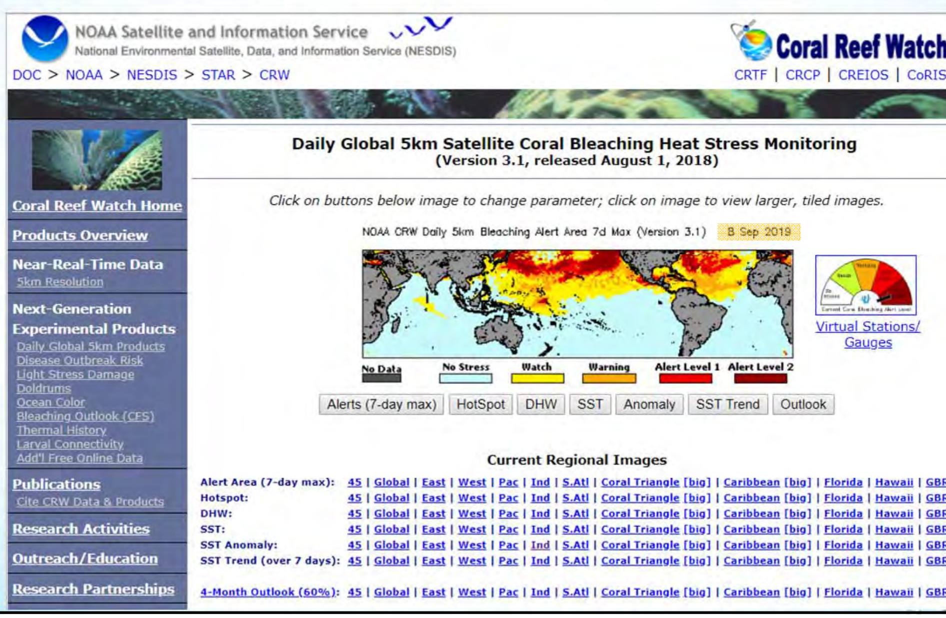


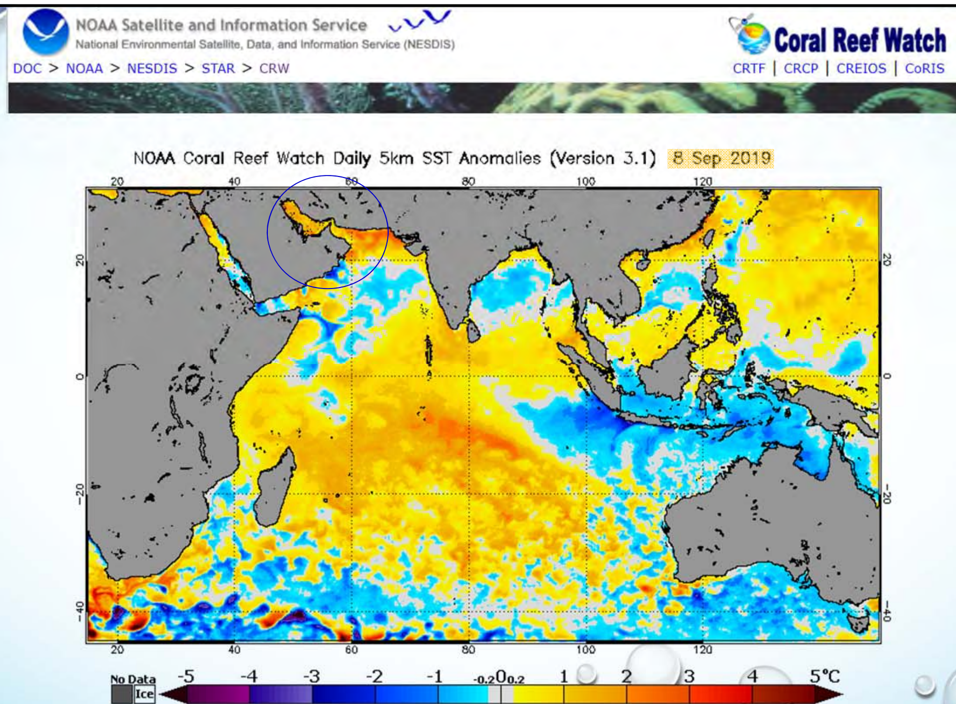
This Saturday August 12, 2017 aerial photo released by Kuwait Environment Public Authority, shows an oil spill near Kuwait's southern Ras Al-Zour, Kuwait. (AP)



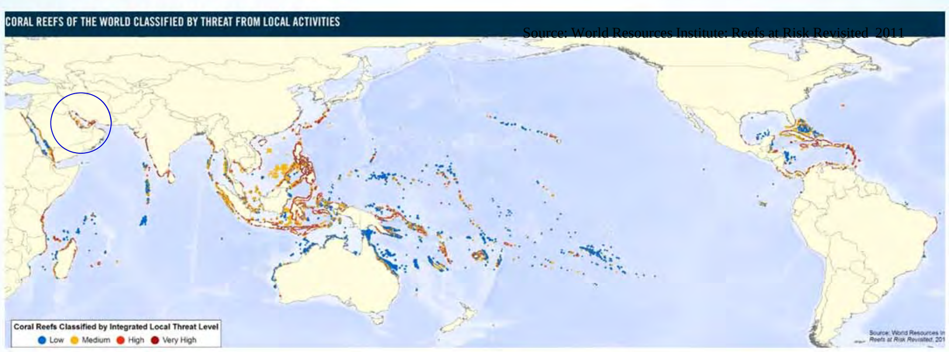
Monitoring of bleaching events in coral reef areas

NOAA Coral Reef Watch





Current status of coral reefs



- **Approximately 75% of the world's coral reefs are currently threatened by local and global pressures; mostly in SE Asia, Indian Ocean & Middle East**
- **In the 10 years since the first Reefs at Risk analysis, threats have increased on 30% p of reefs.**
- **Unless steps are taken to reduce local pressure and reduce the emission of greenhouse gases, the percent of threatened reefs will increase to more than 90 percent by 2030 and to nearly all reefs by 2050.**

Concluding Remarks:

- Satellite imagery can provide a very detailed and accurate information about state of coastal natural habitats (extent, density, and change over time and space).
- Satellite imagery can also provide a very important information about physical and chemical variables affecting coral reefs and other major benthic habitats and hubs of biodiversity.
- RS can also track the extent & intensity of the threats to these habitats, driving stressors and to detect the consequences of the implementation of policies or actions aimed at preventing or reducing their loss.
- Remote sensing also offers significant potential to help in their rehabilitation and in design and management of marine protected areas.
- There is an obvious need for periodical mapping and monitoring of the major coastal natural habitats in the ROPME Sea Area

For further information, please visit:
http://ropme.org/

Thanks For Your Attention

Policies and strategies on the conservation and restoration of the coastal and marine ecosystems

Mr. Takehiro Nakamura, UN Environment

Third ROPME-JICA Workshop on Coastal Habitat Conservation and Rehabilitation on ROPME Sea Area

UN environment

Policies and strategies on the conservation and restoration of the coastal ecosystems

Takehiro Nakamura

Chief, Marine and Coastal Ecosystems Unit

United Nations Environment Programme

Ecosystem and Ecosystem approach

Ecosystem – functional ecological systems including biotic and abiotic elements, which are interacting to each other.

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 services are closely linked with social and economic benefits of human beings

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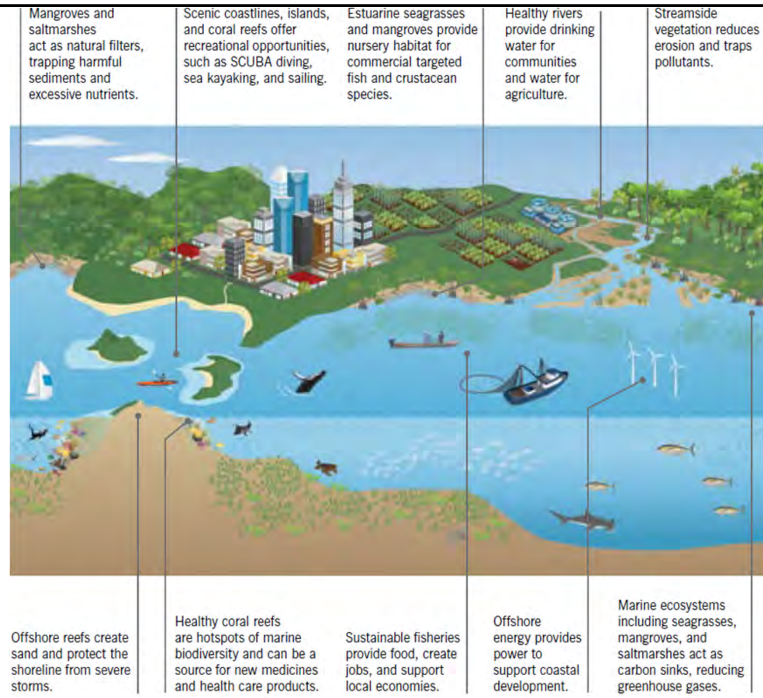
Human activities

Impacting the ecosystems, their functions and services

Drawing on ecosystem services



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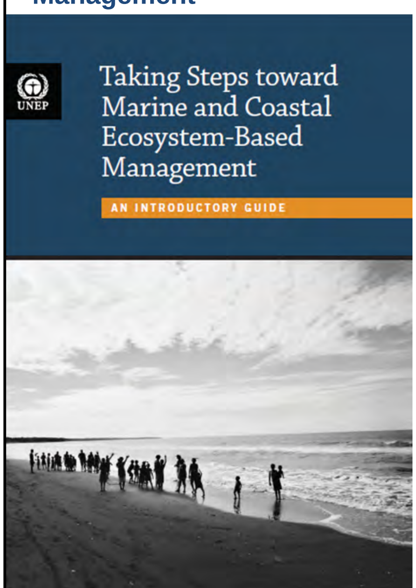
Incremental steps toward Ecosystem-based Management



I. Making the case for marine and coastal EBM

II. Core elements of EBM:

- Recognizing connections
- Ecosystem service perspective
- Cumulative impacts
- Multiple objectives
- Learning and adapting

III: **Moving towards EBM**

1. *Visioning* – Establish foundation for EBM, understand context, shared objectives, take stock of existing management

2. *Planning* – Assess services and drivers, trade-off, set specific objectives, choose management strategy

3. *Implementation* – Apply, learn and adapt, communicate, financing and sustainability

4

Ecosystem strategy and International frameworks on marine biological diversity

- Convention on Biological Diversity and its Strategic Plan for Biodiversity 2011-2020 (Aichi Biodiversity Targets)
- Agenda 2030 and Sustainable Development Goals (SDGs), particularly SDG14 (Life below Water)
- Convention on Migratory Species (Bonn Convention) and its daughter agreements
- Convention on International Trade in Endangered Species of Wild Flora and Fauna (Washington Convention)
- Convention on Wetlands (Ramsar Convention)

Biodiversity strategy vs. Ecosystem-based Management Strategy

Marine Biodiversity Strategy	Ecosystem strategy
Ecosystem approach	
Conservation and protection	Sustainable use of resources and ecosystem services
species and ecosystems – endangered species, critical habitats	Ecosystems with service delivery capacity and high values
Protected areas – ecological conservation effectiveness	Area-based management – optimal resource use and ecosystem service trade-off
Sectors that have impacts on the ecosystems and species	Multiple sectoral coordination for effective resource allocation and space use
Single impacts and impact assessment	Cumulative impacts

Aichi Biodiversity Targets

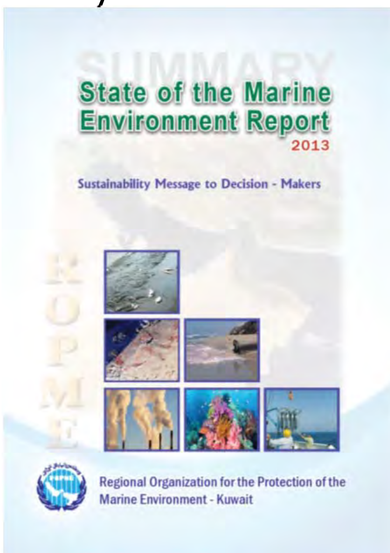
The Conference of the Parties of the Convention on Biological Diversity last month agreed on a process of developing:

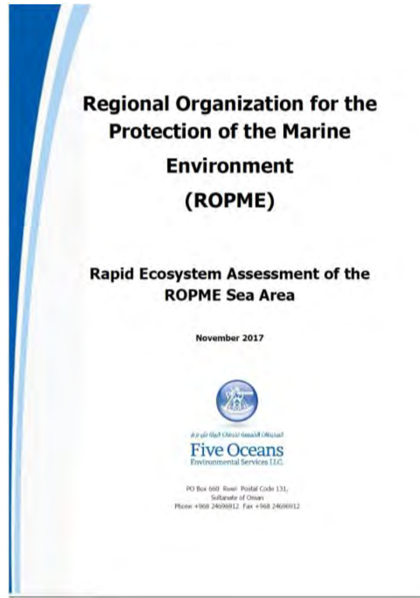
The post 2020 Biodiversity framework (2021-2030)

Under the United Nations Framework Convention on Climate Change

- Nationally Determined Contributions (NDCs)
- National Communications
- National Action Plan on Adaptation
- Nationally Appropriate Mitigation Action

ROPME state of marine biodiversity and ecosystems





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Policies: National Development Plan/Strategy, National Sustainability Strategy; National Sustainable Development Plan

10

Sustainable Development Goal 14

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

14.1: "By 2025, prevent and reduce **marine pollution**.."

14.2: By 2020, **sustainably manage and protect marine and coastal ecosystems** including by **strengthening their resilience**, and take action for their **restoration**..."

14.3: "Minimize and address the **impacts of ocean acidification**..."

14.4: "By 2020, effectively **regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing** ..."

14.5: "By 2020, **conserve at least 10 per cent of coastal and marine areas**..."

14.6: "By 2020, **prohibit certain forms of fisheries subsidies** which contribute to overcapacity and overfishing..."

14.7: "By 2030, **increase the economic benefits** to Small Island developing States and least developed countries from the sustainable use of marine resources..."

14.a: "**Increase scientific knowledge**, develop research capacity and **transfer marine technology**..."

14.b: "**Provide access for small-scale artisanal fishers** to marine resources and markets"

14.c: "Enhance the conservation and sustainable use of oceans and their resources by **implementing international law**..."

Voluntary commitments for achieving Sustainable Development Goal 14 (June 2017)

Global, regional and national level reporting

11

National Marine and Ecosystem Strategy or Policies?

National Integrated Coastal Zone Management Plans

National Marine Spatial Planning

National Action Programmes to support regional seas programmes or regional projects addressing degrading marine and coastal ecosystems

There is no global mechanism to coordinate national strategy/policy development on marine ecosystems.

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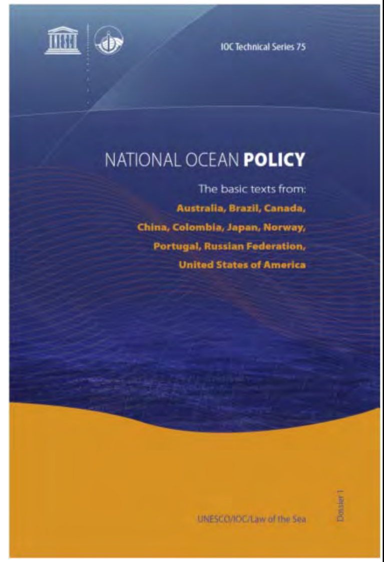
National Ocean Policy/Strategy

- Strategy/policy to decide on Ocean resources and space use in marine and coastal areas within national jurisdiction
- Some national examples included in the UNESCO-IOC publication
- National governance structure for the implementation of the structure



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Incorporating Ecosystem Approach

Current programme

- Ecosystem (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 (trade-off analysis, etc.)
- Integrated planning and management tools (MPA, MSP, ecosystem restoration, etc.)
- Climate change proofing (blue carbon, Ecosystem-based Adaptation)
- Action Programming (regional Action Programme, national action programmmes)
- Prompting sectoral change (fisheries, tourism, navigation, etc.)
- Monitoring and Evaluation

Integrated, ecosystem-based programme

Moving towards integrated Ocean policy/strategy

Current programme → Ecosystem-based management

- Marine spatial planning
- Strategic Environment assessment
- Environment Impact Assessment
- Integrated natural resources management
- Sustainable Blue Economy
- Climate change mitigation and adaptation
- Monitoring and Evaluation

Integrated Ocean Policy/Strategy

Policy relevant tools

- Marine Spatial Planning/Integrated Coastal Zone Management
- Blue natural capital accounting
- Ecosystem restoration methodology and technologies
- Strategic Environment Assessment
- Blue Economy?
- Implementation Monitoring and Evaluation

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Ocean related targets and goals within national strategies

National level implementation and follow-up – main vehicle for the implementation and reporting

Implementation should involved stakeholders at all levels (local, national, regional and global)

Coordinated implementation at the ecosystem scale – regional seas?
Ecosystem based reporting and follow-up

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UN environment

www.unenvironment.org

Managing the impacts of development on coastal ecosystems in the West Asia Region

Ms. Etaf Chehade, West Asia Office, UN Environment

Managing the impacts of development in the West Asia Region

Etaf Chehade

16 Sept 2019, Kuwait

- Countries of the Region have developed 40% of their coastlines during the past 20 years
- Coastal 'mega-projects' including: artificial islands, waterfront cities, ports, marinas and man-made waterways

- Loss of productive coastal habitats due to unsustainable development
  - Dredging, reclamation and disposal practices
- Disturbance of spawning/nursery areas
- Disturbance of sensitive receptors (e.g. seagrass)
- Sedimentation and turbidity caused by dredging activities causing degradation of natural reefs
- Speed of development outpaces the capacity of existing infrastructure for waste management
- Contamination of coastal habitats by untreated wastewater
- Effect on overall water quality

Impacts/ pressures

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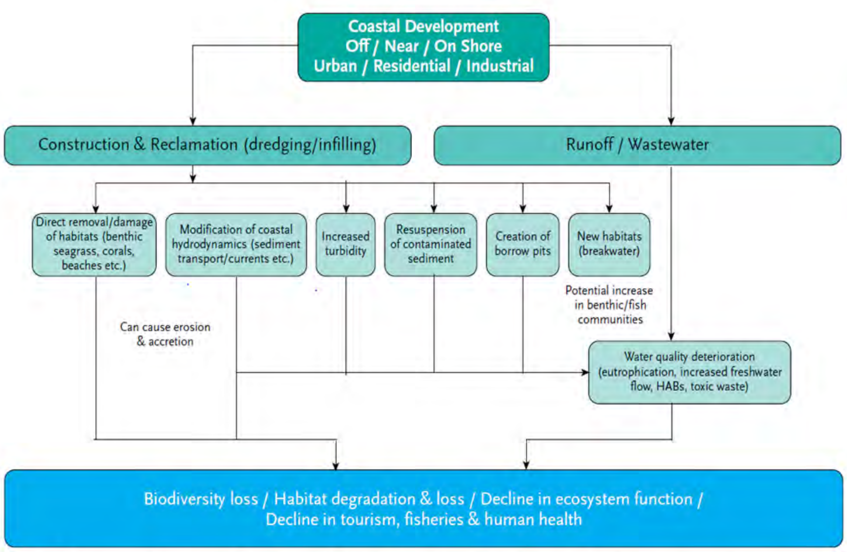

Figure 8. Summary of on-near-off shore coastal development impacts on the coastal and marine ecosystems.

Managing the growing impacts of development on fragile coastal and marine ecosystems: UNU University 2011

Without good planning and careful consideration for existing coastal features, hydrodynamics and offshore bathymetric conditions, the consequences of such development can be severe and long lasting

Marine and coastal area-based management can contribute towards a wide range of SDGs and targets

Ecosystem Approach

- Understanding of how coastal ecosystems function, the flows of economic and environmental resources each system can generate, which environmental processes create and maintain the functional integrity of each system and how human activities can influence that functional integrity
- Identify the linkages between different coastal systems to obtain a broader understanding of how such systems are mutually supportive and contribute to the sustainability of development.
  - knowledge, experience and theories of ecosystem structure and function
  - biodiversity and the resilience of ecosystems to distress, scale and hierarchy, productivity, and ecological indicators.

Ecosystem Approach – integrated strategy:

Principles:

1. Sustainability principle
2. Adaptive management
3. Precautionary principle
4. Marine and coastal protected areas and buffer zones
5. Collaborative conservation
6. Participatory approach (involving non-scientists and stakeholders)
7. Economic incentives/disincentives

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Sustainability Principle

How can the ecosystem and its biological diversity be placed central in the integrated management of coastal areas subject to major human pressures, without compromising the socio-economic development of these areas?

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Five main criteria's in sustainable development:

Ecosystem productivity

Environmental protection

Social acceptability

Economic viability

Dependence security

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Adaptive Management

- Acknowledges a continuous proves of action based on doing, learning, sharing and improving, while sustainability is not absolute: the responses of ecosystems, agencies and people depend on changing circumstances, whether these are the climate, the population pressure or economics factors

- The basic elements of adaptive management processes are:

1. Collection of ecological, socio-economic and institutional information
2. Definition of goals and priorities
3. Formulation of assumptions and working hypotheses
4. Testing assumptions via ecological and socioeconomic monitoring
5. Reassessment of assumptions and adoption
6. Learning and integrating lessons into decision making

UN environment

Precautionary Approach

- How to deal with the limited knowledge of ecosystem structure and functioning, and the resulting uncertainties, when determining ecosystem performance?
- This approach has been incorporated into most UN biodiversity-related processes, including Rio (Agenda 21, UNCED), the Convention on Biological Diversity (CBD) and the Code of Conduct on Responsible Fisheries
- Encompasses two key elements:

1. The need to base any decisions on the best available science.
2. The need to take into account the gaps in our understanding as we make decisions

Governance

- 'How can socio-economic development be a main goal of integrated coastal management without compromising the ecosystem and its biological diversity?'
- Both coastal governance and coastal ecosystems must be conceived as 'nested systems' across a range of spatial scales.

- Most of the countries in the Region have not implemented policies and actions that engender better coastal management.
- Although many of these countries have enacted national legislation for marine conservation and have signed various regional and international environmental agreements the standards are not up to date and do not take into account the latest environmental data and modelling.
- At this rate, development will not be sustainable unless accompanied by appropriate policies and mechanisms for minimizing and mitigating the environmental impacts.

GCC Dredging and Reclamation Project

UN environment

- The project covers the 6 countries of the GCC.
- Commitment to reviewing the existing standards by which the region abides and further update and improve them by incorporating the latest environmental dimensions/data into the regional plans and outlooks for which they are responsible.

GCC Dredging and Reclamation Project

UN environment

GCC Dredging and Reclamation Project

1 → 2 → 3

1. General manual on standards and mechanisms for reclamation, dredging and mitigation actions
2. Environmental code of practice for dredging and reclamation – including:
   - Describing the environmental issues and challenges
   - Practical measures to minimize environmental impacts
   - Environmental standards
3. Regional Workshop (2020) to present international best practices with respect to reclamation, dredging and mitigation actions

UN environment

Outputs

- Stakeholder meetings
- Desk study on GCC current standards and guidelines
- Remote sensing analysis of GCC reclamation
- GIS analysis of GCC dredging
- Guld wide hydrodynamic model + local plume models and analysis
- Consultation meetings with key stakeholders

UN environment

- The unique biophysical environment in the ROPME Sea Area
- Dredging and Reclamation: Scale, scope, and impacts
- International Best Practices in Dredging and Reclamation
- Status of Legislation, regulations, and guidelines for dredging and reclamation
- Current monitoring guidelines
- Recommended actions for more sustainable best practices for dredging and reclamation

UN environment

Thank you

UN environment

www.unep.org

Overview of the tools for the marine environment and coastal habitat conservation shared in the ROPME-JICA Partnership Programme

Mr. Satoshi Sasakura, JICA Study Team

Over View of the Tools for the Marine Environment and Coastal Habitat Conservation Shared in the ROPME-JICA Partnership Programme

16 September 2019, Kuwait

Satoshi SASAKURA
JICA Study Team

Outline

Technologies for Coastal Habitat Conservation and Rehabilitation

- Bio-Symbiotic Structures
- Eelgrass Bed Restoration
- Sediment Improvement (sand capping)
- Coral Restoration
- Fishery Sector’s Approach

Coastal Habitat Conservation and Rehabilitation

Recent conceptual shift in the management policies of the Seto Inland Sea

"Passive conservation" (Do not do something) such as:

Total Pollution Load Control — Stop excessive discharge !

Suppression of land reclamation — Decrease landfill !

"Active conservation" (Do something) such as:

Restoration of biodiversity, biological productivity, habitat and well balanced nutrient cycle between land and sea. — Restore tidal flat !, Improve sea grass bed !

Single issue approach such as: water quality control

Holistic approa

Satoumi is a coastal area where biological productivity and biodiversity has increased through human interaction

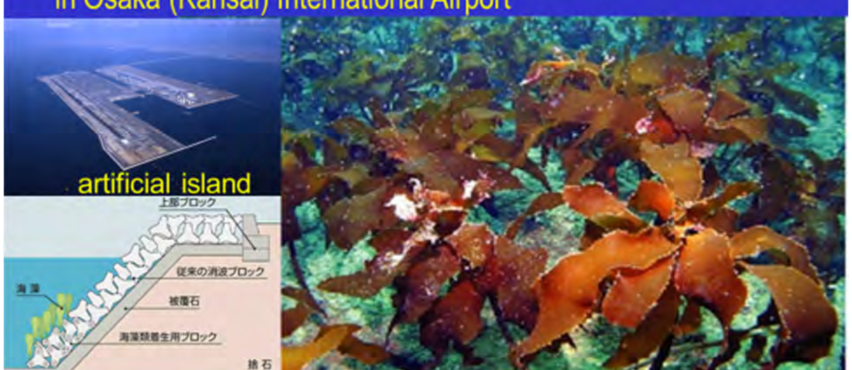
Water quality is improved, however, biological production is not recovered

Shared by Dr. Osamu Matsuda, 2018

3

Coastal Habitat Conservation and Rehabilitation

"Creation" of new ecosystem services by "active conservation" in Osaka (Kansai) International Airport



Gentle slope of bio-philic block and natural rock promoted expansion of seaweed bed (ca. 55 h: more than 100 species)

Muddy bottom without vegetation→Dense seaweed bed:

"Creation" of new ecosystem services

Gentle-slope Structure(revetment)

Shared by Dr. Osamu Matsuda, 2018

4

Coastal Habitat Conservation and Rehabilitation

Technology transcending the boundary between natural capital and artificial capital

Biosymbiotic seawall (from 2000)

- Minimizing protrusions

Canal

Port

Technology transcending the boundary between natural capital and artificial capital

Producing blocks from dredged soil using steel slags

(By the Japan Iron and Steel Federation)

Utilization of By-product

Shared by Dr. Tomohiro Kuwae, 2016

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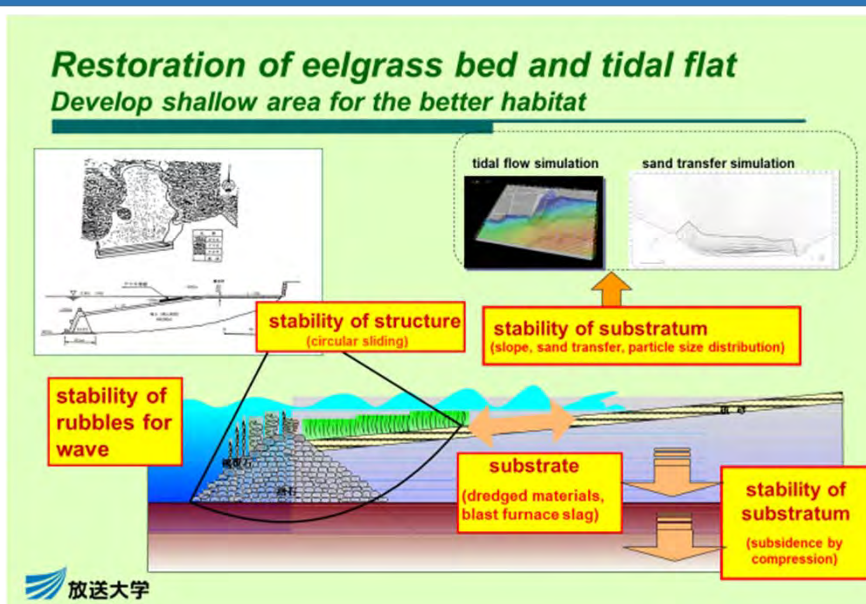
Coastal Habitat Conservation and Rehabilitation



Creating shallow area and planting eelgrass bed

Shared by Dr. Mitsumasa Okada, 2018

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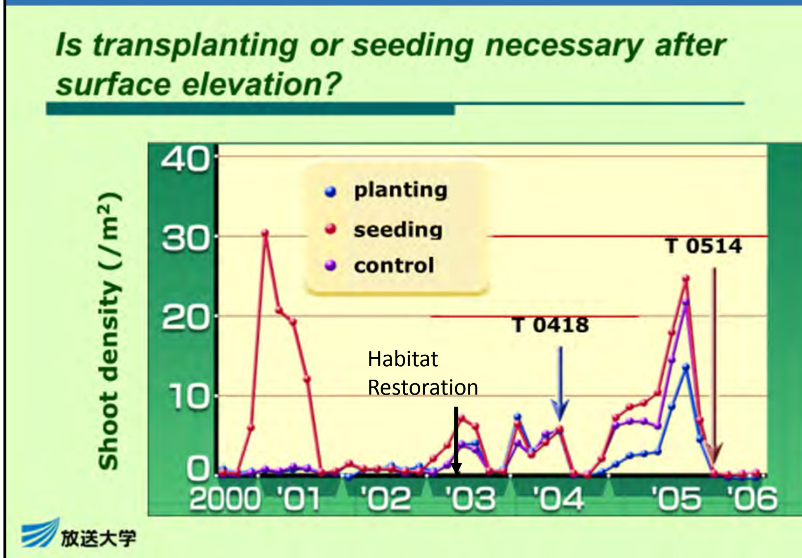
Coastal Habitat Conservation and Rehabilitation



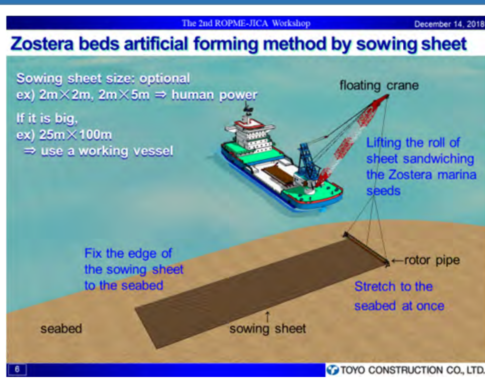
- Only transplanting/seeding without habitat restoration resulted in fail
- After habitat restoration, eelgrass has increased without transplanting/seeding

Habitat restoration >> planting/ seeding

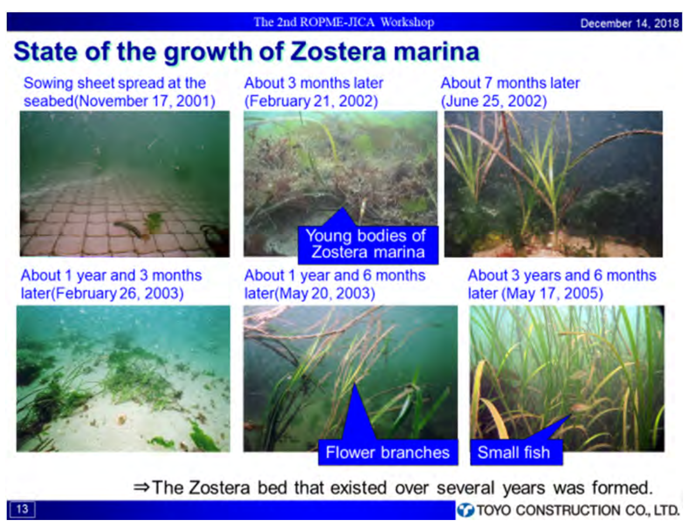
breakwater, surface elevation, ...

Shared by Dr. Mitsumasa Okada, 2018

Coastal Habitat Conservation and Rehabilitation



Eelgrass Forming Technology

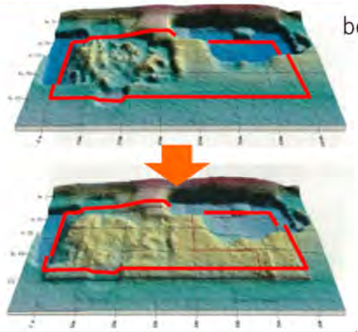


Shared by TOYO Construction, 2018

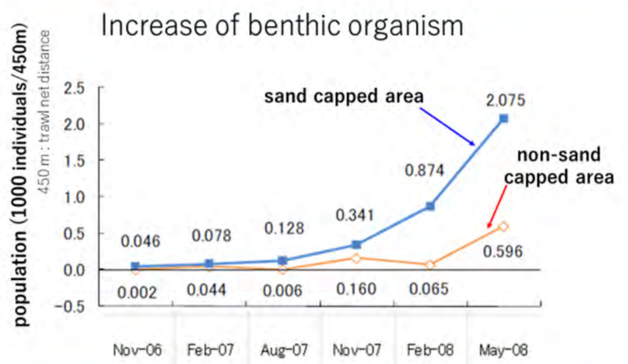
Coastal Habitat Conservation and Rehabilitation

Sand Capping Technology

Improvement of sediment



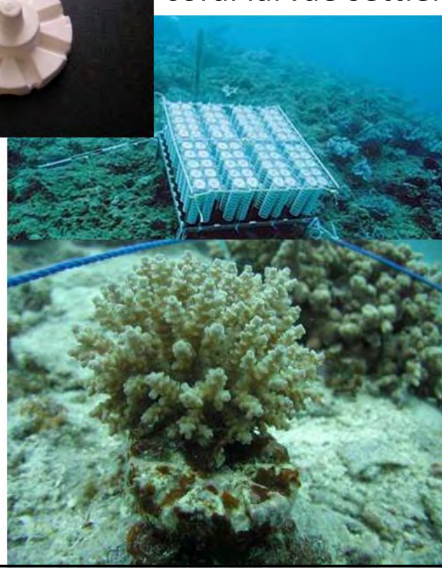
Effect by Sand capping



Shared by TOA Corporation, 2018

Coastal Habitat Conservation and Rehabilitation

Ceramic devices for coral larvae settlement



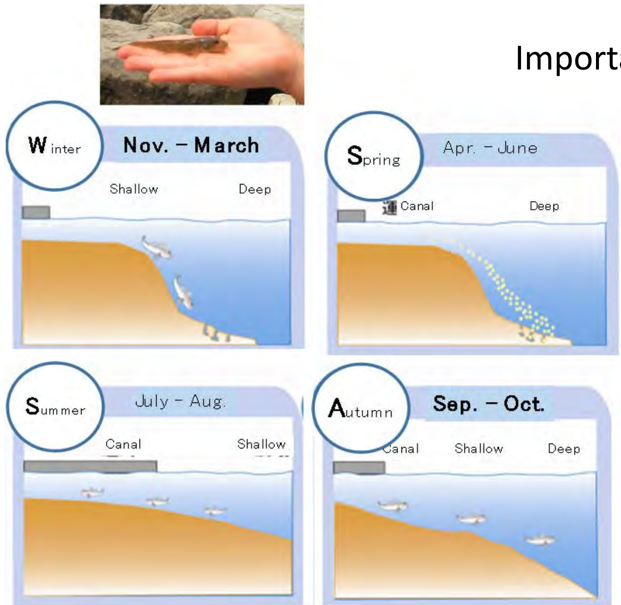
Coral Restoration Technology

Coral Hatchery

Shared by Dr. Kakuma, 2018

Coastal Habitat Conservation and Rehabilitation

Importance of Ecosystem Network



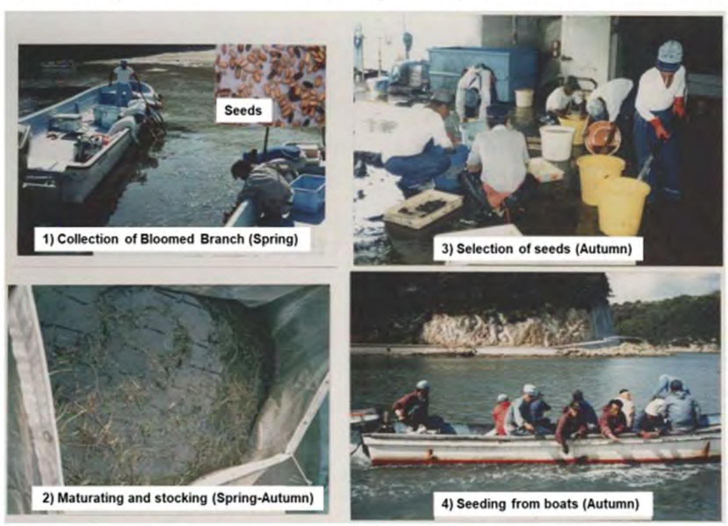
- Habitat Creation with Life Stage
  - Shallows for Larvae
  - Sand for Young
  - Deep and Mud for Adult

Shared by Dr. Keita Furukawa, 2016

11

Fishery Sector's Approach

Seeding activities by the Hinase Fishery Cooperative Association (HFCA)



Fishermen carrying out eelgrass bed restoration by their selves

Shared by Mr. Tanaka, 2018

12

Fishery Sector's Approach

Improvement of the sea bottom environment by utilizing oyster shells

- ✓ Oyster shells act as an anchor for eelgrass.
- ✓ Minimize re-suspension of sediments and keep good condition for photosynthesis activities of the eelgrass.

Shared by Mr. Tanaka, 2018

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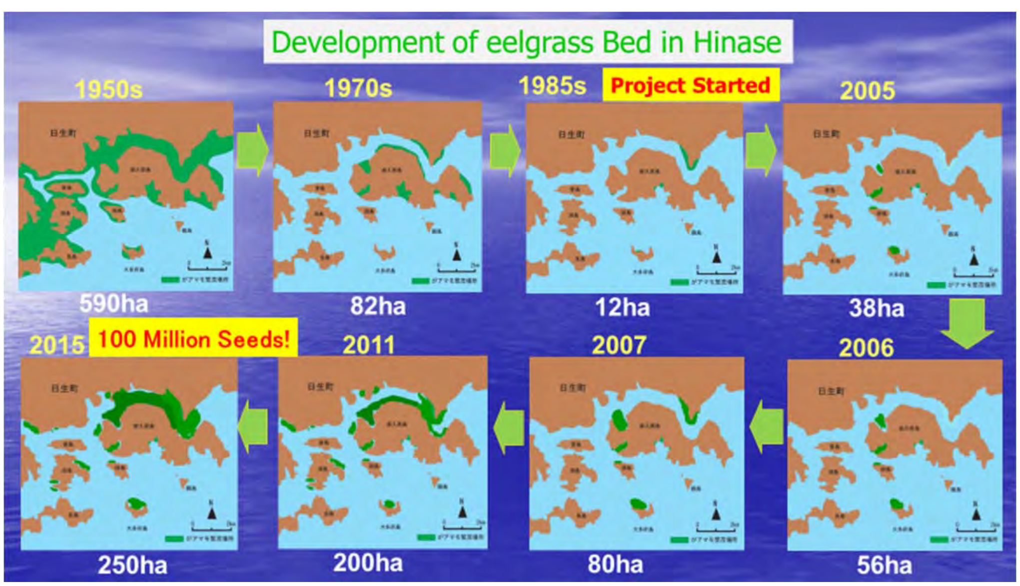
Fishery Sector's Approach



Shared by Mr. Tanaka, 2018

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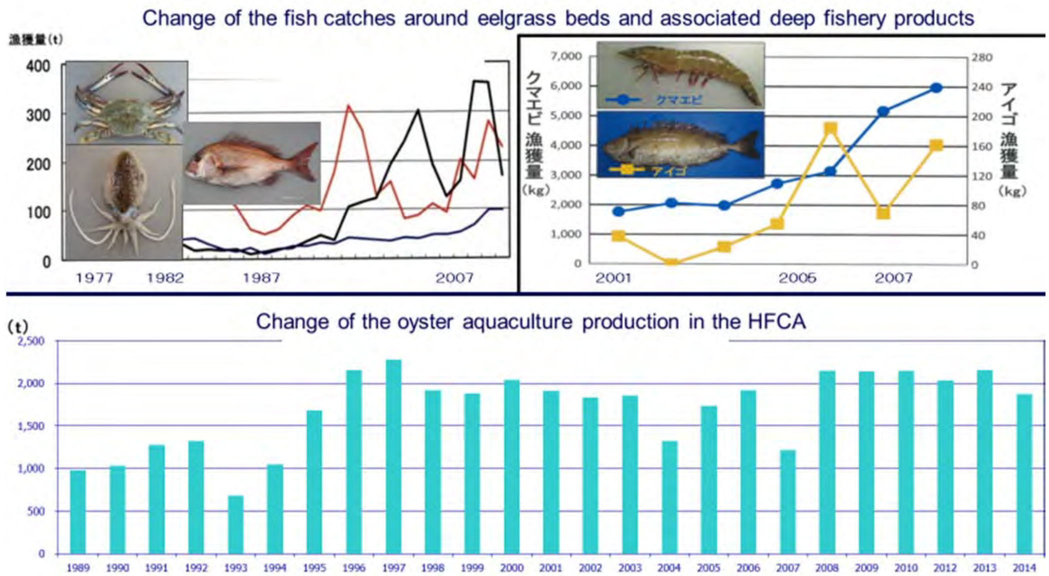
Fishery Sector's Approach



Shared by Mr. Tanaka, 2018

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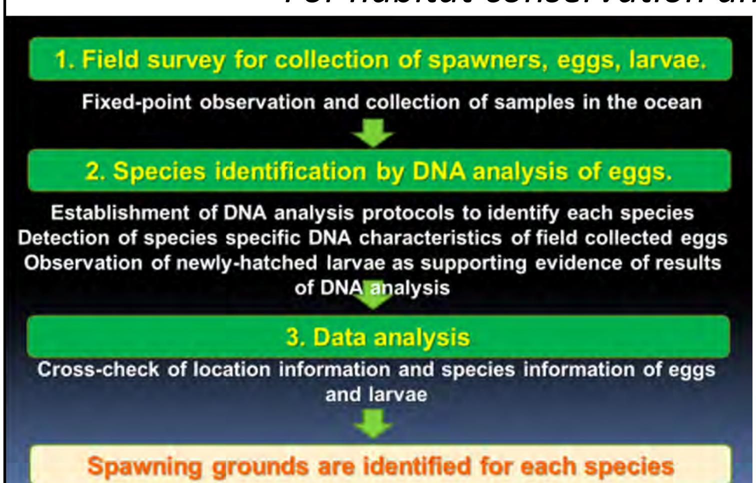
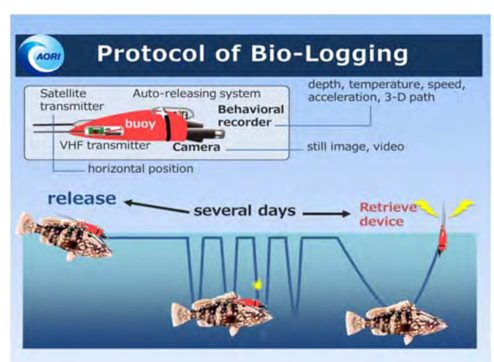
Fishery Sector's Approach

Identification of Spawning Grounds

For habitat conservation and Sustainable Fishery





Shared by Dr. Sawada, 2019

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Way Forwards

- How to apply these technologies and experience to develop and implement the Action Plans for each ROPME Strategic Direction?
- How to establish sustainable network and collaboration between RMS and Japan?

Thank you for your kind attention!

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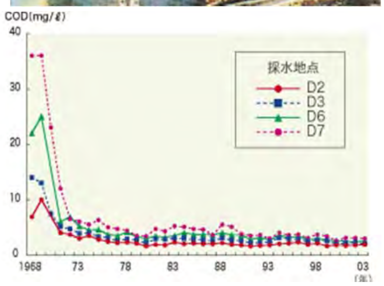
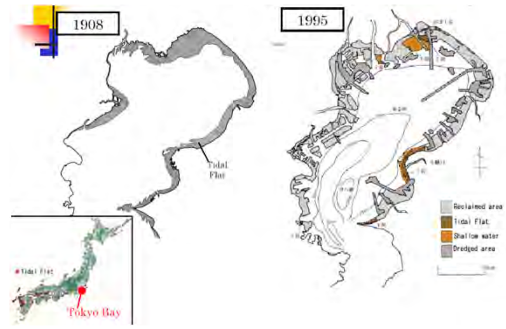
Appendix

18

History of Water Pollution in Japan



Shared by MOEJ, 2016



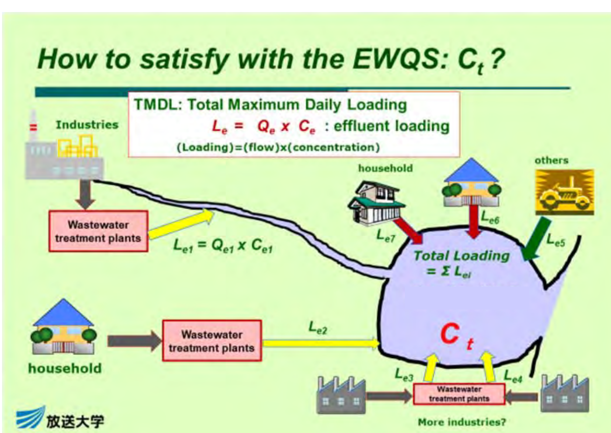
Shared by JST, 2018

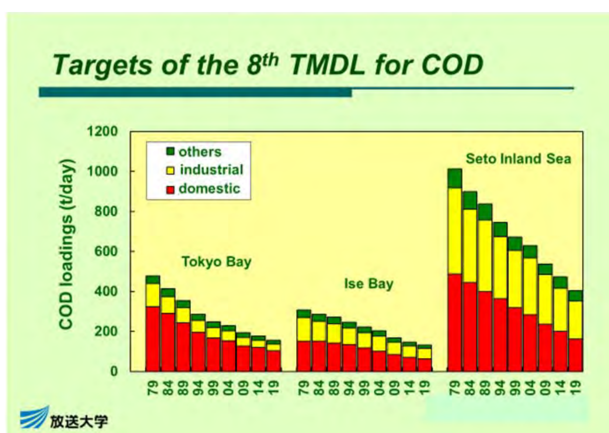
Several Regulations and measures were done

- ● Water Pollution Prevention Law (1971)
- ✓ Effluent Standard
- ✓ Water Quality Standard
- ● Total Pollution Load Control (COD, 1979)
- ● Total Pollution Load Control (T-N, T-P, 2001)

History of Water Pollution in Japan

Due to the Total Pollution Control, Pollution Load and Water Quality were improved

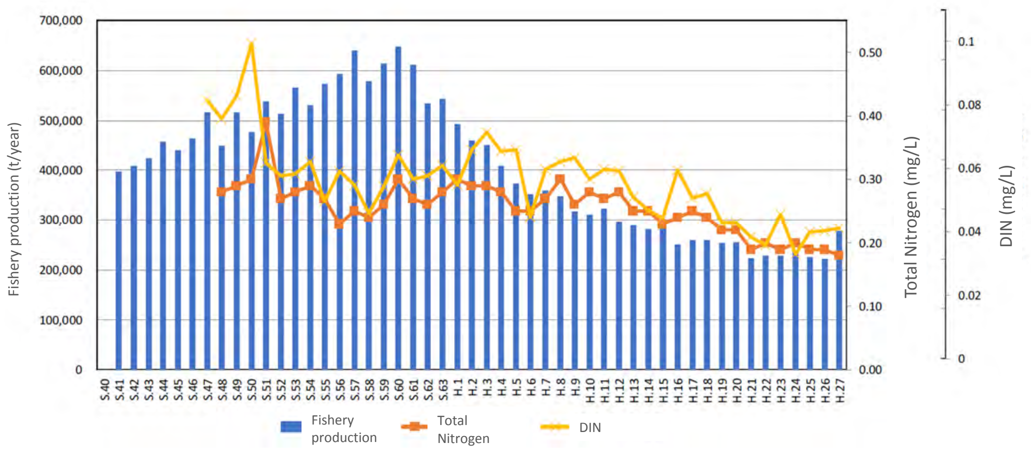




Shared by Dr. Mitsumasa Okada, 2018

History of Water Pollution in Japan

However, Fishery Production is still decreasing



Shared by Dr. Mitsumasa Okada, 2018

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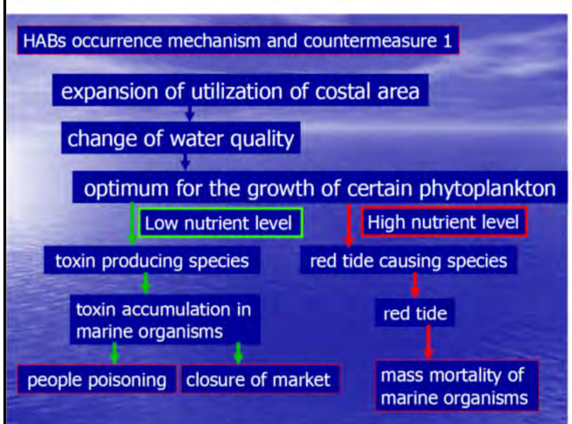
Harmful Algal Blooms (HABs)



Mitigation measures against red tides to eliminate their occurrences and harmful consequences

1. Preparation: before an event......Indirect methods
   Improvement of environmental condition in order to reduce probability of occurrence of red tides
   1-1. Enforcement of regulations to improve water and sediment quality
   1-2. Implementation of rehabilitation projects to improve water and sediment quality
   1-3. Improvement of aquaculture techniques
   1-4. Establishment of monitoring and information exchange network

2. Response: during or after an event......Indirect and Direct methods
   Termination of red tide microalgae and rescue of marine life
   2-1. Evacuation of cultured fish (transfer, shutter sheet)
   2-2. Termination of red tide cells
      2-2-1. Absorption by clay particles or iron powder
      2-2-2. Collection by filtration
      2-2-3. Decomposition by chemical (Ozone, hydrogen peroxide)
      2-2-4. Virus
   2-3. Monitoring and information exchange

Shared by Dr. Fukuyo, 2018

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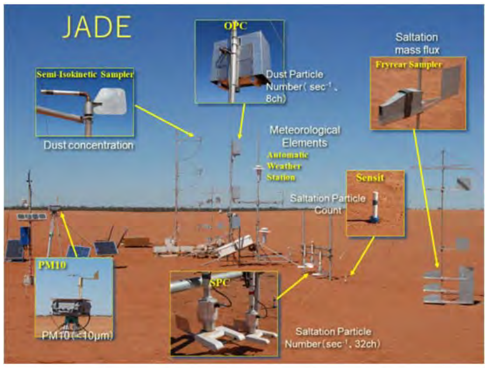
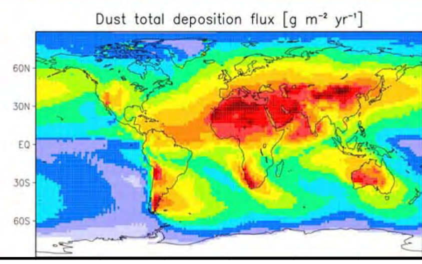
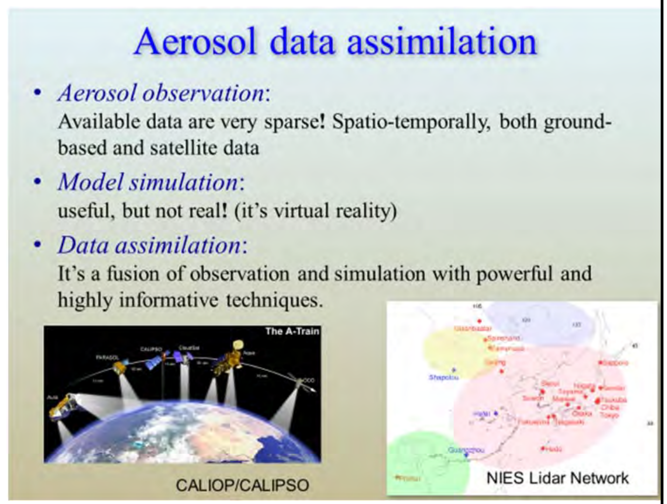
Sand and Dust Storm







Shared by Dr. Mikami, 2016

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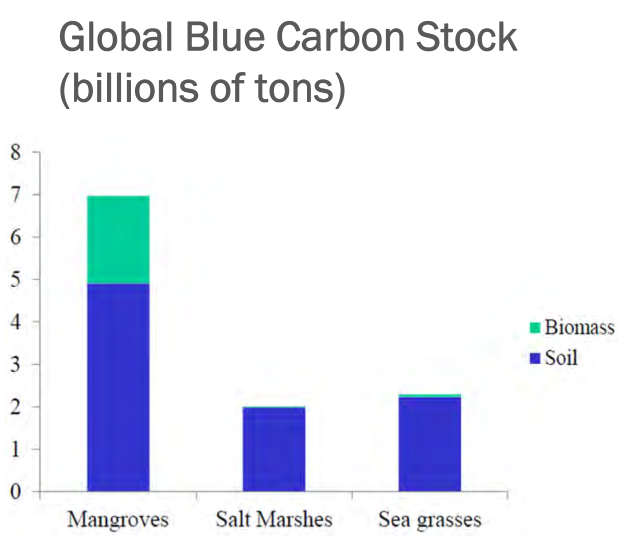
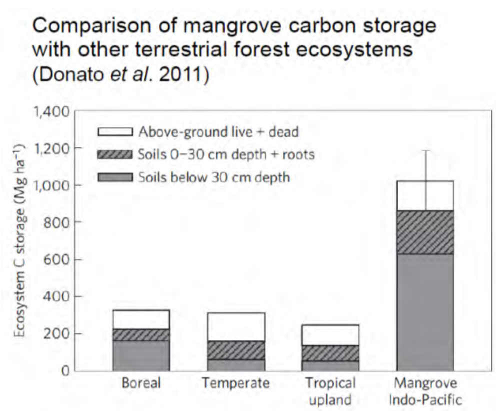
Blue Carbon





Carbon storage underground in mangroves is much higher than that in terrestrial forests

Shared by Mr. Takehiro Nakamura, 2018

Shared by Dr. Noriaki Sakaguchi, 2018

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Fishery Sector's Approach

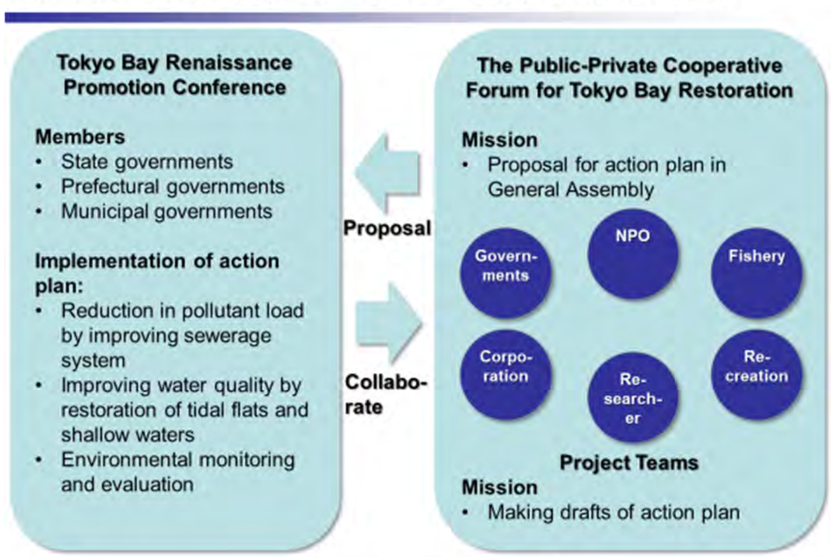
Identification of effectiveness of seedling release

Shared by Dr. Sawada, 2019

25

Cross-Sectoral and Public-Private Cooperative Approach

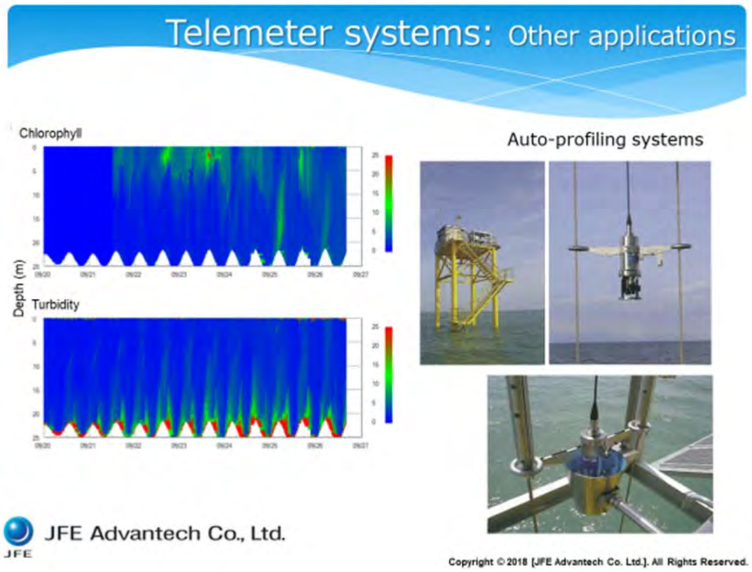
The Public-Private Cooperative Forum for Tokyo Bay Restoration



Shared by MLIT, and Dr. Sasaki, 2018

26

Monitoring and Database

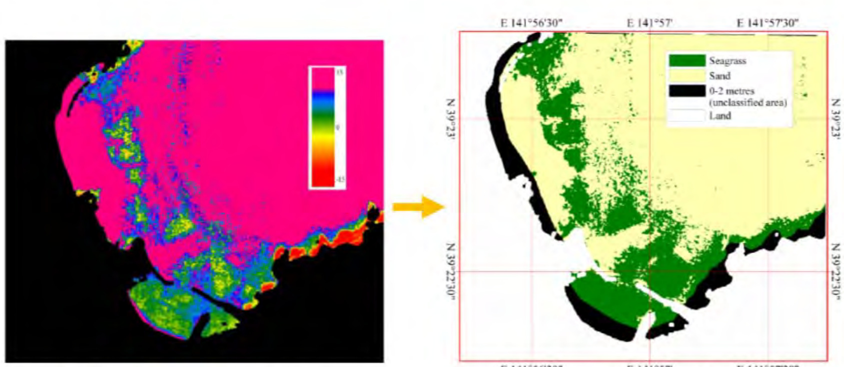


Shared by JFE Advantech, 2018

27

Monitoring and Database

Habitat Mapping by Satellite Image Analysis



Bottom Reflectance Index

Seagrass Map

Shared by Dr. Sagawa, 2016

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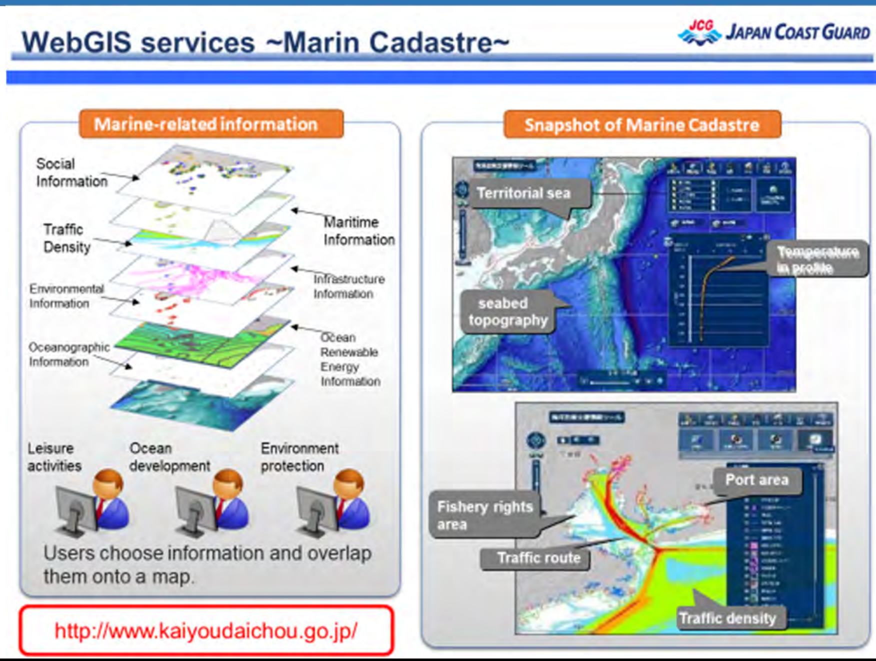
Monitoring and Database



Shared by Japan Coast Guard, 2016

29

Current status and National priority on the Coastal habitat conservation and rehabilitation

(Islamic Republic of Iran)

Current status and National priority on the Coastal habitat conservation and rehabilitation

The coastal area

* Coastal environment is a natural evolutionary system that includes the most complex and, at the same time, the richest ecosystems on the planet.

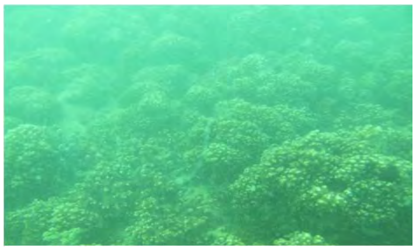
The coastal area

* This region is a transitional and highly vulnerable region and is endangered by the accumulation of pollutants due to the acceptance of drought and marine pollutants.

* Marine pollution and the effects of drought activities that are the result of socioeconomic development on the coastline and its catchments are one of the most important issues in most of the world, which directly affects coastal habitats.

Iranian coastal area

* According to research conducted in Iran on identifying areas and sensitive resources, these areas and resources are divided into two distinct groups:

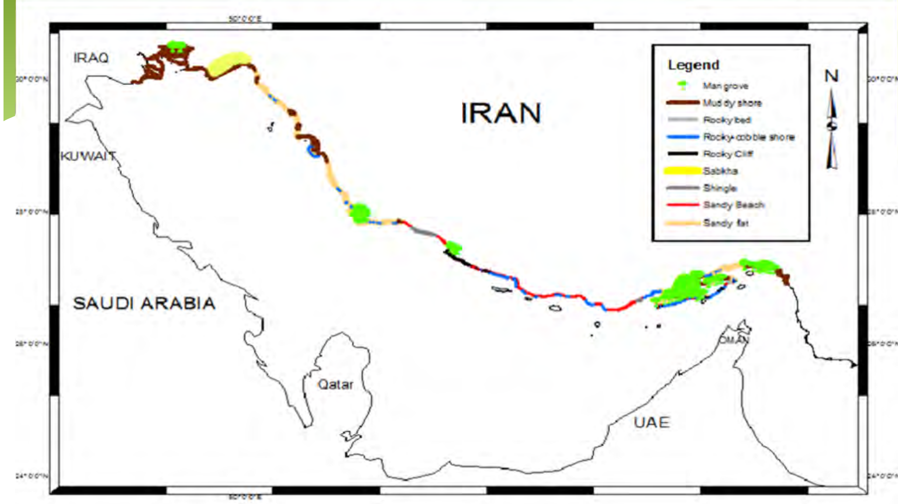


Iranian coastal area

1) The group of biologically sensitive resources: includes mangrove forests, coral reefs, marine turtles, aquatic birds, marine plants and sea mammals.

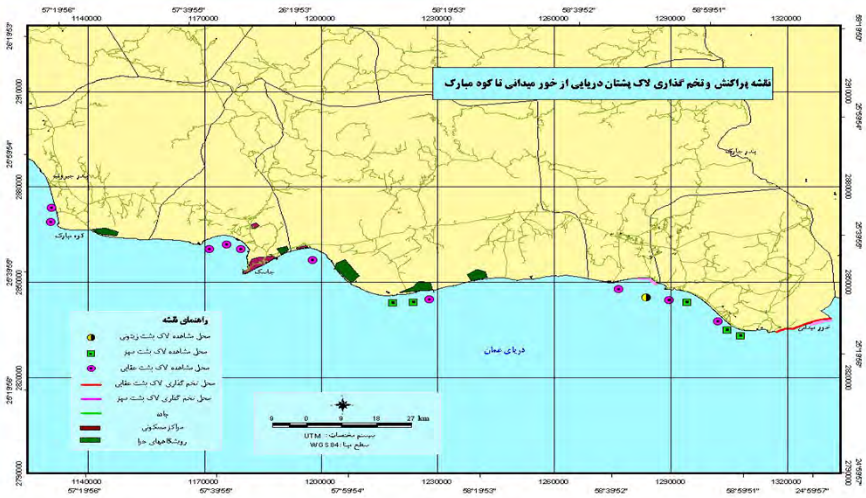
2) The group of physical sensitive resources: includes clay beachs, sandy beachs, rocky shores, Estuary, small gulf and Creek

Current status of the Coastal habitat



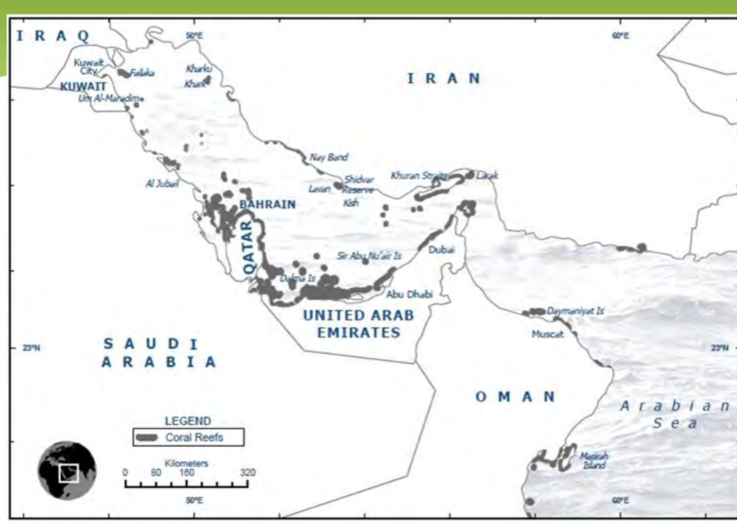
Distribution of the different intertidal habitat types along the Iranian coast.(Naderloo, 2012)

Current status of the Coastal habitat



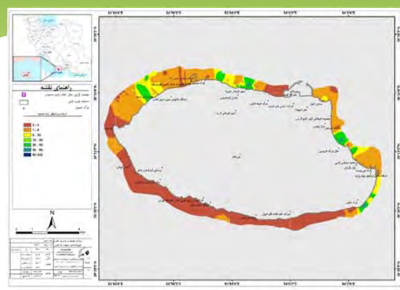
Distribution of Sea turtle habitat along the northern coast of Oman Sea

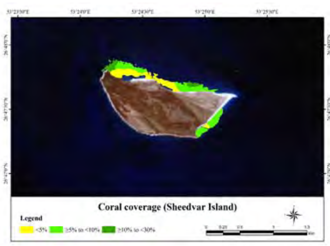
Current status of the Coastal habitat



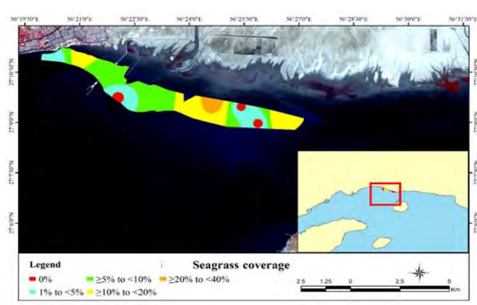
Distribution of Coral reef habitat along the Iranian coast

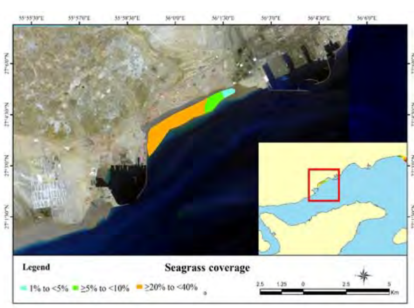
Some coral maps in Iranian islands



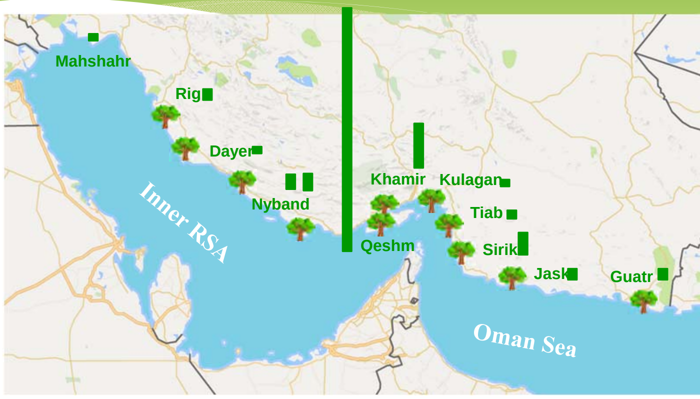


Seagrass maps in Iranian costlaine





Mangroves in Iran



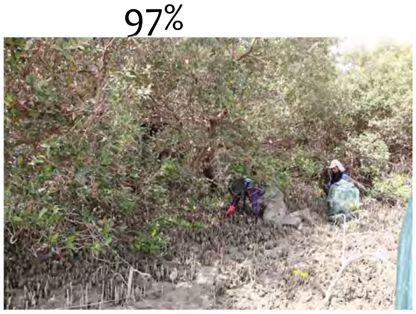
83 square kilometer (Shojaei, et al 2019)

Graphic: M. Shojaei

Mangroves species in Iran

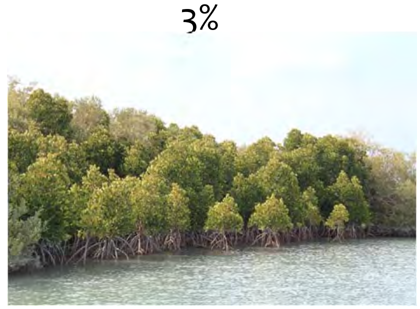
Avicennia marina

97%



Rhizophora mucronata

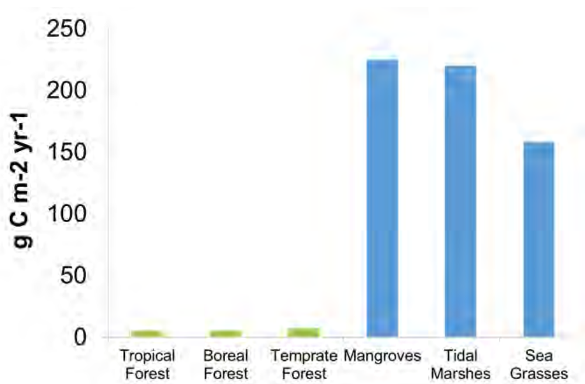
3%



Mangroves mitigate climate change through blue carbon

* **Blue carbon** is the carbon that is taken up by coastal ecosystems. They're already storing usually hundreds or thousands of years worth of carbon in their soils, so that if we do disturb them, we get an enormous amount of carbon that contributes to climate change.

Annual mean carbon sequestration rates per unit of area



Modified from McLeodet al, 2011

Blue Carbon

In order to better manage the mangroves ecosystems, we currently initiated a blue carbon project in other to determine the potential carbon stocks, the source and speed of accumulation. The results will be soon publish and we hope to find new ways to collaborate in saving all ROPME Sea Area mangroves.

National priority on the Coastal habitat conservation and rehabitation

1. **Identification of areas with conservation potential**

* Of the total coastline of the country, about 6,000 square kilometers, about 19 marine areas are managed by the department of environment.
* It accounts for 2 to 3 percent of the country's defense areas.
* Increase our coastal area conservation

National priority on the Coastal habitat conservation and rehabitation

2. Updated Reports of Managed Areas and International coastal Wetlands

3. Increase Environmental standard for facilities and facilities for receiving petroleum waste from tankers, ships and vessels

National priority on the Coastal habitat conservation and rehabilitation

4. Increased environmental inspection operations of oil platforms and installations at oil fields

5. Preparation of "Atlas of sensitive coastal and marine habitats"

National priority on the Coastal habitat conservation and rehabilitation

6. Develop and implement a national action plan for coastal species and habitats

7. Increasing the role of NGO and CBS to conserve and rehabitation of coastal habitat.

National priority on the Coastal habitat conservation and rehabilitation

7. Conserve and rehabilitation of Coral reef

National priority on the Coastal habitat conservation and rehabilitation

8. Applying the Ecosystem Approach in the integrated management of coastal wetlands and mangrove forest

9. Conserve and rehabilitation of some species habitat like sea turtle

10. Reduce effect of fishing on marine species and habitat

11. Reduce marine debris

Thanks for your kind attention

Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area

(Republic of Iraq)

Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area Kuwait, 16 – 17 September 2019

Republic of Iraq

Dr. Waleed Ahmed
and Mr. Hadi Alhasan

Features of the Iraqi Coastline

*Narrow coastline (58 km)
* located at the north -west end of the Inner ROPME Sea Area
* Annually Recipient of large amount of fresh water and sediments from Shatt al-Arab creating delta region (coastal fisheries depends on the flow of nutrients

Features of the Iraqi Coastline

* The delta Area is the spawning and nursery ground for the commercially important penaeid shrimp *metapenaeus affiinis and diadromous Fish species (e.g. Tenualosa ilisha)*

(Al Hassan et. al 1989)

* High salinity waters

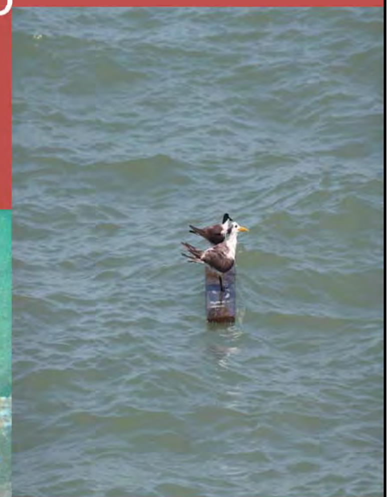
Features of the Iraqi Coastline

*High turbidity water reach 0.7 NTU loaded with nutrients

*A Climate is subtropical ,semi arid and seasonally violable ,with high temperature in summer (commonly > 38˚c) and in winter average (3-13 ˚c

Features of the Iraqi Coastline

*A vegetation limited to
halophilic herbal
*Richness biodiversity



most important Coastal Habitat

1- the Shatt Al-Arab delta
2 - Coral reef
(Nominated to record AS
natural protected Areas by
the(national committee of PAs)


most important Coastal Habitat

3- the western part of the east
Hammar marshes , this part
is connected with khour Abdulah
by channel of khour Alzubair and
shat Al- basrah , (world heritage
site 2016) , safe refuge for marine
biodiversity specially the fishes,
crustacean and waterbirds

most important Coastal Habitat

4- Al- khuwaisat region / (IBA)

Site is Besides khour Al- Zubair chanal

Nominated to record AS N. PAs

Threats in Coastal Habitat

1- pollution

2- Coastline Erosion

3- presence of Mines

The most important procedures to conservation Coastal Habitat and rehabilitation

1-Highly progress in achievement of the infrastructure projects especially that related with nets of drainage
and treatments units to reduce the pollution of water sources
in all provinces and its now in different rates

The most important procedures to conservation Coastal Habitat and rehabilitation

2- to tackle the erosion of coastline

(the Center of restoration marshes and wetland ,cooperation with joint team

Implant 100 sapling of Mangrove At khour al zoubair Coast Chanel

The most important procedures to conservation Coastal Habitat and rehabilitation

3-Preparation the national oil spill

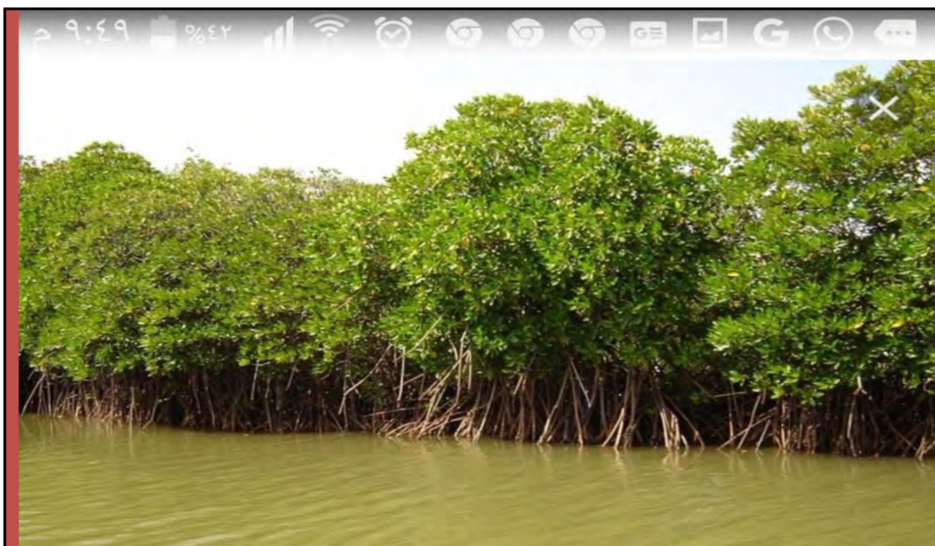
contingency plan (NOSCP) cooperation with JICA organization, coverage whole

Of Iraqi territorial land and marine ,rivers

Marshes Areas

The most important procedures to conservation Coastal Habitat and rehabilitation

4- listed and inclusion the Mines in coastline within the national plan to remove mines by the southern center of mines affairs



THANK YOU FOR

Recent Rehabilitation Efforts of the Environment Public Authority (EPA) in Kuwait

(State of Kuwait)

Recent Rehabilitation Efforts of the Environment Public Authority (EPA) in Kuwait

Presented By: Aisha Al-Marhoun

Prepared By: Aisha Al-Marhoun, Asmaa Al-Haddad & Wafeyah Al-Oqab

Tel: +(965) 22208310 I +(965) 22208410 I @epa_kw www.epa.org.kw

Introduction

- *Avicennia marina* is a species of mangrove classified in the family Acanthaceae.
- The most common species in the Countries of the Region and commonly known as grey mangrove.
- Grey mangroves existed in Kuwait in 1940s (khwaisat to the west of kadhima), and they were collected and sold as firewood.

- Mangroves once existed along Kuwait's coastline and disappeared due to anthropogenic causes.
- Mangroves are performing well in other Countries of the Sea Area.
- Recognizing the importance of mangroves, Kuwait Institute for Scientific Research initiated *avicennia marina* research in 1991 and established the technical feasibility for reintroducing mangroves plantation (*Avicennia marina*) into the country in cooperation with PAAF and KFAS.

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- Conservation of Biodiversity Department (EPA) has collaborated with the Ministry of Environment and Climate Affairs of Oman (Mr. Bader Al Al Bulushi)
- Thus initiated a study to revegetate (*Avicennia marina*) plantations at the coastal-line of **Al-Jahra nature reserve** which is a highly productive and protected area, also the morphology of the environment favor for mangroves plantation.

Al-Jahra Natural Reserve Coastline

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Method

- Immediately upon arrival , approximately 300 of the mangrove *(Avicennia marina*) propagules were unpacked and placed in fresh water .
- Black polyethylene bags were filled with muddy to sandy soil.
- The outer coat of the propagules was removed to rapid germination.
- In each bag 3-4 propagules are sowing considered that the head of the seed is not dipping completely in the soil and the bags are placed along the area


© a.alzaidan


September
2019


September
2019
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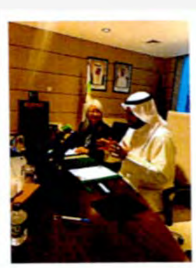
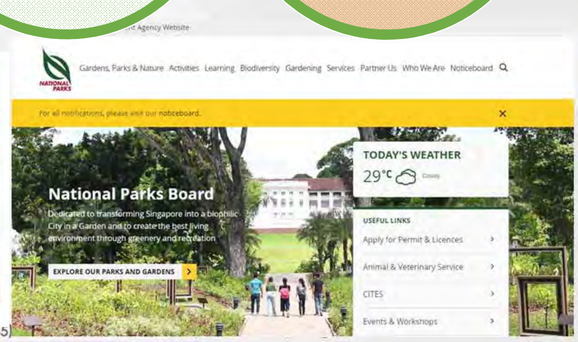
Coral Reef Monitoring
and Enhancement

Why corals?

- Corals are facing many challenges (climate change, anthropogenic activities, bleaching).
- Currently there is a lack of an official active coral monitoring program
- Baseline Study is needed
- Information regarding corals are fragmented and done by several parties (not compiled).

MoU with National parks board - Singapore → Coral Reef Monitoring and Enhancement Workshop → Set up a proper monitoring plan





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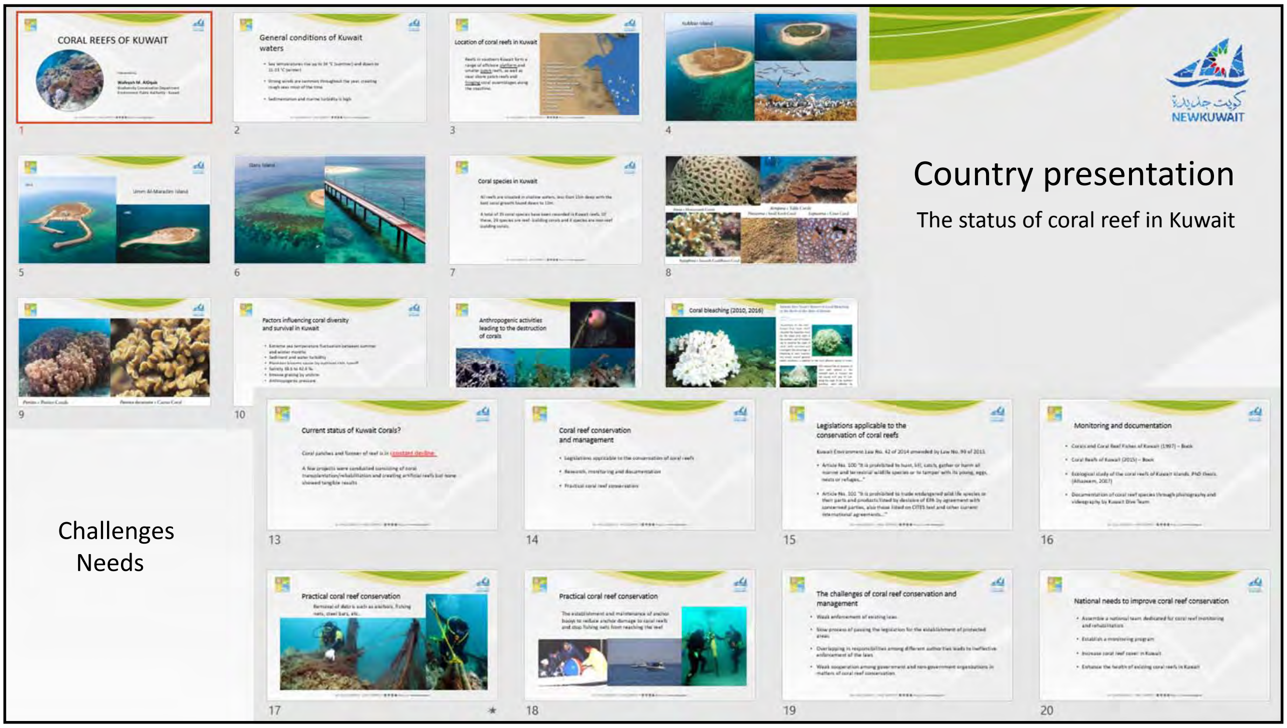
CORAL REEFS OF KUWAIT
NEWKUWAIT
Country presentation
The status of coral reef in Kuwait
Challenges
Needs


NEWKUWAIT
Gained expertise in:
• Coral reef survey and monitoring
• Molecular approaches
• Coral reef restoration approaches and methods
• Coral reef transplantation in Singapore
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Dive at Sister’s Island

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What’s Next?

- Set a monitoring plan with clear objectives
- Assemble a national team dedicated for coral reef monitoring and rehabilitation (collect efforts in one place).
- Provide necessary training to handle the monitoring program and other coral incidents.
- Preform a Reef-check to assess the current status of coral reefs.
- Update our baseline information about corals.
- Restore and enhance the status of coral reefs in Kuwait (increase cover).

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Thank you for your attention

The End

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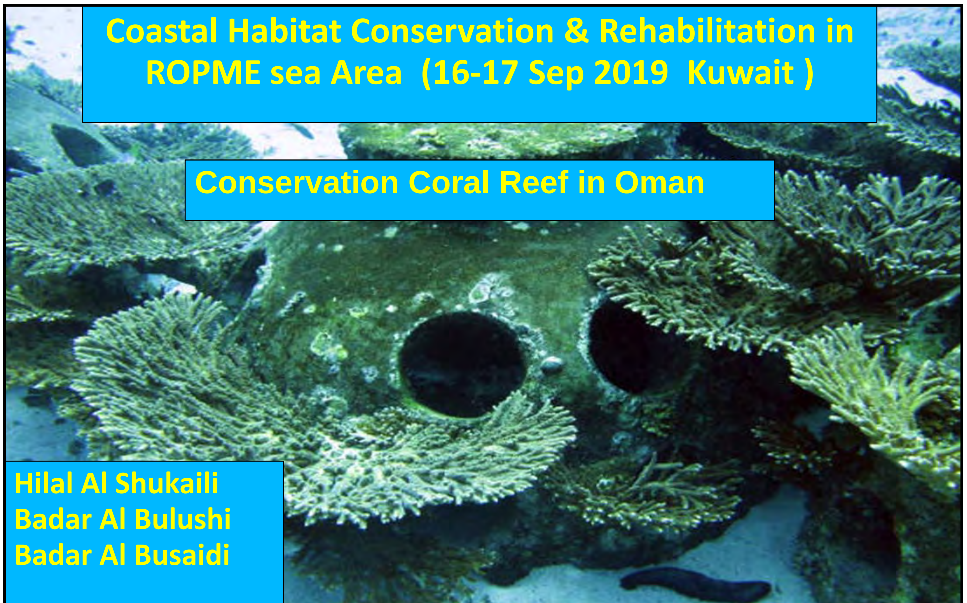
Conservation of Coral Reef in Oman - Coastal Habitat Conservation & Rehabilitation in ROPME sea Area

(Sultanate of Oman)

Coastal Habitat Conservation & Rehabilitation in ROPME sea Area (16-17 Sep 2019 Kuwait)



Conservation Coral Reef in Oman

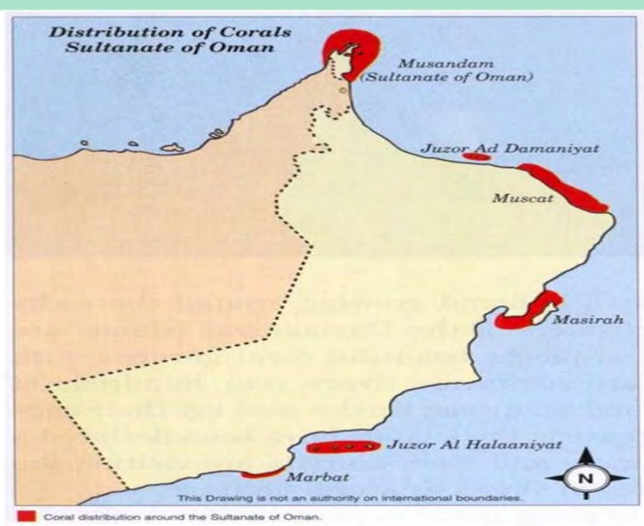
Hilal Al Shukaili
Badar Al Bulushi
Badar Al Busaidi

JICA ジャイカ

UNEP

وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Areas of Major Coral Reef growth in Sultanate of Oman



وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Coral Reef

- The Coral Reef is populations 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 plentey of refuge from predators .

- Coral Reefs generally have specific requirements for :

1- Light

2- Temperature

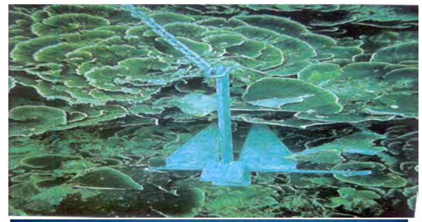
3- Salinity

4- Oxygen

وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

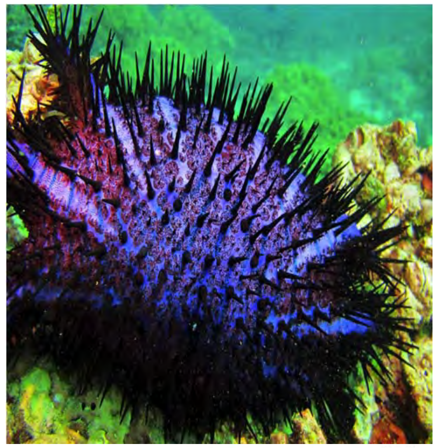
Threats to Coral Reef

- **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 Temperature is too high , Global warming has already led to increased of coral bleaching**

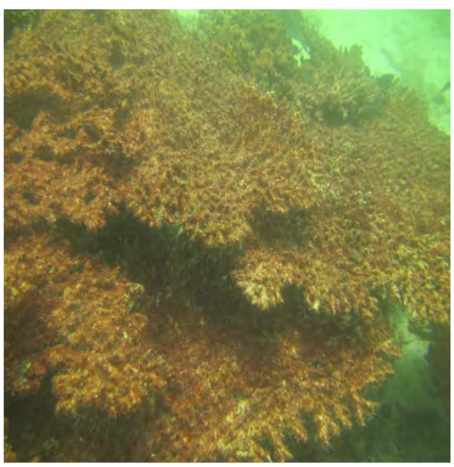


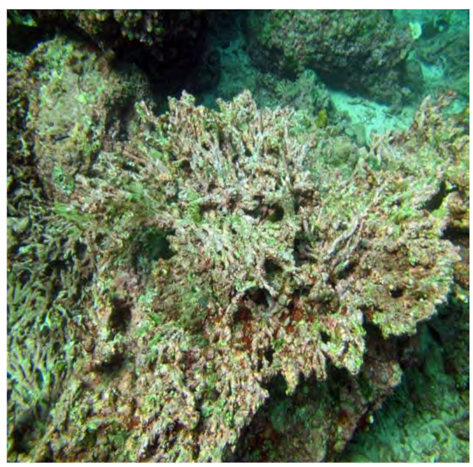
- Starfish – crown of thorns
- Pollution : Urban and industrial waste , Sewage , oil pollution, fishing Net.

Starfish – Crown of Thorns
Dimaniyat Island



Dead Coral





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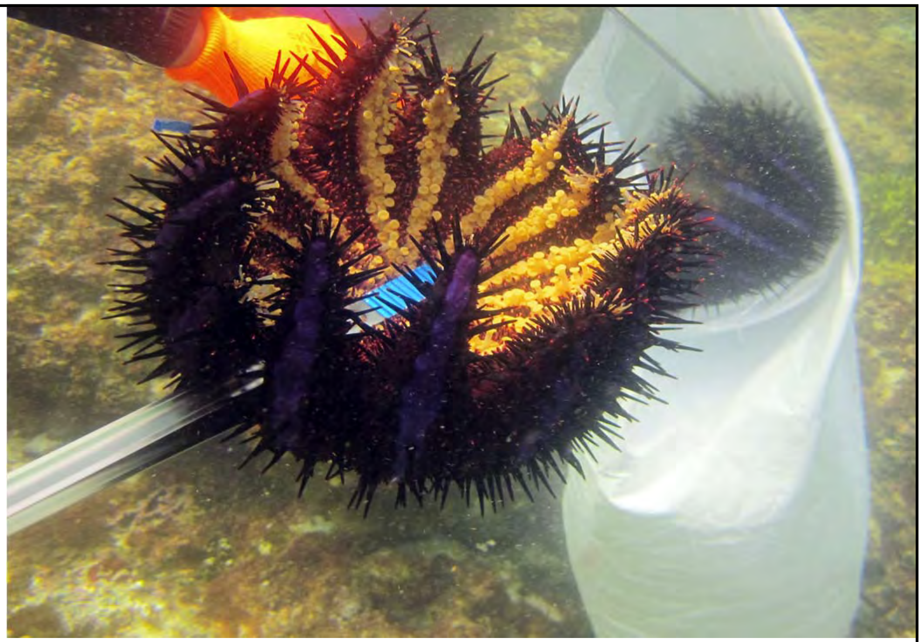
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS



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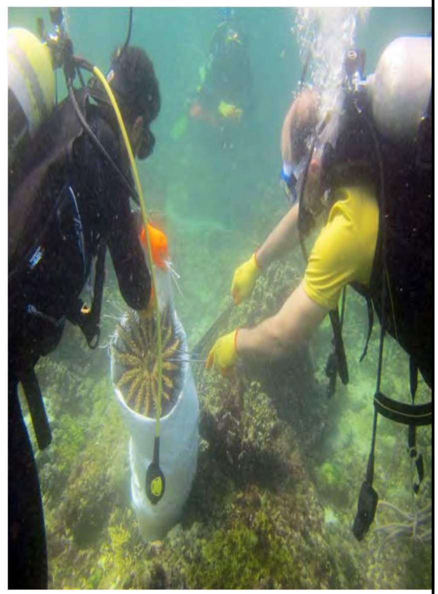
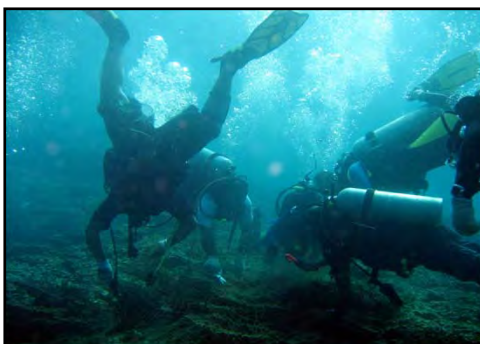
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS



Efforts of MECA in Management and Restoration of coral reef

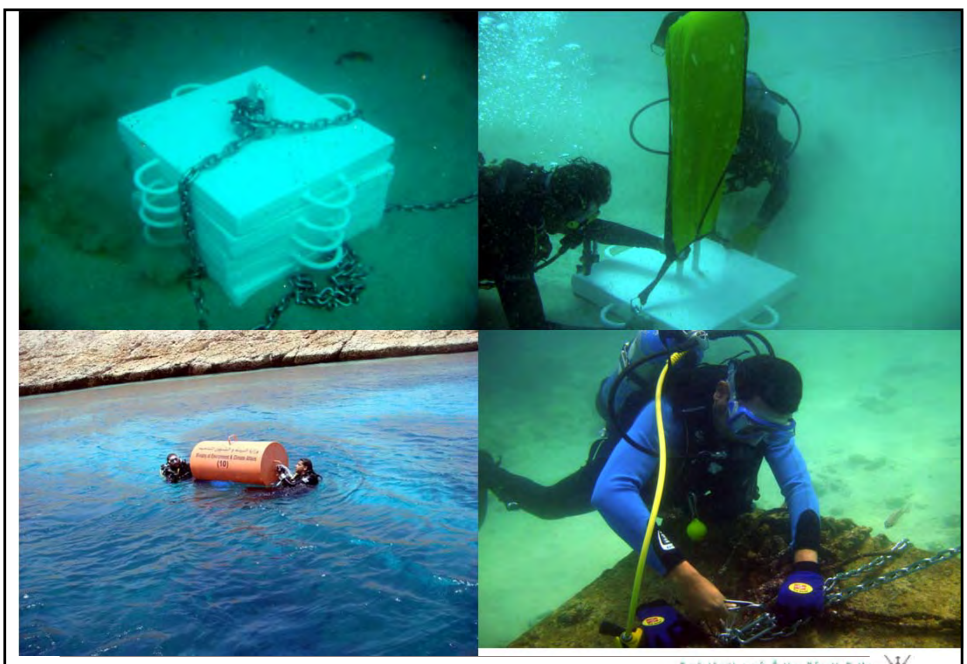
وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

Coral Reef clean up Campaigns



Also Marine Mammals

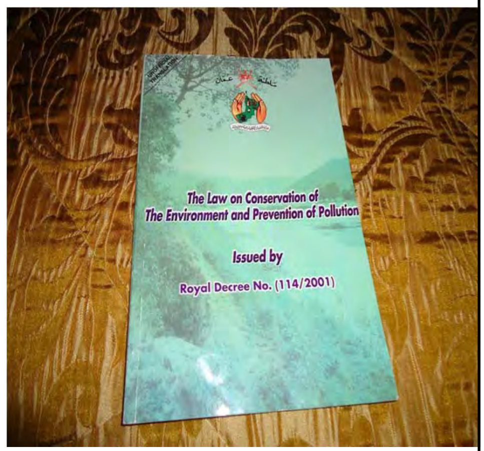
Mooring Buoys



وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS

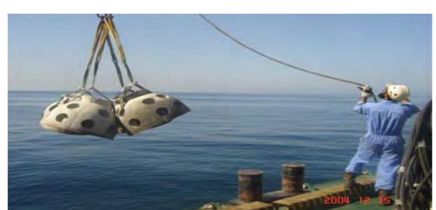
Educate Locals

Diving rules & regulation



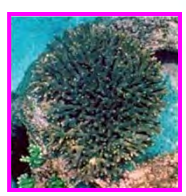
Artificial Coral Reef (reef balls)

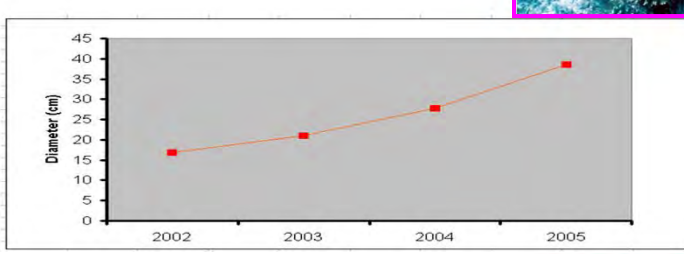
- Artificial reefs have been used in rehabilitation of damaged reefs the improvement of fisheries and the creation diving site .

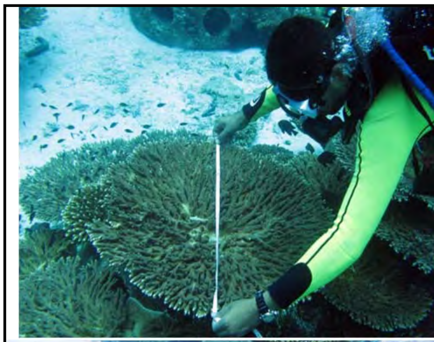


- Deployment of 40 Artificial reef balls structure since 1998 around Fahal Island .
- Data for Horizontal growth of colony shows good growth (25mm \ mo) in first month measured, then the same slowing of growth (6.3mm\mo) over the winter months October to march .

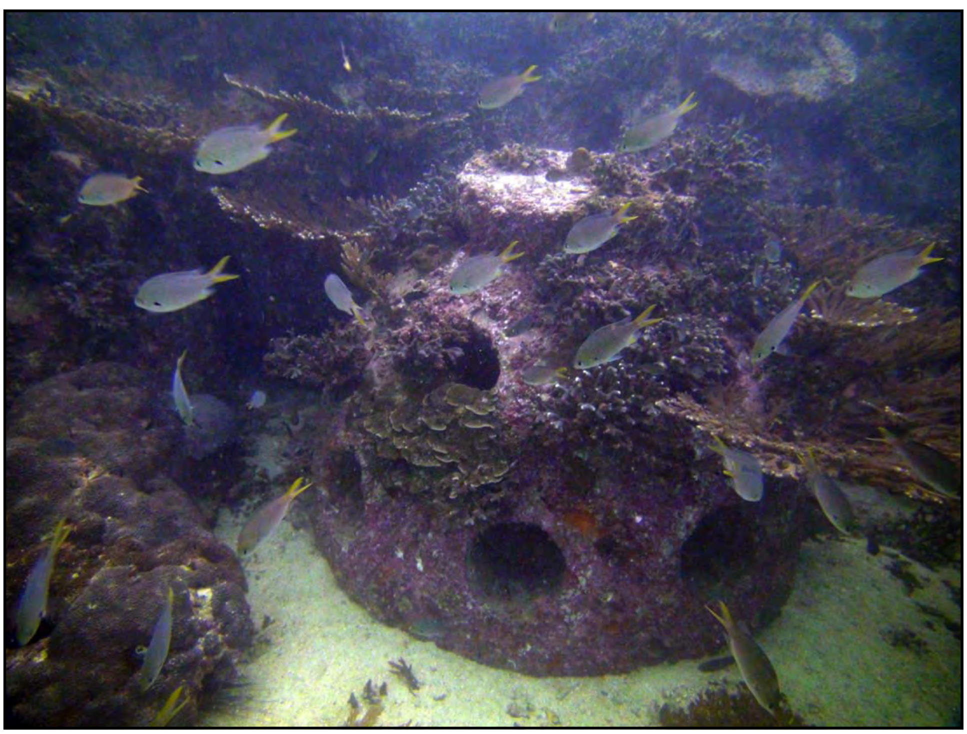
***Acropora arabensis* (top colony S4, Fahal Island)**







وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS




Thank you
شكراً جزيلاً

Marine Environment Developmental Impact and the Protection Procedures

(Kingdom of Saudi Arabia)

Marine Environment
Developmental Impact & the Protection Procedures

Presented by:

Areen Nasif
Abdulelah Al-Hatami
General Authority of Meteorology & Environmental Protection (GAMEP)
Kingdom of Saudi Arabia

1

The Main Marine Life Features in the Saudi Arabian waters:

- Coral Reefs
- Mangroves Forests
- Sea Grass Beds
- Coastal Wetlands & Sabkhas
- Fishery Resources
- Coastal ecosystem

More than 200 Species of Corals in the Saudi Arabian Coastal Zones:

There are 2 Species of Mangroves :

1) Avicennia marina

(Available in both the Red sea and the ROPME Sea Area)

2) Rhizophora mucronata

(in the Southern Parts of Saudi Red Sea Coastal Areas)

Salt Marshes & Seagrass beds




The Main Developmental Activities & Environmental Issues in the Saudi Arabian Marine & Coastal Areas

- **Oil Industry and Other Industrial Projects**
- **Maritime Transportation**
- **Commercial & Residential development**
- **Dredging & Reclamation (Sea Felling)**
- **Water Pollution**
- **Debris & Solid Wastes**
- **Fish Mortalities**
- **Over fishing & Marine Aquaculture**

The Uses in The Coastal Zone are Concentrating in 3 Major Points:

- **Implementation of Economic & Strategic Projects**
- **Implementation of Private Projects and Residential Groups**
- **Implementation of recreational Projects**

Main Causes of Destruction of the Coastal Zones

- **Absence of Plan for the ICZM**
- **Interference of Tasks of Concerned agencies (Conflicts)**

Solutions Taken into Consideration:

1- As a temporary and immediate action: There is a Mechanism of Bilateral cooperation between the relevant agencies (MOU) .

2- Formulation of Technical Committee (8 agencies) to look into the existing state and to deal with each case separately with the following objectives:

- Removal of Environmental Degradation
- Achievement of the Objectives of the Public Benefits.

3- Formulation of Guidelines & Procedures between the stakeholders (Coordination & Integration) .

4- Implementation of the EIA for the Major Developmental Projects.

5- As a permanent Solution: Developing and Implementing of: ICZM as a law, When issued GAMEP is requested to Prepare (General Operational plan & it's Implementation procedures) .

THANK YOU

Current Status and national priority on the Coastal Habitat Conservation and Rehabilitation

(United Arab Emirates)

UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

Current Status and national priority on the Coastal Habitat Conservation and Rehabilitation

September 2019

UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

Coastal Habitat Conservation and Rehabilitation

- Coral reef monitoring and control stations
- Artificial Caves Program (eco-friendly caves)
- Cultivation and rehabilitation of coral species in coastal areas
- Gardens Plantation of mangrove seedlings on coastal areas

UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

Rehabilitation of coastal and marine habitat in UAE

Progress Achieved

273,210

mangrove seedlings planted in an area 283,068 m2

20,000

coral fragments transplanted in an area of 2,500,000 m2 in partnership with local authorities

2,805

artificial reefs deployed within an area of 154,709 m2

UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

Natural Rock Barriers Installation project in Coastal Areas

restoring natural habitats and building artificial ones for species to breed and flourish-recreate natural habitats and breeding grounds for marine creatures, particularly corals, and thereby preserve and strengthen the country's aquatic biodiversity. They will also help protect the UAE's coastline against storm damage and erosion.

Location: implementation of the project's pilot phase along the shores of Umm Al Quwain beaches, with rocks installed at depths ranging between five- and 15-meters.

Coral Species : Acropora, Porites, and Stylophora. The growth of the coral cultures will be monitored over a long-term period.

الإمارات العربية المتحدة
وزارة التغير المناخي
والبيئة

Coral culture in sea water

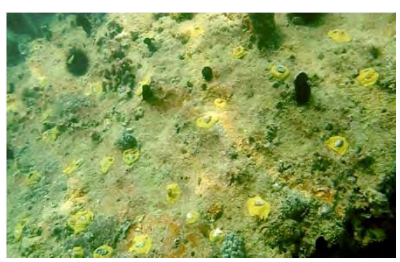
Montipora

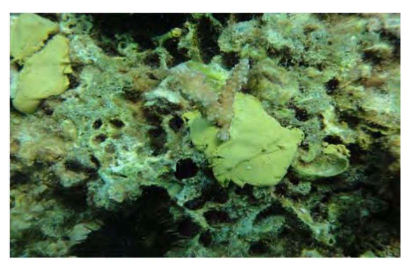
Acropora

Brain Corals

الإمارات العربية المتحدة
وزارة التغير المناخي
والبيئة

Coral culture in sea water





الإمارات العربية المتحدة
وزارة التغير المناخي
والبيئة

Fujairah Cultured Coral Reef Gardens

the largest project of its kind in the UAE. In line with the Ministry's strategy to protect the UAE's biodiversity and ensure its sustainability, the project is set to include the cultivation of 1.5 million coral reef colonies over the next five years.

that spans 300,000 square meters will include the cultivation of 1.5 million coral reef colonies and significantly boost the sustainability of the fish stocks, thereby safeguarding food diversity and food security in the country

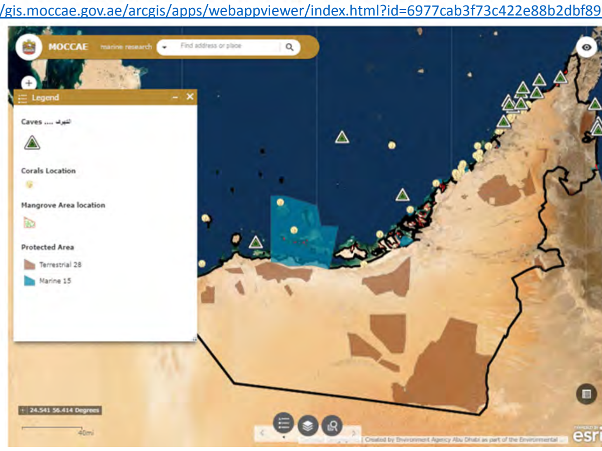
UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

MOCCAE GIS portal

Explore the UAE's Marine Habitats

Use the web mapping application below to explore corals, reefs and industrial caves in the UAE

https://gis.moccae.gov.ae/arcgis/apps/webappviewer/index.html?id=6977cab3f73c422e88b2dbf895c2c83c



الإمارات العربية المتحدة
وزارة التغير المناخي والبيئة

Pictures of some areas planted with mangroves

Thank you

Developing a State of the Marine Environment Report (SOMER) for Kuwait

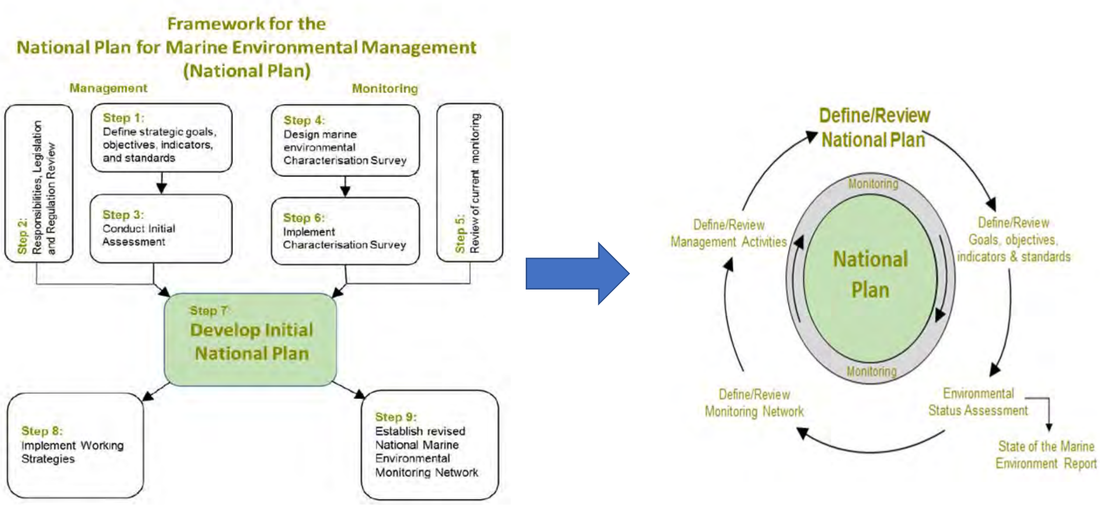
Dr. Brett Lyons, Centre for Environment Fisheries & Aquaculture Science, UK

Developing a State of the Marine Environment Report (SOMER) for Kuwait

Dr Brett Lyons

Coastal Habitat Conservation and Rehabilitation in ROPME Sea Area
16-17 September 2019, ROPME Secretariat, State of Kuwait

Centre for Environment Fisheries & Aquaculture Science



Centre for Environment Fisheries & Aquaculture Science

Vision

- Protect, preserve and, where practicable, restore the marine environment, to prevent pollution, and support sustainable development and conserve biodiversity for the benefit of current and future generations of Kuwaiti's.

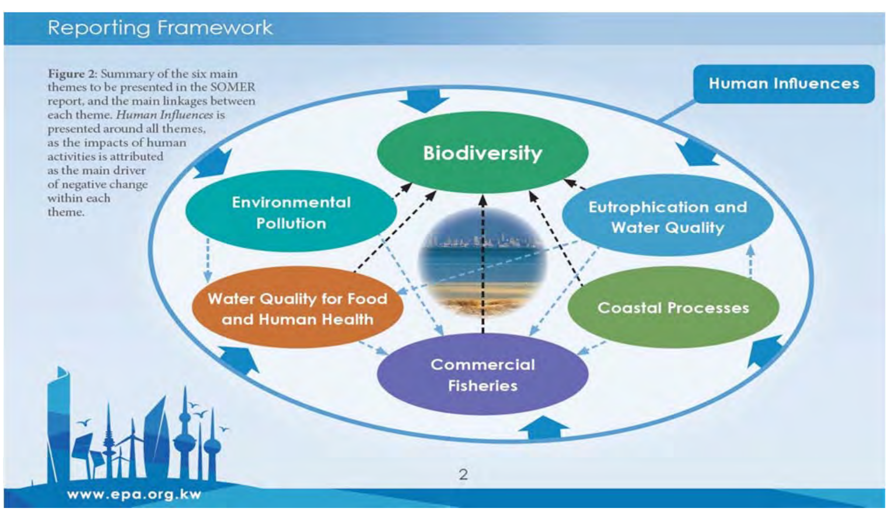
SUSTAINABLE DEVELOPMENT GOALS

Convention on Biological Diversity

Stockholm Convention on persistent organic pollutants (POPs)

Environment Protection Law of Kuwait (Law 42 of 2014).

Breaking environment into bite sized chunks!



Centre for Environment Fisheries & Aquaculture Science

The framework for <u>assessing</u> & <u>managing</u> the health of the marine environment

Vision → Strategic Goal → Management Objective

Management Objective → Management Indicator

Management Indicator → Management Target

Management Indicator → Operational Indicator → Metrics

Operational Indicator → Environmental Standard

Centre for Environment Fisheries & Aquaculture Science

Draft Strategic Goals (SG) for Kuwait.

Biodiversity
SG1: to prevent extinction of threatened and vulnerable species, and where possible, maintain abundant populations of all species.
SG2: to prevent introduction and establishment of invasive species.
SG3: to maintain the condition and extent of threatened and vulnerable habitats, and critical habitats that support threatened or vulnerable species; and to maintain all habitats in a condition to support key ecosystem functions that are dependent on them.
SG4: to maintain community structure and food webs to ensure long-term abundance of species and productivity at all levels.
Food and Water Quality for Human Health
SG1: to maintain the quality of seawater to protect human health.
SG2: to ensure contaminants in fish and other seafood for human consumption do not lead to unacceptable risk to human health.
Pollution
SG1: to ensure that marine ecosystems are not adversely impacted by contaminants.
Fisheries
SG1: to ensure all stocks of commercially exploited species are at levels that enable high long-term sustainable yield consistent with the concept of maximum sustainable yield.
Eutrophication and Harmful Algal Blooms (HABs)
SG1: to minimise human-induced eutrophication, and its adverse or undesirable effects.
SG2: to reduce the frequency of human-induced Harmful Algal Blooms, and, where possible, minimise the adverse consequences of HABs.
Coastal Processes and Oceanography
SG1: to minimise changes in sediment transport by coastal developments and offshore structures that may lead to increased flood risk and undesirable erosion or changes in the shoreline.
CSG2: alterations to the hydrodynamic conditions do not adversely affect coastal and marine ecosystems.

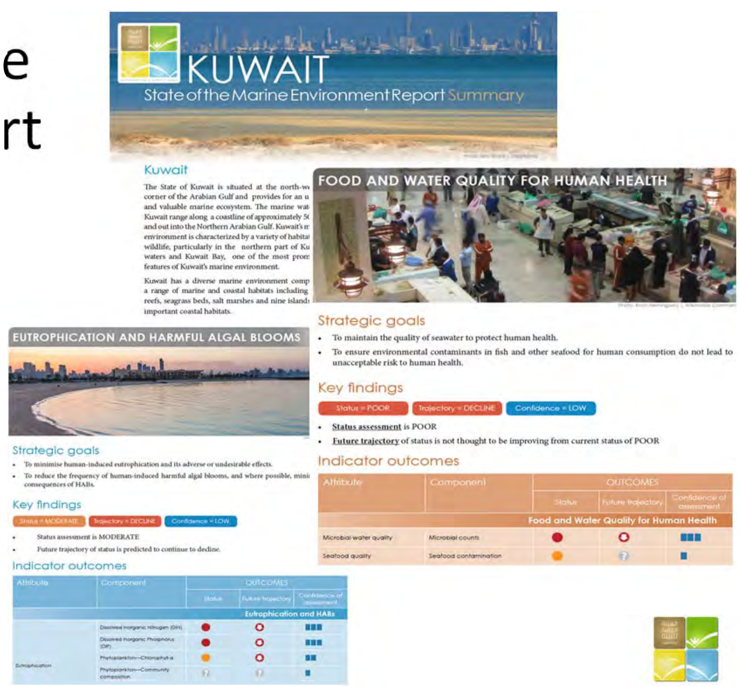
B-SG1: To prevent extinction of threatened and vulnerable species, and where possible maintain abundant populations of all species.

- **Management Objective: To maintain, or improve, the abundance of threatened and vulnerable species.**
  - **Management Indicator: The number of selected sensitive fish species showing no decline in abundance.**
  - **Management Indicator: The number of turtle species showing no decline in nest abundance.**
  - **Management Indicator: The number of selected cetacean species showing no decline in abundance.**
  - **Management Indicator: The number of selected threatened, vulnerable, or regionally important bird species showing no decline in abundance.**
  - **Management Indicator: The number of selected sea snake species showing no decline in abundance.**
- **Management Objective: Direct mortality of threatened and vulnerable species is reduced, or maintained, to levels that do not undermine long-term sustainability of populations.**
  - **Management Indicator: The number of selected sensitive fish species showing no increase in mortality estimates.**
  - **Management Indicator: The number of turtle species with almost zero human-induced mortality rates.**
  - **Management Indicator: The number of selected cetacean species with almost zero human-induced mortality rates.**
- **Management Objective: To maintain abundant populations of all species.**
  - **Management Indicator: The proportion of selected migratory bird species showing no decline in abundance.**

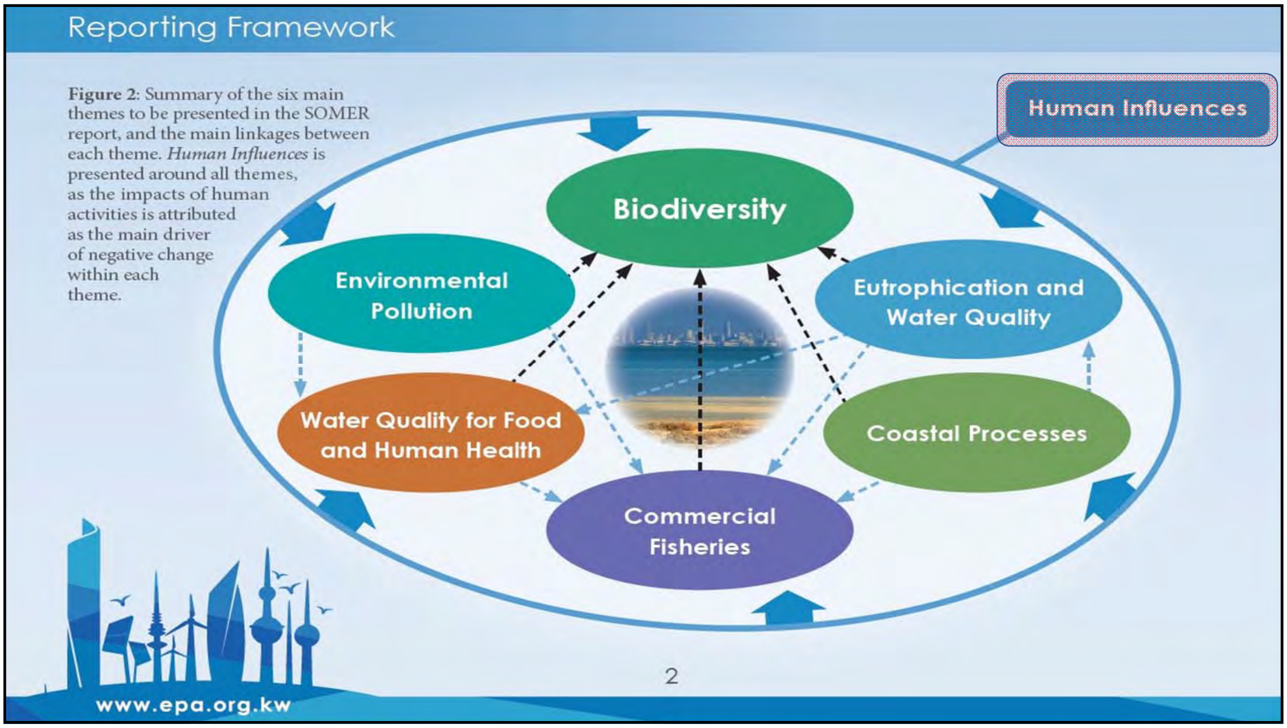
Centre for Environment Fisheries & Aquaculture Science

State Of the Marine Environment Report (SOMER): Kuwait

- Initial coordinated review and assessment of the state of Kuwait's marine environment.
- It details how marine resources have been affected by the range of natural pressures and human activities.



Centre for Environment Fisheries & Aquaculture Science



Thematic assessment process

Status
- High
- Good
- Moderate
- Poor
- Unknown

Future trajectory
- Improving
- Stable
- Declining
- Unknown

Confidence in assessment
- ■■■ High confidence: quantitative data, environmental standards, significant temporal trends
- ■■ Medium confidence: quantitative to qualitative data, less information on temporal and spatial trends
- ■ Low confidence: limited or qualitative data, no environmental standards and lack of trend

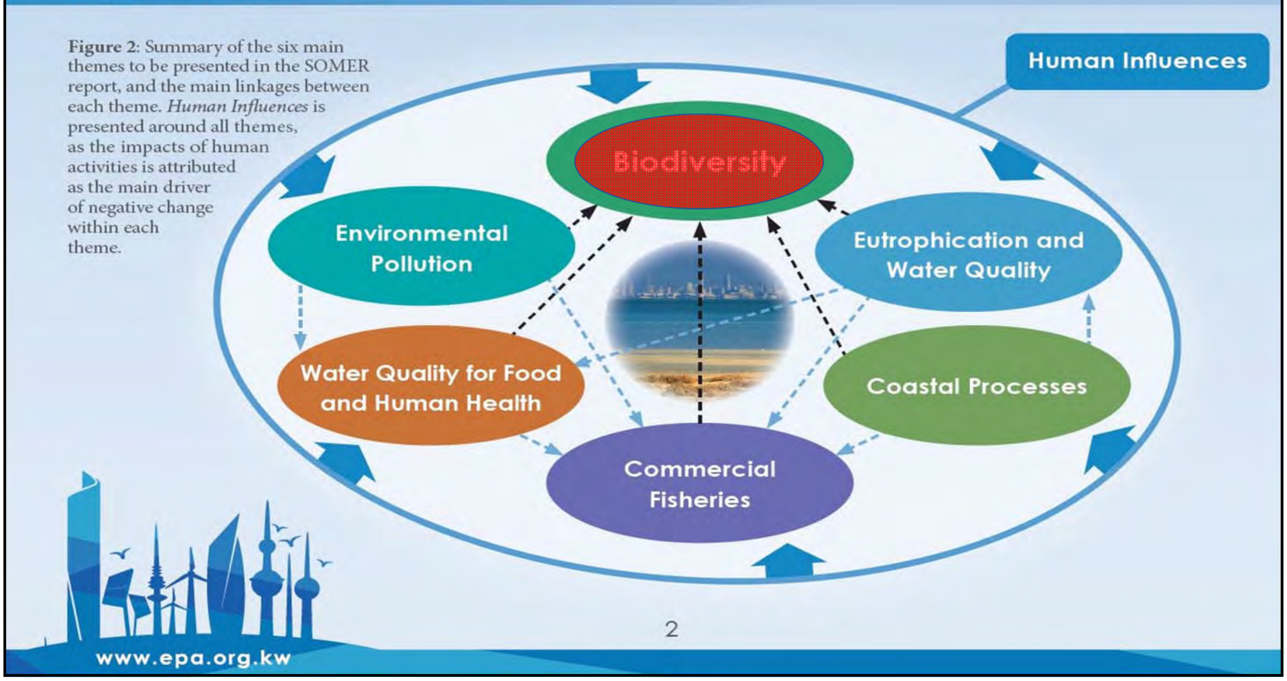
Current State (Status) = High or Good = good ecological quality
Current State (Status) = Moderate or Poor = poor ecological quality, suggests management actions are required.

Data sources

Centre for Environment Fisheries & Aquaculture Science

Reporting Framework

Figure 2: Summary of the six main themes to be presented in the SOMER report, and the main linkages between each theme. *Human Influences* is presented around all themes, as the impacts of human activities is attributed as the main driver of negative change within each theme.



2

Strategic goals

- To prevent extinction of threatened and vul populations of all species.
- To prevent the introduction and spread of priori
- To maintain the condition and extent of threaten threatened or vulnerable species; and to main functions dependent on them.

Key findings

Status = MODERATE | Trajectory = DECLINE

- **Status assessment** is MODERATE.
- **Future trajectory** of status for seabirds, and coa
- Low **confidence** in all other indicators due to pa

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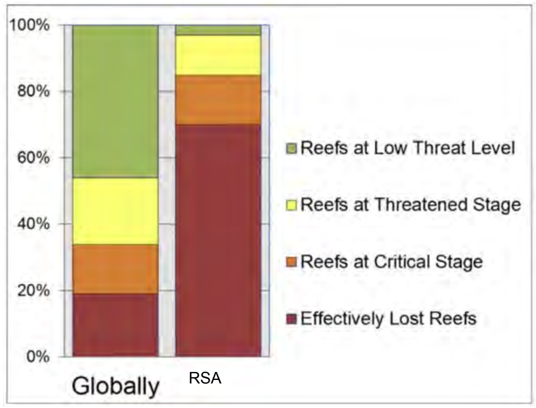
Indicator outcomes

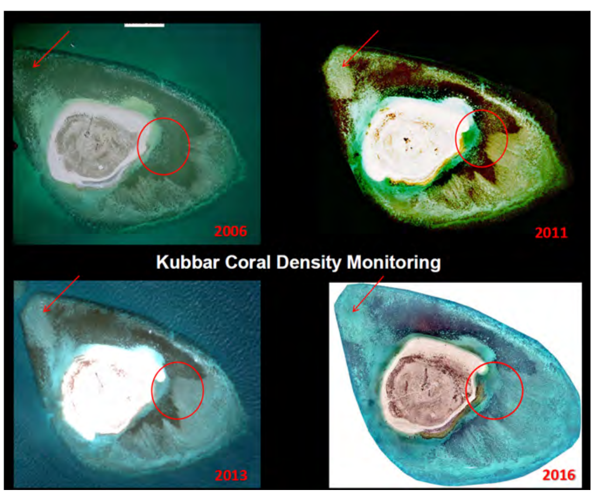
Attribute	Component	OUTCOMES		
		Status	Future trajectory	Confidence of assessment
				Biodiversity
Rare and vulnerable fish	Population abundance			
Cetaceans (Whales and Dolphins)	Population abundance	?	?	
Marine Turtles	Occurrence of nesting			
Seabirds	Population abundance	?		
Impacts from alien species	Frequency of occurrence	?	?	
Coral Reefs	% cover			
Seagrass	Area and condition	?		
Coastal habitats	Area and condition			

Biodiversity: Coral reefs (regional studies)

- Evidence to suggest that a significant decline is happening across all marine systems to the extend that the ROPME Sea Area (I-RSA) has been termed a ***'young sea in decline'*** (Sheppard et al., 2010, Mar. Pollut. Bull., 60, 13-18).
- In the I-RSA estimated that 70% loss of coral reef cover from the historic 3800 km^2 of cover.
- Loss of corals reefs in I-RSA far higher than global average.



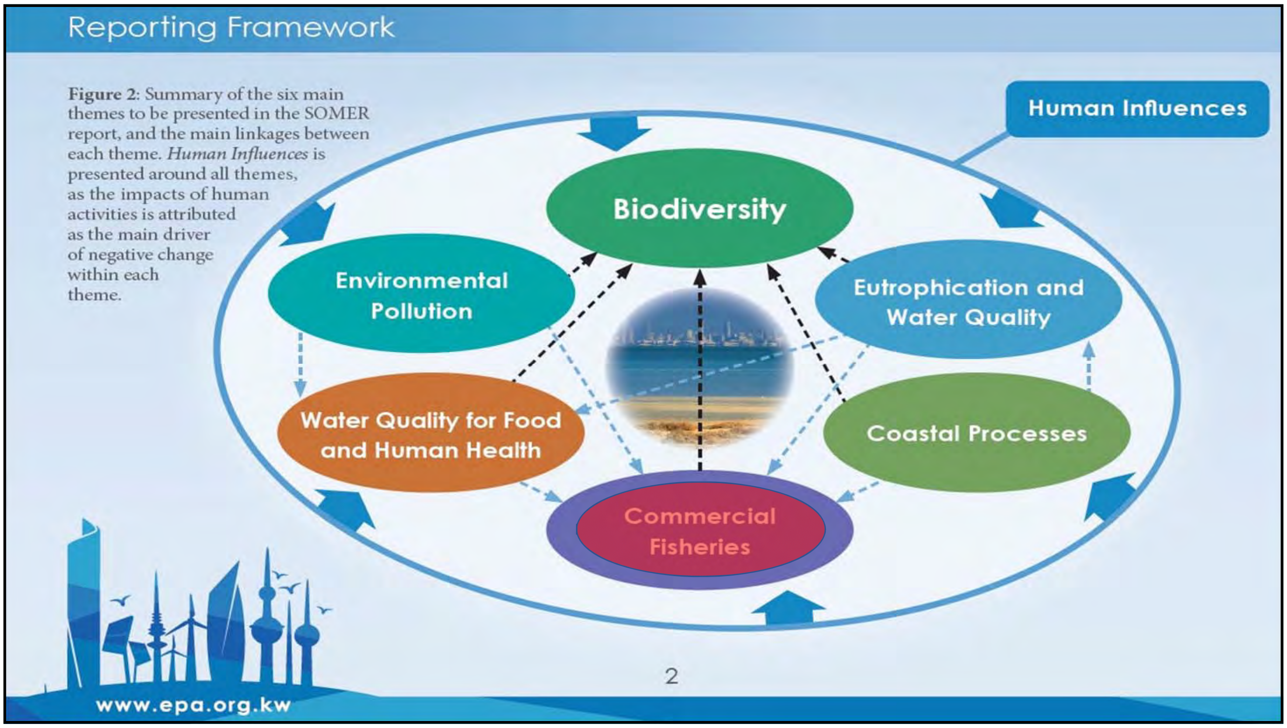
Recently published local research studies

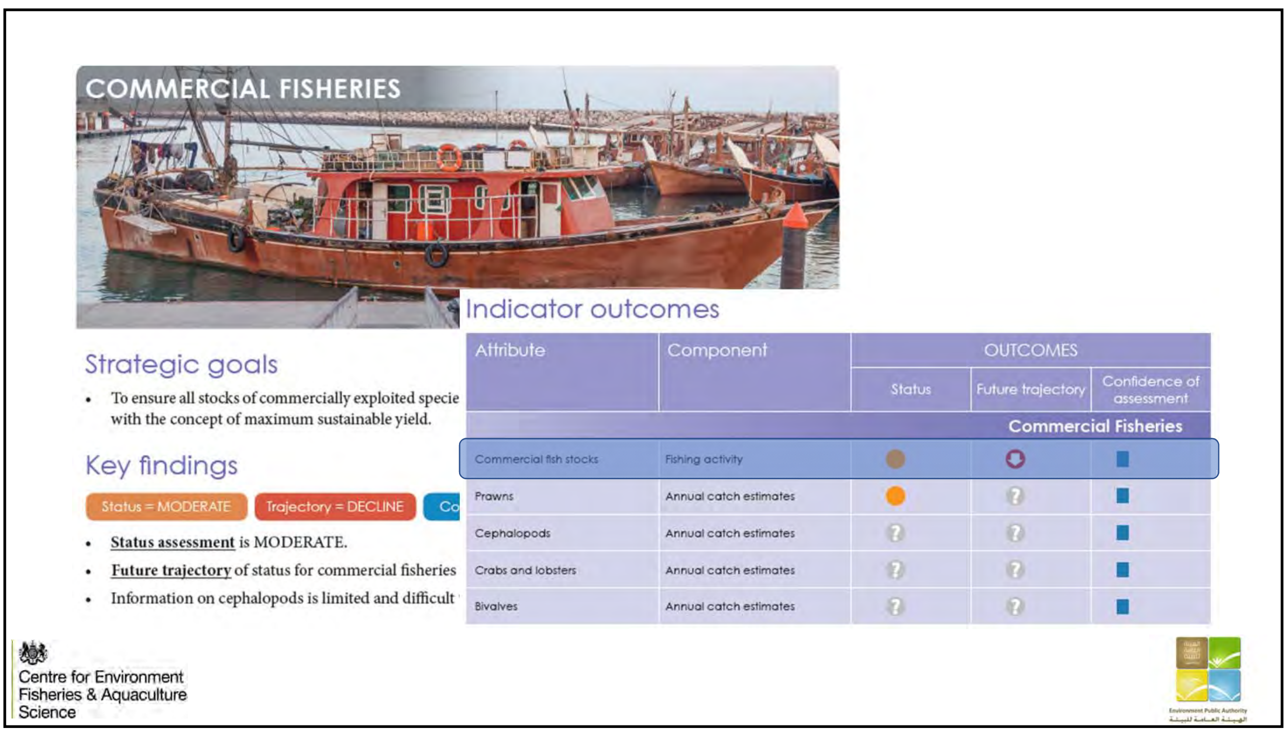


Gholoum, Bruce, Alhazeem (2019). International Journal of Remote Sensing, 40, 4787-4816

- Kubbar Island % coral cover:
  - 2006 = 232,565 m^2
  - 2017 = 152,896 m^2
- Loss 79,669 m^2 over 11 years

KISR Kuwait Institute for Scientific Research | University of South Australia | Public Authority for Applied Education and Training


Reporting Framework
Figure 2: Summary of the six main themes to be presented in the SOMER report, and the main linkages between each theme. Human Influences is presented around all themes, as the impacts of human activities is attributed as the main driver of negative change within each theme.
Human Influences
Biodiversity
Environmental Pollution
Eutrophication and Water Quality
Water Quality for Food and Human Health
Coastal Processes
Commercial Fisheries
2
www.epa.org.kw


COMMERCIAL FISHERIES
Strategic goals
• To ensure all stocks of commercially exploited specie
with the concept of maximum sustainable yield.
Key findings
Status = MODERATE
Trajectory = DECLINE
Co
• Status assessment is MODERATE.
• Future trajectory of status for commercial fisheries
• Information on cephalopods is limited and difficult
Indicator outcomes

Attribute	Component	OUTCOMES		
		Status	Future trajectory	Confidence of assessment
			Commercial Fisheries	
Commercial fish stocks	Fishing activity			
Prawns	Annual catch estimates		?	
Cephalopods	Annual catch estimates	?	?	
Crabs and lobsters	Annual catch estimates	?	?	
Bivalves	Annual catch estimates	?	?	

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Commercial fisheries: Commercial fish stocks

KISR
Kuwait Institute for Scientific Research

Marine Pollution Bulletin

Review

A review of the status and development of Kuwait's fisheries

M. Al-Husaini, J.M. Bishop, H.M. Al-Foudari, A.F. Al-Baz

Marine Policy

Status of Kuwait's fishery resources: Assessment and perspective

Amani S.Y. Al-Zaidan, Salim Y. Al-Mohanna, Preeta George

Landings (t) of five important species of commercial fishes for 1995, 2005 and 2013.

Species	1995	2005	2013
Suboor	1197	154	137
Zobaidy	1085	168	247
Newaiby	1583	674	430
Hamoor	333	152	203
Hamra	137	15	29

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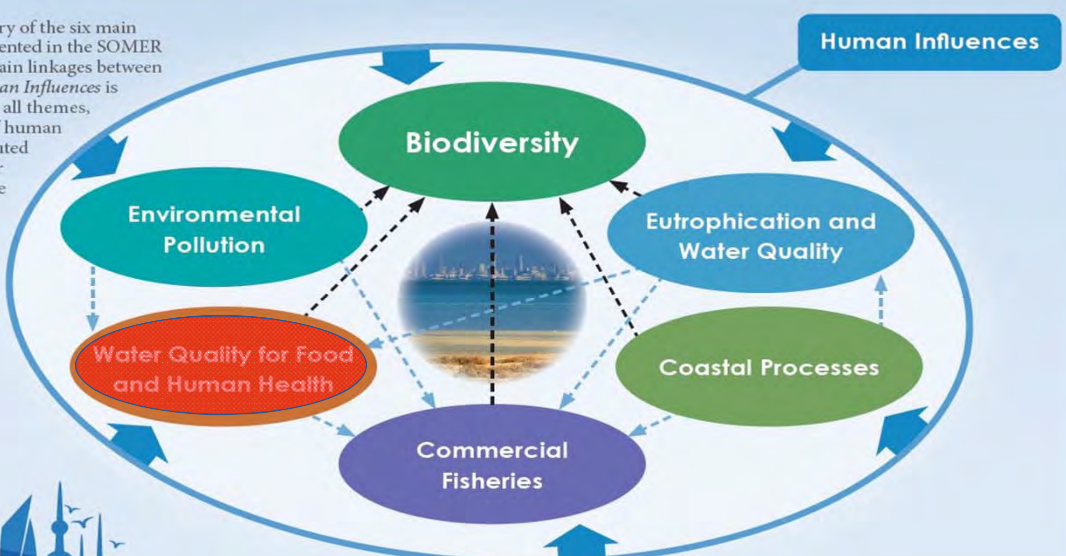
Commercial fish stocks | Fishing activity

Reporting Framework

Figure 2: Summary of the six main themes to be presented in the SOMER report, and the main linkages between each theme. *Human Influences* is presented around all themes, as the impacts of human activities is attributed as the main driver of negative change within each theme.



2

www.epa.org.kw

Photo: Evan Hemingway | Wikimedia Commons

Strategic goals

- To maintain the quality of seawater to protect human health.
- To ensure environmental contaminants in fish and other seafood for human consumption do not lead to unacceptable risk to human health.

Key findings

Status = POOR | Trajectory = DECLINE | C

- **Status assessment** is POOR
- **Future trajectory** of status is not thought to be imp

Indicator outcomes

Attribute	Component	OUTCOMES		
		Status	Future trajectory	Confidence of assessment
Food and Water Quality for Human Health				
Microbial water quality	Microbial counts	●	⬇	■■■
Seafood quality	Seafood contamination	●	?	■

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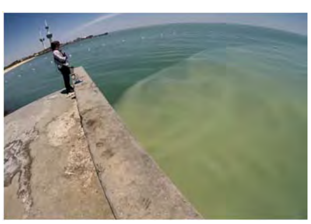
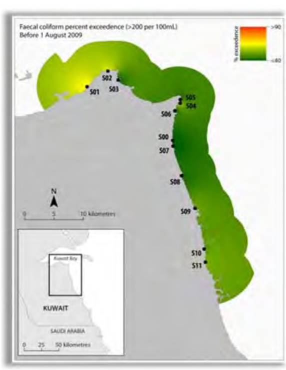
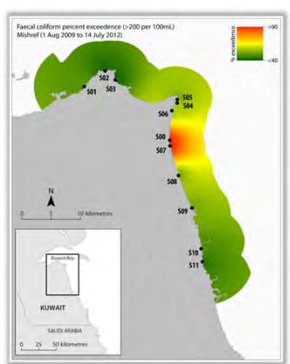
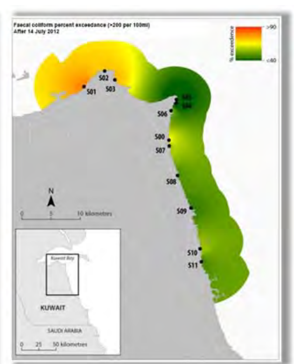
Food & Water Quality Human Health: microbial water quality









Microbial water quality	Microbial counts	●	⬇	■■■

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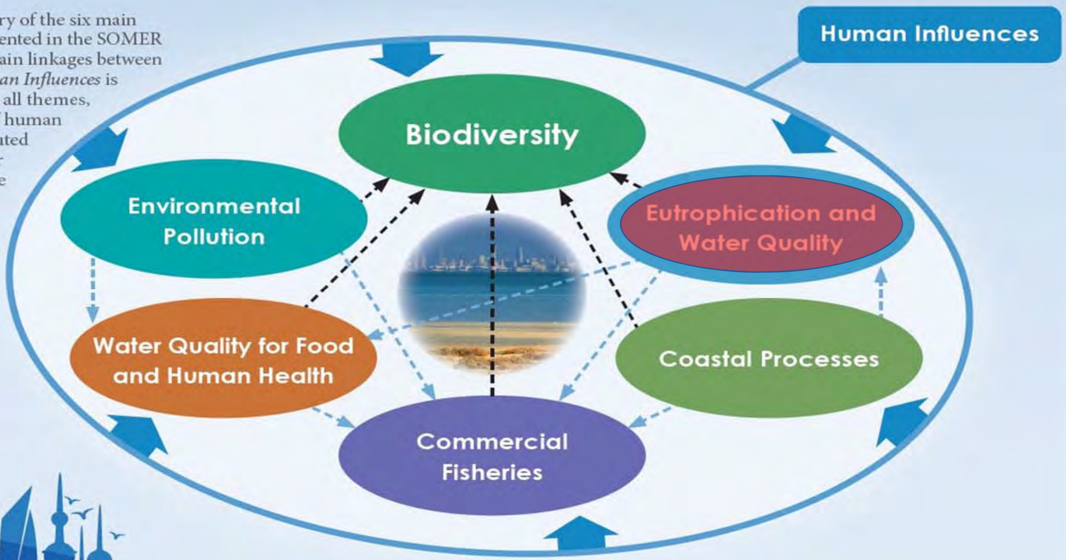
Reporting Framework

Figure 2: Summary of the six main themes to be presented in the SOMER report, and the main linkages between each theme. *Human Influences* is presented around all themes, as the impacts of human activities is attributed as the main driver of negative change within each theme.



www.epa.org.kw

2

EUTROPHICATION AND HARMFUL ALGAL BLOOMS

Indicator outcomes

Attribute	Component	OUTCOMES		
		Status	Future trajectory	Confidence of assessment
		Eutrophication and HABs		
Eutrophication	Dissolved Inorganic Nitrogen (DIN)			■■■
	Dissolved Inorganic Phosphorus (DIP)			■■■
	Phytoplankton—Chlorophyll-a			■■
	Phytoplankton—Community composition			■
	Dissolved oxygen			■
	Water quality index			■■
HABs	Harmful Algal Blooms			■

* Water Quality (WQ) index reports nutrients, phytoplankton, turbidity and dissolved oxygen as a single eutrophication index.

Strategic goals

- To minimise human-induced eutrophication and its
- To reduce the frequency of human-induced harmf consequences of HABs.

Key findings

Status = MODERATE | Trajectory = DECLINE | Co

- Status assessment is MODERATE
- Future trajectory of status is predicted to continue to decline.

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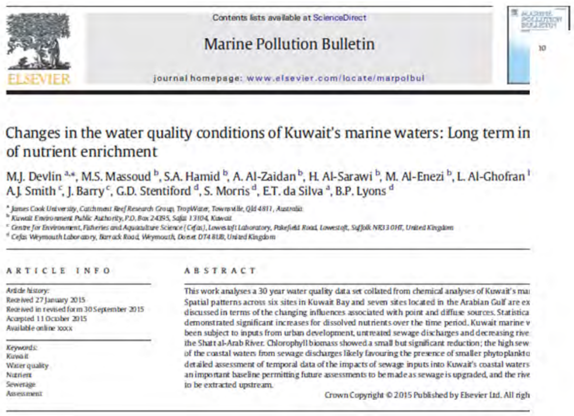
Eutrophication & HABS: DiN and DiP


Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Changes in the water quality conditions of Kuwait's marine waters: Long term in
of nutrient enrichment

M.J. Devlin[a,*], M.S. Massoud[b], S.A. Hamid[b], A. Al-Zaidan[b], H. Al-Sarawi[b], M. Al-Enezi[b], L. Al-Ghofran
A.J. Smith[c], J. Barry[c], G.D. Stentiford[d], S. Morris[d], E.T. da Silva[a], B.P. Lyons[d]

[a] James Cook University, Catchment Reef Research Group, TropWater, Townsville, Qld 4811, Australia
[b] Kuwait Environment Public Authority, P.O. Box 24395, Safat 13104, Kuwait
[c] Centre for Environment, Fisheries and Aquaculture Science (Cefas), Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk NR33 0HT, United Kingdom
[d] Cefas Weymouth Laboratory, Barrack Road, Weymouth, Dorset DT4 8UB, United Kingdom

ARTICLE INFO

Article history:
Received 27 January 2015
Received in revised form 30 September 2015
Accepted 11 October 2015
Available online xxxx

Keywords:
Kuwait
Water quality
Nutrient
Sewerage
Assessment

ABSTRACT

This work analyses a 30 year water quality data set collated from chemical analyses of Kuwait's mai
Spatial patterns across six sites in Kuwait Bay and seven sites located in the Arabian Gulf are ex
discussed in terms of the changing influences associated with point and diffuse sources. Statistica
demonstrated significant increases for dissolved nutrients over the time period. Kuwait marine v
been subject to inputs from urban development, untreated sewage discharges and decreasing rive
the Shatt al-Arab River. Chlorophyll biomass showed a small but significant reduction; the high sew
of the coastal waters from sewage discharges likely favouring the presence of smaller phytoplankto
detailed assessment of temporal data of the impacts of sewage inputs into Kuwait's coastal waters
an important baseline permitting future assessments to be made as sewage is upgraded, and the rive
to be extracted upstream.

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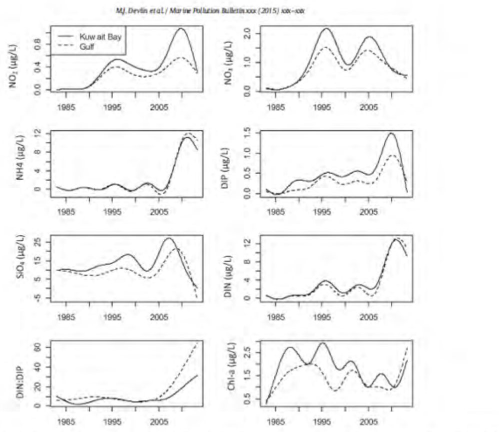

Fig. 6. Long-term trends for each of the nutrients for Kuwait Bay and Arabian Gulf. The trends are fitted using Generalised Additive Models. WQ variables are modelled over the length of the time series (1984–2012). Water quality parameters include NO_3, NO_2, NH_4, PO_4, silicate, DIN ($NO_3 + NO_2 + NH_4$), DIN:DIP (DIN:DIP only) ratio and chlorophyll-a. Units of measure for all nutrient species and chlorophyll-a are µg/L.

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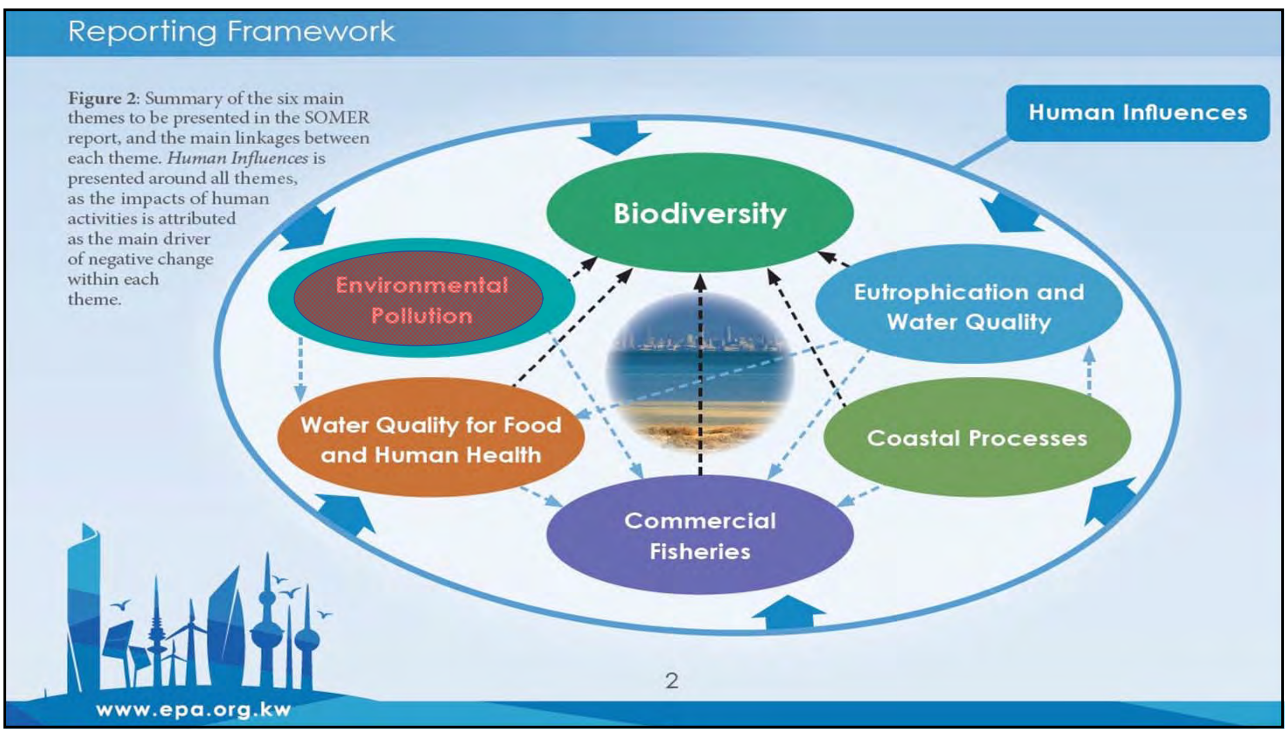
Dissolved Inorganic Nitrogen (DIN)



ENVIRONMENTAL POLLUTION

Strategic goals

- To ensure that marine ecosystems are not adversely impa

Key findings

Status = GOOD | Trajectory = STABLE | Confide

- Status assessment is GOOD
- Future trajectory of status is stable for contamination in w of the environmental pollutants.

Indicator outcomes

Attribute	Component	OUTCOMES: Status	OUTCOMES: Future trajectory	OUTCOMES: Confidence of assessment
Environmental Pollution				
Water	Total Petroleum Hydrocarbons (TPH)			
Water	Heavy metals < thresholds			
Ecotoxicology	Toxicity/endocrine disrupting chemicals			
Sediment	PAH			
Sediment	PCB			
Sediment	Metals			
Sediment	PBDE			
Sediment	Faecal sterols			
Biota	Chemical contamination			
Biota	Fish health			

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Environmental Pollution: Ecotoxicology

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journal homepage: www.elsevier.com/locate/marpolbul

Screening for contaminant hotspots in the marine environment of Kuwait using ecotoxicological and chemical screening techniques

A.J. Smith
H.A. Al-Sa

Contents lists available at ScienceDirect
Marine Pollution Bulletin
journal homepage: www.elsevier.com/locate/marpolbul

Baseline

Sources and levels of endocrine disrupting compounds (EDCs) in Kuwait's coastal areas

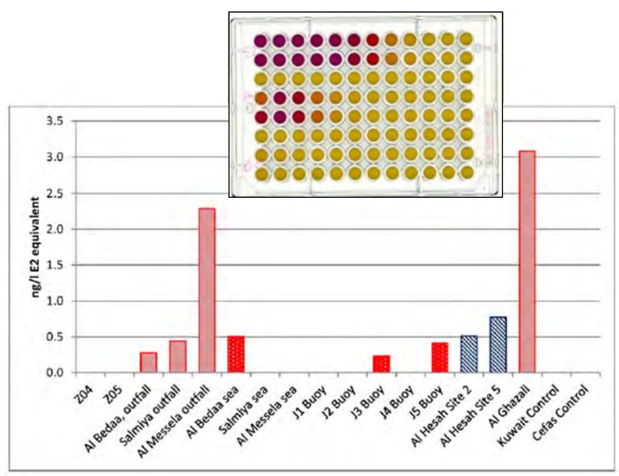
Talat Saeed

Contents lists available at ScienceDirect
Marine Pollution Bulletin
journal homepage: www.elsevier.com/locate/marpolbul

Baseline

Baseline screening for the presence of antimicrobial resistance in *E. coli* isolated from Kuwait's marine environment

Hanan A. Al-Sarawi[a,b,c], Awadhesh N. Jha[a], Craig Baker-Austin[b], Mohammad A. Al-Sarawi[c], Brett P. Lyons[b,*]



Attribute	Component	Status	Future trajectory	Confidence of assessment
Ecotoxicology	Toxicity/endocrine disrupting chemicals			

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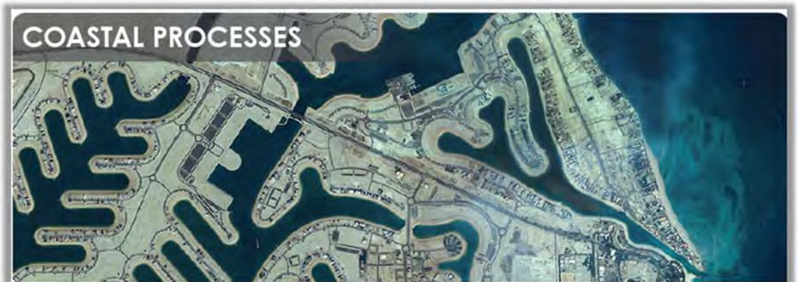
COASTAL PROCESSES



Strategic goals

- To minimise changes in sediment transport caused by co… lead to undesirable changes in the shoreline or increased…

Key findings

Status = MODERATE | Trajectory = DECLINE | Confide…

- Status assessment is MODERATE
- Future trajectory of status is predicted to decline based o…

Indicator outcomes

Attribute	Component	OUTCOMES		
		Status	Future trajectory	Confidence of assessment
Coastal processes				
Coastline stability	Coastal change			
	Changes in sedimentology			
Coastal currents	River flow			

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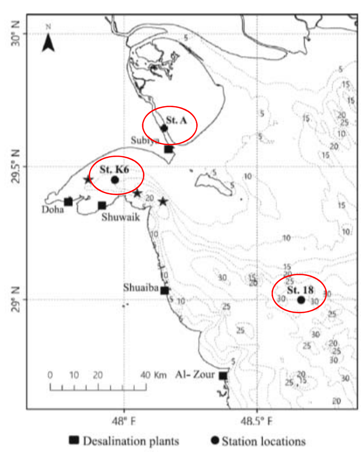
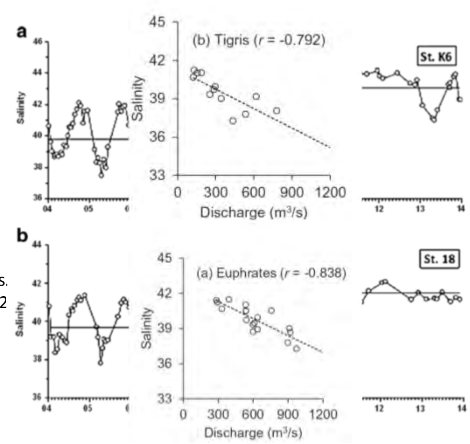
River flow

KISR
Kuwait Institute for Scientific Research



St A: % freshwater
1997 = 25.6 – 42.5 %;
2012-2013 = 0.8 – 4.6%

Said et al., (2017). Environ. Monitor Assess.
Yamani et al., (2017). Mar. Pollut. Bull., 122



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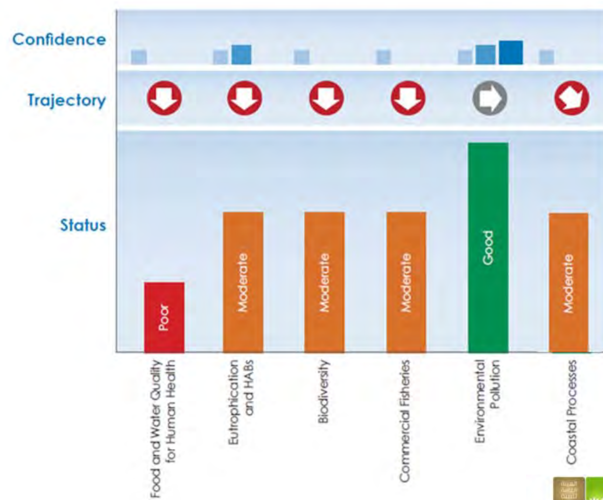
Coastal currents	River flow			

Environment Public Authority

Conclusions

- Major concerns around the themes for: Food and Water Quality for Human Health, Eutrophication, Biodiversity Coastal Processes and Commercial Fisheries.
- Trajectories for future status are predicted to decline for all themes other than Environmental Pollution.
- Provides framework and initial assessment upon which future national assessments can be based.
- Identified data gaps allowing national stakeholders to prioritise monitoring requirements.
- Provides a potential template that other national stakeholders in the region can adopt.



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Thank you

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Blue carbon and its actual cases of application

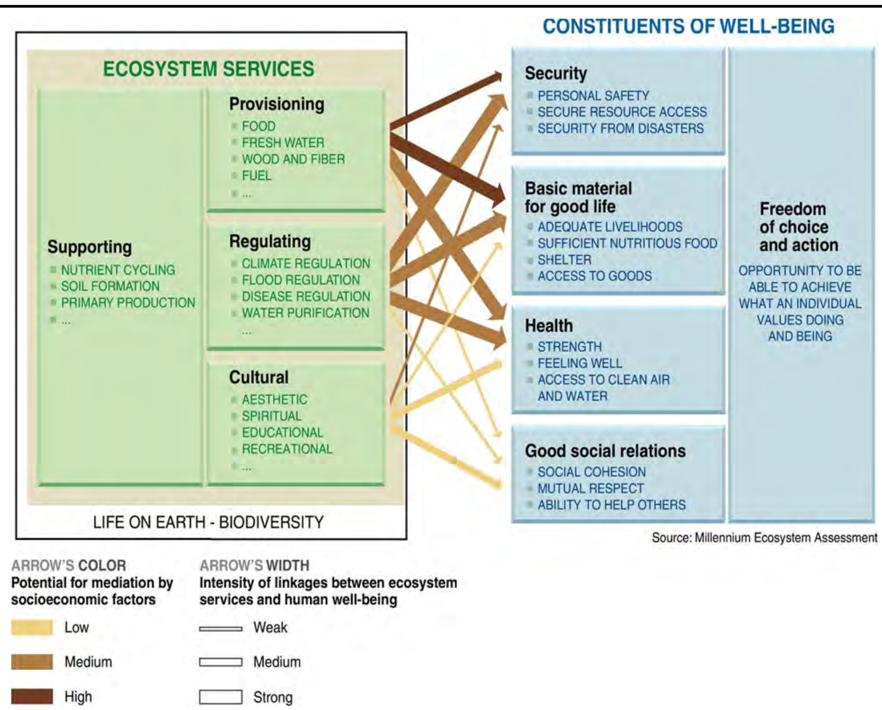
Mr. Takehiro Nakamura, UN Environment

Third ROPME-JICA Workshop on Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area

Blue Carbon and its actual application

Takehiro Nakamura
Chief, Marine and Coastal Ecosystems Unit
United Nations Environment Programme

Ecosystem services and human benefits



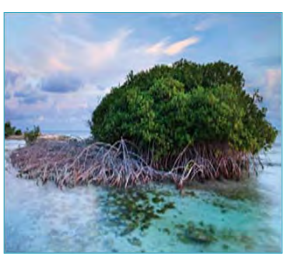
What is "Blue Carbon"?

- Blue carbon is carbon stored, sequestered or released from vegetated coastal ecosystems such as tidal salt marshes, mangroves and seagrass meadows.
- This definition does not include carbon stored, sequestered or released by the open ocean and its water column.
- Over millennia, carbon is stored in the sediments beneath the ecosystems. Sediments in healthy coastal ecosystems continue to accrete vertically as sea levels rise and do not become saturated with organic carbon. Thus vegetated coastal sediments are often extremely rich in organic carbon.

9/29/2019

Three key ecosystems provide critical ecosystem services to human beings

Mangroves



Salt Marshes

Seagrass

Shoreline protection

Pollution filtration

Fishery nursery

9/29/2019

4

…And provide one significant service to all humanity

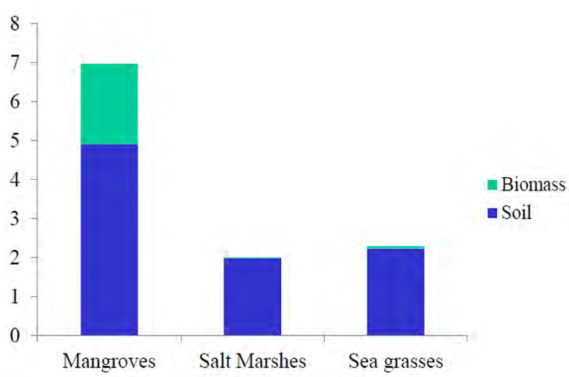
Permanent Carbon Sequestration and Storage

9/29/2019

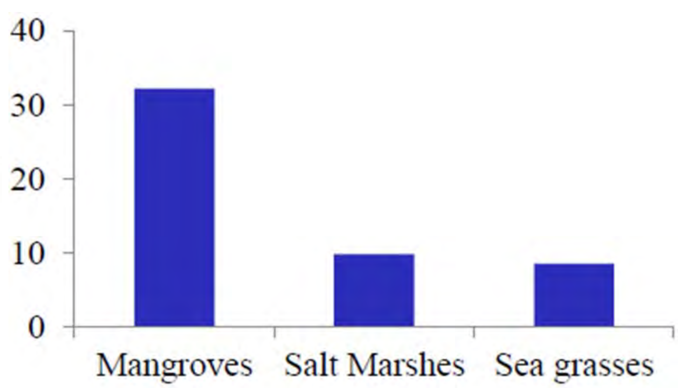
5

Global Blue Carbon

Global Blue Carbon Stock
(billions of tons)



Global Emissions
(millions tons C, annually)



9/29/2019

6

How big is Blue Carbon globally?

~1-3% of total GHGs
OR: ~10-20% as big as REDD
OR: As much as all emissions of Germany

	CO_2 Emissions Mt/year I
Blue Carbon	300-900
Total GHGs	35,000
REDD	4,000
Germany	900

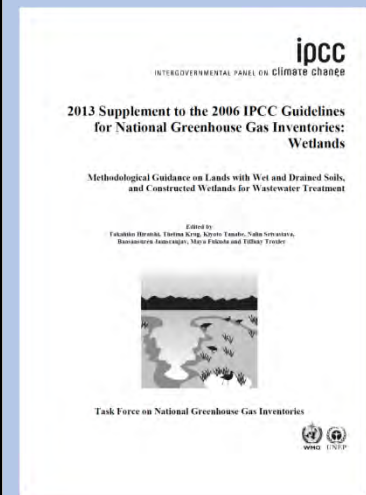
Other possibly important ecosystems

Coastal sabhka

Algae mattress

Kelp beds

Wetlands supplements to the IPCC national inventory guidelines



ipcc
INTERGOVERNMENTAL PANEL ON climate change

2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

Methodological Guidance on Lands with Wet and Drained Soils, and Constructed Wetlands for Wastewater Treatment

Edited by
Takahiko Hiraishi, Thelma Krug, Kiyoto Tanabe, Nalin Srivastava, Baasansuren Jamsranjav, Maya Fukuda and Tiffany Troxler

Task Force on National Greenhouse Gas Inventories

WMO UNEP

2013 Supplement to the 2006 Guidelines for National Green House Gas Inventories: Wetlands

Other scientific methodologies exist on mangroves and tidal slat marshes

9

What approaches does the blue carbon initiative take?

- When these coastal ecosystems are degraded or destroyed they become significant sources of carbon dioxide emissions, due to the oxidization of carbon in biomass and organic soil.

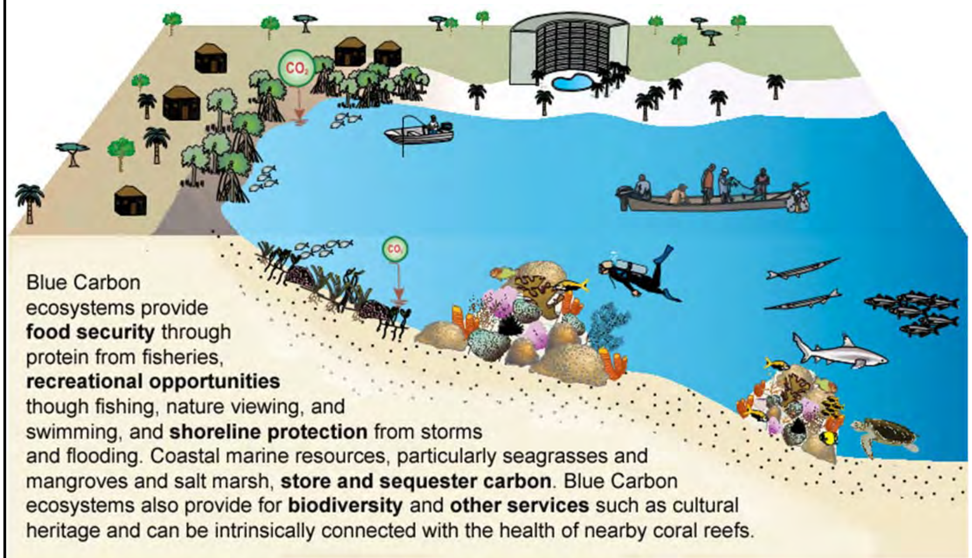
- The approach is to try to maintain the ecosystem functions that maintain the stored carbon, while attempting to sustainably use other ecosystem services for human benefits.

- The Blue carbon activities are aimed at achieving climate change mitigation benefits as well as biodiversity benefits.

9/29/2019

10

Blue Carbon ecosystems



UNEP approach is to address the whole blue carbon ecosystems and consider not only climate change mitigation services but also other services including climate change adaptation related services

Economic values of coastal ecosystem services

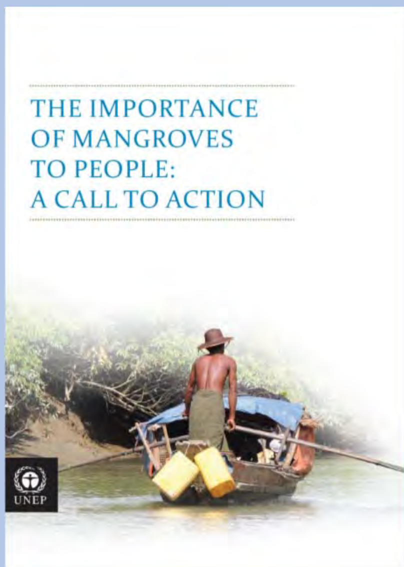
Global ecosystem services values (Constanza et al. 2014)

Ecosystems	Value (Trillion US$2007/yr)
Global	124.8
Coral reef	9.9
Seagrass beds	6.8
Tidal marshes/Mangroves	24.8
Marine and coastal	74.5

Sample values of coastal ecosystems in ROPME SEA area (Preliminary Ecosystem assessment for RSA)

Ecosystems	Value (US$/ha/yr)
Bahrain Mangroves (World Bank 2013)	32,000
Bahrain coral reef (World Bank 2013)	4,432
Iran Coral Reef TEV (Madani et al 2012)	14,695.396 (for the whole area) 237,000 (per ha)
Bahrain mangroves, seagrass and coral (Alkhuzai et al 2009)	1.88 billion (for the total area)
Abu Dhabi blue carbon	Magnitude of billions

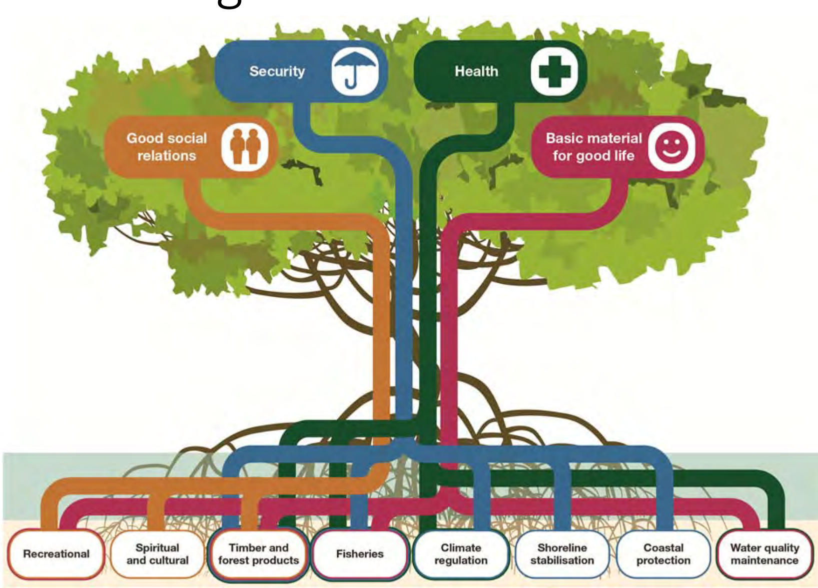
Mangrove Ecosystems and their services



- Global Overview of mangroves ecosystems and their services
- Trend of their condition to provide ecosystem services
- Hot spot analysis.

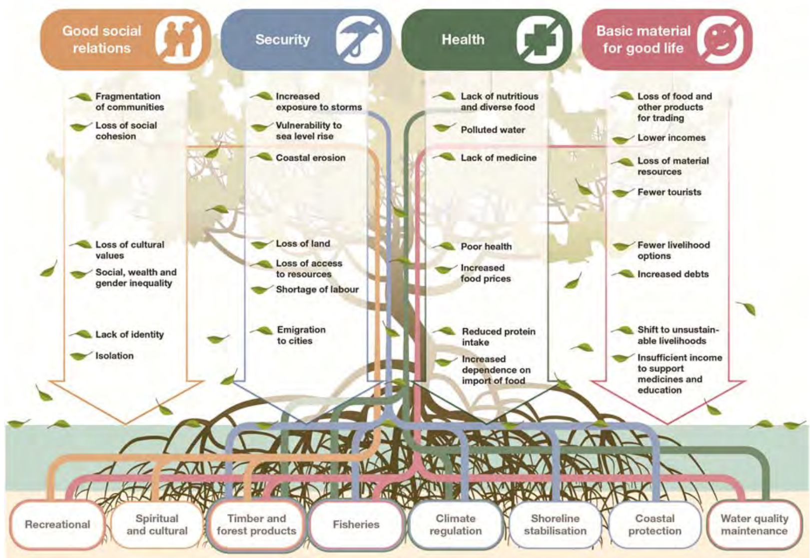
13

Mangrove ecosystem services and benefits for human beings



14

Degraded mangroves and impacts on human benefits



15

Blue Carbon Pathway

Pathway	*Potential actions*
Carbon Finance	• Development of methodologies and protocols for GHG accounting and the carbon market • Generation of Blue Carbon finance
Address National Policy and Management Needs	• Identification of national policies that should consider Blue Carbon (existing and new) • Incorporation of Blue Carbon values into national policies
Address International Commitments	• Identification of international commitments that should consider Blue Carbon • Incorporation of Blue Carbon values into international commitments
Conservation Agreements	• Identification of landowners/coastal communities that could consider Blue Carbon agreements • Negotiation of Blue Carbon agreements with landowners/coastal communities
Other Mechanisms	• Identification of other mechanisms (e.g., conservation funds, debt swap, bundling with payment for other ecosystm service)

Goal

Mitigation of climate change

Sustainable coastal livelihoods

Improved coastal ecosystem management

Conservation of Blue Carbon ecosystems

Some climate change policy and financing options

UNDER THE UNFCCC

- Reducing Emissions from Deforestation and Forest Degradation (REDD+)
- Green Climate Fund
- Least Developed Country Fund, Specially Climate Change Fund, Global Environment Facility
- Nationally Determined Contributions under the Paris Agreement
- National Action Plans on Adaptation

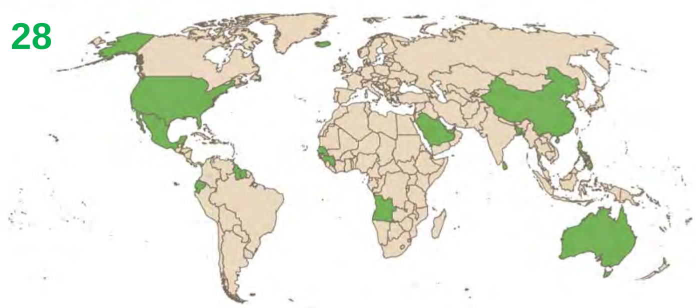
VOLUNTARY

- Voluntary Carbon Market (VCM)
- Emission trade

Blue Carbon in Nationally Determined Contributions

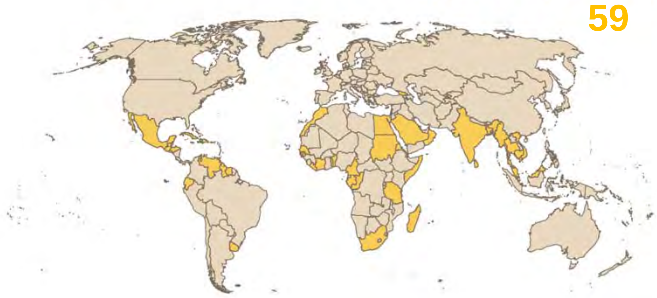
MITIGATION

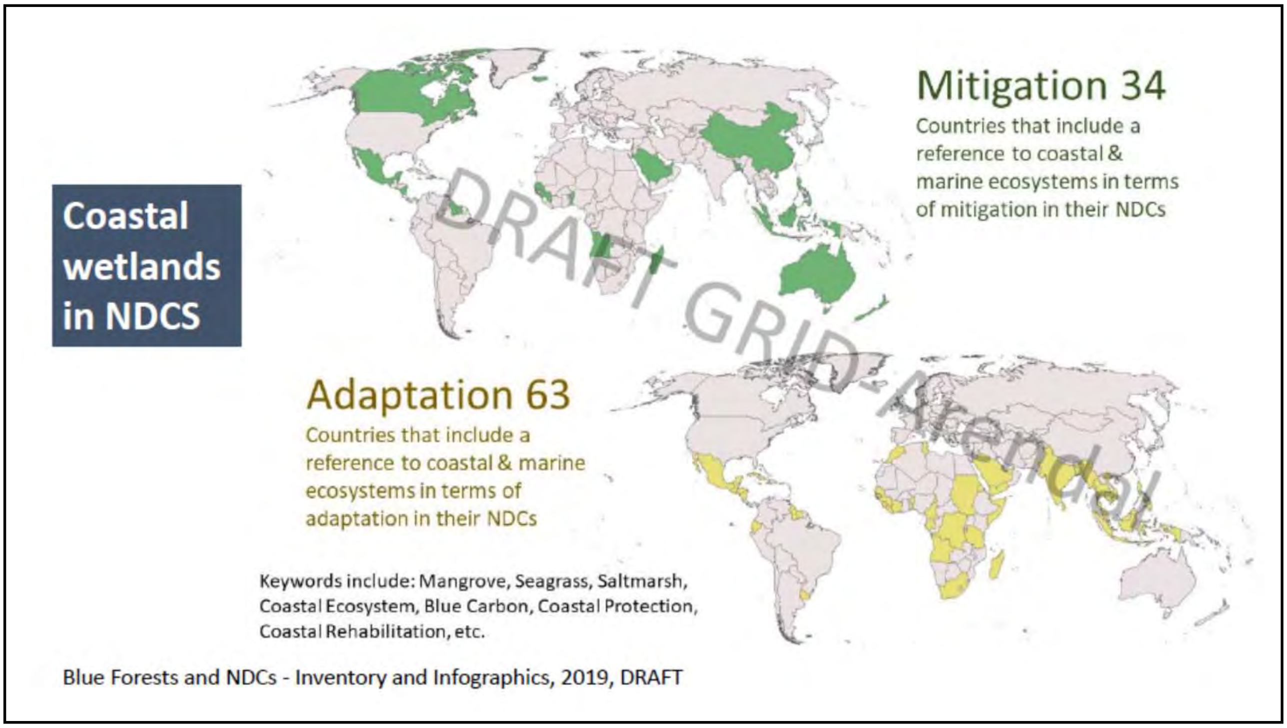
28



ADAPTATION

59





Blue carbon ecosystem services recognised in NDCs

- Carbon sequestration
- General adaptation and reducing risks of climate change
- Protection from sea level rise
- Coastal protection
- Enhance water retention
- Sustaining livelihoods
- Fisheries
- Blue economy
- Ecotourism and recreation
- Food
- Energy resources

9/29/2019 20

Mangrove Honey

Mangrove honey products

- Krabi Province, Thailand
- Nai Nang Apiculture Group
- Community restores mangrove forests and uses bees to assist with pollination
- 51 members (40 men are beekeepers, 11 women are value-add honey product producers)
- In partnership with Marriott Hotels & Resorts
- 15 percent profit goes to the Nai Nang Village Mangrove Conservation Fund

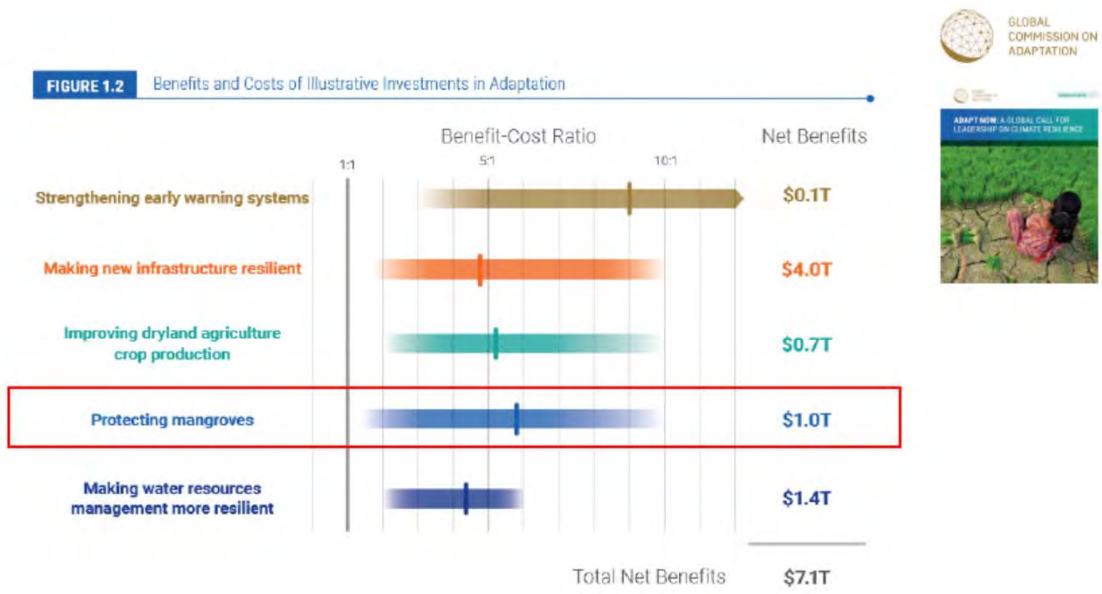
9/29/2019

It's not just Honey!

Training workshop for other villagers

- Honey related products produced by the Nai Nang Women's Apiculture Group include:
- Shampoos
- Conditioners
- Soaps
- Medicinal balms
- Natural plants mixed with honey or beeswax

9/29/2019 22



ADAPT NOW: A GLOBAL CALL FOR LEADERSHIP ON CLIMATE RESILIENCE (Global Commission on Adaptation, 2019)

Blue carbon in ROPME country NDCs

<u>Saudi Arabia</u> (adaptation with mitigation co-benefit):

- Mangroves and other coastal ecosystems’ roles in mitigation and adaptation recognised, with explicit reference to blue carbon. Coastal zone management and planting of mangrove seedlings identified as adaptation measures.

<u>Bahrain</u>

- … Seagrass beds, which constitute an important carbon sink, are distributed along the southeast coast…the Kingdom of Bahrain does not have a full understanding of its seagrass areas as a carbon sink and is planning to further engage with the International Union for Conservation of Nature …

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Blue carbon recommendations for ROPME

- Blue carbon projects not only contribute to climate change mitigation effort but also address climate change adaption needs and the other ecosystem services.
- It is an approach to sustainable management of coastal ecosystems.
- Carbon benefits can bring climate change related financing and can be blended with other conservation financing.
- Blue carbon projects not only contribute to the UNFCC national obligations (NDCs and Adaptation) but also meet national obligations for Convention on Biological Diversity.
- The Blue carbon ecosystems are extremely of high economic value and their conservation contribute to sustainable development.

25

Guiding principles for delivering coastal wetland carbon projects

Guiding principles of delivering blue carbon projects

Case studies supporting the principles

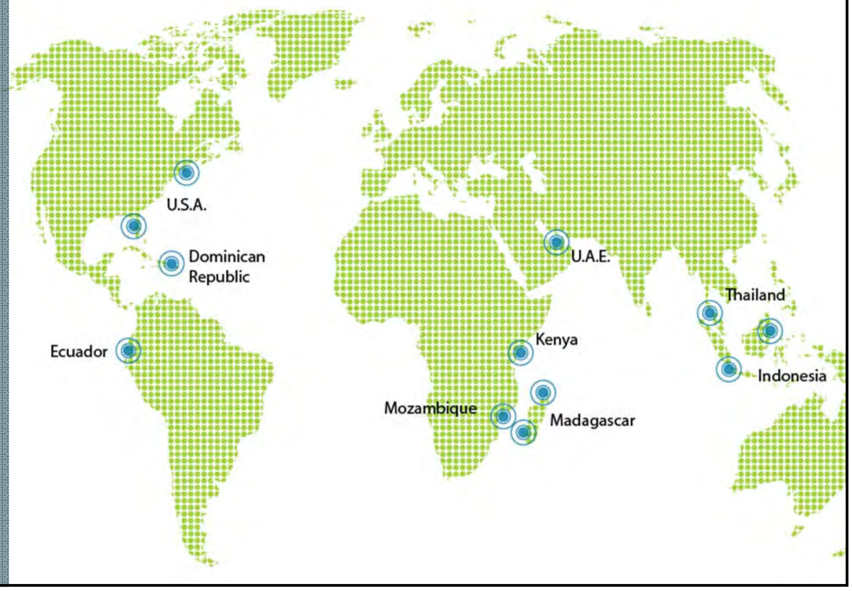
Used to attract project financing and deliver the objectives of the projects (including avoided carbon emission and increased carbon sequestration)

26

GEF Blue Forest project:

- GEF funds: $4.5m
- Total funds: $27 million USD
- Implementation: January 2015
- Duration: 4 years (2016-2018)
- Implementation agency: UNEP
- Executed through GRID-Arendal with partners

blue forests



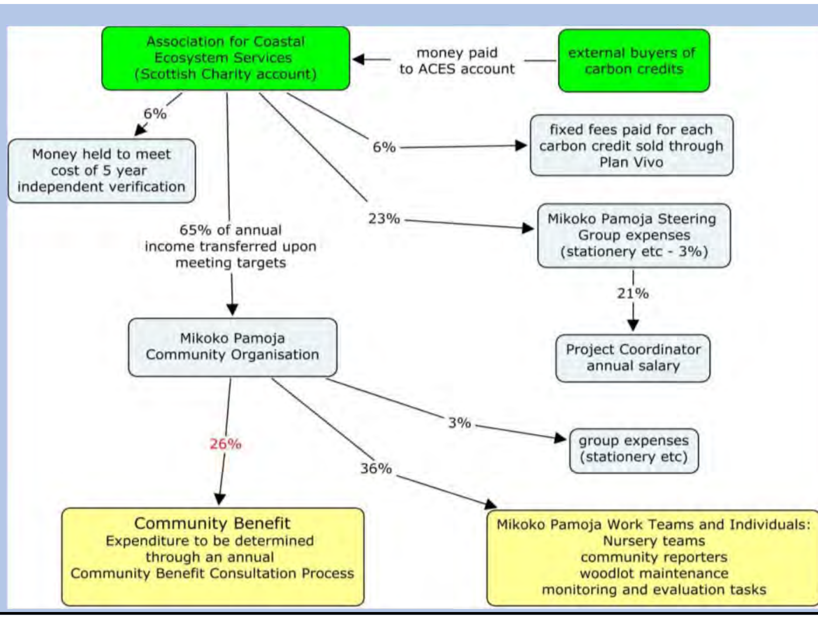
Mikoko Pamoja

- **Certified under Plan Vivo Standard**
- **Project lead - Kenyan Marine Fisheries Research Institute**
- **Small scale - 107 ha = USD $12,000/yr**
- **Co-finance to Blue Forests Project**
- **Up-scaling nationally through the Blue Forests Project**

KMFRI

blue forests

Mikoko Pamoja project financial flows



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Mikoko Pamoja results

- Job creations
- Livelihood support
  - Ecotourism
  - Energy – efficient stoves
- Community services
  - Education
  - Water & Sanitation
- Mangrove reforestation

Project financing options

UNDER THE UNFCCC

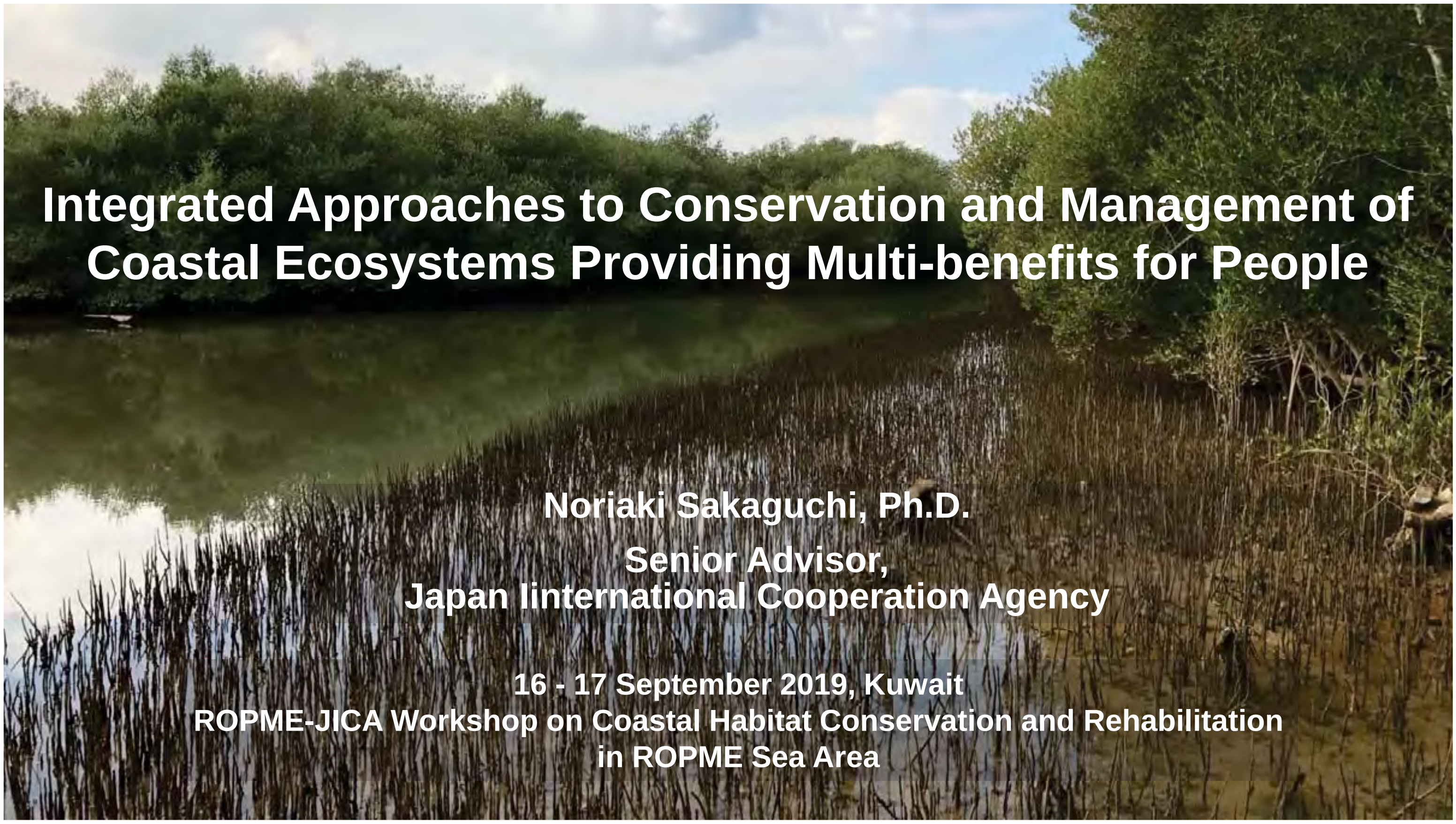
- Reducing Emissions from Deforestation and Forest Degradation (REDD+)
- Green Climate Fund
- Least Developed Country Fund, Specially Climate Change Fund, Global Environment Facility
- Voluntary Carbon Market (VCM)
- etc.

CONSERVATION FINACING

- Blue bond
- Debt for Nature Swap
- Payment for Ecosystem Financing
- Conservation taxes and national park entry
- Conservation Trust Fund
- Etc.

Integrated approaches to conservation and management of coastal ecosystems providing multi-benefits for people

Dr. Noriaki Sakaguchi, JICA



Contents

1. IPBES Global Assessment on Biodiversity and Ecosystem Services
2. Multi-benefits of Coastal Ecosystems
3. JICA’s Cooperation for conservation and management of coastal ecosystem
4. 4. Toward future cooperation for Coastal Ecosystem Conservation and Management

IPBES Global Assessment on Biodiversity and Ecosystem Services

The report was submitted and its SPM was approved at IPBES 7, May 2019.

Key Message A: Status and changes in BES

Biodiversity and ecosystem services are deteriorating worldwide.

- 1 Millions species at risk to extinction.
- Half the live coral cover on coral reefs has been lost since the 1870s, with accelerating losses in recent decades, due to climate change.
- Seagrass beds has been decreased in extent by over 10 % per decade from 1970-2000.
- 33% of fish stocks are classified as overexploited and greater than 55% of ocean area being subject to industrial fishing.

IPBES Global Assessment on Biodiversity and Ecosystem Services

Key Message B: Direct and indirect drivers declining BES

Direct and indirect drivers of change have accelerated during the past 50 years

Direct Drivers

- Fishing has had the most impact on in marine systems.
- The 2nd highest relative impact on the oceans is the many changes in the uses of the sea and coastal land.
- Climate change impacts are also a major driver; Coral reefs are faced to more frequent extreme warming events, with less recovery time in between, declining by a further 70-90% at global warming of 1.5° C, and by more than 99% at 2° C causing massive bleaching episodes with high mortality rates

Indirect Drivers: Changes in Production and Consumption, Population increase, Trade, Innovation of Technology, Governance, *in the past 50 years*

- Population in the world increased to two times.
- Global economy grown to 4 times
- International trade grown to 10 times.

IPBES Global Assessment on Biodiversity and Ecosystem Services

Key Message C: Prediction of achievement of Aichi Targets and SDGs

2020 Aichi Biodiversity Targets and SDGs cannot be met by current trajectories, including

- Target 6 on Sustainable management of fishery stocks
- Target 7 on Sustainable management of aquaculture areas
- Target 10 on Conservation of vulnerable ecosystems to climate change, including coral reef for *Aichi Biodiversity Targets*
- Goal 14 on Conservation and sustainable management of marine and its resources

Goals for 2030 may only be achieved through transformative changes across economic, social, political and technological factors.

IPBES Global Assessment on Biodiversity and Ecosystem Services

Key message D:

Nature can be conserved, restored and used sustainably, simultaneously meeting other global goals through urgent and concerted efforts fostering transformative change

Necessary approaches to foster transformative change addressing multiple direct and indirect drivers

Cross-sectoral integrated approach

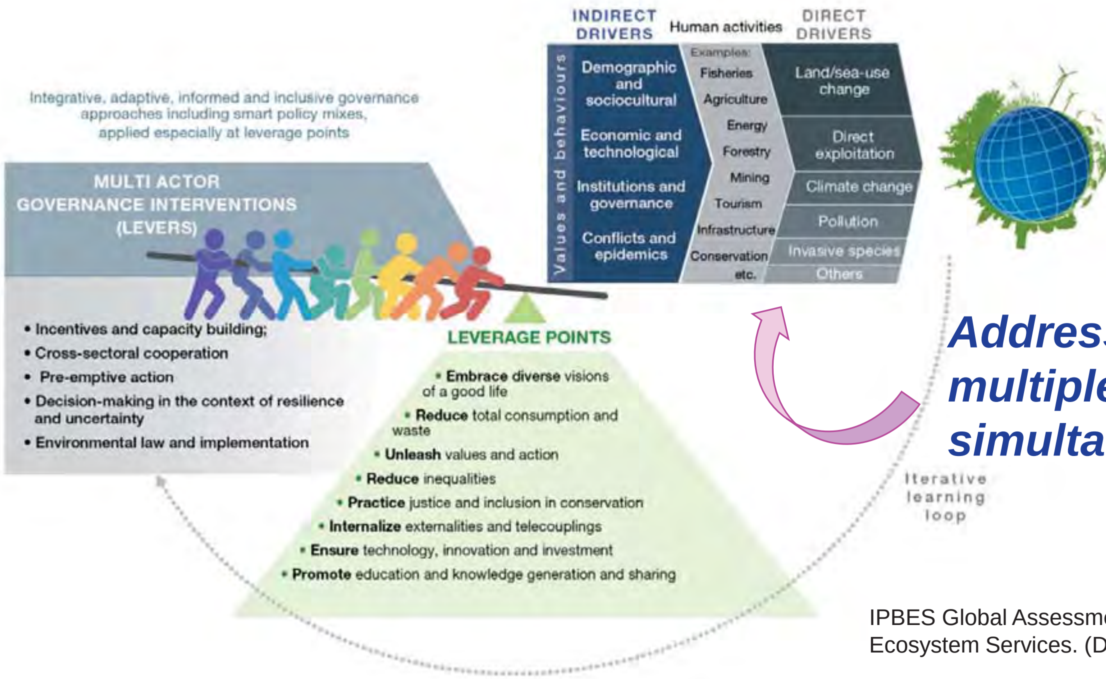
- landscape management, integrated watershed management, coastal management

Innovative governance approach

- Integrative, Inclusive, Informed, Adaptive approaches

In order to foster transformative change

Collaborative implementation of priority governance interventions (levers) targeting key points of intervention (leverage points)



Addressing multiple-drivers simultaneously

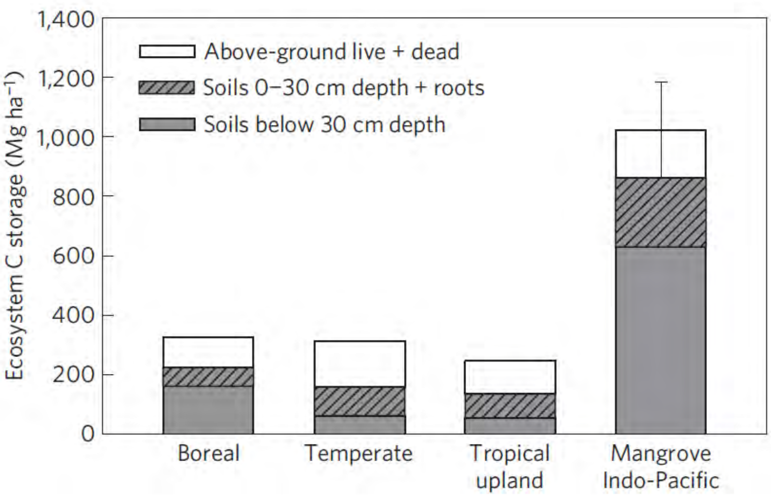
IPBES Global Assessment on Biodiversity and Ecosystem Services. (Díaz et al., 2019)

2. Multi-benefits of Coastal Ecosystems

Category	Services
Provisioning	Foods (Fishery resources, Salt), Genetic resources (Pharmaceutical and other materials), Construction materials (sands, limestone, woods), Fuel (mangrove)
Regulating	Reduction of wave energy (Prevention from erosion of coastal line, Reduction of natural disaster risk from storm wave and tsunami), Carbon storage (Climate change mitigation) , Water purification
Cultural	Recreation, Tourism (Eco-tourism, Diving, Kayaking, Boat tour) , Education, Religion and worship
Supporting	Primary production (carbon fixation, organic production), Nutrients circulation, Decomposition of organism, Generation of habitats (foraging, shelter, spawning sites)

Blue Carbon

Carbon sequestration underground in mangroves is much higher than that in terrestrial forests



Comparison of mangrove carbon storage with other terrestrial forest ecosystems
(Donato *et al*. 2011)

Ecosystem based Adaptation to Climate Changes and Disaster Risk Reduction through Restoration of Coastal Ecosystems

Mangroves and coral reefs can reduce such disaster risks

Predicted extreme events

- Sea water level rise
- Frequent stronger typhoons

Coastal areas

- Higher disaster risk to people
- Erosion of shore lines and disappearance of lands

Provides fishery resources and contributes to enhance livelihood

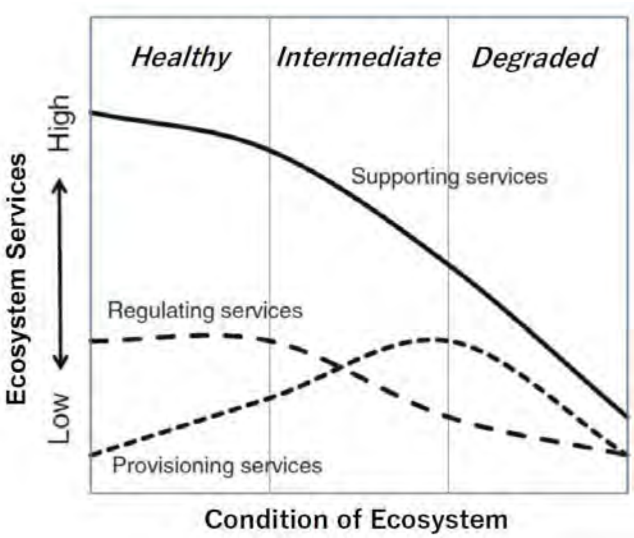
Providing fishery resources

Eco-tourism

Diving

Optimization of Available Ecosystem Services

In order to conserve and sustainably use ecosystem services which bring multiple benefits to local communities, <u>comprehensive and quantitative assessment of the services and optimization of their utilization is necessary</u>.



Schematic diagram on the relationship between ecosystem condition and ecosystem services (Nakaoka *et al*. 2014)

Relationship between ecosystem condition and utilization and availability of each service (provisioning, regulating and supporting)

Healthy (Protection)

- **Restraining provisioning service** such as fish catch,
- **Maintain supporting** (primary production, carbon stock, nutrient circulation) and **regulating services** (water purification).

Intermediate (Sustainable use)

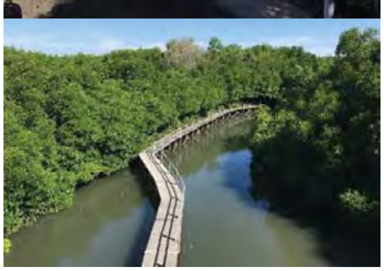
- Once **provisioning service exceeds the its sustainable level** by overuse,
- It causes **decline of supporting and regulating services**, and becomes a **trade-off between provisioning service and supporting and regulating services**.

Degraded (Overuse)

- If overuse of provisioning service is continued, **supporting** and **regulating services exceed** their **threshold levels**,
- All three services are declines and the **ecosystem** is **degraded**.

3. JICA's Cooperation for conservation and management of coastal ecosystem

Cooperation for Conservation and Sustainable Management of Mangroves between Indonesian Government and JICA



MoEF in Indonesia and JICA have been working together since 1992 in pursuit of better mangrove ecosystem management in the form of technical cooperation projects, namely:

1992-99: The Development of Sustainable Mangrove Management Project --- Development of rehabilitation technique and sustainable management

2001-06: Mangrove Information Center Project
Development of MIC and its function

2007-10: Sub-Sectoral Program on Mangrove --- Expansion of sustainable management to site leves

2011-14: Mangrove Ecosystem Conservation and Sustainable use in the ASEAN Region (MECS) Project

Development of Sustainable Mangrove Management Project *1992 - 1996*

Goal: Establishing appropriate silvicultural techniques and sustainable models for mangrove ecosystem management in Indonesia.

Project site: Ngurah Rai Grand Forest Park, 1,300 ha mangrove

Outputs

- Development **a center for nursery**
- **Handbook of Mangroves in Indonesia** (Bali & Lombok)"
- The **Silviculture Manual for Mangroves**
- Nursery Manual for Mangrove Species -at Benoa Port in Bali
- **Rehabilitated 253 ha** of degraded mangrove forests in **Bali (189ha) and Lombok (64 ha)**

1994

2004

Development of Mangrove Environment Information Center in Oman

Goal: Complete the preparation of QEIC to promote sustainable management of mangrove ecosystems in Oman.

Outputs

1. Capacity for the relevant training activities enhanced

→ Identification of training (monitoring, rehabilitation, education) and target groups (policymaker, researcher, student, local community, private sector)
Pilot training (transplantation, monitoring, EE)

2. Monitoring methodologies developed

→ Mangrove ecosystem monitoring guideline (mangrove trees, indicator fauna environmental factors (water, soil, others), monitoring sites and schedule

3. Methodology and technique for mangrove transplantation developed

→ Mangrove transplantation guideline (seedling nursery, transplantation, plan)

4. Capacity for environment education enhanced

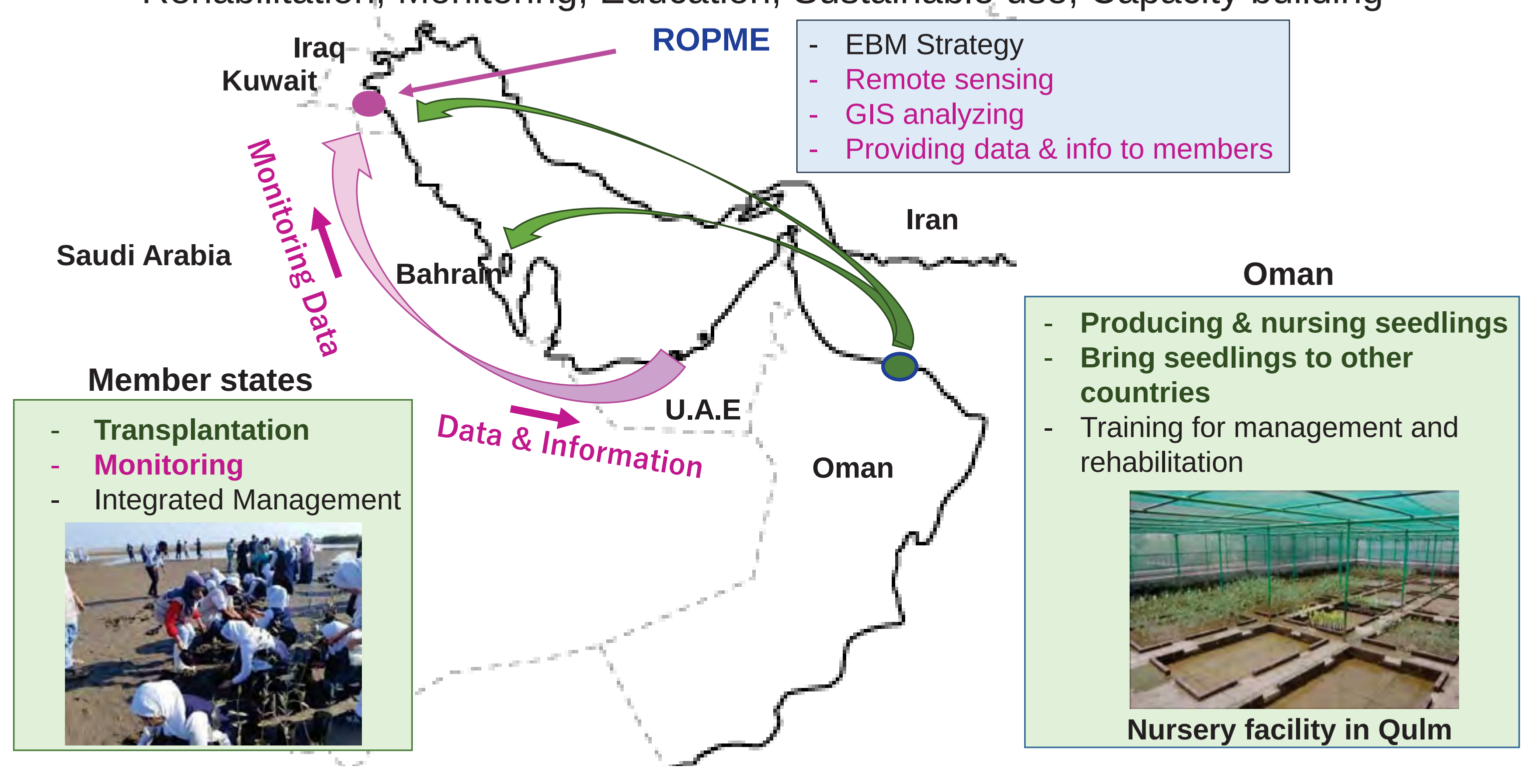
→ Identification of target groups (policymaker, student, local community private sector) , materials (brochure, poster, nature game etc.), program implementation

Super Goal:
Sustainable management of mangrove ecosystems is widely extended in Oman and to the neighboring countries.

4. Toward future cooperation

Cooperation in Sustainable Coastal Ecosystem Management in ROPME

Rehabilitation, Monitoring, Education, Sustainable use, Capacity building




Thank you for your kind attention!!

Roles of blue carbon ecosystems in climate change measures and blue infrastructure

Dr. Tomohiro Kuwae, Port and Airport Research Institute, Japan

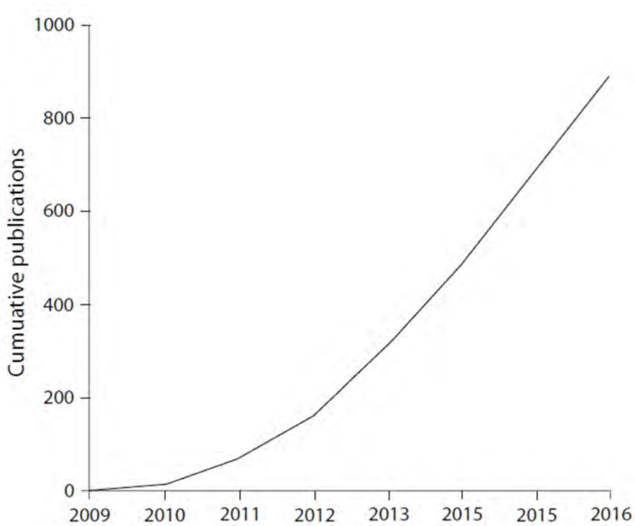
Roles of blue carbon ecosystems in climate change measures and blue infrastructure

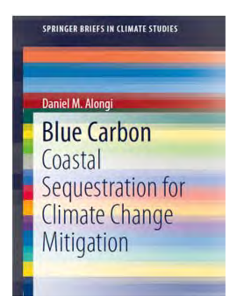
Tomohiro Kuwae, Ph.D.
(kuwae@p.mpat.go.jp)
Port and Airport Research Institute (PARI)

Port and Airport Research Institute

Motivation of publishing a book

Exponential growth of BC science: how about the policy and practice?





Alongi (2018)

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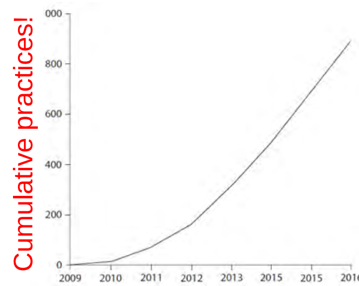
Motivation of publishing a book

Linking the latest science and policies

- Scientists and engineers should support the stakeholders from the aspects of science and technology, coming out from the world of "specific journals" and "academic meetings"
- Publication of a book may be more effective than the scientific journals



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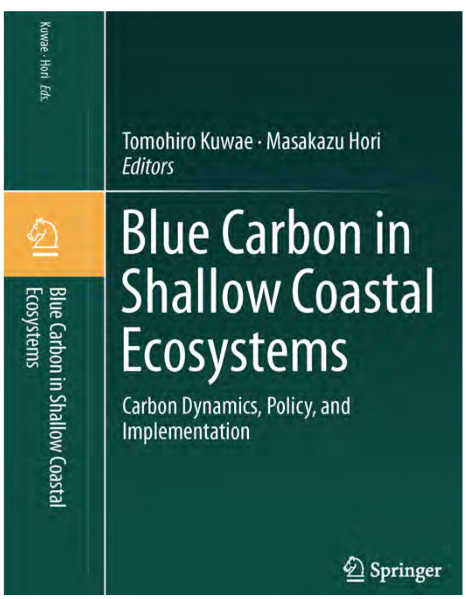
Our book



- Published in September, 2018
- Toward connecting BC science & technology with policy & practice
- Introducing a carbon offset project utilizing marine environment

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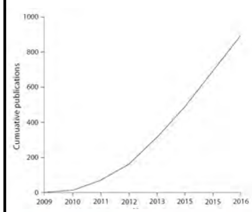
Gap in current BC science



Most of the scientific publications are classical BC stock

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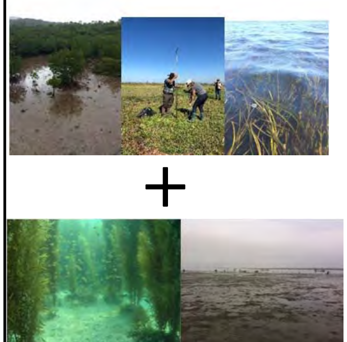
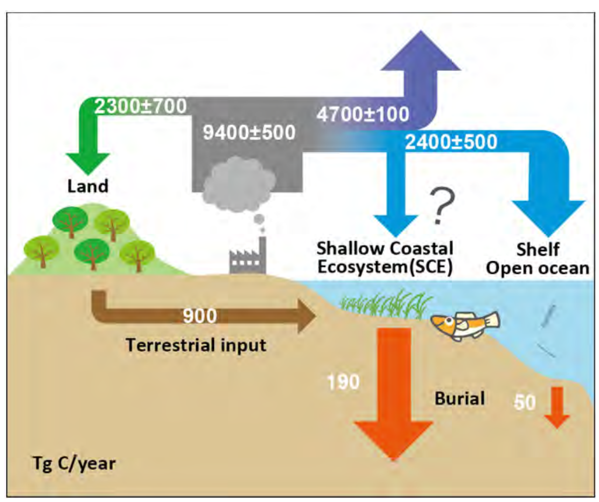
Gap in current BC science

Other potential ecosystems and CO_2 gas exchanges



Tries to broaden the potential areas: from classical BC ecosystems to macroalgal beds, tidal flats, coral reefs, and urban embayments



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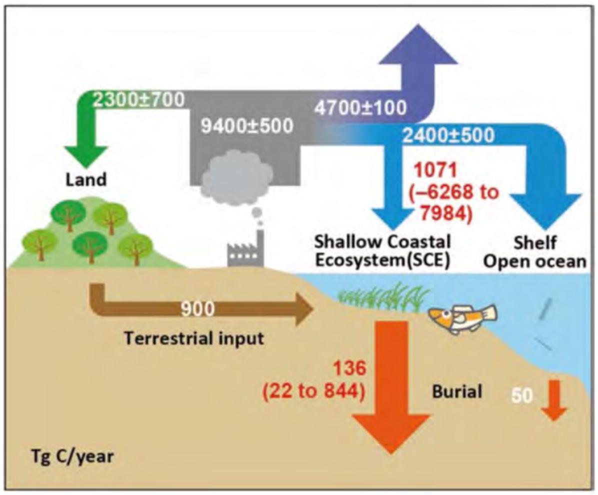
Atmospheric CO_2 uptake

About 8 times higher than the previously recognized blue carbon sink potential (carbon burial rate)!



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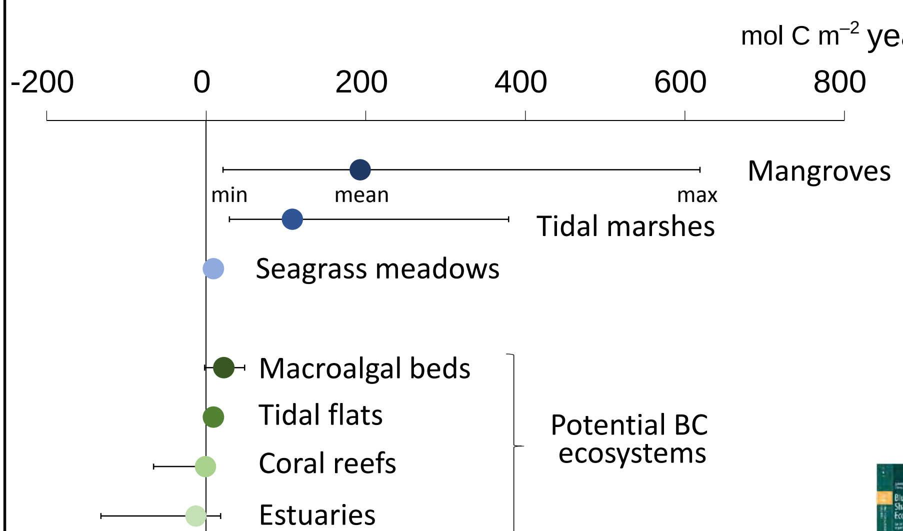
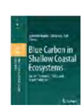
Atmospheric CO_2 uptake rate per unit area

High capability of the classical BC ecosystems





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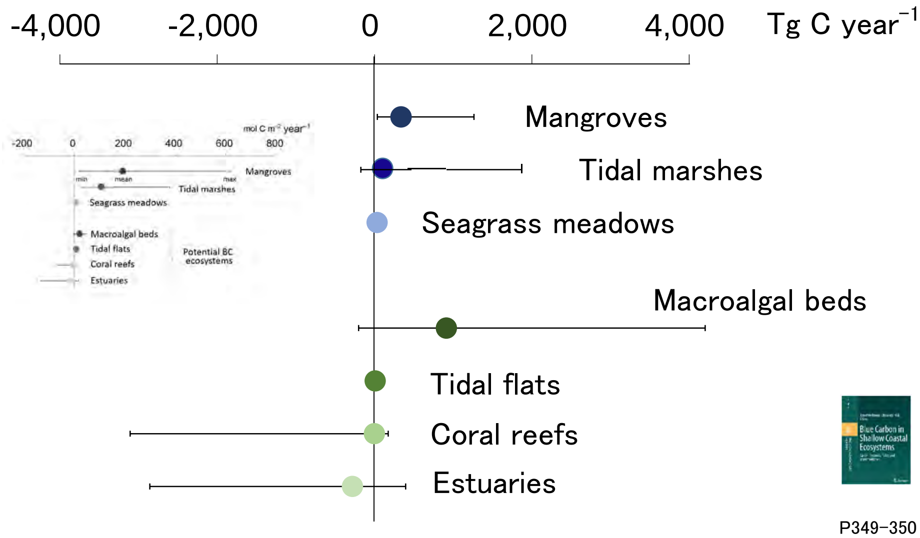
Global estimate of CO_2 uptake rate

High contribution of macroalgal beds?



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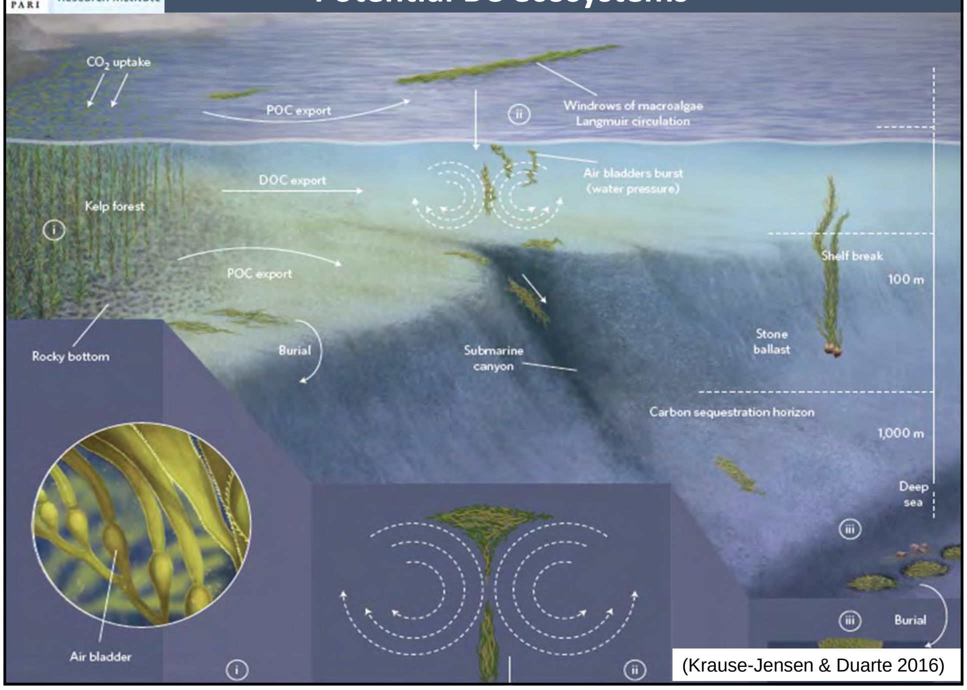
Potential BC ecosystems



(Krause-Jensen & Duarte 2016)

Mentioned in the forthcoming IPCC special report

Document for Expert and Govt Review

418306ba

SECOND ORDER DRAFT Chapter 5 IPCC SR Ocean and Cryosphere

Chapter 5: Changing Ocean, Marine Ecosystems, and Dependent Communities

Coordinating Lead Authors: Nathaniel L. Bindoff (Australia), William W. L. Cheung (Canada), James G. Kairo (Kenya)

Lead Authors: Javier Arístegui (Spain), Valeria A. Guinder (Argentina), Robert Hallberg (USA), Nathalie Hilmi (France), Nianzhi Jiao (China), Md saiful Karim (Australia), Lisa Levin (USA), Sean O'Donoghue (South Africa), Sara R. Purca Cuicapusa (Peru), Baruch Rinkevich (Israel), Toshio Suga (Japan), Alessandro Tagliabue (United Kingdom), Phillip Williamson (United Kingdom)

Contributing Authors: Sevil Acar (Turkey), Juan Jose Alava (Ecuador/Canada), Eddie Allison (United Kingdom), Brian Arbic (USA), Tamatoa Bambridge (French Polynesia), Inka Bartsch (Germany), Philip W. Boyd (Australia), Thomas Browning (Germany/United Kingdom), Francisco P. Chávez (USA), Mine Cinar (USA), Daniel Costa (USA), Omar Defeo (Uruguay), Salpie Djoundourian (Lebanon), Catia Domingues (Australia), Sonja Endres (Germany), Alan Fox (UK), Thomas Frölicher (Switzerland), Charles Greene (USA), Nicolas Gruber (Switzerland), Gustaav Hallegraef (Australia), Matthew Harrison (USA), Sebastian

IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

Mentioned in a recent paper by world-leading scientists

https://www.bluecarbonlab.org/news/big-blue-carbon-questions/

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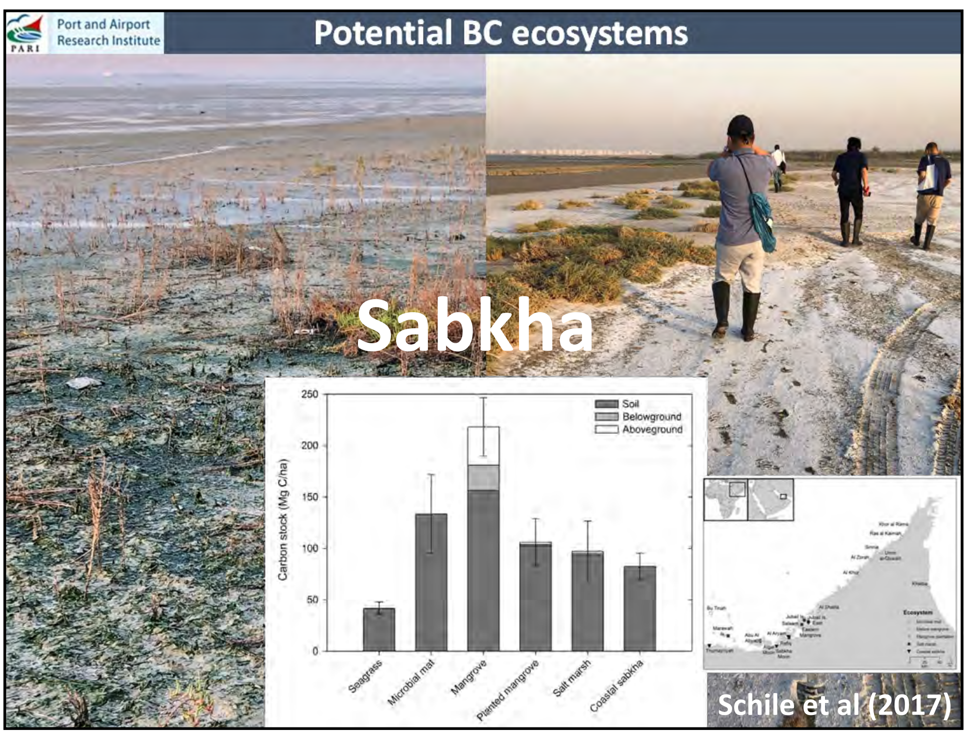
PARI
Potential BC ecosystems
Current Biology
Report
CellPress
Blue Growth Potential to Mitigate Climate Change through Seaweed Offsetting
Halley E. Froehlich,1,2,3,5,* Jamie C. Afflerbach,1 Melanie Frazier,1 and Benjamin S. Halpern1,4
1National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara, 735 State Street, Suite 300, Santa Barbara, CA 93101, USA
2Ecology, Evolution, and Marine Biology, University of California, Santa Barbara, Santa Barbara, CA 93106, USA
3Environmental Studies, University of California, Santa Barbara, Santa Barbara, CA 93106, USA
4Bren School of Environmental Science & Management, University of California, Santa Barbara, Santa Barbara, CA 93106, USA
5Lead Contact
N:P
10
20
30
40
50
Countries farming seaweed
Native range for wild seaweeds
CO2 eq offset scenarios
Finfish & crustacean aquaculture
California agriculture
Global agriculture
Figure 1. Ecological Suitability Map for Seaweed Aquaculture
The nutrient ratio range (N:P of 4:1 to 80:1) is depicted in the gradient of blue (30:1 mean optima); known native range of the most dominant seaweed genera adapted from Teagle et al. [22] is depicted in red, and current seaweed producing countries [15] are depicted in green. The areas (square kilometers; km2) required to offset CO2eq for the three scenarios are depicted by the gray and black boxes in the bottom left corner of the map and identified in the key. Aquaculture refers to (median) finfish and crustacean production. Global agriculture relates to direct emissions only.
See also Tables S1 and S2.
Seaweed farming
and carbon offset
(Yokohama, Japan)
マコンブ・最終的に4～5m
80mで約3～4トンの水揚げ



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PARI
Potential BC ecosystems
Sabkha
Soil
Belowground
Aboveground
Carbon stock (Mg C/ha)
250
200
150
100
50
0
Seagrass
Microbial mat
Mangrove
Planted mangrove
Salt marsh
Coastal sabkha
Schile et al (2017)

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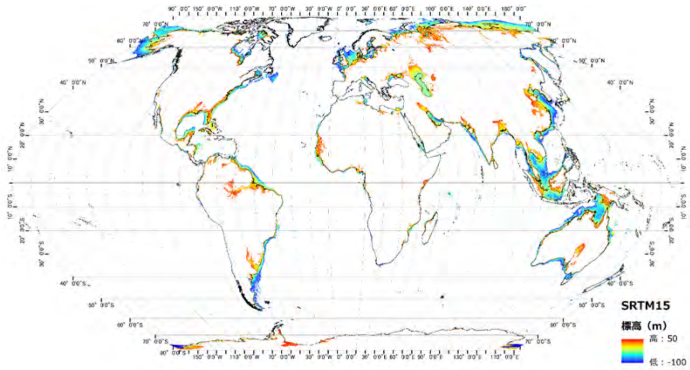
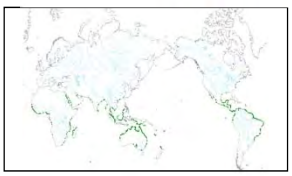
Global estimate of CO_2 uptake rate

Global map for elevation and various ecosystems

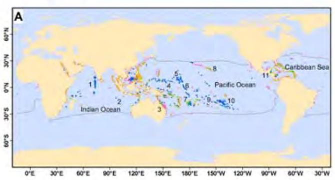


Elevation (SRTM15)



Mangrove (ISME)

Seagrass (UNEP-WCMC 2016)



Coral reef (UNEP-WCMC 2010)

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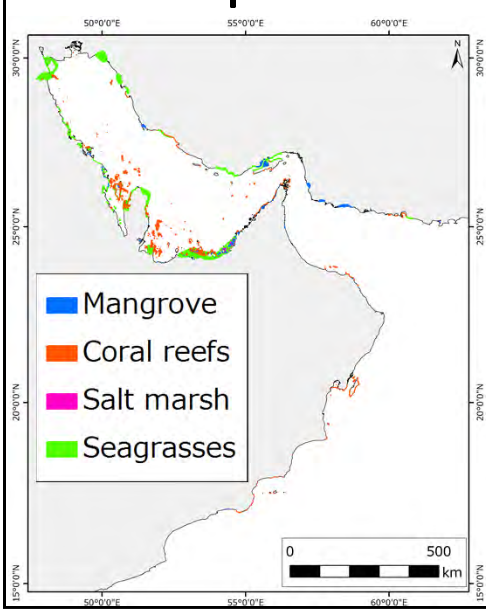
Global estimate of CO_2 uptake rate

Need maps of subkha and macroalgal beds?




nature
International journal of science

Letter | Published: 19 December 2018

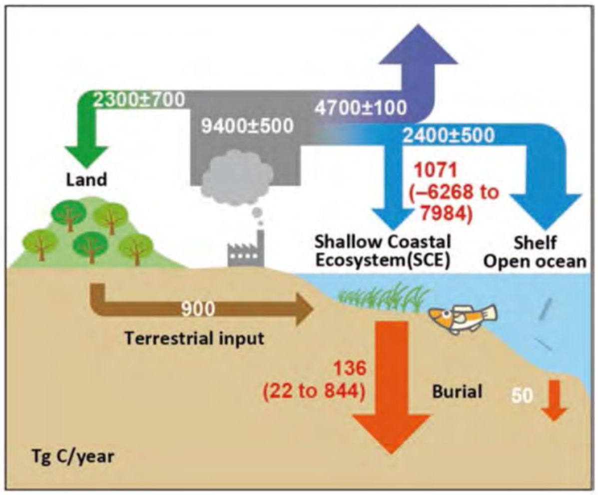
The global distribution and trajectory of tidal flats

Nicholas J. Murray, Stuart R. Phinn, Michael DeWitt, Renata Ferrari, Renee Johnston, Mitchell B. Lyons, Nicholas Clinton, David Thau & Richard A. Fuller

http://intertidal.app

Atmospheric CO_2 uptake

Considerably large uncertainty…



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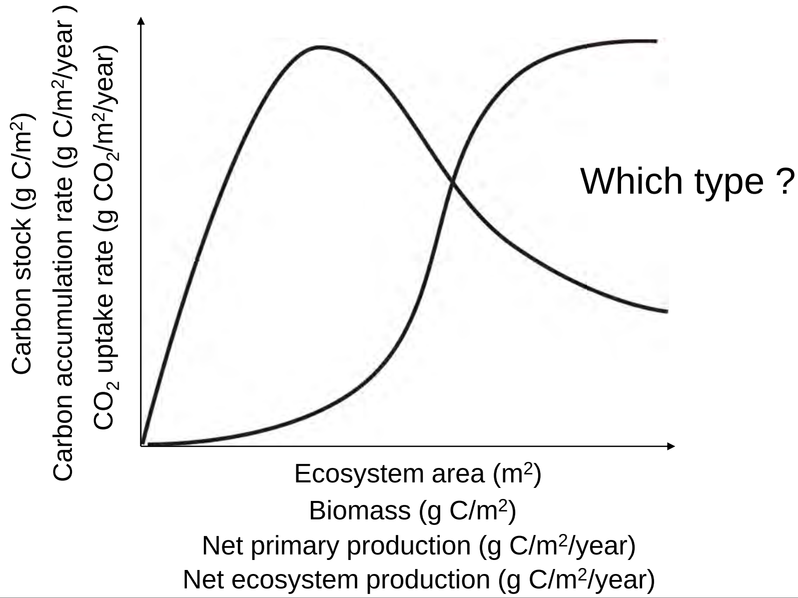
Toward advancing BC science

Reducing uncertainty



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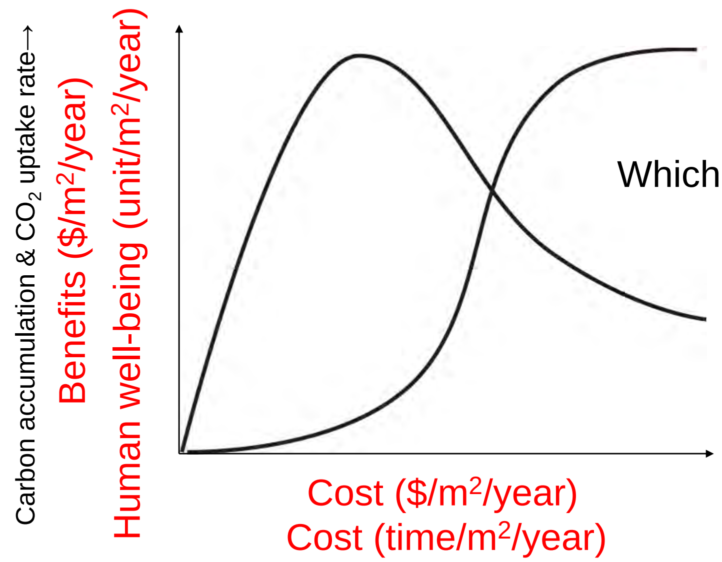
Bridging BC science and policy/implementation

Converting BC functioning into benefits



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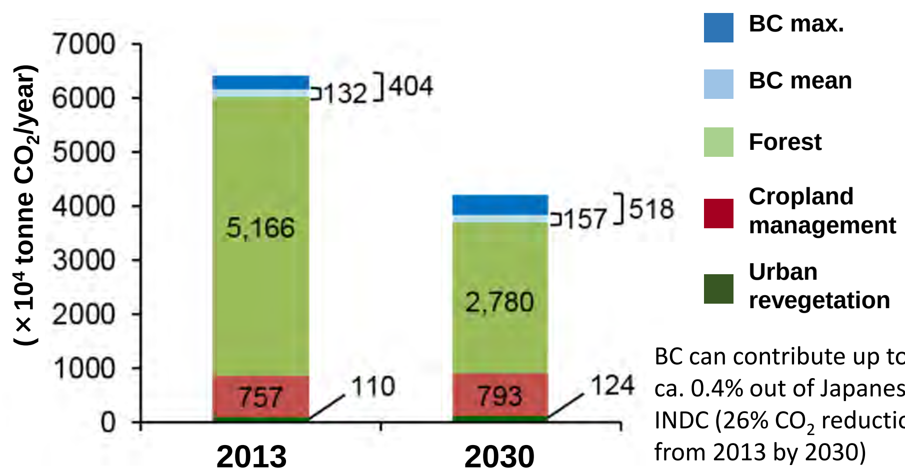
Towards inclusion into Japanese carbon sink

The first estimate of BC sink potential in Japan
2 to 5 million tonne CO_2/year in 2030



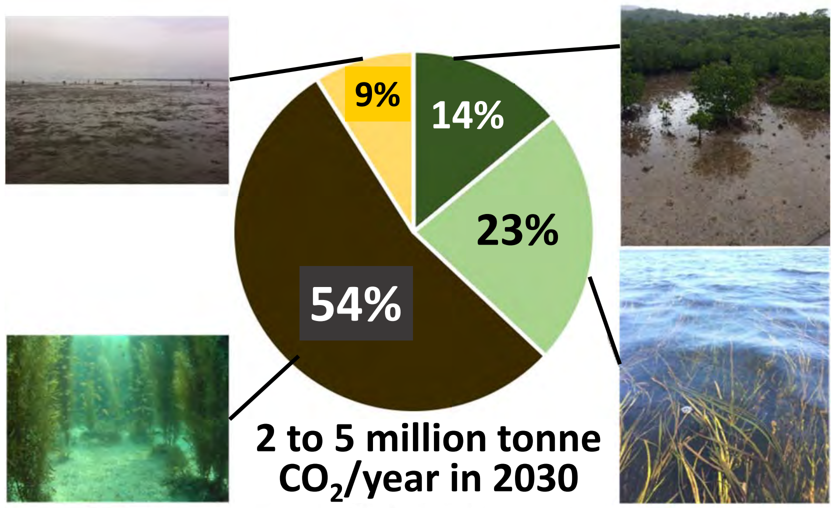
BC can contribute up to ca. 0.4% out of Japanese INDC (26% CO_2 reduction from 2013 by 2030)

Kuwae et al. (2019) published in a Japanese journal

First estimate of BC sink potential in Japan

Port and Airport Research Institute

Component of BC sink potential



Kuwae et al. (2019) published in a Japanese journal

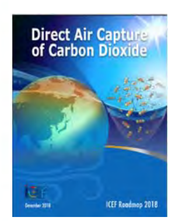
Assessment of BC as a climate change measure

Port and Airport Research Institute

The best option for direct air CO_2 capture?

		Cost	Energy Requirements	Land Use	Water Consumption	Risk of Reversal	Verifiability	Implement Readiness
NATURAL	Reforestation & Enhanced Forest Management	Generally Acceptable/ Available	Generally Acceptable/ Available	Potentially Unacceptable/ Unavailable	Exercise Caution	Exercise Caution	Generally Acceptable/ Available	Generally Acceptable/ Available
NATURAL	Wetland & Coastal Restoration	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Exercise Caution	Exercise Caution	Generally Acceptable/ Available
NATURAL	Soil Carbon Restoration	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Exercise Caution	Potentially Unacceptable/ Unavailable	Exercise Caution
TECHNOLOGICAL	DACS	Potentially Unacceptable/ Unavailable	Exercise Caution	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Exercise Caution
TECHNOLOGICAL	Terrestrial Enhanced Weathering	Exercise Caution	Exercise Caution	Generally Acceptable/ Available	Exercise Caution	Generally Acceptable/ Available	Generally Acceptable/ Available	Exercise Caution
TECHNOLOGICAL	Ocean Alkalinity Modification	Exercise Caution	Exercise Caution	Generally Acceptable/ Available	Generally Acceptable/ Available	Generally Acceptable/ Available	Exercise Caution	Potentially Unacceptable/ Unavailable
HYBRID	Hybrid Bioenergy with CCS (BECCS)	Exercise Caution	Generally Acceptable/ Available	Potentially Unacceptable/ Unavailable	Exercise Caution	Generally Acceptable/ Available	Exercise Caution	Generally Acceptable/ Available
HYBRID	Bioenergy with Biochar Sequestration (BEBCS)	Exercise Caution	Generally Acceptable/ Available	Potentially Unacceptable/ Unavailable	Exercise Caution	Exercise Caution	Potentially Unacceptable/ Unavailable	Generally Acceptable/ Available

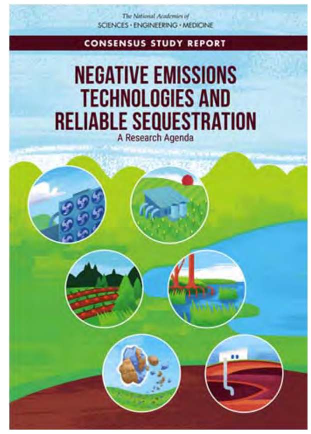
LEGEND: Generally Acceptable/ Available; Exercise Caution; Potentially Unacceptable/ Unavailable



Innovation for Cool Earth Forum (ICEF 2018)

BC as Negative Emission Technologies (NETs)

- Low CO_2 removal potential compared to other options (0.13 billion tCO_2/year)
- Low additional cost (0 to 20 USD/tCO_2) because the investment in BC ecosystems has been for other objectives (e.g., ecosystems services and adaptation)
- Need to understand how sea level rise, climate change, and coastal management affect CO_2 removal rates in BC ecosystems



National Academies of Sciences, Engineering, and Medicine (2019)

Port and Airport Research Institute
Assessment of BC as a climate change measure

IPCC special report says “No regrets” option

Benefits exceed than costs due to co-benefit (charismatic carbon), even though low CO_2 sink potential

Document for Expert and Govt Review

418306ba

SECOND ORDER DRAFT Chapter 5 IPCC SR Ocean and Cryosphere

Chapter 5: Changing Ocean, Marine Ecosystems, and Dependent Communities

Coordinating Lead Authors: Nathaniel L. Bindoff (Australia), William W. L. Cheung (Canada), James G. Kairo (Kenya)

Lead Authors: Javier Aristegui (Spain), Valeria A. Guinder (Argentina), Robert Hallberg (USA), Nathalie Hilmi (France), Nianzhi Jiao (China), Md saiful Karim (Australia), Lisa Levin (USA), Sean O’Donoghue (South Africa), Sara R. Purca Cuicapusa (Peru), Baruch Rinkevich (Israel), Toshio Suga (Japan), Alessandro Tagliabue (United Kingdom), Phillip Williamson (United Kingdom)

Contributing Authors: Sevil Acar (Turkey), Juan Jose Alava (Ecuador/Canada), Eddie Allison (United Kingdom), Brian Arbic (USA), Tamatoa Bambridge (French Polynesia), Inka Bartsch (Germany), Philip W. Boyd (Australia), Thomas Browning (Germany/United Kingdom), Francisco P. Chávez (USA), Mine Cinar (USA), Daniel Costa (USA), Omar Defeo (Uruguay), Salpie Djoundourian (Lebanon), Catia Domingues (Australia), Sonja Endres (Germany), Alan Fox (UK), Thomas Frölicher (Switzerland), Charles Greene (USA), Nicolas Gruber (Switzerland), Gustaav Hallegraef (Australia), Matthew Harrison (USA), Sebastian

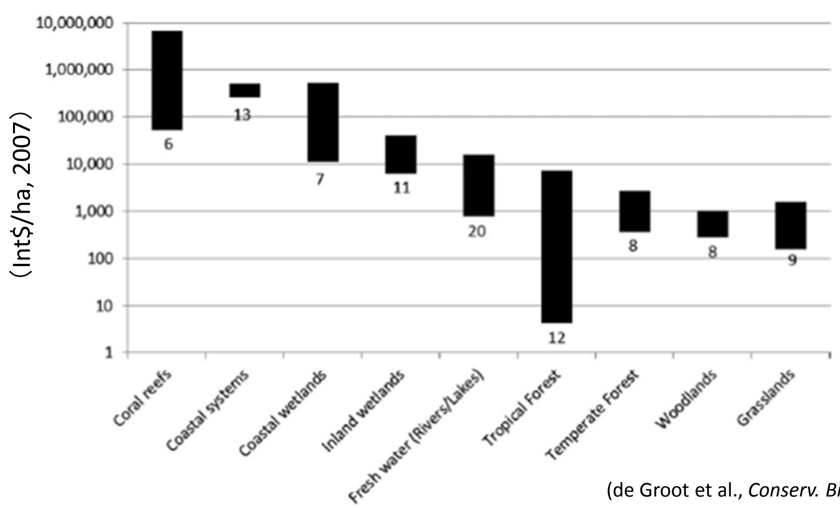
IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

Greater benefits than terrestrial

	No. of estimates	*Mean TEV of all services in US$ · ha^{-1} · year^{-1} (SD)*
Open oceans	14	491 (762)
Coral reefs	94	352,915 (668,639)
Coastal systems	28	28,917 (5,045)
Coastal wetlands	139	193,845 (384,192)
Inland wetlands	168	25,682 (36,585)
Rivers and lakes	15	4,267 (2,771)
Tropical forest	96	5,264 (6,526)
Temperate forest	58	3,013 (5,437)
Woodlands	21	1,588 (317)
Grasslands	32	2,871 (386)

(de Groot et al., *Conserv. Biol.* 2013)

But costs are high

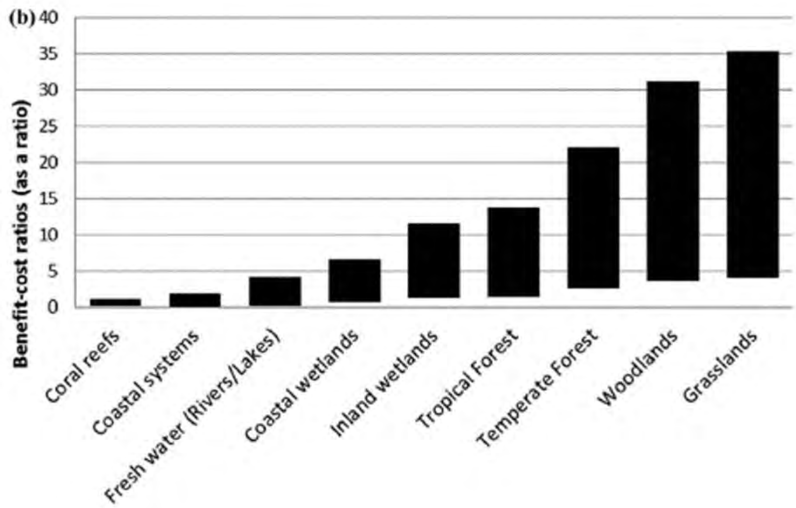


(de Groot et al., *Conserv. Biol.* 2013)

Port and Airport Research Institute

Assessment of BC as a climate change measure

Benefit/Cost ratio



(de Groot et al., *Conserv. Biol.* 2013)

Port and Airport Research Institute

Take home message

Linking the latest science and policies

- As a BC science, non-conventional BC ecosystems having high sink potential, are now exploring
- Connecting knowledge of S&T to economic evaluations such as B/C analysis
- Nevertheless, BC is a "charismatic carbon" and thus "no regret" option


Acknowledgments
Masakazu Hori
Toshihiro Miyajima
Tatsuki Tokoro
Tomomi Inoue
Goro Yoshida
Toru Endo
Sosuke Otani
Anirban Akhand
Katsuyuki Abo
Atsushi Watanabe
Masato Nobutoki
Kenta Watanabe
Kenji Sugimoto
Takeshi Matsumoto
Oscar Serrano
Carlos M. Duarte

Blue Forests of the Arabian Peninsula: Update on activities and findings

Ms.Jane C. Glavan, Arabian Blue Forests Working Group (ABFWG)

ARABIAN BLUE FORESTS WORKING GROUP (ABFWG)

An Overview of who we are

An increasing interest exists throughout the region in exploring the management of carbon in natural coastal biological systems. This is based on the recognition that managing Blue Carbon can safeguard existing stores of carbon, reduce emissions and maximize the potential of coastal marine ecosystems for removing carbon from the atmosphere.

So that there is a mechanism for collaborative opportunities, research, and lessons sharing on blue carbon in the region, the Arabian Blue Forests Working Group was formed.

Kickoff meeting held in Abu Dhabi on the 20th March 2019

ARABIAN BLUE FORESTS WORKING GROUP (ABFWG)

ARABIAN BLUE FORESTS WORKING GROUP

The geographic extent covers the coastal and marine areas of the Arabian Peninsula, from the ROPME Sea Area to the Red Sea

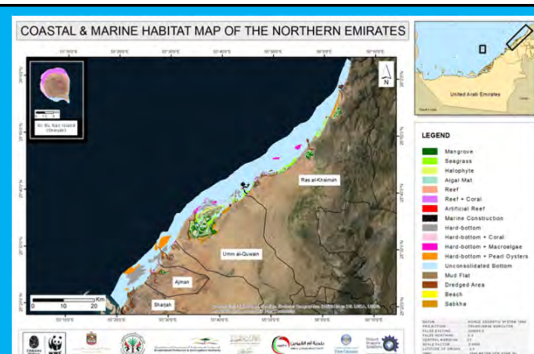
Emirates Nature - WWF

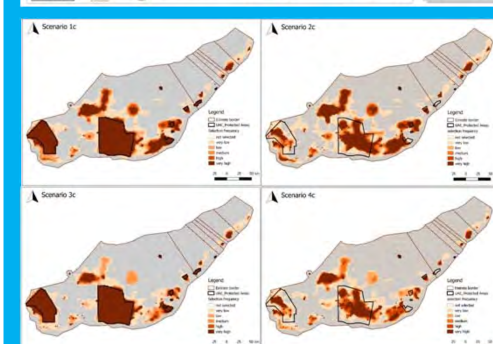
- **Coastal and marine Habitat mapping for Northern Emirates through an innovative, integrative and participatory approach.**

  The project included the 10m resolution mapping of BC coastal habitats such as mangroves, seagrasses and mudflats.

- **Identification of Areas for Particular Importance for Marine Biodiversity**

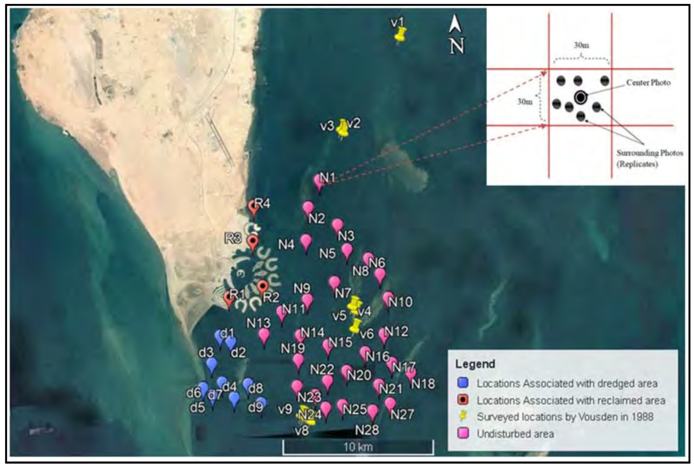
  Highlighting the relevance of BC habitats, and including other species and coastal habitats. Some of the areas identified concentrate the presence of BC habitats





Monitoring Locations on Seagrass Beds South of Bahrain

- This survey is conducted in 2018 as part of Ph.D. dissertation carried out at AGU by Al-Khtlan.
- 55 sampling locations have been selected to represent 55 pixel size on Landsat OLI 2018 Image covering an area of 30x30m^2 for each.
- The locations are located at different depths.
- Some of these are associated with areas previously dredged and others near by reclaimed ones to find out any difference with undisturbed areas by cover and biodiversity.
- The BC will be estimated at different seagrass covers to indicate the impact of seagrass loss due to dredging /reclamation process.



Whale and Dolphin Research in the Emirate of Fujairah

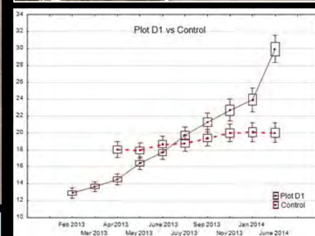




11 species of whales and dolphins have been recorded off Fujairah, all of which are top predators and indicators of the high carbon storage value of the UAE marine environment. Studies, which began in 2017, have included aerial and vessel surveys, acoustic research, photo-identification studies and genetic sampling.



Mangrove Restoration and Management



Mangroves impacted by the construction of Hamad Port in Qatar needed to be compensated through an offsetting scheme which saw around 80,000 plants being planted and transplanted into a nearby receiving area, and monitored over 1-3 yr period (2014 – 2018).

Five Oceans Environmental Services LLC

- **ROPME has a remote sensing program and a Satellite Receiving Station installed in early 2003 for environmental monitoring of the ROPME Sea Area. A new more sophisticated station has been installed in ROPME's new headquarters in May 2018.**

- **This station serves as the leading and top operated ground station in the GCC Region. It operates one antenna 03-meter X-band 24 hours a day, seven days a week and receive and freely distributes satellite data from NASA's MODIS and VIIRS sensors focused on, but not limited to, ocean color, costal water quality, state of benthic habitats, emerging coastal hazards primarily to coastal environmental managers and scientific users.**

- **Satellite imagery received and processed by ROPME Station are being used for real-time monitoring of coastal hazards and stressors e.g. oil spills, harmful algal blooms, dust storms, and cyclones that can negatively impact coastal marine environments and productivity and health of mangrove stands, seagrass beds, coral reefs and other blue carbon habitats.**

- **Other Regional ROPME programs and facilities such as "monitoring of land-based sources", "marine biodiversity" programs, and Marine Emergency Mutual Aid Centre (MEMAC) which is based in Bahrain also contribute to study and conservation of blue carbon habitats in many ways.**

AGEDI Work on Blue Carbon:

Dubai Water Quality Towards Amenity Services Valuation – The project was implemented as a partnership between AGEDI and Dubai Municipality. The priorities for valuation was towards the increasing incidence of Harmful Algal Blooms (HAB) as a useful proxy for the declining water quality. The surveys found that the value of Dubai's coastal and marine ecosystem services ranges between AED 6 billion and AED 21 billion per year in the case of total algal bloom. These values are much higher than that of Abu Dhabi which ranges between AED 1,8 billion and AED 3,1 billion for total algal bloom and between AED 348 million and AED 578 million when an offset is possible. **Given the fact that Dubai's coastal and marine area is 1 870 ha, this implies that the plausible range of the unit value of the resource is between AED 3,2 million/ha and AED 11,3 million/ha, or US$0,87 million/ha and US$3 million/ha. This is among the highest and most valued ecosystems in the world (Blignaut et al. 2016 & 2017).**

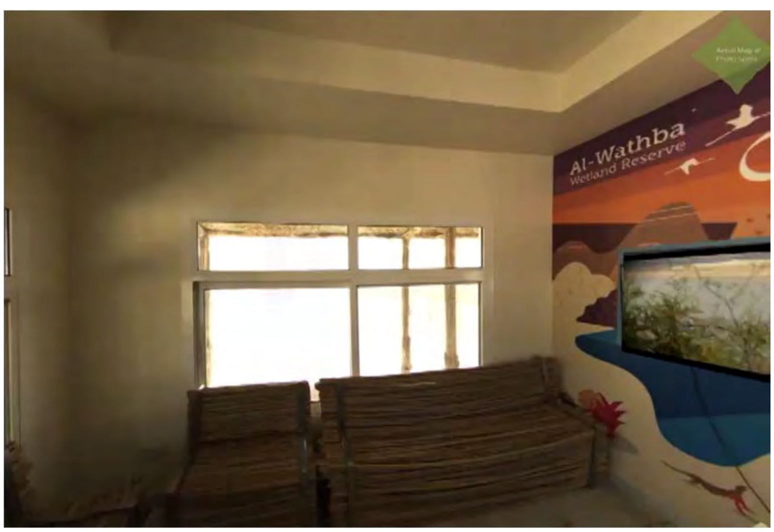
UAE Oceanic Blue Carbon Project - This project was implemented as a partnership between AGEDI and GRID-Arendal, and involved marine mammal experts and recognized academics from the region. The project aims to provide an assessment of oceanic blue carbon ecosystems within the UAE by quantifying the capacity for fish, cetaceans, dugongs, sea turtles and seabirds inhabiting UAE's marine environment to store and sequester carbon. **The analysis represents the world's first oceanic blue carbon audit and policy assessment at the national level. As a pilot study, the findings will allow relevant policy and management entities in the UAE to evaluate options for the potential implementation of oceanic blue carbon policies at the local and national level.** The study's findings suggest that the application of oceanic blue carbon policy has significant potential in the arenas of climate change, biodiversity conservation and fisheries management.

UAE Mangrove Annual Carbon Sequestration Project –Implemented in partnership between AGEDI and the Ministry of Climate Change and Environment, the project aims to quantify annual carbon sequestration rates of mangroves in the UAE through radiometric means: Lead-210 and Cesium-137. **Such methods offer the most appropriate means to determine carbon sequestration rates in mangroves for national inventories and coastal management planning.** The project findings aim to present an opportunity to incorporate carbon sequestration dating within national policies and strategies and will further provide information towards the Environment Agency – Abu Dhabi's completed Health Index Analysis (NDVI) for mangroves. The results of the study will be released by the end of 2019.

AGEDI's full reports and publications are available and freely accessible at www.agedi.org

Virtual Tours

Distant Imagery Solutions
Understanding Through Imagery



SCOPE OF WORKING GROUP

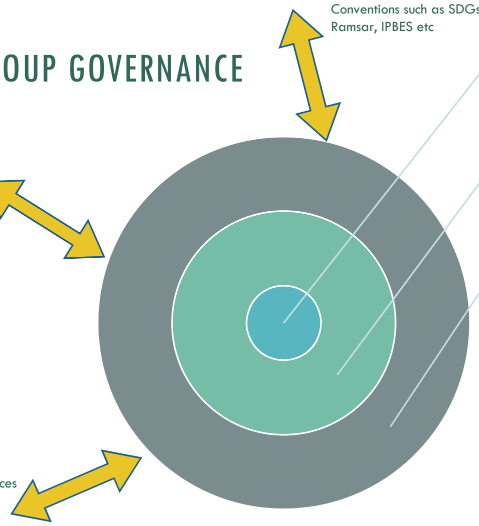
1. Act as facilitator between BC and marine/coastal ES practitioners within the region, and provide a platform for communication with the wider international community

2. Within region coordination role would be
   - To share best practices, methodologies and data between regional practitioners
   - Help facilitate research in the region and capitalize on potential synergies between activities
   - Produce integrated papers/reviews for use in at national, regional and international levels
   - Prepare expert opinion towards regional and international dialogue and intergovernmental processes
   - Identification of experts within the region to enhance Blue Carbon analysis
   - Facilitate capacity building for regional experts for in-house analysis and implementation
   - Enhance regional awareness of blue carbon and ecosystem services of our region

WORKING GROUP PRINCIPLES

- The Working Group shall make every effort to maintain open, positive and constructive dialogue through all activities
- All positions within the Working Group are voluntary and provided through their own in-kind contribution
- The working group is not a funding body
- All positions will not be required to pay a joining or membership fee.

WORKING GROUP GOVERNANCE



WORKING GROUP SECRETARIAT

Responsible for guiding the development and implementation of the strategic direction of the Working Group and the roadmap of activities.

- *Secretariat Membership:*

Comprises of Government, Regional organizations representing governments, Research institutions, NGOs and Private Sector

- Current Secretariat members

Amongst others…

TYPES OF ACTIVITIES

- Expert knowledge enablethink tank to help support addressing challenges occurring from regional stakeholders and observers
- Expert knowledge towards acting as technical advisors to regional and national climate change and services processes
- Compiling of regional blue carbon and ecosystem services expert profiles as well as analysis being done in region
- Communications and training on the importance of blue carbon and ecosystem services
- Development of peer reviewed public cross boundary journal submissions and reporting
- Sharing lessons and regional know-how whilst also garnering knowledge and opportunities from international processes, working groups and conventions
- Providing case studies and expertise to international and regional reporting processes such as GEO, IPBES, GEF Blue Forests, IPBC amongst others

Our ongoing mangrove activities focused on SDGs

Dr. Shigeyuki Baba, Professor Emeritus of University of the Ryukyus, Japan
International Society for Mangrove Ecosystems

Our ongoing mangrove activities focused on SDGs

Prof. Dr. Shigeyuki BABA

Executive Director, International Society for Mangrove Ecosystems (ISME)

Professor Emeritus, University of the Ryukyus, Okinawa, Japan

President, Japan Society for Mangroves

Photo in India

Thank you, Mr. Hamad Alqadaifi, Mr. Badar Al Blushi and Mr. Kazuhiro Yoshida for bringing me to Jahra Reserve to see mangroves.

Contents of my presentation

- Brief introduction of International Society for Mangrove Ecosystems (ISME)
- ISME's ongoing three mangrove projects in India, Kiribati and Malaysia
- Lessons we have learned
- Conclusion

Nursery activities and planting of *Avicennia marina* by local people (India)

Brief introduction of International Society for Mangrove Ecosystems (ISME)

- The Society was founded in 1990 as an international NGO/NPO
  to rehabilitate mangroves, advise on how to plant mangroves, promote research and training on mangrove ecosystems, and compile and disseminate mangrove information.
- The Mission is
  through international cooperation, the Society collects, evaluates and disseminates information on mangrove ecosystems for the conservation, rational management and sustainable utilization of mangroves.

Ranong, Thailand

Brief introduction of International Society for Mangrove Ecosystems (ISME)

- The Society has
  44 institutional members, nearly 1,200 individual members from 94 countries/regions as of August 2019
- The headquarters is in Okinawa, Japan
- ISME Executive Committee members (voluntary bases):
  President: Prof. Sanit Aksornkoae (Thailand)
  Vice-President: Prof. François Blasco (France)
  Prof. Norman Duke (Australia)
  Treasurer: Dr. Hung Tuck Chan (Malaysia)
  Executive Director: Prof. Shigeyuki Baba (Japan)

Ranong, Thailand

ISME's activities
<Completed Projects on Mangroves>

EE activity for children in Iriomote Isl. Japan

- **1994-1997: Indus Delta with IUCN Pakistan**
- **1997: Senegal with local NGOs**
- **1997-1999: Lombok and Bali Islands, Indonesia**
- **1999-2001: UAE with Zakum Oil Company and JODCO**
- **2001-2002: Maldives with local communities supported by Maldives Gov.**
- **2005-2006: Samoa with Ministry of Natural Resources and Environment**
- **2005-2008: ISME's Grass-Root Activities in Brazil with local communities funded by JICA**
- **2006-2009: Maldives with local communities supported by Maldives Gov.**

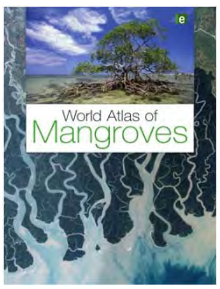
Since 1990: more than 50 small activities with Japanese volunteers in Malaysia, Thailand, Viet Nam, Tonga, Tuvalu, Kiribati, *etc.*

Rehabilitation activity in Malaysia

EE activity for Japanese volunteers, Malaysia

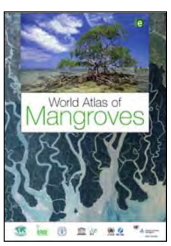
ISME's activities <Publications-1>

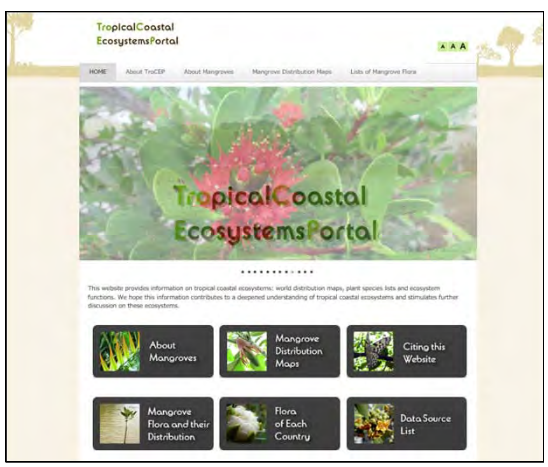
- World Atlas of Mangroves was to revise and improve the accuracy of the original 1997 World Mangrove Atlas.
- Funding from the Government of Japan through ITTO, and additionally US Department of State and Government of Spain.
- The atlas constitutes the first truly global assessment of the state of mangroves, providing recent and reliable coverage of nearly 99% of the world's mangroves and a wealth of statistics on biodiversity
- Partners: ISME and ITTO, and UN Organizations: FAO, UNESCO-MAB, UNEP- WCMC and UNU-INWEHT



- English version was published in 2010
- French version was published in 2011
- Spanish version was published in 2012

We are updating data of World Atlas of Mangroves through "Tropical Coastal Ecosystems Portal （TroCEP)" working together with National Institute of Environmental Studies (NIES), Japan

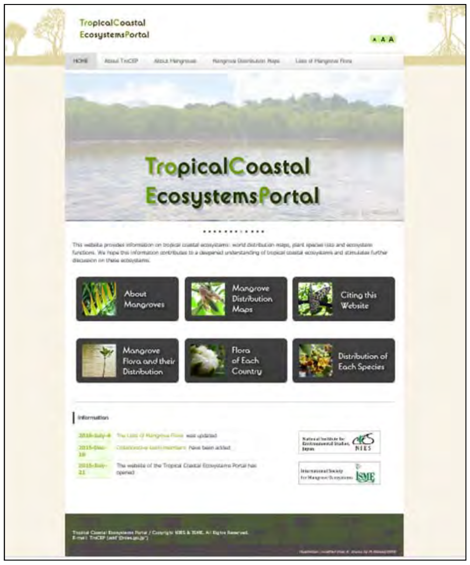




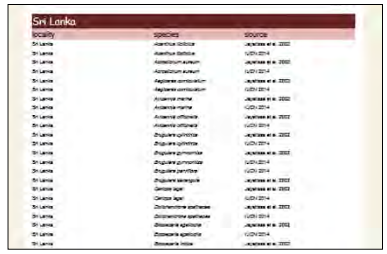
You can retrieve the data for free from http://www.nies.go.jp/TroCEP/index.html

You can get updated data for free from the website of TroCEP

http://www.nies.go.jp/TroCEP/index.html



Flora list sorted by country

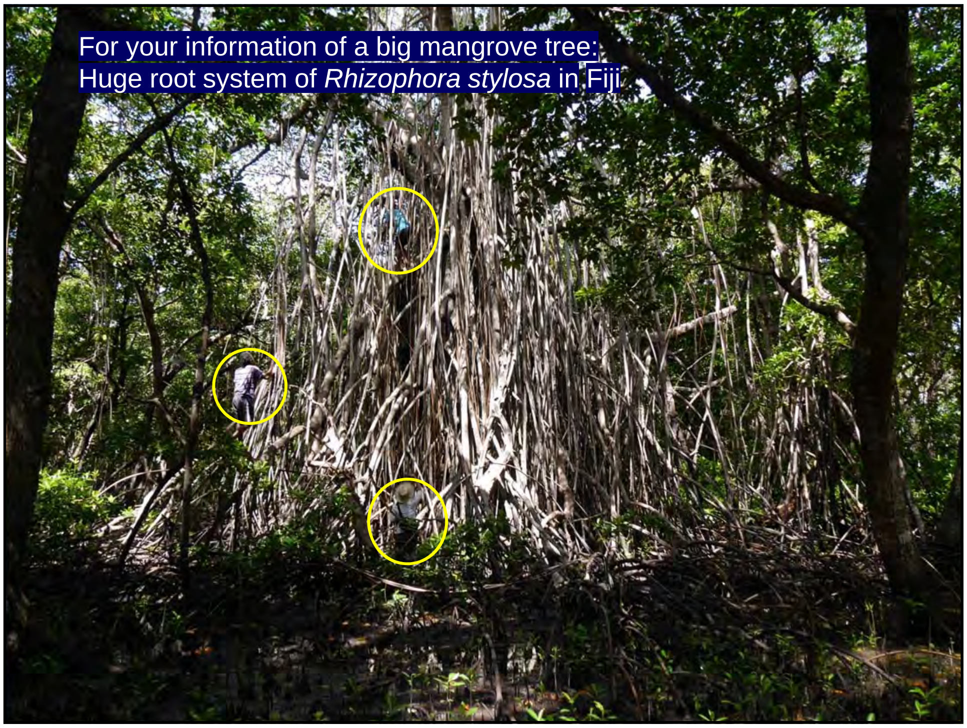


Flora list sorted by species

We need your further kind collaboration to provide precise data on mangroves, because extents of mangroves are changing day by day, and we still do not have accurate mangrove data in each country.

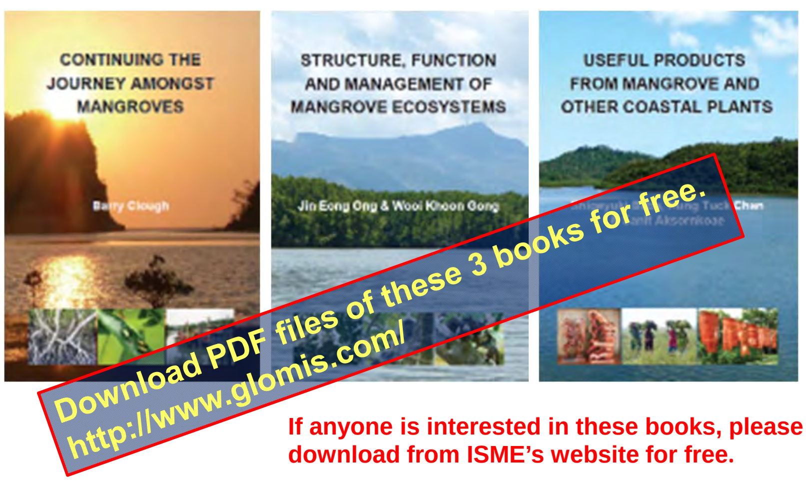
One of Examples on A NEW RECORD:

When I went to Ranong, Thailand, in July 2019, the Head of Ranong Mangrove Forest Research Center brought me to see very big trees of *Avicennia marina* found very recently. One of those is over 30m in height.



ISME's activities <Publications-2>

Mangrove Educational Books, published in March 2013, financially supported by International Tropical Timber Organization (ITTO)



If anyone is interested in these books, please download from ISME's website for free.

All of you know very well about SDGs.

The 2030 Agenda listed “Sustainable Development Goals” consisting of 17 goals was adopted by the UN Sustainable Development Summit held in 2015.

We have been implementing mangrove rehabilitation projects mostly focused on Global Environmental Issues, but we could emphasize not only Global Issues, but also SDGs for realizing a sustainable world.

Download from UNDP HP.

<Ongoing project-1>
Mangrove Afforestation Project, Gujarat, India

- The objectives are to establish mangrove plantations for coastal protection, to enhance mangrove biodiversity including habitats for endangered birds, and to generate income for the local community, especially the womenfolk.
- Location: at the estuary of Sabarmati River near Vadgam in Gujarat, India.

About SDGs, focused on no. 1 Goal: No Poverty, no.5 Goal: Gender Equality, no. 13 Goal: Climate Action and no.14 Goal: Life below Water, and no.15 Goal: Life on Land.

Planting site is a semi-arid coast
Annual rainfall: less than 280 mm
Tidal range: 8 m

From Google Map

- **Since 2009, about 80 – 100 ha of *Avicennia marina* plantation have been established annually.**
- **Daheda Sangh, a local NGO, carries out the planting activities together with the local community.**
- **As of August 2019, mangroves covered more than 800 ha.**


Coastal erosion

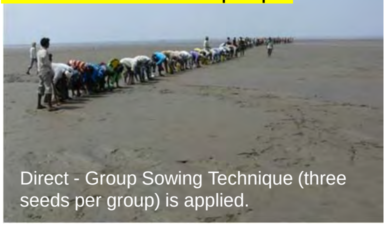

In 2009


In 2015

For compensation planting, approx. 300,000 potted seedlings of *A. marina* were produced annually from 2009 to 2011.

Every year, about 3,000,000 seeds of *A. marina* are collected.

Working together with the local NGO and local people

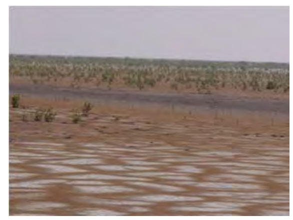


Planting seeds of *A. marina* by local people

Hiring 50% of womenfolk for Gender Equality as no. 5 Goal of SDGs

1 year old of *A. marina*

3 – 4 years old of *A. marina*

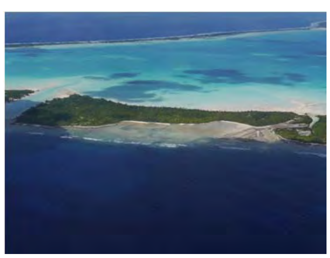


Still harsh and super-saline condition

The plantations are attracting fauna.

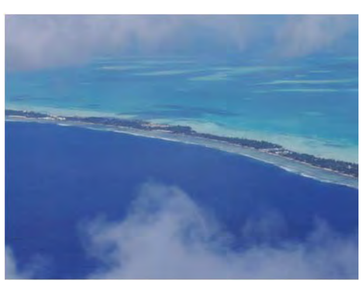
Seeds, young leaves and twigs of *Avicennia marina* as fodder for cattle especially the dry season (March to the beginning of June)

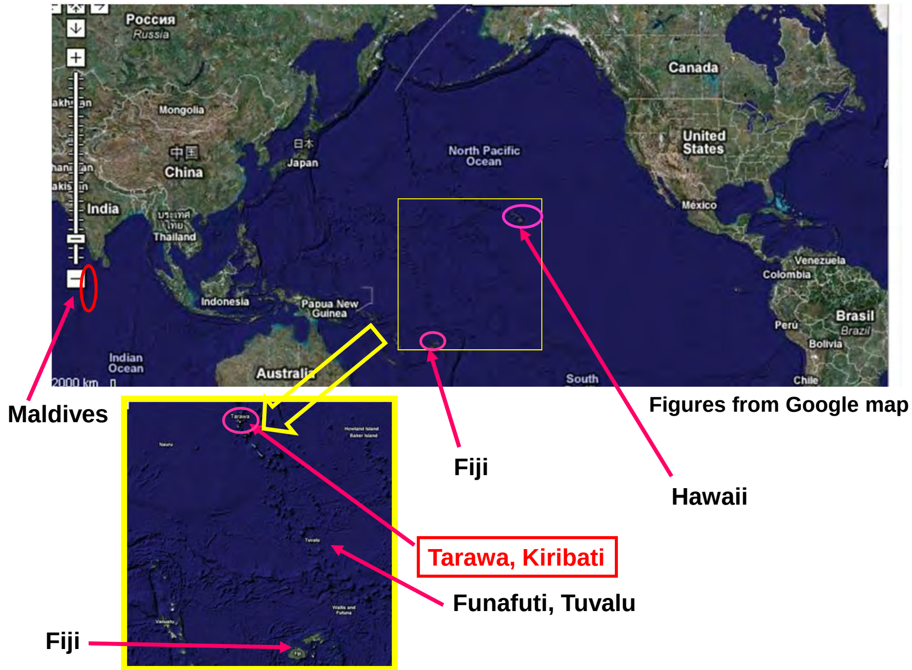
<Ongoing project-2>
Mangrove rehabilitation project in Republic of Kiribati



Tarawa Atoll, the population is nearly 80,000.

Coastal erosion

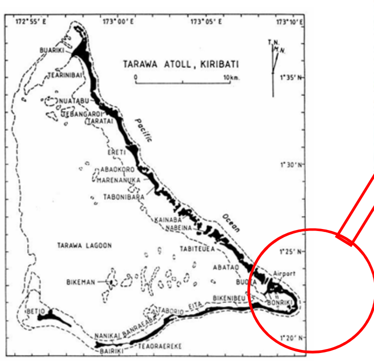




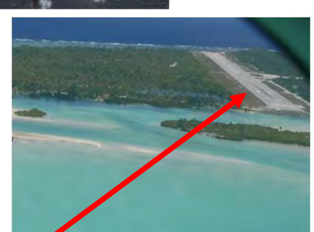
Figures from Google map

Since 2004, ISME has been implementing a mangrove rehabilitation project in Kiribati where consists of many very small islands, and there is no river – no freshwater supply from any river.

Aims are mainly focused on Mitigation and Adaptation to Climate Change as no. 13 Goal of SDGs, and no. 14 Goal: Life below Water, and no. 15 Goal: Life on Land.



Tarawa, Kiribati
From Google map



Runway of Bonriki International Airport

The objective of this project is

to introduce techniques of planting mangroves to the local communities and to plant mangroves together with children for environmental education purpose.

At the beginning of the project, we mainly focused on issues of <u>Mitigation and Adaptation to Climate Change</u>. Recently I have to say not only Mitigation and Adaptation as no.13 Goal: Climate Action, but also to focus on no.14 Goal: Life below Water, and no.15 Goal: Life on Land.


Group planting technique (three propagules per group) is applied


Close spacing plantings are applied 25 x 25 cm or 50 x 50 cm



Planting mangroves together with school kids (left and middle), and islanders (right)

The group planting technique of *Rhizophora stylosa* propagules was applied, and plantings were conducted on the white coral sand under blistering heat.

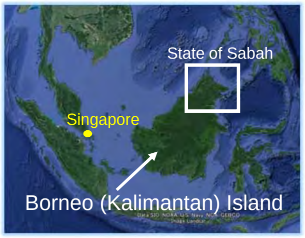
Since 2004, we have planted mangroves together with school kids and local communities strongly supported by Ministry of Environment, Land and Agriculture Development (MELAD), Kiribati.

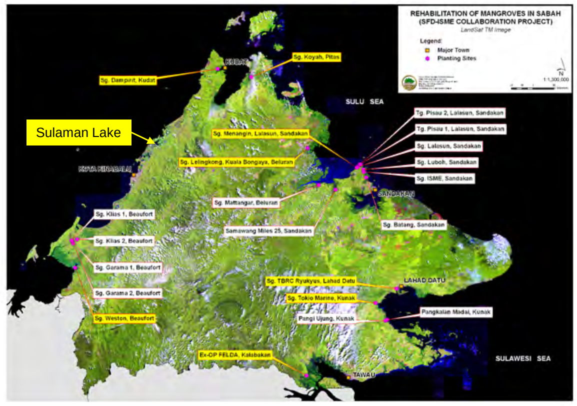
<Ongoing project-3>
Mangrove Rehabilitation Project, Sabah, Malaysia

- Rehabilitated 40 - 50 ha of degraded mangrove area annually since 2011, mainly focused on Mitigation and Adaptation to Climate Change, and Biodiversity Conservation.
- Carried out by the Sabah Forestry Department (SFD) with technical advice from ISME.
- As of August 2019, over 350 ha in 23 project sites has been planted with more than 11 mangrove and associated species.

Illegal encroachment at areas surrounded by oil palm plantation, even in mangrove forest reserves

Twenty-three project sites in Sabah, Malaysia





White colored: Phase I (2011-2013)
Yellow colored: Phase II (2014-2018) and Phase III (2019-2023）
Total Area of the Stare of Sabah: 76,115km^2

The project is implemented not only for <u>Mitigation and Adaptation to Climate Change, and Biodiversity Conservation</u>, but also for no.14 Goal: Life below Water, and no.15 Goal: Life on Land.

Growth of *Rhizophora* seedlings at Lalasun River from 2011 to 2019

The Mangrove Task Force of Sabah Forestry Department (SFD) led by the Project Leader (left) works closely with the forestry staff in the districts and contractors of the project (middle and right).

Rehabilitation at abandoned fish ponds

Working together with volunteers.
They came to Sabah, Malaysia, at their own expenses.

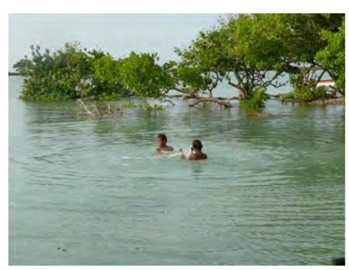
Volunteers of office workers from Japan and USA

Mangrove plantings by Japanese high school students



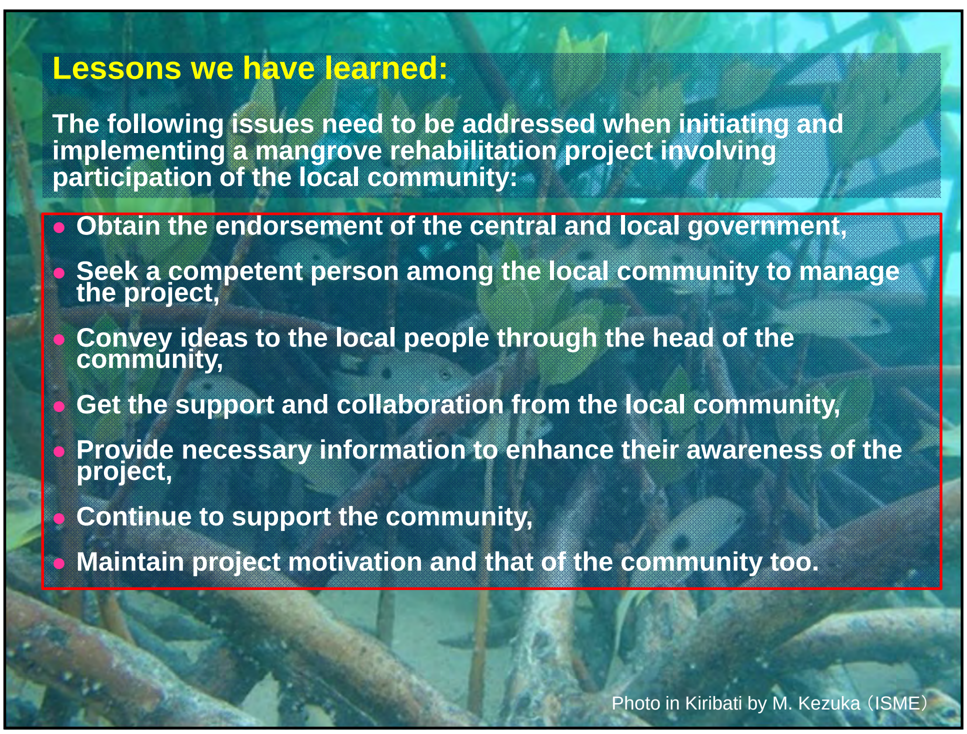

As you remember, these photos show one of our very very small challenge for coastal protection in Kiribati


Photos in Kiribati

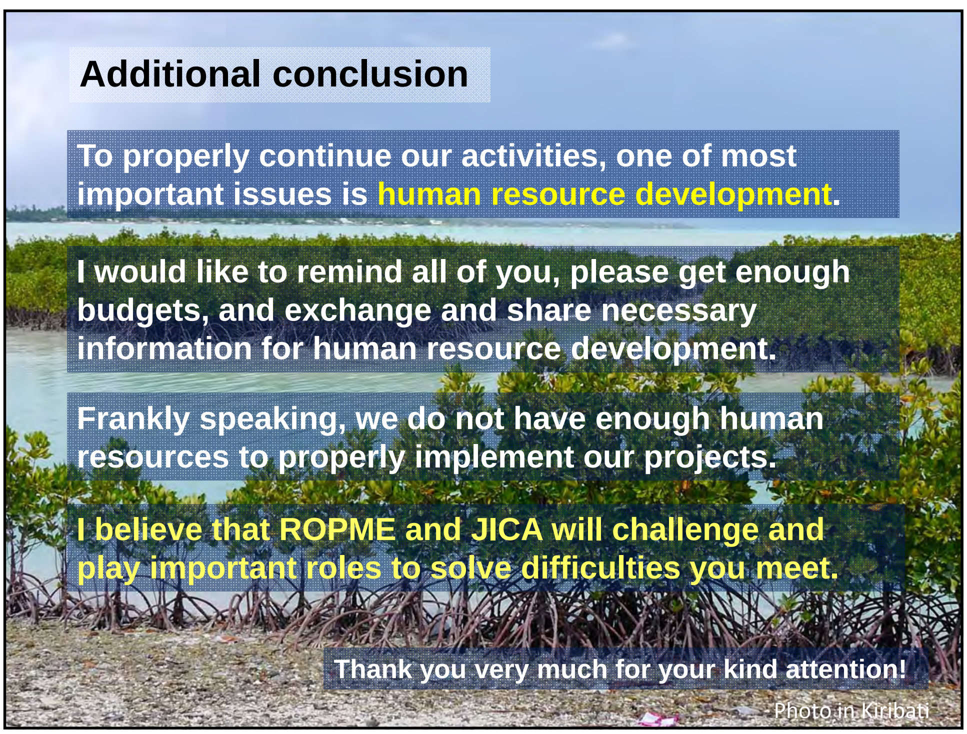



Since coastal ecosystems are integrated, we have to collaborate with not only local communities, but also marine scientists, social economists, and other scientists to conserve and restore coastal ecosystems properly.


Before closing
I know that most participants of this workshop are UN officers, government officers and so on, but daily management of planted mangroves is conducted by local communities.
For this reason, the local community participation is essential to properly implementing mangrove rehabilitation project.
Because you may not always look after mangrove planting sites.
JABATAN PERHUTANAN
Photo in Sabah, Malaysia


Lessons we have learned:
The following issues need to be addressed when initiating and implementing a mangrove rehabilitation project involving participation of the local community:
• Obtain the endorsement of the central and local government,
• Seek a competent person among the local community to manage the project,
• Convey ideas to the local people through the head of the community,
• Get the support and collaboration from the local community,
• Provide necessary information to enhance their awareness of the project,
• Continue to support the community,
• Maintain project motivation and that of the community too.
Photo in Kiribati by M. Kezuka（ISME）


Conclusion
We realize the importance of community participation, but our experience shows that we cannot work easily with any local community, because each village has different social and political conditions.
Without proper analyses of these conditions, we cannot work well with the local community.
It is easy to say, but hard to do.
Photo in Kiribati by M. Kezuka（ISME）


Additional conclusion
To properly continue our activities, one of most important issues is human resource development.
I would like to remind all of you, please get enough budgets, and exchange and share necessary information for human resource development.
Frankly speaking, we do not have enough human resources to properly implement our projects.
I believe that ROPME and JICA will challenge and play important roles to solve difficulties you meet.
Thank you very much for your kind attention!
Photo in Kiribati

Case study: Mangrove conservation in Oman and its relevance to the Region

Mr. Bader Al Bulushi, Ministry of Environment and Climate Affairs, Sultanate of Oman

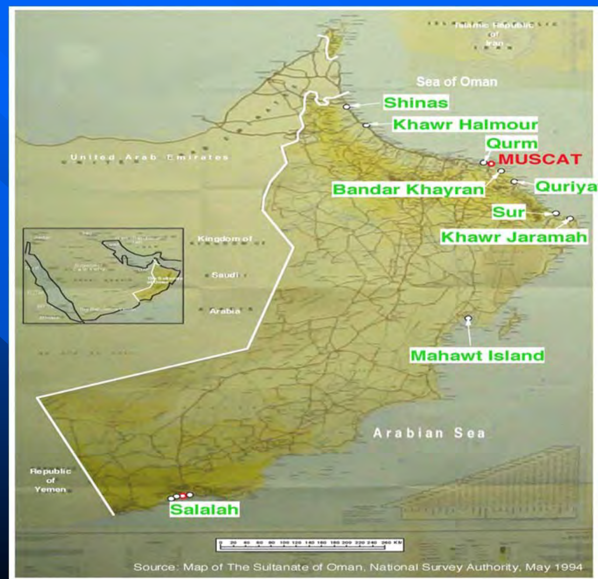
What is Mangrove

- Mangrove forests are a unique ecosystem generally found along sheltered coasts where they grow abundantly in saline soil and brachish water .

2019/9/29

Major Mangrove Vegetations in Oman

- 1. Shinas
- 2. Khawr Halmour
- 3. Qurm
- 4. Bandar Khayran
- 5. Quriyat
- 6. Sur
- 7. Khawr Jaramah
- 8. Mahawt Island
- 9. Salalah



All mangrove forest in Oman is composed of Avicennia marina.

2019/9/29

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.

2019/9/29

- It is major spawning nursery and breeding habitat for commercial fishery species and prawns.
- Important site for habitant birds

2019/9/29

Mangrove woods in Kiln

2019/9/29

Bali -Indonesia

Women and children working in mangrove forest (fishing), Mahawt Island

Muhot Island

Restoration Conservation and Management of Mangrove plan in oman

2019/9/29

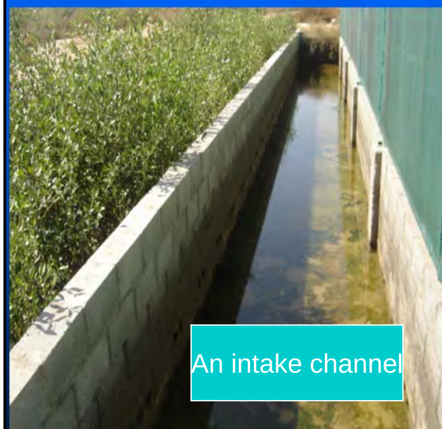
- The project start in 2002 between the Ministry and **JICA** to implementing aproject to Transplant Mangrove Seedling and rehabilitation all Mangrove Area .
- Project Objection : conservation all Mangrove forest and Transplanting Million Tree at the end of year 2022 .

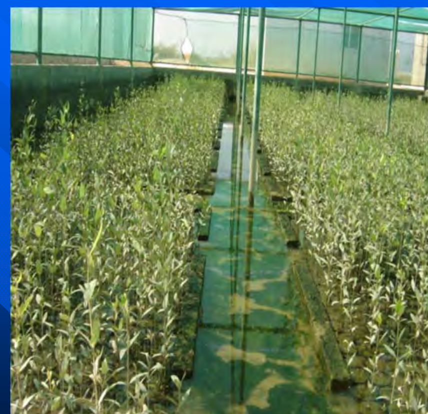

An Aerial Photograph of QNR
April 8, 2000
QEIC
Qurm Environment
Information Center
The Nursery constructed in the year 2000
The Nursery constructed in the year 2001

Pump Irrigation

2019/9/29

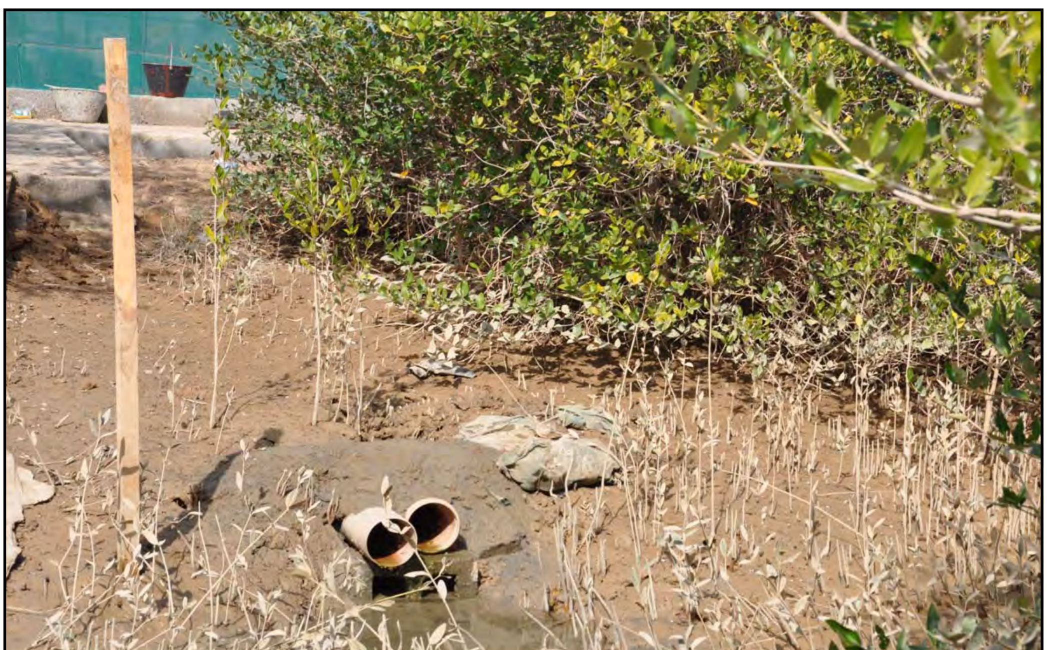
Tidal Irrigation





2019/9/29


Reconstruction new Nursery



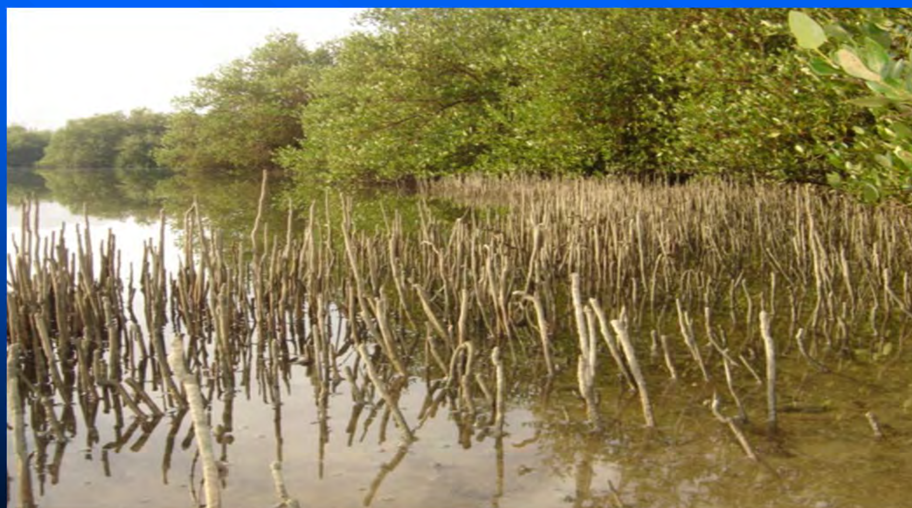
2019/9/29

SUR NURSERY(TIDAL IRRIGATION)

Tourism

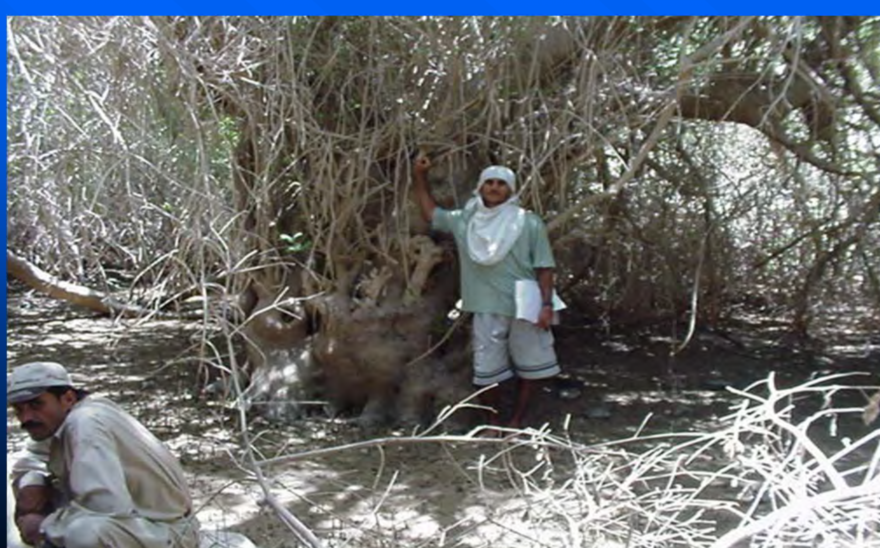
MUD CRAB

Aerial Roots

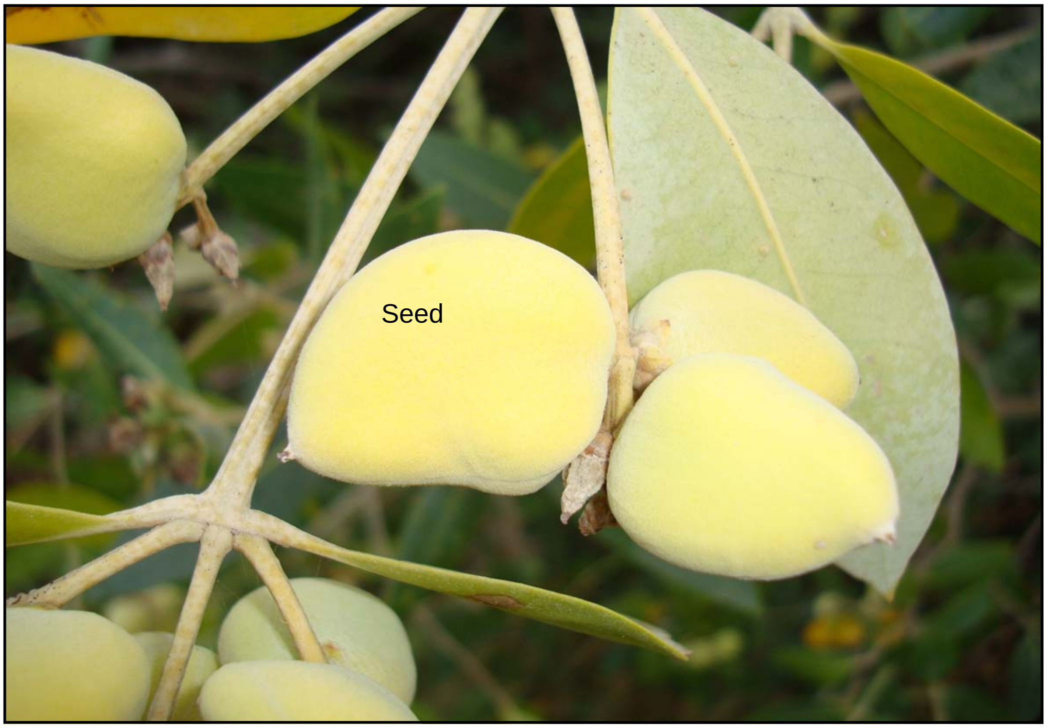


2019/9/29

AL- KHAYRAN




Flowering


Seed


Seed Collection in QNR
This is a photograph of seed collection in 2000, August.
There is no photographs of seed collection in 2001.
Seed collection and their sowing was done from June 30 to July 5, 2001


Where is the Seed


Seed need washed for 6 hours


Salalah

Peeling Seed

- COLLECTED SEEDS OF AVICENIA MARINA NNED PRETREATMENT BEFORE SOWN , AND WASHED 6 HOUR , SEED COAT WILL BE PEELED OFF BY THEMSELVES

2019/9/29

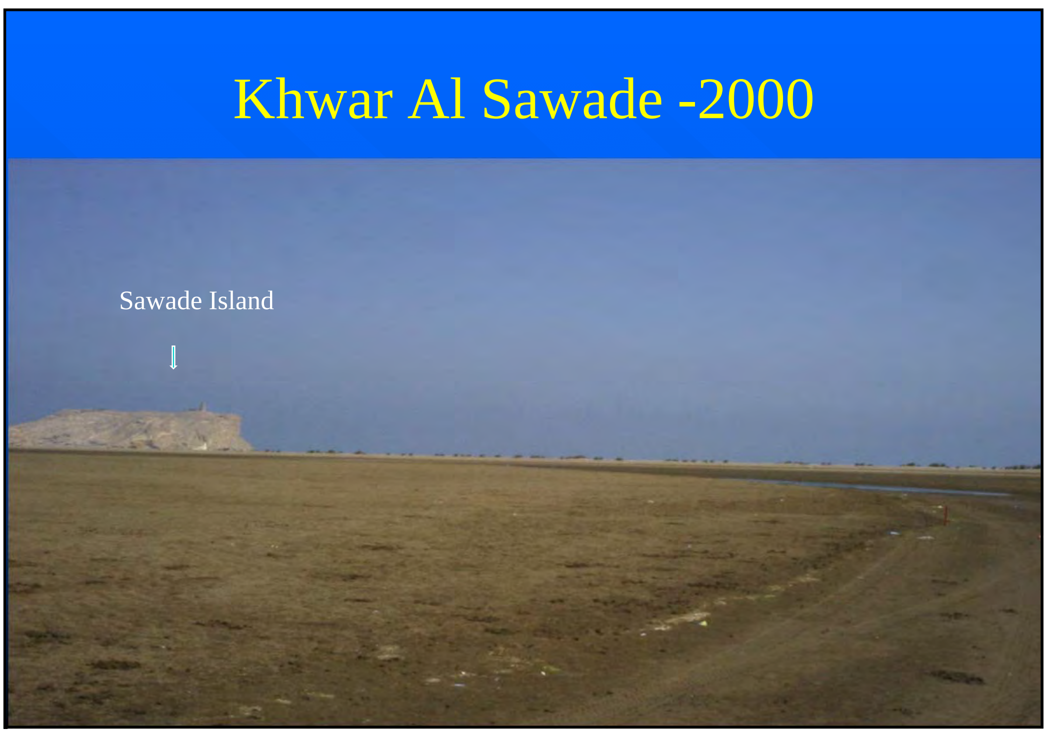
2019/9/29

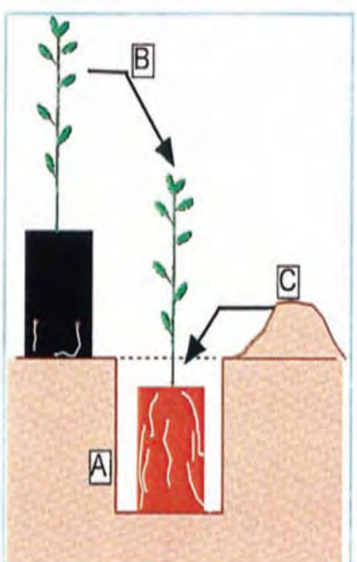

2019/9/29

Germiation After 14 day

MUSCAT NURSERY

2019/9/29


Khwar Al Sawade -2000
Sawade Island



A: Dig a hole a little bit deeper than the pot

B: Remove the plastic pot and put the seedling with soil without damaging roots

C: Backfill the hole with soil and compact moderately

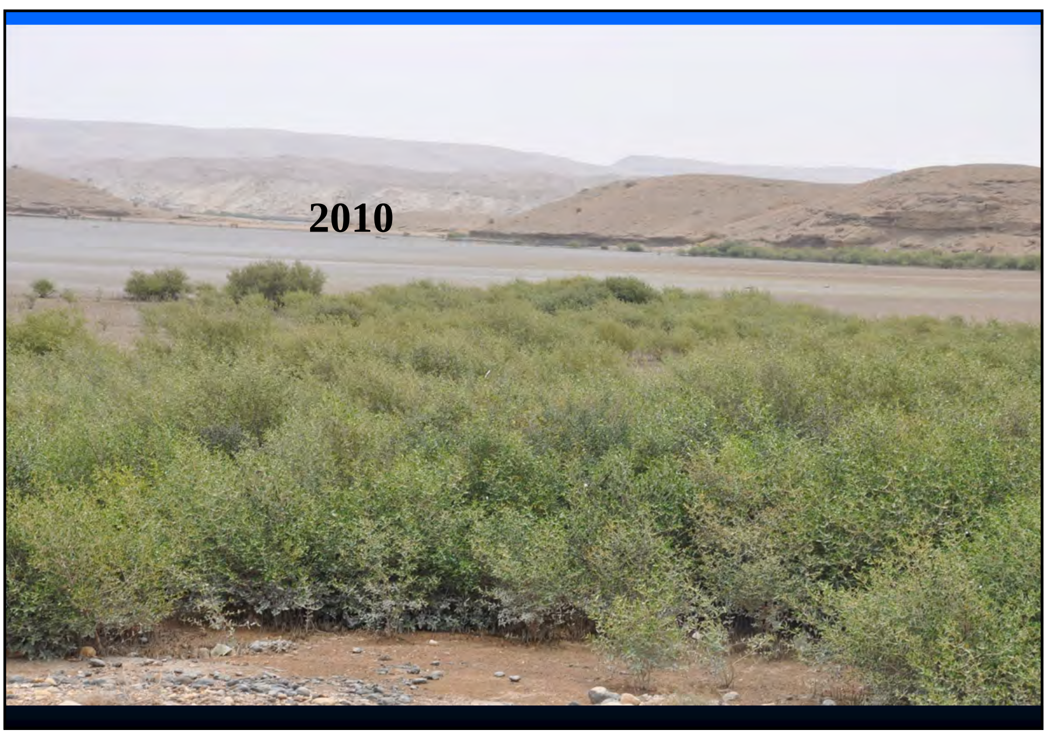
2019/9/29


Sawade project2006
Sawade Island

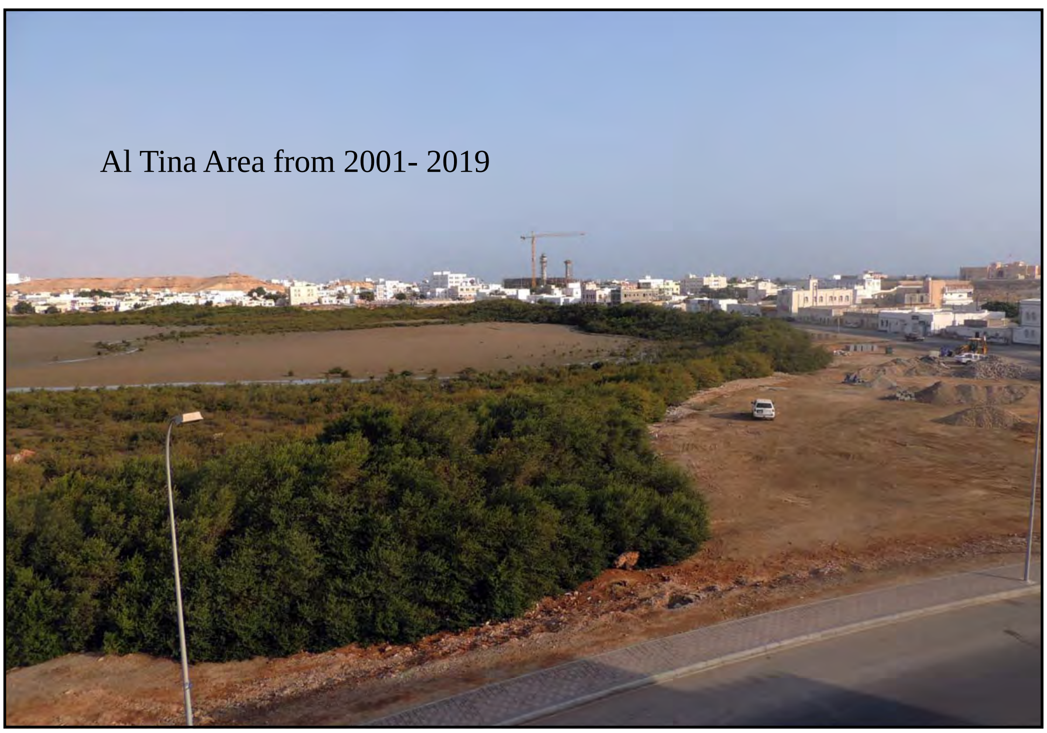

2001
Sawade
2017
Sawade Island
Sawade Island
2019/9/29

Common problem

2019/9/29


2010


2013


Al Tina Area from 2001- 2019


Rass Al Haad Project
2008 - 2012
2013
2012
2011
2010
Yarub
2008
Badar
2009


After 5 year
Yarub
After 4 year
Badar


266

Survey

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	**680750**

وزارة البيئة والشؤون المناخية
MINISTRY OF ENVIRONMENT AND CLIMATE AFFAIRS


MELY BUG
Disease – insect Larva on the leaves


Spraying Leave with sea water

Natural Impacts – Mangrove falsh flooding

2019/9/29


problem

Big Problem

2019/9/29

Environmental Education Program in Mangrove forest

2019/9/29

2019/9/29

2019/9/29

2019/9/29

Transplant in Khwar Al Har

2019/9/29


KHAWR AL GAWI- 2005

Participation of Omani Womens Association

The traditional knowledge is one of the best tools to solve the global environmental issues


Sultanate Of Oman
Ministery of Environment &
Climate Affairs
Mangrove Transplanting Project
Shinas Transplanting Site
- Established :
January 2004
- Plant Transplanted :
Avicennia marina (indigenous)
Protect & conserve the beautiful
natural environment all over the
Sultanate by your action
سلطنة عمان
وزارة البيئة والشؤون المناخية
مشروع إستزراع أشجار القرم
موقع إستزراع شناص (خور الوديات)
بدء تنفيذ المشروع:
يناير / ٢٠٠٤ م
النبات المستزرع
شجرة القرم (Avicennia marina
حماية وصون البيئة الطبيعية في سلطنه عمان
مسئولية كل فرد في المجتمع

Scattering in khawr Durf 2005


Durf in 2008


Durf 2010

2019

2019/9/29


2019/9/29


Okayama University Student


First Kuwait
Experiment


Gujarat


Second visit

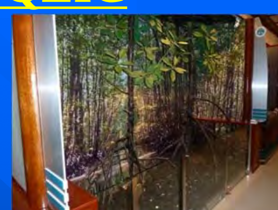

10 month old
70 cm


Bahrain Experiment

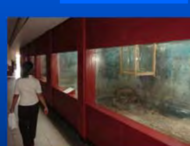
Qurm Environmental Infrormation Center project

- QEIC project is under implementation through good Technical cooperation with **JICA** .

Image Photographs of the QEIC



Exhibition



Exhibition Hall

Auditorium

Board walk

201


Superman !!!!

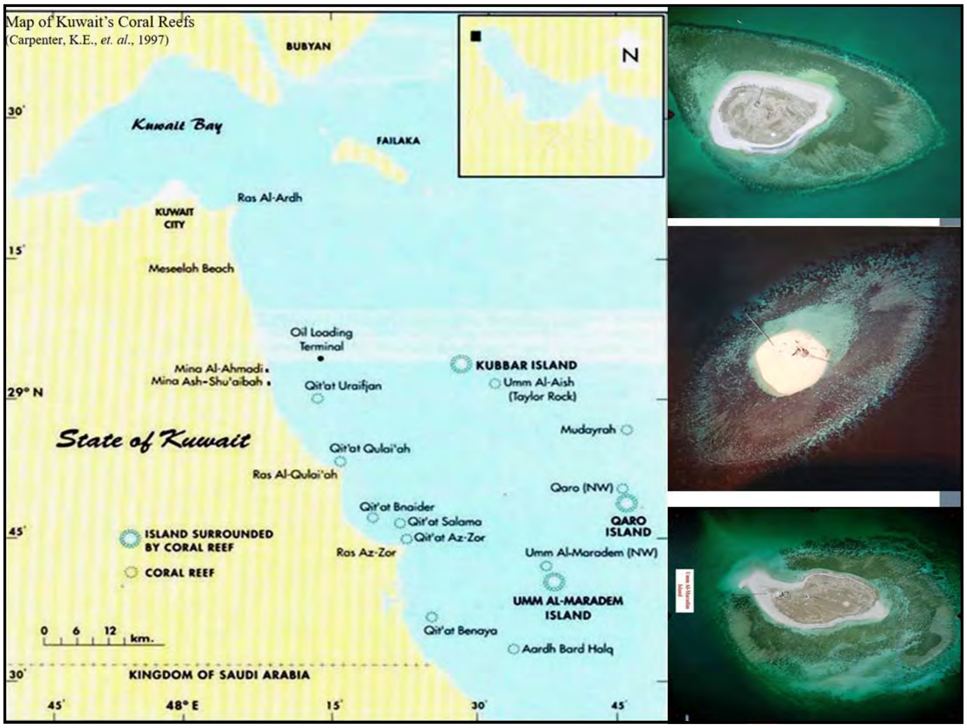

Thank you

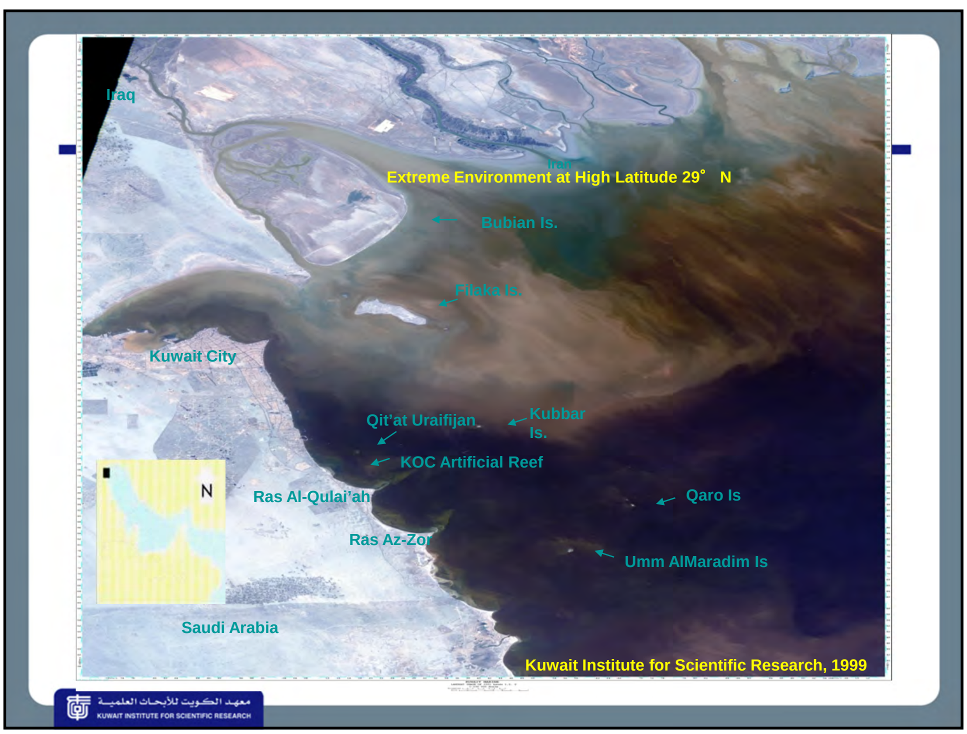
Kuwait’s coral reefs restorations

Dr. Shaker H. Al Hazeem,
Kuwait Institute for Scientific Research (KISR)

Background

- **Experimental artificial reef: scrap car tires 1981.** (Downing *et. al.*,1985)
- **Study of Corals and Coral Reef Fishes, 1983-89.** (Downing, 1985)
- **Ecology of Coral Reefs in Kuwait and Effects of Stressors on Corals, 1995. (**Harrison *et. al*.,1997 **)**
- **Corals and Coral Reef Fishes of Kuwait (Book, 166 pp.).** (Carpenter *et. al*.,1997)
- **Ecological study of the coral reefs of Kuwait islands. PhD thesis** (Alhazeem, 2007).
- **Ecological Assessment of the KOC's Artificial Reef** (Alhazeem, *et. al.*, 2013).
- **Rehabilitation of Kubbar Island's Coral Reef 3 years** (Alhazeem, *et. al.*, 2018).


Map of Kuwait's Coral Reefs
(Carpenter, K.E., et. al., 1997)
BUBYAN
N
30'
Kuwait Bay
FAILAKA
Ras Al-Ardh
KUWAIT CITY
15'
Meseelah Beach
Oil Loading Terminal
Mina Al-Ahmadi
Mina Ash-Shu'aibah
Qit'at Uraifjan
KUBBAR ISLAND
Umm Al-Aish (Taylor Rock)
29° N
State of Kuwait
Mudayrah
Qit'at Qulai'ah
Ras Al-Qulai'ah
Qaro (NW)
Qit'at Bnaider
Qit'at Salama
Qit'at Az-Zor
QARO ISLAND
45'
ISLAND SURROUNDED BY CORAL REEF
CORAL REEF
Ras Az-Zor
Umm Al-Maradem (NW)
UMM AL-MARADEM ISLAND
Qit'at Benaya
0 6 12 km.
Aardh Bard Halq
30'
KINGDOM OF SAUDI ARABIA
45'
48° E
15'
30'
45'


Iraq
Extreme Environment at High Latitude 29° N
Bubian Is.
Filaka Is.
Kuwait City
Qit'at Uraifijan
Kubbar Is.
KOC Artificial Reef
N
Ras Al-Qulai'ah
Qaro Is
Ras Az-Zor
Umm AlMaradim Is
Saudi Arabia
Kuwait Institute for Scientific Research, 1999
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Coral Reefs

- Coral reefs contain the largest variety of species of marine life, and produce more living biomass than any other marine ecosystem.
- They provide protection and shelter for many different species of fish, as documented 124 fish species of 337 species.
- They are important in controlling the amount of carbon dioxide in the water, consumed by algae.
- They protect coasts from strong currents and waves, avoiding coastal erosion.

The Consequences

- Distracting the Coral reefs ecosystem would affect the large variety of species of marine life.
- The fishes would be affected if the shelter were distracted.
- The carbon dioxide in the water would be less consumed with less presence of coral reef.
- The coasts protection would be weaken as coral reef distracted (ex. Qaru Island in the west side eroding).
- The revenue and tourism would be reduced if distraction happen to coral reefs specially Kuwait reefs are world unique reef.


The Corals and Coral Reef Fishes of Kuwait
The Corals and Coral Reef Fishes of Kuwait
Kent E. Carpenter, Peter L. Harrison, Gregor Hodgson, Adel H. Alsaffar and Shaker H. Alhazeem
A total of 35 Coral Species were recorded in the coral reef communities, about 29 reef building coral 6 species not reef building were recorded in Kuwait.
A total of 124 Fish Species were recorded in the coral reef communities, about 35 % of the total number of fish species (337 species) recorded in Kuwait.
Supervised and Compiled by the Kuwait Institute for Scientific Research
Sponsored by the Environment Public Authority
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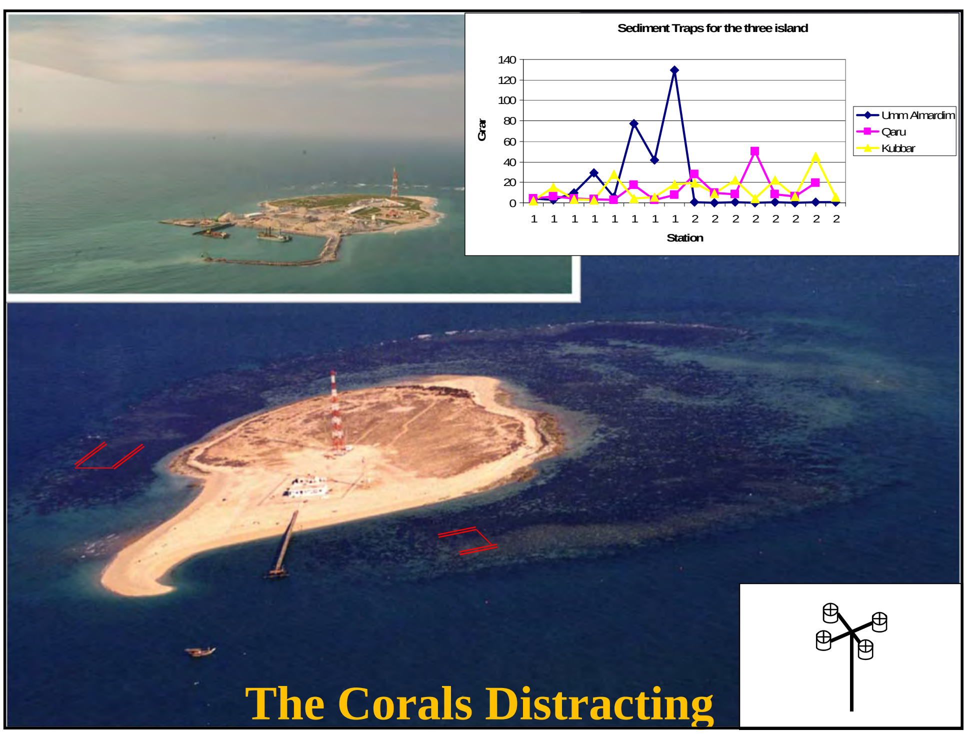
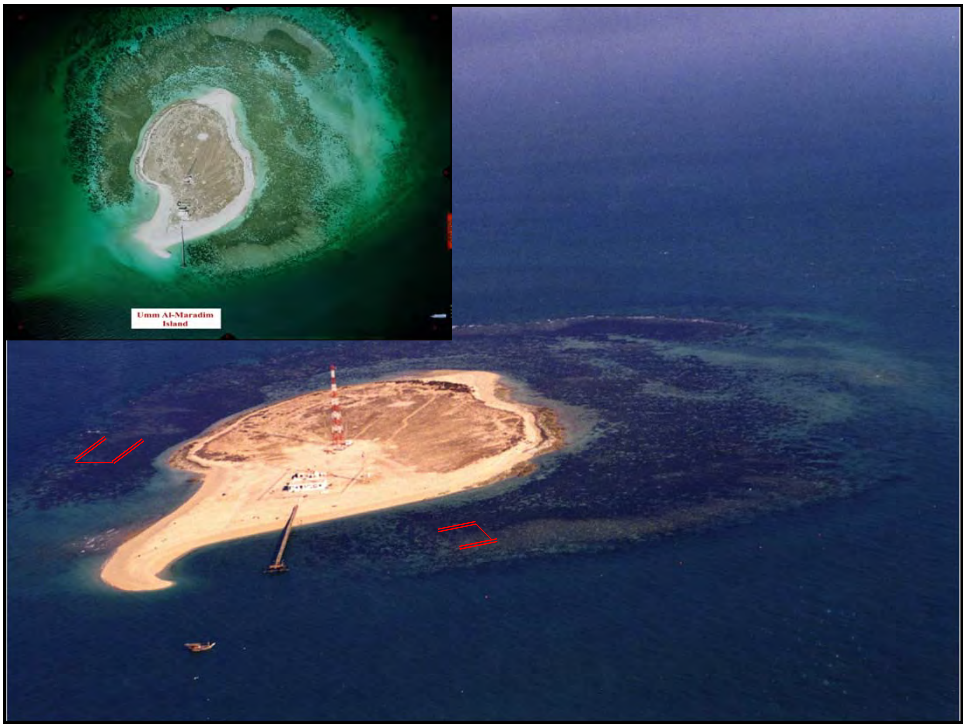
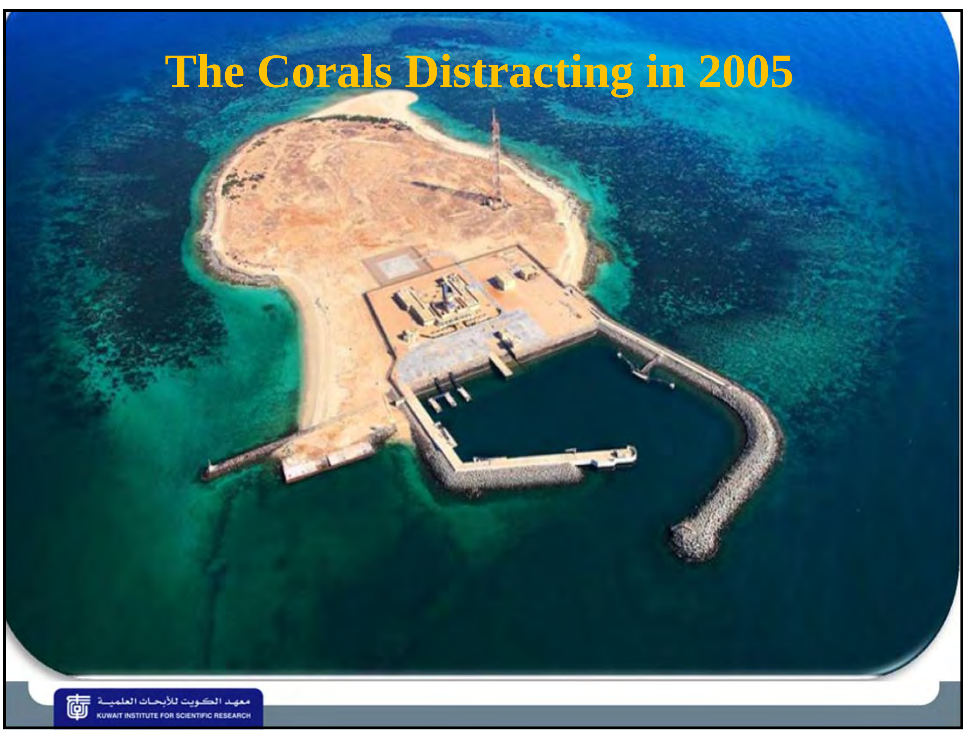

Sediment Traps for the three island
Umm Almardim
Qaru
Kubbar
Station
The Corals Distracting


Umm Al-Maradim
Island


The Corals Distracting in 2005
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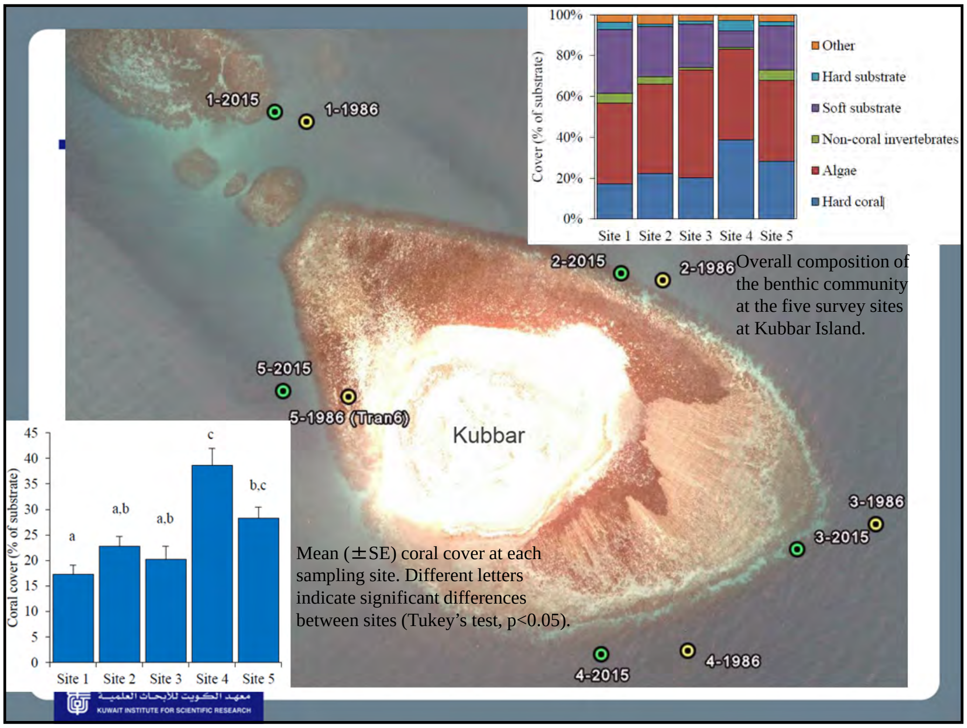


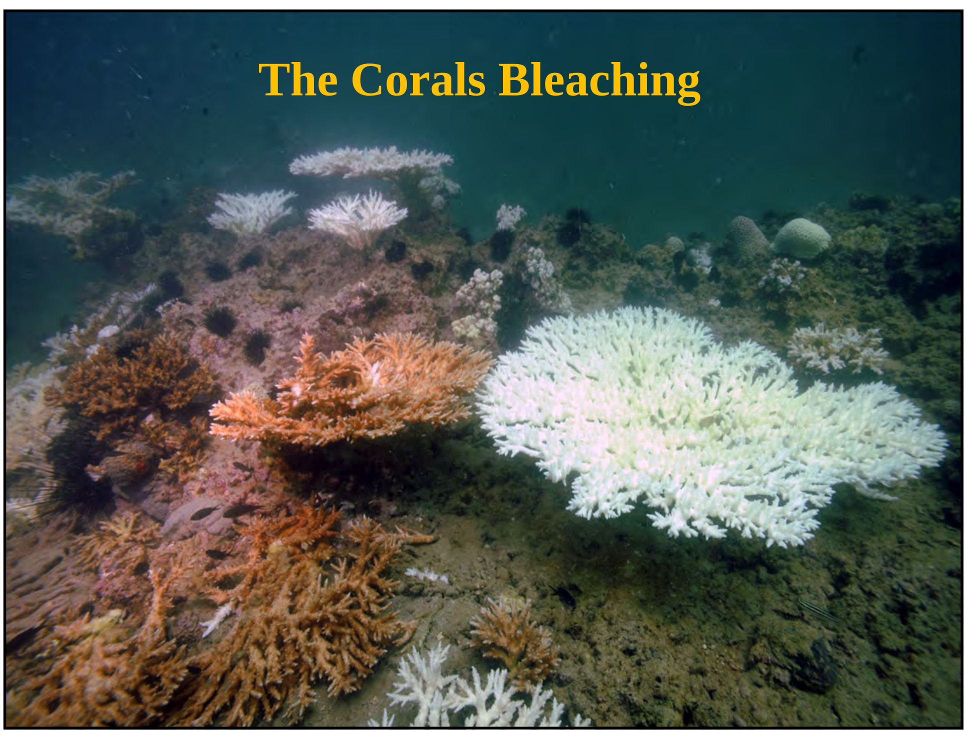
Major benthic categories of living cover Downing (1989) versus in 2005 and 2015 along the reef edge to shallow water at the 3 coral reefs.

There was no significant changes

Kuwait's Coral Reef Reality

Mean % Cover	K1	K2	Q1	Q2	Um1	Um2
Living (1989)	28.0	44.5	41.3	47	34	42
Living (2005)	40 – 55	37 – 28	43 – 56	42 – 32	39 – 59	14 - 47
Living (2015)		25				


The Corals Bleaching
2010, 2016


The Corals Bleaching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The Corals Grazing
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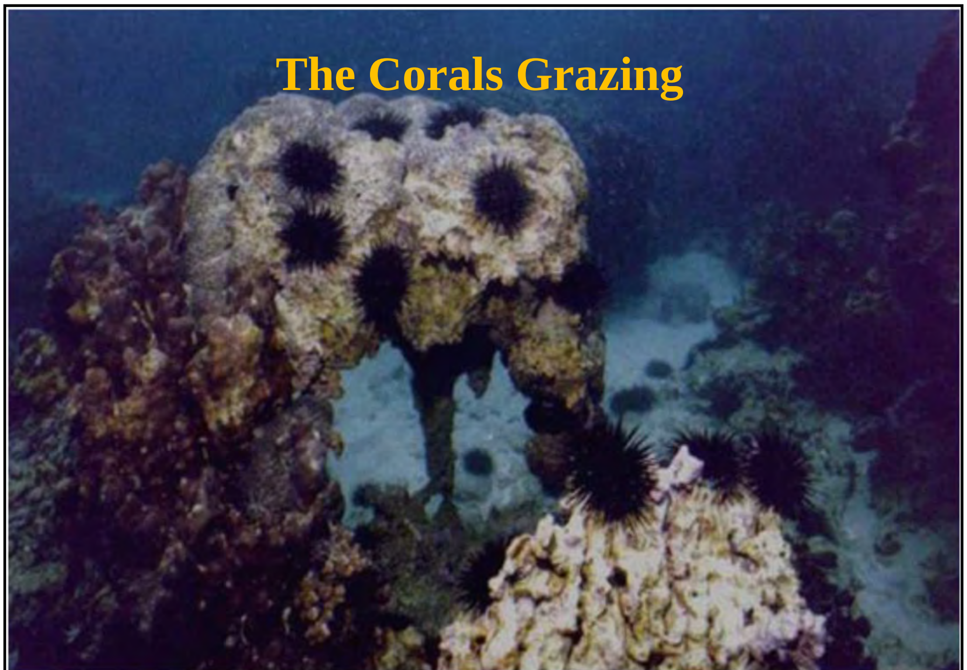
The Corals Grazing



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The Corals Distracting

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The Destruction of Coral Reefs
معهد الكويت للأبحاث العلمية
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The Corals Distracting
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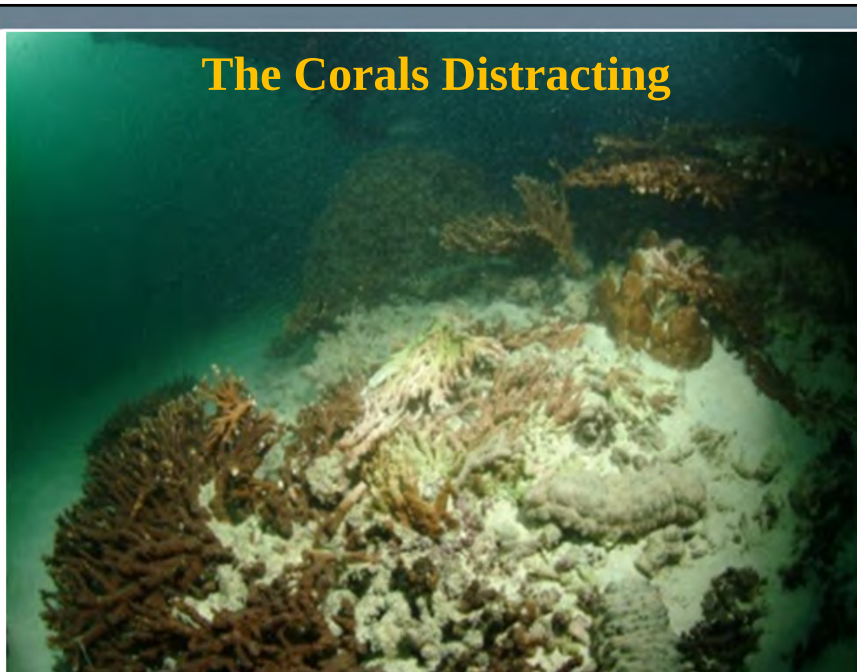
The Corals Distracting


The Corals Distracting

The Corals Distracting

The Corals Distracting



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The Corals Distracting
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The Corals Distracting
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The Corals Distracting


The Corals Distracting

Restoration and Rehabilitation

Professor Peter Harrison; Southern Cross University

Intensive Coral Reef Assessment

↓

Coral Reef Health and Condition

↓

Kubbar's Coral Reef Site Selection

↓

Restoration

Artificial reef
Coral Transplant
Propagation

↓

Kubbar Coral Reef Rehabilitated Model

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Coral's Sexual and Asexual Propagation

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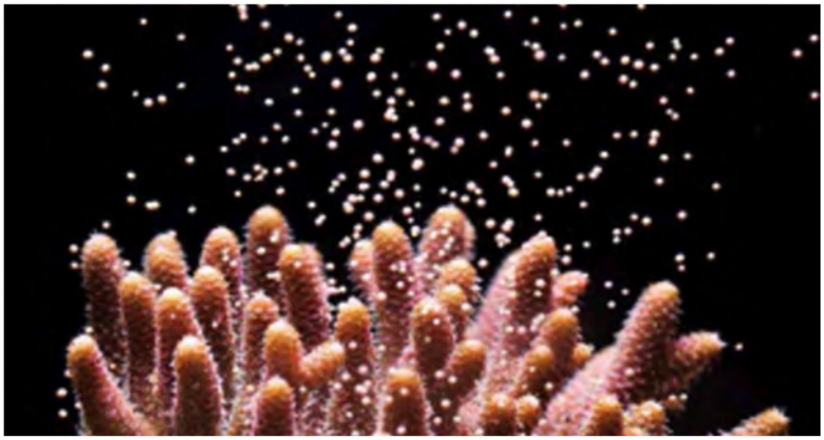
Standing steel rods used to hang coral fragments for asexual propagation.

Four one-ton seawater outdoors holding tanks at shaded area.

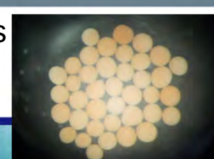
Constituents of the recirculating aquaculture system (RAS).

Gametes collecting tents.

Super Corals



http://www.secore.org/site/newsroom.html



Hatching tents and buckets

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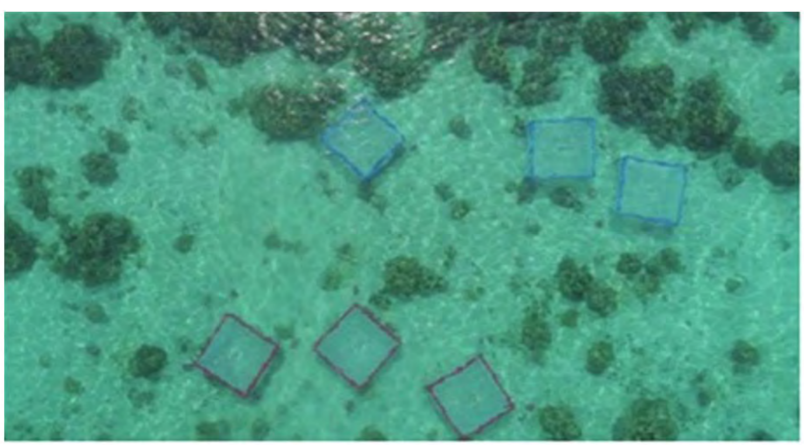
Settlement cages setup



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Coral’s Asexual Reproduction

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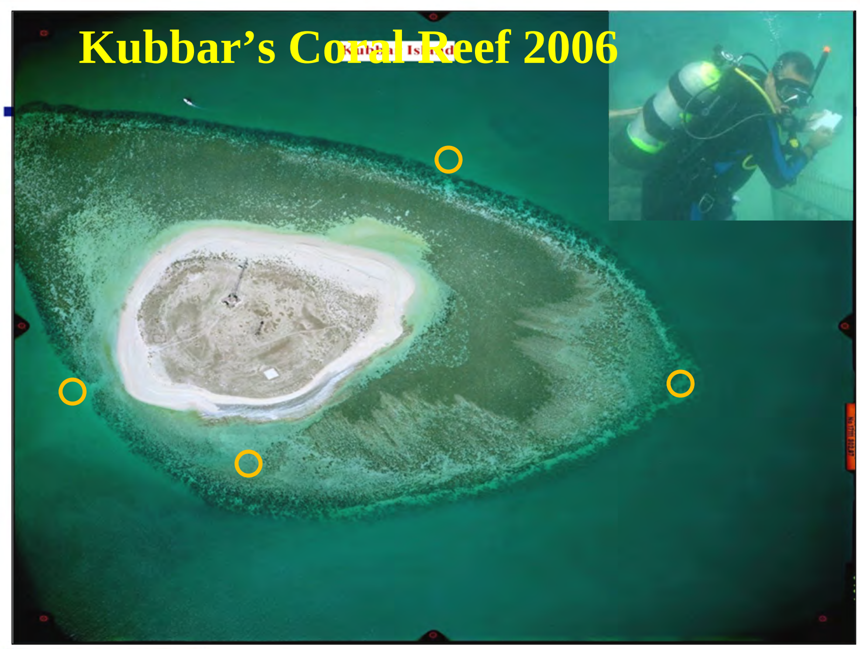
Kubbar’s Coral Reef 2006



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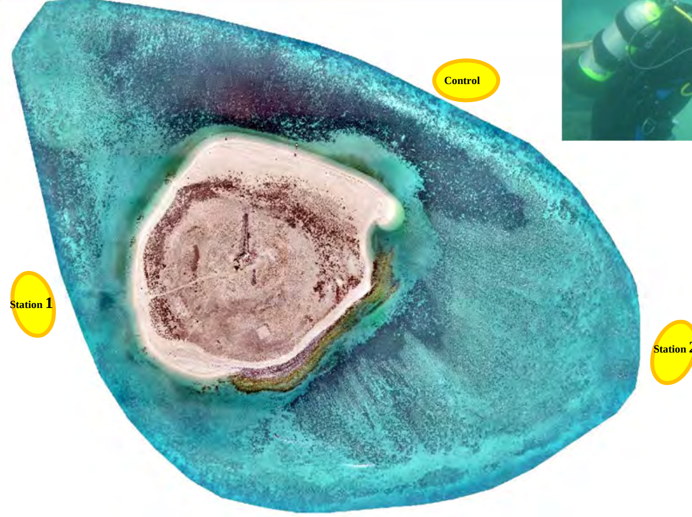
Kubbar's Coral Reef 2016 October



معهد الكويت للأبحاث العلمية
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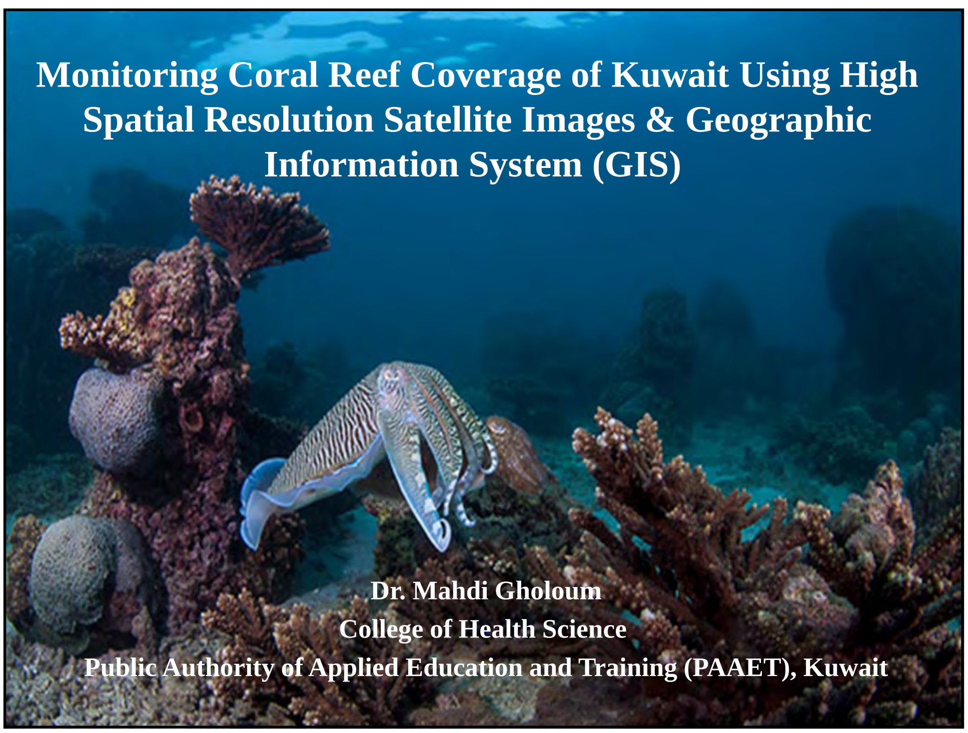
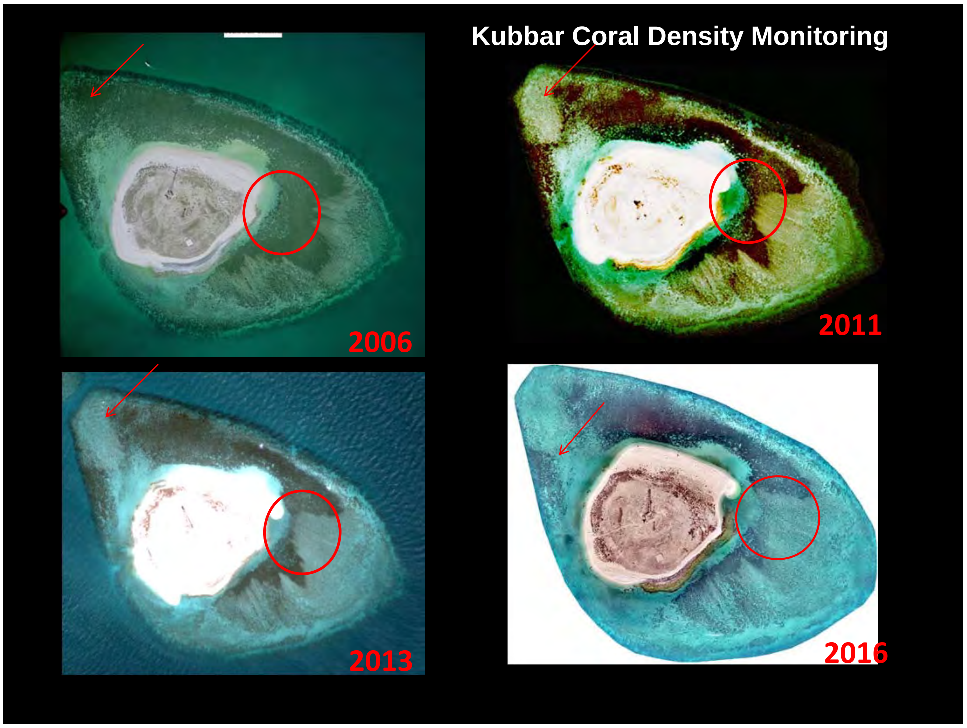
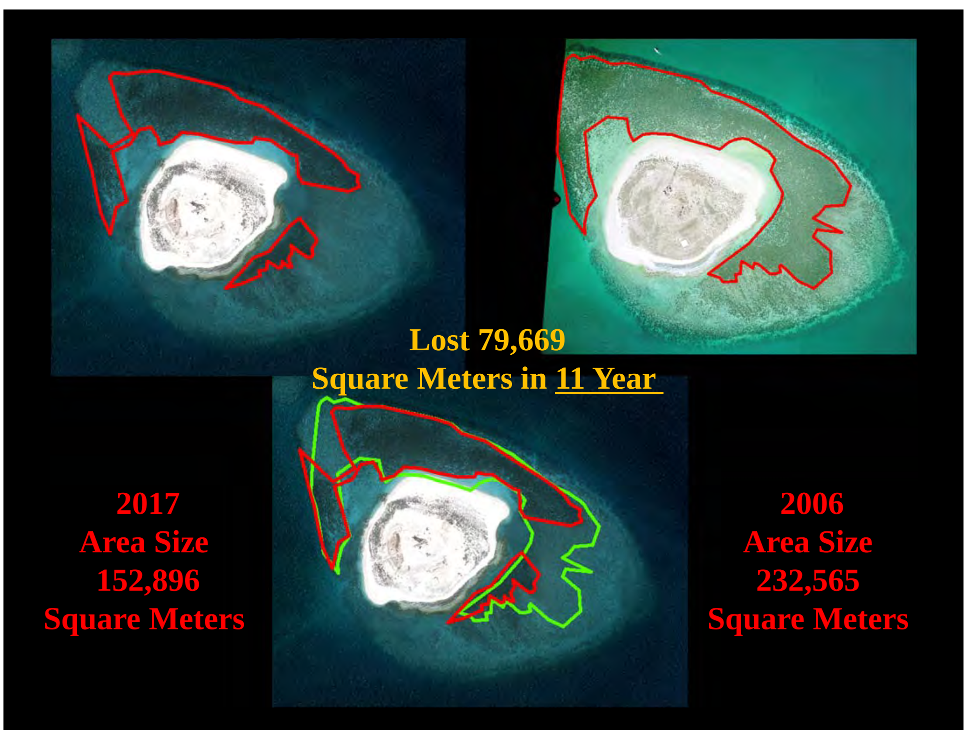


Monitoring Coral Reef Coverage of Kuwait Using High Spatial Resolution Satellite Images & Geographic Information System (GIS)

Dr. Mahdi Gholoum
College of Health Science
Public Authority of Applied Education and Training (PAAET), Kuwait

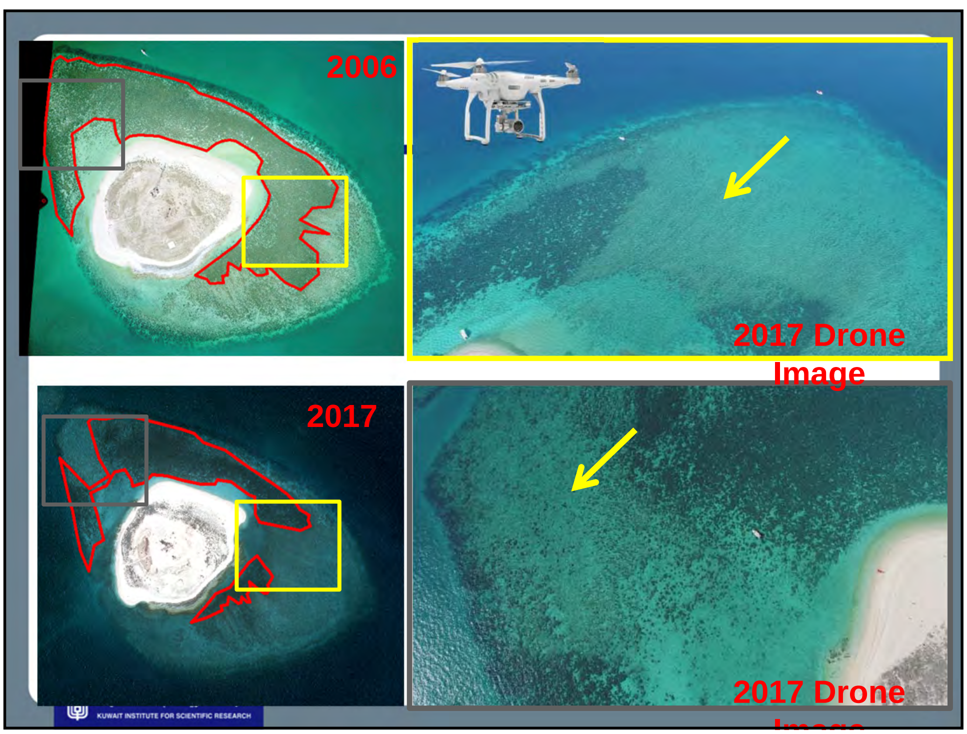

Kubbar Coral Density Monitoring
2006
2011
2013
2016


Lost 79,669
Square Meters in 11 Year
2017
Area Size
152,896
Square Meters
2006
Area Size
232,565
Square Meters

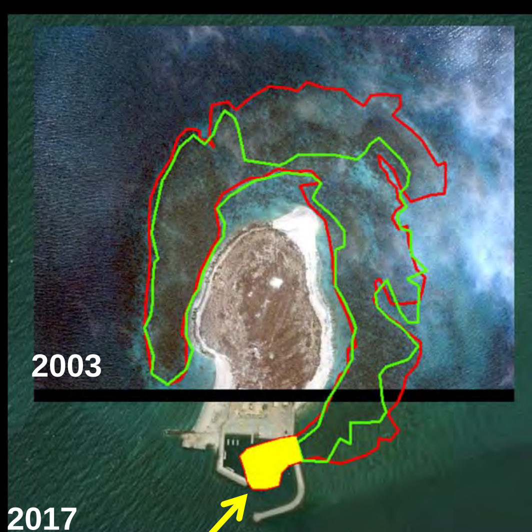
Kubbar Coral Reef Coverage

Years	Area Size (Square Meters)
2006	232, 565
2011	187, 100
2013	171, 488
2016	156, 863
2017	152,896

Lost 79,669
Square Meters in 11 Year



Um Al Maradim Island 2004



Lost 13,750 Square Meters of Coral Reef Area

Um Al Maradim Island

Taylor & Francis Online

Journal
International Journal of Remote Sensing >
Volume 40, 2019 - Issue 12

Submit an article | Journal homepage

Articles

A new image classification approach for mapping coral density in State of Kuwait using high spatial resolution satellite images

M. Gholoum, D. Bruce & S. Alhazeem

Pages 4787-4816 | Received 19 Jan 2018, Accepted 01 Dec 2018, Published online: 07 Mar 2019

Download citation | https://doi.org/10.1080/01431161.2019.1574991 | Check for updates

Recommendations

1. Coral Reef Ecosystem network of interactions between algae, their grazers and coral assemblages Should be Understood with Continued Historical Data.

2. Designate the three coral Islands as marine natural reserve and used as Kuwait's Coral Reef Indicator.

3. Establish periodical development observation program Highlight the Impacted area.

4. Establish a Coral Reef and Fish Rescue Committee.

5. Develop a Plan of Restoration and Rehabilitation


Nature & People
Thank You
KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH


Nature Doesn't Need People But
People Needs Nature
Team Work for the Seek of Environment
Acknowledgment:
KISR & KOC & KEPA & PAAET
Our Duty to Save and Protect Our Coral Reef Ecosystems
For Our Future Generations
معهد الكويت للأبحاث العلمية
KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH

ROPME-JICA Workshop in Kuwait 概要報告

2019.9.27
JICA 専門家チーム

目的:
1) パートナーシッププログラム終了に当たり、今までの総括を兼ね、海洋環境保全に係る地域の取り組み、生態系の再生技術等の情報の更新を行う。
2) 地域共通の課題を再認識する。
3) 今後の地域的な取り組みの一助とすべき、人的ネットワークの構築を行う。

期間:
2019 年 9 月 16 日（月）～17 日（火）

場所：
クウェート国 ROPME 本部会議室

プログラム:
別紙-1 参照

参加者
（詳細は別紙-2 参照）
- ROPME メンバー国参加者: 全 8 か国 23 名
- ROPME: 4 名
- リソースパーソン: 8 名（CEFAS, KISR, MECA, ABFWG, PARI, ISME[1]）
- UN Environment: 1 名
- UN Environment West Asia Office: 1 名
- 在クウェート日本大使館: 2 名
- JICA: 2 名
- JICA Team: 3 名

[1] CEFAS: Centre for Environment, Fisheries and Aquaculture Science, UK
KISR: Kuwait Institute for Scientific Research
MECA: Ministry of Environment and Climate Affairs, Oman
ABFWG: Arabian Blue Forest Working Group
PARI: Port and Airport Research Institute, Japan
ISME: International Society for Mangrove Ecosystem

主な議事

- 開会時に足木大使と 9 月に ROPME の事務総長代理に就任された Dr. Jassem Beshara の同席を得て、開会後休憩時にクウェート環境庁長官 H.E. Sheikh Abdulla Ahmad Al-Humood Al-Sabah の表敬を受けた。
- 専門家チームからは、これまでの活動概要と会議の趣旨の説明とともに、地域で応用できるあろう自然環境保全に係る日本の技術を紹介した。
- UN Environment からは、海洋環境保全に係るポリシーや様々なガイドラインの説明、地域での課題説明があった。
- メンバー国による海洋環境保全への取り組みでは、マングローブ、サンゴ、藻場等に保全への関心が示された。
- 地域的な課題として、マングローブ移植、サンゴの地域的なつながり、情報共有、沿岸環境管理、藻場再生などが共通認識され、それらへのアクションに向けた協議や分科会設置といった提案がなされた。

主な成果

- JICA の技術協力によるオマーンでのマングローブ保全への取組みは、オマーンの担当者からクウェート、バーレーンにも移転されていることが共通認識となり、オマーンとクウェートを軸にした域内での自立的な活動がさらに広がる可能性を示すこととなった。
- ブルーカーボンの理念と活動の紹介により、沿岸生態系保全事業がもつ気候変動対策（緩和と適応）におけるマルチベネフィシャルな面から、政策的、施策的なインセンティブとする狙いは概ね効果をあげたと考えられ、オマーンとバーレーンからは強い関心と今後の協力についての要請があった。
- サンゴの保全に対して、ROPME 海域では最も サンゴ生息域に乏しいイラク、クウェートからもサンゴ保全の取組みに対する関心が高いことが共有でき、特にクウェート KISR での保全、移植に向けた取組みは各国の関心も高く、サンゴの豊富なオマーンなどとともに、域内での自立的な活動の基礎をつくることができたと考えられる。

以上

ROPME-JICA Workshop

Coastal Habitat Conservation and Rehabilitation in ROPME Sea Area
16-17 September 2019, ROPME Secretariat, State of Kuwait

Background Notes and Provisional Agenda

Background and Purpose

Under the ROPME-JICA Partnership Programme, JICA has held several joint-workshops with ROPME, providing Japanese experts to the regional workshops organized by ROPME as well as cooperating with the Ecosystem Based Management (EBM) Strategy Working Group activities. EBM is addressed under the MOU since November 2015 between ROPME and the United Nations Environment Programme (UN Environment).

The Workshop on Development of Marine Environment Conservation Strategy 2050 and Action Plans in Oman – Preparatory Survey for full-scale Project, hosted by the Ministry of Environment and Climate Affairs in September 2017 was the first one organized by JICA under this Partnership Programme in the Region. Besides, two workshops held in Tokyo during October 2016 and December 2018 provided some good opportunities to share the experiences on the conservation of the marine environment and the ecosystem with ROPME Member States. Furthermore, JICA in cooperation with the ROPME Secretariat and the Member States has accumulated a valuable amount of knowledge in the Region through organizing the above workshops and participating in several Regional Task Force meetings.

Since the beginning of this Partnership Programme, JICA has prioritized to contribute to the development of the EBM Strategy in the Region. As such, JICA has been focusing on sharing the technologies and experiences of conservation and rehabilitation of coastal habitats, with a desire to contribute to the conservation and improvement of the marine environment and ecosystem services, such as the fishery resource conservation. On the other hand, through the activities mentioned above, JICA has considered that the coastal habitat conservation and rehabilitation would be the common key aspect for the three prioritized Strategic Directions of ROPME, i.e. EBM, the Marine Biodiversity and the Marine Climate Change.

Aim of the Workshop

This Workshop aims at sharing some '**practical** and **multi-beneficial**' technologies and experiences on marine coastal habitat conservation and rehabilitation, with a view to contribute to the development and implementation of the Action Plans for each ROPME Strategic Direction as mentioned above, and finally to establish a network of Initiatives and Institutions as a bridgehead for future sustainable cooperation.

It is expected that the practical techniques and know-how exchanged at the Workshop will contribute to the development of these Action Plans. For example, habitat conservation and restoration would contribute to the environment sector (biodiversity, ecosystem services, etc.) and the fishery sector (fishery resources, aquaculture, etc.), and also to address SDG14 and Climate Change: blue carbon, etc.

Participation

The Workshop expects participation of two Delegates from each ROPME Member State. ROPME Secretariat, UN Environment, The Embassy of Japan and JICA will also participate and provide resource persons.

別紙-1

Agenda

Day 1: Monday, 16 September 2019		
Time	**Programme**	**Speaker**
08:30 - 09:00	Registration	
Opening Session		
09:00 - 09:40	Welcome Remarks Opening Remarks from ROPME Guest of Honour Remarks Opening Remarks from JICA	– Dr. Jassem Beshara, Acting Executive Secretary, ROPME – Dr. Hassan Mohammadi, Coordinator of ROPME – H.E. Mr. Takashi Ashiki, Ambassador of Japan – Ms. Wakana Hirata, JICA
09:40 - 10:00	Break	
Organization of work		
10:00 - 10:05	- Election of Workshop Chairman and Rapporteur	
Session 1: Workshop orientation		
10:05 - 10:25	Background, reflection on the past activities, purpose and expected outcomes	Mr. Yoichi Harada, JICA Study Team
10:25 - 11:00	Overview of the current status of the coastal habitat and prioritized issues in RSA	Dr. Wahid Mohamed Moufaddal, Dr. Subra Madhavapeddi, ROPME Secretariat
11:00 – 11:20	Break	
Session 2: International background on coastal habitat conservation		
11:20 - 11:50	Policies and strategies on the conservation and restoration of the coastal and marine ecosystems	Mr. Takehiro Nakamura, UN Environment
11:50 - 12:20	Managing the impacts of development on coastal ecosystems in the West Asia Region	Ms. Etaf Chehade, West Asia Office, UN Environment
12:20- 12:40	Discussion: the direction and outcomes of the workshop	Chaired by ROPME Secretariat and JICA Study Team
12:40 - 14:00	Prayer and Lunch	
Session 3: Prioritized issues among the Member States		
14:00 - 14:30	Overview of the tools for the marine environment and coastal habitat conservation shared in the ROPME-JICA Partnership Programme	Mr. Satoshi Sasakura, JICA Study Team
14:30 - 16:10 (including short breaks)	Current status and national priority on the coastal habitat conservation and rehabilitation from technical perspective	ROPME Member States (ca. 10 minutes for each Member State)

Day 1: Monday, 16 September 2019		
Time	**Programme**	**Speaker**
16:10 - 16:30	Developing a State of the Marine Environment Report (SOMER) for Kuwait	Mr. Brett Lyons, Centre for Environment Fisheries & Aquaculture Science, UK
16:30 - 17:00	Discussion: Differences and similarities on the prioritized issues and necessary approaches to address them	Moderated by the Workshop Chairman

別紙-1

Day 2: Tuesday, 17 September 2019		
08:30 – 08:40	Recap of the proceedings of Day 1	Workshop Chairman
Session 4: Blue carbon as the multi-beneficial approach		
08:40 - 09:00	Blue carbon and its actual cases of application	Mr. Takehiro Nakamura, UN Environment
09:00 – 09:20	Integrated approaches to conservation and management of coastal ecosystems providing multi-benefits for people	Dr. Noriaki Sakaguchi, JICA
09:20 – 09:40	Roles of blue carbon ecosystems in climate change measures and blue infrastructure	Dr. Tomohiro Kuwae, Port and Airport Research Institute, Japan
09:40 - 10:00	Blue Forests of the Arabian Peninsula: Update on activities and findings	Ms.Jane C. Glavan, Arabian Blue Forests Working Group (ABFWG)
10:00 – 10:30	Discussion: Potential approaches to the blue carbon in the region	Plenary (Chaired by Member States)
10:30 - 11:00	Break	
Session 5: Practical activities for the Regional network		
11:00 - 11:30	Our ongoing mangrove activities focused on SDGs	Dr. Shigeyuki Baba, Professor Emeritus of University of the Ryukyus, Japan, International Society for Mangrove Ecosystems
11:30 - 11:50	Case study: Mangrove conservation in Oman and its relevance to the Region	Mr. Bader Al Bulushi, Ministry of Environment and Climate Affairs, Sultanate of Oman
11:50- 12:10	Kuwait's coral reefs restorations	Dr. Shaker H. Al Hazeem, Kuwait Institute for Scientific Research (KISR)
12:10-12:40	Short presentations on habitat conservation and rehabilitation from participants	Participants (5 minutes for each person)
12:40-13:30	Discussion and wrap-up: networking, future collaboration	Plenary moderated by the Workshop Chairman
13:30	Closing of the Workshop	ROPME and JICA
14:00	Lunch	

別紙-2

Workshop on Coastal Habitat Conservation and Rehabilitation in the ROPME Sea Area
Kuwait, 16-17 September 2019

List of Participants

(Omitted)

別紙-2

Sl No.	Names (s)	Country
29.	Dr. Shigeyuki Baba	ISME
30.	Mr. Takehiro Nakamura	UN Environment
31.	Ms. Etaf Chehade	UN Environment, West Asia Office
32.	H.E. Mr. Takashi Ashiki	Embassy of Japan
33.	Mr. Masaki Shimoi	
34.	Ms. Wakana Hirata	JICA
35.	Dr. Noriaki Sakaguchi	
36.	Mr. Yoichi Harada	JICA, Study Team
37.	Mr. Satoshi Sasakura	
38.	Mr. Kazuhiro Yoshida	
39.	Dr. Hassan Mohammadi	ROPME
40.	Dr. Wahid Mohamed Moufaddal	
41.	Dr. Subra Madhavapeddi	
42.	Dr. Ramaraju Sudarshana	

Note: * **Names with bold letters are for additional certificate Printing.**