

How Oceans- and Seas-related Measures Contribute to the Economic, Social and Environmental Dimensions of Sustainable Development:



Local and Regional Experiences



Oceans and Law of the Sea
Division for Ocean Affairs and the Law of the Sea



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Note

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B. Foreword



Oceans and seas are crucial to sustainable development as they contribute to all aspects of our life on this planet. Although they provide numerous economic, social and environmental benefits, oceans and seas are facing a multitude of local and global challenges caused by human activity and climate change. These include unsustainable extraction of marine resources, ocean acidification, alien invasive species and marine pollution, to name only a few. As a consequence, the state of the oceans remains alarming.

The international community has made attempts to respond to this challenge. At the Rio+20 Conference, Member States pledged to protect and restore the health, productivity and resilience of oceans and marine ecosystems, and to maintain their biodiversity. They set forth forward-looking, interconnected and integrated actions in several areas, including the full implementation of international legal instruments by States parties.

The present e-publication is a contribution to a growing collection of studies on how to conserve and sustainably manage the resources of the oceans and seas to foster sustainable development. It contains a selection of successful local and regional examples of oceans- and seas-related measures from around the world. In particular, the publication seeks to illustrate how these measures were able to contribute to all three dimensions of sustainable development with benefits not only for the environment, but also for local communities and national economies. I hope that this will encourage stakeholders to further the implementation of sustainable oceans- and seas-related measures. The e-publication can also provide useful background information for ongoing discussions conducted by stakeholders in relation to oceans and seas, including in the context of the Open Working Group on Sustainable Development Goals and the upcoming Third International Conference on Small Island Developing States¹, where the topic of oceans and seas is expected to figure prominently.

I would like to thank the Division for Ocean Affairs and Law of the Sea (UN-DOALOS) of the United Nations Office of Legal Affairs (OLA), the International Atomic Energy Agency (IAEA), the International Maritime Organization (IMO), the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the World Tourism Organization (UNWTO) for their valuable contributions, and we acknowledge colleagues who made this publication possible.

Much work still needs to be done over the coming years. It is our common responsibility to ensure healthy, resilient and productive oceans and seas. Going forward, promoting the conservation and sustainable use of oceans and seas through adequate measures will be crucial to their health and productivity and will require the participation of all stakeholders. Let us all together face this challenge for the benefit of current and future generations.

Mr. Nikhil Seth

*Director, Division for Sustainable Development,
United Nations Department of Economic and Social Affairs*

¹ 01-04 September 2014 in Apia, Samoa - www.sids2014.org

C. Introduction¹



In the Rio+20 outcome document, *The future we want*, Member States stressed the importance of “the conservation and sustainable use of the oceans and seas and of their resources for sustainable development, including through their contributions to poverty eradication, sustained economic growth, food security and creation of sustainable livelihoods and decent work, while at the same time protecting biodiversity and the marine environment and addressing the impacts of climate change”².

Oceans cover more than two-thirds of the earth’s surface and contain 97% of the planet’s water. They contribute to poverty eradication by creating sustainable livelihoods and decent work. Over three billion people depend on marine and coastal resources for their livelihoods. Oceans are crucial for global food security and human health. As a valuable source of nutrition globally, fish provide 4.3 billion people with about 15 per cent of their intake of animal protein. In addition, oceans are the primary regulator of the global climate, capture and store about 30% of carbon dioxide produced by humans, and provide us with water and the oxygen we breathe. Oceans also host huge reservoirs of biodiversity.

¹ Please refer to the *TST Issues Brief on Oceans and Seas* prepared by the UN System Technical Support Team (2013) in support of the Open Working Group on Sustainable Development Goals for further information. Available at: <http://sustainabledevelopment.un.org/owg.html>.

² A/RES/66/288 (2012): *The Future We Want* – Outcome Document of the Rio+20 Conference.

However, there are increasing, complex challenges facing oceans and seas which can be divided into five broad categories:

1. *Unsustainable extraction of marine resources*, including overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices.
2. *Marine pollution*, which originates from a number of marine and land-based sources. More than 80% of marine pollution is derived from land-based sources.
3. *Alien invasive species*, which have been transported into areas where they do not occur naturally, and which can negatively impact native ecosystems.
4. *Ocean acidification and climate change impacts*, which are caused by increasing atmospheric greenhouse gas concentrations. Negative effects of climate change include increased frequency and intensity of weather and climate extremes, ocean warming, sea-level rise, as well as changes in ocean circulation and salinity.
5. *Physical alteration and destruction of marine habitat*, which are caused by unsustainable coastal area development, submarine infrastructure, unsustainable tourism, fishing operations in fragile or vulnerable marine areas, and physical damage from ship groundings and anchors.

In order to face these challenges, adequate and sustainable oceans-and seas-related measures will be important, including through the development of national, regional and global action plans, strategies, policies, institutional and fiscal reforms as well as protocols. They should be undertaken as part of an effective implementation of existing Conventions, agreements and instruments and the bridging of implementation gaps. In this regard, it is recalled that United Nations Convention on the Law of the Sea (UNCLOS) lays down a comprehensive regime of law and order, establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated and need to be addressed as a whole.

The local and regional examples of oceans-and seas-related measures in this e-publication are aimed at the conservation and sustainable use of oceans, seas and their resources while targeting a broad range of oceans-and seas-related challenges. A particular focus was given to how these measures were not only able to support the protection and conservation of the environment, but also contributed to poverty eradication, food security, the well-being of local communities and the prosperity of national economies.

D. Local and regional examples

1. Division for Ocean Affairs and Law of the Sea (DOALOS) of the Office of Legal Affairs (OLA)

a) Introduction to fellowship programmes¹



As an oceans-related measure, capacity-building programmes aimed at the strategic strengthening of human resources can contribute to the economic, social and environmental dimensions of sustainable development.

The challenge: insufficient capacity

As reaffirmed in the Rio+20 outcome document, *The future we want*, the United Nations Convention on the Law of the Sea (UNCLOS) provides the legal framework for the conservation and sustainable use of the oceans and their resources.² The General Assembly has also recognized the pre-eminent contribution provided by UNCLOS to the promotion of the economic and social advancement of all peoples of the world, in accordance with the purposes and principles of the United Nations as set forth in the Charter, as well as to the sustainable development of the oceans and seas.³ *The future we want* reaffirmed that building the capacity of developing countries is essential to enable them to benefit from the conservation and sustainable use of the oceans and seas and their resources.⁴

¹ E-mail: germani@un.org

² A/RES/66/288 (2012): The Future We Want – Outcome Document of the Rio+20 Conference, paragraph 158.

³ A/RES/68/70, currently available as A/68/L.18 (2013): Resolution on Oceans and the law of the sea.

⁴ A/RES/66/288 (2012): The Future We Want – Outcome Document of the Rio+20 Conference, paragraph 160.

In the context of the implementation of UNCLOS and related instruments at all levels, with a view to advance sustainable development, capacity-building can empower individuals, institutions and entire societies. Individual capacity-building aims at addressing major obstacles to the sustainable development of oceans and seas such as inadequately qualified staff at the national/regional levels, lack of incentives for dedicated staff, non-continuity of trained personnel and turnover of staff leading to loss of knowledge and expertise.

Capacity-building programmes

The Division for Ocean Affairs and the Law of the Sea (DOALOS), Office of Legal Affairs, places great emphasis on its capacity-building activities, including through provision of advisory services; administration of trust funds; organization of briefings and training programmes; preparation of publications; maintenance of databases; administration of fellowship programmes; and dissemination of information through its website.

DOALOS manages two fellowship programmes that provide human resource development customized for individuals from developing States, in the context of specific and clearly identified needs at the national and regional levels:

United Nations–The Nippon Foundation of Japan Fellowship Programme: The Programme was established in 2004 through a trust fund project agreement for Human Resources Development and Advancement of the Legal Order of the World's Oceans with funding provided annually by The Nippon Foundation of Japan. The objective of the Programme is to provide, on an annual basis, advanced research opportunities in the field of ocean affairs and the law of the sea and related disciplines to Government officials and other mid-level professionals from developing States. It aims at providing the necessary knowledge and skills to assist developing States to formulate comprehensive ocean law and policy, and to implement UNCLOS and related instruments to achieve the sustainable management of their ocean spaces, resources and activities. So far, the Fellowship Programme has awarded 100 fellowships to individuals from 64 States (with female-male ratio of 44:56) and has established an Alumni Programme to provide a global dynamic platform that serves the evolving capacity and networking needs of the alumni as they progress through their careers.

Hamilton Shirley Amerasinghe Memorial Fellowship: The Fellowship was established by the General Assembly in 1981,⁵ in memory of the late Hamilton Shirley Amerasinghe and in recognition of his contribution to the development of the law of the sea. The Fellowship is intended, primarily, for Government officials as well as research fellows or lecturers who are involved in ocean law or maritime affairs, or related disciplines. Its purpose is to assist candidates to acquire additional knowledge of UNCLOS, in order to promote its wider appreciation and application, and to enhance specialized experience in those fields. The Fellowship has awarded 29 fellowships to individuals from 26 States (with female-male ratio of 13:16).

⁵ See General Assembly resolution 36/108 on the United Nations Programme of Assistance in the Teaching, Study, Dissemination and Wider Appreciation of International Law (10 December 1981) and General Assembly resolution 36/79 on the Third United Nations Conference on the Law of the Sea (9 December 1981).

The fellowship programmes are raising a generation of ocean leaders with expertise relating to the international legal framework for oceans and seas, as well as to the sustainable development of oceans and seas, including integrated oceans policies, sustainable resource management, environmental protection and identification of capacity gaps. They offer an individualized and demand-driven programme of research, based on the specific national or regional problems and needs identified by the fellows and their nominating authorities, with a view to identify feasible solutions to be implemented in a national or regional context.

The fellowship programmes can contribute to individual growth by:

- Advancing the awareness of fellows and enhancing their understanding of key issues in the law of the sea;
- Advancing their skillset, including research, presentation, policy analysis, and report-drafting skills; and
- Forming the basis for their recognition as specialized professionals, for example by becoming a “reference” to others in the field.

Additionally, armed with these skills, the individuals can more effectively participate and influence the organizations and eventually societies in which they operate.

Fellows choose a theme which is studied in a thesis, developed initially through a 3-month placement at UN Headquarters (with DOALOS) and then through a placement in one of over 50 Host Partner Universities. The placement with DOLAOS provides the fellows with the opportunity to develop their research study theme while gaining practical experience within the United Nations system. The placement with a Host University allows the fellows to elaborate and finalize their research under the supervision of one of over 100 professors with expertise in analyzing such themes in a national or regional context.

The fellowship programmes provide a good example of South-South cooperation, both through placement possibilities in a number of Universities located in the global South and through alumni meetings which provide an opportunity to exchange good practices and oceans-related knowledge on emerging issues relating to ocean affairs and effective ocean governance.

The fellowships have had an impact on the fellows’ individual capacity to contribute to national/regional efforts in the field of ocean affairs and the law of the sea, including efforts to promote sustainable development. For example: A fellow from Guatemala⁶ wrote her thesis on The General Fisheries and Aquaculture Law Versus other International Laws related to Fisheries, in an effort to facilitate the undertaking of modifications to the General Fisheries and Aquaculture Law of Guatemala and its regulation. Her thesis has been used as a basis to undertake other related studies on Guatemala fisheries legislation and it was used as a frame of reference for consultants who worked on relevant legislation in Guatemala.

⁶ Ms. Bryslie Cifuentes–Velasco, Guatemala, Fellow 2008-2009. Testimonials from other fellows can be found at: <http://www.unfalumni.org/testimony>.

In addition to her position as Legal Adviser to the Ministry of Agriculture, Livestock and Food in the Directorate of Fisheries and Aquaculture, the skills and knowledge regarding the law of the sea acquired during the fellowship, allowed her to become a Professor of Law of the Sea, Special Areas of International Legislation and International Fisheries Law, at the Faculty of Law and at the School of Social and Political Studies, at the Francisco Marroquin University of Guatemala. Further, she was appointed as Commissioner for Guatemala at the Inter-American Tropical Tuna Commission and member of the Fishery and Aquaculture Regulation Group part of the Organization for Fisheries and Aquaculture Sector of the Central American Isthmus. In her view, it is important to continue to form specialized professionals in the law of the sea, and help them to obtain key positions in government, to ensure that countries implement a policy aimed at sustainable development of the oceans.

Case studies contributed by alumni of the fellowships programmes

The following case studies demonstrate how capacity-building at the individual level can have an impact on national and regional oceans-related efforts, thus contributing to the economic, social and environmental dimensions of sustainable development in the respective country or region.

b) Case Study 1: The development of mariculture activities as an alternative livelihood option for coastal communities: Milkfish farming in Kilwa and Mtwara districts, United Republic of Tanzania

[By Gloria Yona¹, Tanzania Fisheries Research Institute (TAFIRI) (Fellow 2010 - 2011) and Aviti John Mmochi², Institute of Marine Science, University of Dar es Salaam (Fellow 2010-2011)]



i. The challenge

Capture fishery is a major economic activity for coastal communities in the United Republic of Tanzania (URT), but unsustainable fishing practices have resulted in the decline of fish quality and quantity. For instance the fish catch per fisher has decreased from 3.6 tons/year in 1983 to 1.4 tons/year in 2011. Box 1 illustrates the impacts of overfishing in the Bagamoyo district. The population in URT has been increasing tremendously from 6 million people in 1961 (Independence of Tanganyika) to 44.9 million in 2012. The population density is higher in coastal areas compared to other places in the country. For instance, Dar es Salaam City is leading with 1,793 people/m² followed by Urban West Region, Zanzibar with 1,700 people/m². With the increase in population, the number of fishers and other users of coastal resources contributing to overfishing and using destructive fishing gears increased.

¹ E-mail: glokavia@yahoo.com

² E-mail: mmochi@ims.udsm.ac.tz

The open access policy in URT, which allows licensed artisanal marine fishers to enter and practice fishing anywhere in the territorial waters, has encouraged and increased the fishing efforts and reduced the sense of ownership by local fisher communities. This accelerated the use of destructive gear, which in turn affected fish habitats, breeding grounds and nursery grounds. Dynamite fishing, an illegal practice in Tanzania by law, is extremely destructive to the surrounding ecosystem, as it kills targeted and untargeted organisms and destroys coral reefs and local habitats that support fish life.

Box 1: Overfishing in Bagamoyo district

A study conducted in Bagamoyo, Tanzania in 2010 showed that marine resources were severely threatened by human activities like overfishing and the use of illegal and destructive fishing gears as well as the depletion of mangrove forests. The district's artisanal catches were declining drastically as fish stocks were collapsing. Poverty was escalating in these fishing communities, worsening economic well-being and increasing time at sea. Today, finfish farming behind the mangroves in Bagamoyo and elsewhere is aimed at giving alternative livelihood to harvesting the marine resources. This will reduce the fishing pressure and facilitate the recovery of fish stocks. Furthermore, Tanzania has developed very strong policies and enforcement on fisheries, including regulation of the minimum allowed fish size of 2.5 inches (6.25 cm) as another measure aimed at improving fish stocks.

Source: Mkama, W. et al, Fisheries Value Chain Analysis, Bagamoyo District, Tanzania, 2010.

The limited number of alternative income generating activities for coastal people and the high dependency on coastal resources for their livelihood leads to a resulting overexploitation of marine resources. Mangrove and coastal forest cutting for charcoal production, pole building, and fuel wood, affects marine and coastal ecosystems that are important breeding, feeding, hiding and nursery grounds for both marine and terrestrial fauna. Coral mining, for corals used as building material (lime) for local buildings and trade, destroys live corals and affects marine organisms that are dependent on corals. Like mangroves, these corals are important breeding, nursery, feeding and hiding grounds.

ii. Oceans-and seas-related measures undertaken

To counter these trends, the Government introduced conservation measures, including marine parks, reserves and protected areas, in the 1960s and started implementing them in 1974. By 2008, 17 marine protected areas had been established.³ The need for sustainable use of the country's natural resources as a means to alleviate rural poverty was emphasized in URT's National Strategy for Growth and Poverty Reduction of 2005, which is the country's overarching framework for policy dialogue and formulation. The Strategy regards environmental conservation as a means for reducing the vulnerability of the poor. Accordingly, the Government and other stakeholders introduced mariculture activities as alternative income-generating activities for coastal communities to improve coastal communities' livelihoods.

This case study focuses on mariculture groups funded by the Marine and Coastal Environment Management Project (MACEMP) launched in 2005 in the Kilwa Mtwara District, and the Regional Programme for the Sustainable Management of the Coastal Zones of the Indian Ocean (ReCoMaP) launched in 2006 in the Mtwara District.

³ World Bank indicators: www.tradingeconomics.com/tanzania/marine-protected-areas-number-wb-data.html

A total of 13 community groups in Kilwa District were funded by MACEMP and 15 groups in Mtwara rural District were funded by ReCoMaP to promote milkfish farming. Awareness-raising meetings on mariculture promotion were conducted in coastal communities in each district. Groups of villagers elected leaders, which were mainly chairpersons, secretaries and treasurers. The MACEMP provided 80% of the project budget whereas 20% was contributed by group members in cash or in kind (e.g., labour charges for pond construction).

The different groups in the Kilwa and Mtwara Districts were trained in site selection, suitable soil types and pond construction, pond fertilization and feeding, stocking and pond management, harvesting, and marketing. ReCoMaP worked with trainees over a span of two years to develop a 1 hectare farm, divided into 6 ponds for demonstration purposes, which was used as farmer field school. The farmers were encouraged to develop their own ponds and an incentive package was developed in the form of developing concrete gates for the farms.

A total of US\$ 114,598 was provided by MACEMP and US\$ 50,749 was provided by ReCoMaP in the Kilwa and Mtwara Districts respectively for these activities. A total of 182 individuals (120 men and 54 women) in the Kilwa District and 202 individuals (106 men and 96 women) in the Mtwara District participated in these fish farming projects. Before the inception of the projects, indicators were set, which included: improved welfare; improved food security; and enhanced investments and savings. After completion of the projects, the groups were questioned on their perception of mariculture as a means of livelihood improvement.

iii. Impact on the three dimensions of sustainable development

Field visits were conducted in the Mtwara and Kilwa Districts to assess the achievements of the ReCoMaP and the MACEMP based on the set indicators. The relevant officials were consulted to assess their inputs and involvement as well as the possible sustainability of the projects. Brief discussions were held with district project staff and collaborators to assess the different levels of implementation, challenges faced and lessons learned. Group members, both men and women, were selected randomly to assess their perception of mariculture as a potential source of income and how it improved the livelihoods of poor coastal communities.

The interviews provided clear and direct assessment of the beneficiaries' perception of three critical issues in terms of:

- whether there were improvements with regard to the welfare of local communities;
- whether there was an improvement with regard to food security; and
- whether there was an enhancement of investments and savings.

Perception of interviewed groups on welfare improvements

The Kilwa fish farmers of MACEMP acknowledged and appreciated that there had been welfare gains over the last couple of years. Specifically, 41% of the interviewed fish farmers said that they had experienced significant welfare improvement, whereas 44% had experienced moderate welfare gains.

Only 15% percent had noticed no change in their welfare. Government officials reported that about 85% of all projects funded by MACEMP had improved their welfare. These welfare improvements were in the form of improved dietary intake, better capacity to meet household food needs, ability to purchase new assets (e.g., bicycles, motorcycles, home rehabilitation) and the ability to meet student requirements for school (e.g., uniforms, fees). Other indicators of improved welfare were identified by communities as being important for their well-being, though not necessarily at the household level. These included improved social cohesion, including through contribution to various community-related social events, which was seen as being related to improved income. Another welfare improvement mentioned was the learning of alternative livelihood activities.

Improved food security

Broadly, the concept of food security is built on food availability, where sufficient quantities of food are available on a consistent basis, and food access, where there are sufficient resources to obtain appropriate foods for a nutritious diet. There is a direct and cyclical relationship between poverty and food insecurity, whereby poverty contributes to food insecurity, which contributes to poor nutrition, health, and cognitive development, which in turn contributes to poverty.

MACEMP and ReCoMaP have strategically placed food security at the centre of direct benefits that communities along coastal areas should enjoy as a result of the projects. The interview with group members suggested that the implementation of the fish farming projects has significantly improved the food security in coastal communities. 78% of the interviewed fish farmers in Kilwa acknowledged that it was difficult before the project to guarantee two meals per day, but that after implementation of the MACEMP they were now able to comfortably have three meals a day.

Enhancing investments and savings

Government reports and literature show that in general communities along coastal areas are low saving communities. As part of MACEMP and ReCoMaP, an effort was made to promote a savings and investment culture. In addition, interventions were made to equip coastal communities with tools to better manage social risks and respond to shocks. The key output of this sub-component of the projects was to enable individuals in coastal communities to participate in informal and formal savings and market-driven initiatives. The evaluation of the projects discerned two types of saving opportunities, namely through Village Community Banks (VICOBA) and through Savings and Credit Cooperative Organizations (SACCOs). Out of the 13 groups in the Kilwa District, only 3 fish farming groups had saved at least US\$ 1,000 in SACCOs; however 51% of the interviewed members (both men and women) were actively saving and borrowing from the VICOBA, helping to shape the economic profile and attitudes towards sustainable development in general.

As a result of the ReCoMaP project, farmers in the Mtwara District were able to enhance their revenue from fishing.

iv. Lessons learned

- A focus on the development of alternative livelihoods and the creation or promotion of enterprises vital to the development of the mariculture industry can provide a platform for sustainability.
- Empowering communities with the requisite resources and skills to undertake business ventures enhances their ability to manage projects and further improve their livelihoods.
- Community groups can benefit significantly from project interventions; however, working as a group can sometimes be a problem, especially when production is at a low scale.
- Social capital, in the form of formal and informal networks, is very important for the coastal poor on the path to sustainable development and is an important buffer against downward mobility.
- As the poor climb the economic ladder, it becomes more important for them to be part of economic networks to develop joint interests and access more opportunities. Through exposure to other actors in the chain, harvesters can for example diversify into other activities such as becoming intermediaries between fingerlings consolidators and cage investors.
- Enabling the poor communities to obtain healthy food and sufficient income can reduce their dependence on direct harvesting of natural resources and support environmental conservation which in turn lead to restoration of coastal resources for current and future generations.

References

- Medard M. and Wilson, D.C. (1996): Changing Economic Problems for Women in the Nile Perch Fishing Communities on Lake Victoria. Paper to be presented at the Annual Meeting of the Society for Applied Anthropology, Baltimore, MD 27-31 March, 1996.
- Mkama, W., Mposo, A., Mselemu, M., Tobey, J., Kajubili, J., Robadue, D., Daffa, J. (2010): Fisheries Value Chain Analysis, Bagamoyo District, Tanzania. Coastal Resources Center, University of Rhode Island, Narragansett, RI, 28 pp.
- Mmochi, A.J. (2010): Sustainable Milkfish Farming: Cost-Effective Methods to Increase Food Supply, Incomes and Employment in Mtwara/Lindi, Tanga and Pemba Coastal Communities. Report submitted to WIOMSA vide Contract No: ReCoMaP/07/01/408. 28 pp.
- Mwaipopo, R. N., (2008): The Social Dimensions of Marine Protected Areas: A Case Study of the Mafia Island Marine Park in Tanzania. International Collective in Support of Fish workers (www.icsf.ne). 38 pp.
- National Fisheries Statistics (2011). Annual Statistics Report. Ministry of Livestock and Fisheries Development, United Republic of Tanzania.
- Report (2012): Socio-economic Impact Assessment of MACEMP Supported Projects, Health and Environmental. Report submitted to the Ministry of livestock and Fisheries Development, Tanzania.
- Review of the Implementation of MACEMP Environmental and Social Safeguards Instruments, Health and Environmental Concerns (HEC) Limited (2012), Dar es Salaam.

c) Case Study 2: Ban of queen conch harvesting by fisheries: A recent conservation co-management initiative in Banco Chinchoro, Quintana Roo, Mexico

[By: Liliana Rodriguez Cortes¹, Mexico (Fellow 2011-2012)]



i. The challenge

The Queen Conch (*Strombus gigas*, hereafter conch) is one of the most valuable fisheries of the Caribbean reefs. The Mexican State of Quintana Roo sees the conch as a central marine resource, indicating both its cultural and economic importance to the people of the region. Historically, it represented the most valuable fisheries resource in the Yucatan peninsula after the spiny lobster (*Panulirus argus*), yielding 450 tons of pulp catch per annum in the late 1970s, and some 300 tons of catch during the 1980s. This represented an unsustainable level of pressure on the resource. Since then, the conch fishery has continued to decline to unsustainable levels, particularly in Banco Chincorro, thus threatening economic, social and environmental development in the region.

These effects are particularly felt in the small fishing communities of Xcalak and Mahahual which saw their conch-related income drop drastically. This had a three-fold effect:

- their traditional diets became compromised, resulting in higher food costs and reduced quality of their diets as they shifted to processed and canned food;

¹ E-mail: lilirocor25@gmail.com

- their ability to generate an alternative income from conch shell products for tourism declined significantly; and
- the fishers were compelled to seek alternative food and livelihood sources, sometimes illicit, and often through unsustainable harvesting practices, thereby placing new pressures on marine species such as lobster.

Overall, these effects eroded considerably the socio-economic and cultural fabric of local small fishing communities and placed increased pressures on the marine environment.

ii. Oceans-and seas-related measures undertaken

In 1981, the conch fishery “was informally (no document was signed) assigned to the fishers grouped into [three]² fishing cooperatives and hence [...] became a de facto common property resource”. But by 1983 landings had reached 1,250 tons and the federal Government closed the fisheries for two and a half months; and in 1987 began to regulate the total allowable catch (TAC), setting it to 77 tons per annum. Nevertheless, between 1990 and 1997, the stocks continued to decrease, both in abundance and distribution, particularly in Banco Chinchorro.³

Reinforcing conservation and management measures, the federal Government designated Banco Chinchorro in 1996 as a biosphere reserve in recognition of its significant ecological value. Indeed, Banco Chinchorro is one of the most outstanding marine sites in the wider Caribbean region⁴ and the Secretariat for the Environment, Natural Resources and Fisheries⁵ was mandated by the Government to develop a management plan in consultation with civil society so as to promote the sustainable development of local communities and protect the ecosystem. In order to ensure stakeholder participation in the development of the reserve’s management plan, a technical advisory body⁶ was established two years later, specifically involving the fishing community.

Now engaged within the management plan development process, and increasingly concerned about the sustainability of the fishery, the cooperatives proposed a two-year self-imposed conch harvesting ban in 1997 — an unprecedented action in Mexico. However, poaching continued to place pressure on the resource base and undermined the management regime, rendering measures (self-imposed closures, harvestable size and quota) ineffective and representing a disincentive for the cooperatives to comply. The ban was largely seen as a failure by the fishers due to the Government’s inability to ensure effective surveillance, monitoring and control (SMC). This led to the fishermen withdrawing their proposal for the ban in 1998.

² The three fishing cooperatives are: Andres Quintana Roo, Pescadores de Banco Chinchorro and Langosteros del Caribe.

³ In Banco Chinchorro, the population surveys revealed an alarming decrease from 0.108 conch m² in 1990 to 0.006 conch m² in 1997.

⁴ Banco Chinchorro encompasses over 144,866 ha of a unique reef formation consisting of a false atoll with an inner reef lagoon. It serves as reproduction and breeding refuge for many ecologically and economically important species, the two principle species being the spiny lobster and the queen conch. It is part of the Mesoamerican Barrier Reef System, the second largest barrier reef system in the world. It is a habitat for 96 species of corals, 206 species of fish and 13 species of reptiles, amongst others.

⁵ In Spanish: *La Secretaría de Medio Ambiente, Recursos Naturales y Pesca*.

⁶ In Spanish: *Consejo Tecnico Asesor* (established 17 October 1998).

By 2004, the conch fishery deteriorated to overexploited status, and illegal fishing continued to be the single largest contributing factor to this decline. In 2007, the Mexican General Fisheries Law⁷ was enacted, and codified the role of traditional management frameworks and the Government's obligation to develop community organizations for the purpose of conservation and management of fisheries resources. This legislation formalized the management and conservation role of the fishers' cooperatives operating in Banco Chinchorro making them effectively co-managers of the resources, as opposed to their previous consultative role in the context of the management plan framework. With a reinforced mandate, the fishers of the three cooperatives mobilized themselves to contribute to the management process.

Despite these management measures, the conch population further declined, and in 2008, the federal Government further reduced the TAC to 21 tones which represented 4.6 % of the harvest undertaken 30 years before. By 2009, only 37 licensed boats were harvesting conch in the Yucatan peninsula as a whole. In 2009, stock studies advised that the conch quota for the period 2009-2010 should be between 6 to 10 tons (compared to 45 tons in 1993), with a further recommendation to prepare fishers for a possible closure for the period 2010-2011. These recommendations came in parallel to the passing of a new act establishing annual seasonal closures for the harvesting of conch along the littoral of the state of Quintana Roo, which includes Banco Chinchorro.

Faced with few economic alternatives, or inspired by a renewed sense of conservation purpose, the three cooperatives began to actively take part in the management of the reserve. They participated in several workshops on scientific diving, reef monitoring, and sustainable fishing, and shared experiences with fishermen from other protected areas around Mexico and the wider Caribbean. The cooperatives further undertook a conch conservation project in Banco Chinchorro, aimed at stock enhancement and replenishment through the establishment of a "no-take zone" which is seen as one of the most important management tools for the protection of conch populations. In cooperation with researchers from the federal Government, the fishers relocated conch which did not meet the minimum harvestable size to a conservation zone where they were marked, monitored, and their distribution, density and movements studied.

This co-management project is the first stock recovery initiative for conch in Mexico, and, once again, was a conservation approach initiated by the fishers themselves. Nevertheless, it will take time for this area to be harvestable and the overall conch population is still rapidly decreasing in other zones due to illegal harvesting and habitat degradation. In 2010, following extensive and wide-reaching consultations,⁸ the fishermen from the three cooperatives proposed to extend the Government ban for 5 years, while being granted a twenty-year exclusive concession for conch harvesting if they can demonstrate that they are implementing conservation and, eventually, sustainable fisheries practices. The ban was enacted in November 2012.

⁷ In Spanish: *Ley General de Pesca y Acuicultura Sustentables*.

⁸ Several meetings were held with representation of tourism services, restaurants, scientific community, research institutions, NGO's, SEMAR (Marine Secretary), CONAPESCA (National Fishing Commission), CONANP (National Commission of Natural Protected Areas), municipal and State Authorities.

iii. Impact on the three dimensions of sustainable development

With the proposal of the five year ban, the fishers are now faced with a new reality, the need for: stronger engagement in enforcement activities undertaken by the federal Government, further commitment to repopulation projects, and participation in other conservation programs such as those related to habitat conservation and restoration. The importance of, and the necessary commitment to, the conservation of the conch goes far beyond simple legal provisions.⁹ There are early indications that the above measures have already fostered higher levels of compliance within the coastal fishing communities and even increased participation of fishers in effective surveillance, monitoring and control activities.¹⁰

Economically, the self-imposed ban is a challenge. Alternative livelihoods have become necessary.¹¹ Thus far, community-based alternative livelihood programmes have been focused on:

- Harvesting of live lobster (*Panulirus argus*), which is done in a sustainable way in accordance with legislation aimed at conservation of lobster fisheries.¹²
- Deep-sea snapper fishery, for which all the cooperatives have received support from the Chinchorro Biosphere Reserve in terms of the management of this fishery and equipment such as GPS, fish finders, echo sounders and fishing gear.¹³
- Tourism through the establishment of tourism cooperatives formed by fishers from the fishing cooperatives who have taken courses in conversational English, nature guiding skills, ecology and natural history, fly fishing, scuba diving, bird watching, etc.¹⁴ These courses have been mainstreamed into the National Development Strategy for Conservation and its instruments such as the Program of Rural Sustainable Development and for Temporal Employment.

While many of these initiatives are nascent, some tangible positive effects can be observed with respect to the livelihoods of the communities such as Xclak and Mahahual. From a fisheries perspective, lobster and deep-sea snapper harvests provide a new source of income and seafood for the communities and seem to be well regulated. The gains in the quality of the marine flora and fauna, and the increased emphasis on ecological tourism have also lead to very significant improvements in the communities' livelihoods.

⁹ Personal communication with heads of fishing cooperatives (September 2013).

¹⁰ Interestingly, the United States National Academy of Science notes the approach to SMC "at the Banco Chinchorro Biosphere Reserve is a co-management arrangement in which the ministries of the Navy, of Transportation and Communications, and of the Environment work cooperatively with the World Wildlife Fund (WWF) and fishing communities to support adequate enforcement", National Academy of Science (2008).

¹¹ Personal communication with Gerardo Arreola, President of Fishing Cooperative Andres Quintana Roo (September 2013).

¹² See *NORMA Oficial Mexicana 006-PESC-1993*: For example, harvested lobsters must be more than 13.5 centimeters (5.3 inches) long and cannot be females carrying eggs.

¹³ "In taking this decision of ban, we have full support from the Reserve - they help us with equipment for new alternatives of fishing, training and involve us in temporary employment programmes". Personal communication with Antonio Pad, President of Banco Chinchorro Cooperative (September 2013).

¹⁴ "Now we are dedicated a 100% to other alternatives of fishing and 5 members of my cooperative are also part of the Tourism Cooperative so we all get benefits". Personal communication with Jaime Medina, President of Langosteros del Caribe cooperative (September 2013).

For example, Xcalak has become a world-class fly fishing destination and the local guides control the entire market. It is also a top destination for scuba diving, and the local tourism cooperative has captured a good portion on this market. Mahahual has captured a very significant portion of the south Yucatan scuba diving market and the tourism cooperatives — once fishing cooperatives — have secured exclusive concessions from the federal Government to operate in the Banco Chinchorro Reserve, which is one of the most highly regarded diving destinations of the Caribbean.

Real challenges remain, but this case does provide significant insight into possible approaches to establish meaningful conservation measures through the empowerment of organized coastal communities and the provision of alternative livelihoods.

iv. Lessons learned

- Oceans-related measures can foster higher levels of compliance within the coastal fishing communities and increase the participation of fishers in effective surveillance, monitoring and control activities.
- A sustained long-term buy-in of the coastal communities is required, which implies recognition that their livelihoods are intimately linked to the impacts of their activities on the marine resources.
- A clear legislative and policy framework must be in place to foster community organization and to allow for their full participation in the management of the marine resources as stewards.
- Meaningful alternative livelihoods must be made available to the communities, and these should be an integral part of the national development agenda.
- Effective enforcement measures, including traditional and community-based measures, must back-stop conservation initiatives so as to foster compliance and maintain a sense of the following the right path.

References

- Acuerdo por el que se modifica el similar que da a conocer el establecimiento de periodos de veda para la pesca comercial de caracol rosado o blanco (*Strombus gigas*) en aguas de jurisdicción federal correspondientes al litoral del Estado de Quintana Roo (published 13 February 2009).
- Alberto de Jesús-Navarrete, Alejandro Medina-Quej and José Juan Oliva-Rivera (2003): Changes in the queen conch (*Strombus gigas*) population structure at Banco Chinchorro, Quintana Roo, Mexico, 1990–1997. *Bulletin of Marine Science*, 73(1): 219–229 2003. P. 219.
- CITES (2003): Progress on the implementation of the review of significant trade (phases iv and v). AC19 Doc. 8.3 (Rev.1). Nineteenth Meeting of the Animals Committee: Review of Significant Trade in Specimens of Appendix-II Species (Resolution Conf. 12.8 and Decision 12.75). P. 45.
- Decreto por el que se declara área natural protegida, con el carácter de Reserva de la Biosfera, la región conocida como Banco Chinchorro, ubicada frente a las costas del Municipio de Othón P. Blanco, Estado de Quintana Roo, con una superficie total de 144,360-00-00 hectáreas (19 July 1996).
- De Pescador a Pescador (21-24 marzo 2003): Bahía de Kino Sonora. Buscando mejorar la pesca a través de las reservas marinas.
- Ernesto A. Chávez and Silvia Constanza-Mora (2009): Conceptual framework for estimating annual quotas in Mexican queen conch (*Strombus gigas*) fisheries. *Proceedings of the 62nd Gulf and Caribbean Fisheries Institute*, 2-6 November 2009. PP. 376-382.

- García-Salgado M.A., Nava-Martínez, G.G., Yáñez-Rivera, B., Molina-Ramírez, A., Muñoz-Salcedo, G. (2008): Redoblamiento de la zona de cayo centro con individuos de Caracol Rosado (*Strombus gigas*), para la protección y manejo del recurso por la comunidad de pescadores de Banco Chinchorro. Reporte interno OCEANUS, A.C. – Reserva de la Biosfera Banco Chinchorro. CONANP.
- Increasing Capacity for Stewardship of Oceans and Coasts: A Priority for the 21st Century. Committee on International Capacity-Building for the Protection and Sustainable Use of Oceans and Coasts, National Research Council.
- Instituto Nacional de Pesca (2009): Análisis de biomasa de Caracol Rosado (*Strombus gigas*) en Banco Chinchorro. Estimación de cuota de captura para la temporada de pesca 2009-2010. P. 6.
- Joanne Rebecca Peel and Dalila Aldana Aranda (2012): Growth and population assessment of the queen conch *Strombus gigas* (Mesogastropoda Strombidae) by capture mark-recapture sampling in a natural protected area of the Mexican Caribbean. *Int. J. Trop. Biol.* Vol. 60 (Suppl. 1): 127-137, March 2012.
- Ley General de Pesca y Acuacultura Sustentables (27 July 2007).
- Martha Basurto, Pedro Cadena, Gabriel Escobedo, Fernando Fernández (2005): Evaluación de la Población de *Strombus Gigas* en los Bancos de Cozumel y Chinchorro y Recomendaciones para su Aprovechamiento Sostenible. Instituto Nacional de la Pesca. Centro Regional de Investigación Pesquera de Puerto Morelos, 2005. P. 2.
- Norma Oficial Mexicana 006-PESC-1993 para regular el aprovechamiento de todas las especies de langosta en las aguas de Jurisdicción Federal del Golfo de México y mar Caribe, así como del Océano Pacífico incluyendo el Golfo de California (1993).
- OECD (2006): Agricultural and Fisheries Policies in Mexico Recent Achievements, Continuing the Reform Agenda: Recent Achievements, Continuing the Reform Agenda, 2006. P. 313.
- OECD (2012): Rebuilding Plans in Mexico in Rebuilding Fisheries: The Way Forward. P. 40.
- Secretaría de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP) (2000): Programa de Manejo de la Reserva de la Biosfera Banco Chinchorro. Instituto Nacional de Ecología.
- SEMARNAT/CONANP (2007). Programa de Turismo en Áreas Protegidas 2006-2012.
- Yuself R. Cala, op. cit. P. 646; de Jesús-Navarrete, A., Medina-Quej and J. Oliva-Rivera (2003): Changes in the queen conch (*Strombus gigas*) population structure at Banco Chinchorro, Quintana Roo, Mexico, 1990-1997. *Bull. Mar. Sci.* 73: 219-229. 2003.
- Yuself R. Cala, Alberto de Jesús-Navarrete, Frank A. Ocaña and José Oliva-Rivera (2013): Density and reproduction of the Queen Conch at Cabo Cruz, Desembarco del Granma National Park, Cuba. *Int. J. Trop. Biol.* Vol. 61 (2): 645-655, June 2013.

d) Lessons learned via above-mentioned case studies



- The land-sea interface has ecological, social and economic dimensions and relevant issues should be addressed in an integrated manner;
- Sustained and long-term buy-in from coastal communities in conservation and development efforts is crucial; livelihoods, income and food security are intimately linked to the management of and impacts on marine resources;
- Community organizations and their full participation in the management of the marine resources as stewards need to be codified in law and fostered on the ground;
- Meaningful alternative livelihoods must be made available to the communities, as an integral part of the national development agenda;
- Effective enforcement measures, including traditional and community-based measures, must support conservation initiatives so as to foster compliance and maintain a sense of keeping on the right path; and
- Improving the local economy can potentially create sustainable prosperity for coastal populations and provide an effective means of addressing the root causes of illicit activities, such as armed robbery at sea, piracy and illegal fishing.

2. International Atomic Energy Agency (IAEA)

a) Case study: The impact of ocean acidification in Washington State, USA

[By: Christopher Kavanagh, Lina Hansson, Marc Metian, David Osborn and Michel Warnau, International Atomic Energy Agency (IAEA) Environment Laboratories, Principality of Monaco¹]



i. The challenge

The oyster industry of Washington state, on the west coast of the United States, provides the first documented example of a business sector experiencing direct impacts attributed to ocean acidification; it is also the first sector to adapt to the problem. Production failures due to extreme larval mortality in the Pacific Northwest oyster hatcheries started in 2005, resulting in successive years of decline in production, with as much as 80% losses for a year. This trend continued until corrective actions were taken in 2009. Ultimately, poor water quality attributed to ocean acidification was identified as the cause of the aquaculture production failure.

Definition of ocean acidification

Ocean acidification refers to a lowering of the average pH in seawater. It occurs through chemical changes in the ocean carbon balance. This imbalance is currently driven by the large input of carbon dioxide gas (CO₂) to the atmosphere, which is emitted by human activity for energy production, mainly through combustion of carbon fuels.

¹ E-mail: d.osborn@iaea.org

The CO₂ is subsequently absorbed by ocean surface waters. At this time, human activity is producing 36 billion tonnes of atmospheric CO₂ each year. Approximately 25% of atmospheric CO₂ is absorbed by the ocean annually. As pH decreases (meaning acidity increases) in seawater, the carbonate ion concentration decreases. Carbonate ions (CO₃²⁻) are the carbon form most readily used by marine invertebrate organisms to bind calcium for the production of their shells or skeletal parts. Ocean acidification thus has implications for many calcifying organisms, such as corals, oysters, mussels and many species of plankton, as shell production may become energetically more expensive and pH conditions more stressful metabolically.

The pH of water is represented by a logarithmic scale of 1 to 14, with neutral pH equivalent to 7. While localized variability occurs naturally, current surface ocean pH is, on average, between 8.1 and 8.2 units. A reduction of 1 unit of pH is equivalent to a ten-fold increase in acidity. A decline in mean surface seawater pH has been measured in open-ocean monitoring sites in the North Atlantic and Pacific Oceans for the past few decades. Models project further changes of 0.3 to 0.5 units by the end of the 21st century. Marine geologic data suggests the rate of change currently occurring in ocean carbon is the most rapid chemical change to occur in tens of millions of years.

Other sources of localised acidification may include nitrogen oxides and sulphur oxide gases and organic carbon inputs to marine waters from discharges and runoff from land-based activities.

Impacts of ocean acidification

A rapidly growing number of experiments have been performed in recent years to understand the effects of high CO₂ concentrations in seawater and the concurrent decreases in pH on various types of marine organisms. Efforts have mainly focused on species that produce calcium carbonate shells but have spanned nearly all classes of organisms. More recently, these experiments have been expanded from small laboratory settings to field mesocosm² investigations that include multiple levels of ecosystem components. Although the effects can be complex, some generalizations have been drawn from the results to date.

Primarily, many organisms producing carbonate-based shells or structures are negatively impacted by the ocean acidification effects associated with pH decreases of 0.4 to 0.5 units from current levels (corresponding to conditions expected for the end of this century). Corals, calcifying algae, microscopic calcifying plankton, and shellfish (oysters, mussels, and clams) all produce calcium carbonate shells or structures and have been identified as the organisms that will potentially be most impacted.

Coral reefs are biologically rich and provide a multitude of economic, social, cultural and environmental services to millions of people. Negative effects on corals and calcifying algae, both essential to healthy reef-building, have implications for tropical reef ecosystems. Loss or deterioration of these reefs would in turn impact on their numerous ecosystem services such as shoreline protection, tourism, and productive reef fisheries.

² A mesocosm is an experimental setup in the field that encloses a small part (several cubic meters) of the natural environment and allows studying it under controlled conditions.

The impact of ocean acidification on some organisms, such as phytoplankton, could have far-reaching negative effects on entire food webs. Such effects, causing loss or weakening of shelled parts, have been found in *pteropods* (microscopic plankton that are food for fish and other organisms) and *coccolithophores* (phytoplankton with calcium carbonate shells) which are at the base of complex food webs, therefore potentially leading to a cascading effect along food chains. Negative effects on shellfish will have direct impacts on the availability and quality of harvest by both subsistence and commercial fisheries and aquaculture.

In summary, the biological effects of ocean acidification at the species level could result in significant negative impacts for humans, among others, threatening their subsistence and livelihoods as well as numerous ecosystem services of benefit to them.

ii. Oceans-and seas-related measures undertaken

Production failures in the Pacific Northwest oyster hatcheries starting in 2005 and continuing until corrective actions were taken in 2009 led to the initiation of joint federal and local government, public and private partnerships to support the oyster industry and the communities that depend upon it. The response consisted of several stages; including:

- initial attempts to identify the source of larval oyster mortality;
- emergency federal funding to support scientific research to identify and verify the source of the mortality;
- initiation of immediate actions to adapt to the water quality problem;
- review and recommendation of practical and policy options; and
- adoption of policy for sustained support of adaptation and remediation actions to locally emergent ocean acidification.

After initial in-house attempts to identify the cause of the oyster larvae die-offs, researchers at Oregon State University and the US National Oceanic and Atmospheric Administration (NOAA) were called upon to identify the source of the threat to this highly-valued industry. The Pacific Coast Shellfish Growers Association proposed the Oyster Emergency Project, consisting of collaboration among regional shellfish growers, NOAA, Oregon State University, and The Nature Conservancy. The goal of the proposal was to identify short-term solutions to enhance hatchery production, establish monitoring programs in key estuaries to better understand changes in the environment, and find resilient oyster genotypes and better tools to detect disease-causing bacteria.

The scientific investigations excluded the pathogen *Vibrio*, a known cause of oyster disease, as being the source of the hatchery failures. Instead, the researchers found a high correlation between the water quality associated with coastal upwelling events and the incidence of larval mortality. Northwest United States oyster aquaculture typically uses coastal Pacific Ocean surface water (upper 200 meters) as its seawater source, and water quality is paramount to healthy seafood production.

The water quality correlated with larval oyster mortality included low pH and low CO₃, which is characteristic of the deeper Pacific water that regularly upwells near the coasts. These high-CO₂ waters can be corrosive to shell formation and increase metabolic demand, and are often accompanied by hypoxic conditions.³

Working together, scientists and oyster production business owners implemented monitoring measures to indicate when upwelled waters were entering seawater intake facilities, and when the aquaculture operators should close the valves and use recirculated water to maintain the cultures. A more extreme measure was taken by one oyster farm in response to the failing oyster production of 2008 and 2009, and that was to relocate from Washington State to Hawaii for a more reliable production of shellfish in the island waters.

Local level action – the Blue Ribbon Panel on ocean acidification

The immediate actions above were paralleled by the Governor of Washington appointing a Blue Ribbon Panel of stakeholder representatives to identify long-term adaptive measures and generate recommendations for policy actions in response to ocean acidification. The Panel produced comprehensive reports, both scientific and policy oriented, which incorporated all stakeholder concerns. The response applied state and federal support to a broad Washington shellfish initiative to address oceans-related issues.

The Blue Ribbon Panel recommended a number of key early actions needed in response to ocean acidification in Washington State. These actions fell into six broad categories:

1. reduce carbon dioxide emissions;
2. reduce local land-based contributions to ocean acidification;
3. increase adaptive capacity and remediation of impacts;
4. invest in monitoring and research;
5. inform, educate and engage all stakeholders in responding to ocean acidification; and
6. maintain a sustainable and coordinated focus on ocean acidification at all levels of government.

As a result of the recommendations, the Governor announced that \$3.3 million would be allocated towards priority actions such as helping shellfish hatcheries to adapt to increasingly acidic water conditions and the creation of a new institute at the University of Washington to study ocean acidification, especially its impacts on native species.

As ocean acidification is a global problem, collaboration with international, regional and national partners to reduce carbon dioxide emissions was also identified as a first order action, along with engaging policymakers and key leaders to advocate for these reductions and the protection of marine resources. However, ocean acidification continued to manifest its effects locally, as seen in the Puget Sound and along the Washington coastline, and actions at the local level to curb land-based nutrient and organic carbon inputs that exacerbate water quality problems remain equally important.

³ Hypoxic conditions are conditions of low dissolved oxygen, to a point where it becomes detrimental to aquatic organisms.

National level action – the NOAA Ocean Acidification Program

At the national level, NOAA has become the focal point for ocean acidification research. The Federal Ocean Acidification Research and Monitoring (FOARAM) Act of 2008⁴ mandated that NOAA have an active monitoring and research program to determine the potential impacts of decreased ocean pH and carbonate saturation states. The Ocean Acidification Program Office was established, which seeks to increase the understanding of the impacts of ocean acidification on coastal ecosystems and supports research on the physiological effects on important species and the development of linked geochemical and biological trophic models⁵ to assist regional assessments.

The NOAA Pacific Marine Environment Laboratory has become a hub for developing monitoring efforts for ocean acidification based on networks of observations collected in concert with experiments, field studies, and modelling.

The United States responded to scientific reports of emerging ocean acidification through stepwise implementation of a national policy that includes a regional approach to ocean acidification impacts on coastal resources. This arose from the strategic plan delivered by the Interagency Working Group on Ocean Acidification (IWG-OA) under the direction of the Subcommittee on Ocean Science and Technology in 2009. The IWG-OA includes representatives from NOAA, the National Science Foundation, the Bureau of Ocean Energy Management, Regulation, and Enforcement, the U.S. Department of State, the Environmental Protection Agency, the National Aeronautics and Space Administration, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the U.S. Navy.

The agencies represented in the IWG-OA have mandates to research and manage the resources likely to be impacted by ocean acidification. The group meets regularly to coordinate ocean acidification activities at the federal level to fulfill the goals of the FOARAM Act. The strategic research plan outlines six US regions, namely: Alaska, West Coast, Pacific Islands, Southeast Atlantic and Gulf of Mexico, Northeast, and Great Lakes, and comprises the following six common themes to be addressed in each region:

1. Develop monitoring networks;
2. Analyze organism response, including physiological, behavioral, and evolutionary adaptive capacities;
3. Develop biogeochemical and ecosystem models;
4. Assess human dimensions, including cultural, social, and economic effects of ocean acidification;
5. Provide data and information products;
6. Develop engagement strategies.

⁴ HR 4174

⁵ Geochemical and biological trophic models are mathematical models that take into account geochemical and biological (including food webs) components.

Global level action –From local to global

a. Global Ocean Acidification Observing Network

One of the key infrastructure-related actions recommended by the Blue Ribbon Panel was the establishment of an expanded and sustained monitoring network to measure local acidification conditions and the related biological responses. This recommendation was the course of action adopted in the Washington case, and has now been taken to the international level with the development of the Global Ocean Acidification Observing Network (GOA-ON).⁶

GOA-ON is an international partnership that facilitates the merging of national and regional efforts that monitor ocean areas and the effects of ocean acidification. The aim of GOA-ON is to form a global observing network to:

- document the status and progress of ocean acidification in open-ocean, coastal, and estuarine environments;
- understand the drivers and impacts of ocean acidification on marine ecosystems; and
- provide the spatially and temporally resolved biogeochemical data necessary to optimize modeling for ocean acidification.

Its goal is to identify areas of common concern, optimize the use of resources, and improve data quality and comparability. Two international workshops were convened to establish a coordinated approach for developing an integrated global observing network, and scientists from twenty-eight countries are involved in the ongoing planning phase of GOA-ON. The Executive Council of the network includes representatives from scientific organizations and major ocean acidification research programmes, as well as from the International Atomic Energy Agency (IAEA) and the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

b. IAEA's Ocean Acidification International Coordination Centre

In addition to GOA-ON, the IAEA actively supports ocean acidification research through a number of projects. One of them, the Ocean Acidification International Coordination Centre (OA-ICC)⁷ was announced at the Rio+20 United Nations Conference on Sustainable Development in June 2012 as a response to the increasing concerns of IAEA Member States and leading scientists. Based at the IAEA Environment Laboratories in Monaco, the OA-ICC project serves Member States by engaging stakeholders, including the scientific community, policymakers, media, and the general public, and by facilitating, promoting and communicating a number of global activities on ocean acidification.

⁶ www.pmel.noaa.gov/co2/GOA-ON/

⁷ www.iaea.org/ocean-acidification

In addition to support for the GOA-ON mentioned above, OA-ICC activities include:

- promotion of the use of joint platforms and facilities, and conducting joint experiments;
- collaboration between physical, natural, and social sciences;
- exchange of students and scientists;
- online bibliographic database;
- international data management;
- identification and definition of best practices;
- capacity-building and information dissemination.

The OA-ICC project works in close partnership with IOC-UNESCO, the Food and Agriculture Organization of the United Nations, the United Nations Environment Program, and other United Nations and non-United Nations organizations.

c. IAEA's Coordinated Research Projects and Technical Cooperation Programme

The IAEA supports transfer of knowledge to developing countries through Coordinated Research Projects (CRP) and the Technical Cooperation Programme. The IAEA has for example initiated a CRP to assess regional economic vulnerabilities and to create bio-economic models based on marine fishery components which are changing due to ocean acidification. The project targets ocean areas of coastal upwelling, semi-enclosed seas, and tropical coral reefs, and includes research institutions from the United States and Canada in North America; Chile, Peru, and Brazil in South America; Ghana, Kenya and Namibia in Africa; and from Kuwait and the Philippines.

The CRP attempts to: (1) identify and describe pathways of impact; (2) improve understanding of the vulnerability of regions and markets; and (3) quantify economic impacts to assist natural resource management and policy decisions in relation to ocean acidification on local and regional scales. The assessments and models are needed to develop scenarios of impacts on factors important to food security, livelihoods, ecosystem services, and socio-economic systems of developing and developed countries in the coming decades.

iii. Impact on the three dimensions of sustainable development

Ocean acidification can hamper the life-sustaining and regulating functions of the oceans, threaten marine ecosystems and negatively affect the sustainable development of coastal communities.

In the state of Washington, marine shellfish represent a substantial part of its economic and cultural prosperity. For example, Washington has the highest production of farmed clams, oysters and mussels in the United States, with an annual value of US\$ 107 million. Over 300,000 licenses to harvest clams and oysters from Washington waters provide US\$ 3.3 million in state revenues each year. An estimated 125,000 harvesting trips to Puget Sound beaches produce an annual net economic value of US\$ 5.4 million for the region. The Washington state shellfish growers employ over 3,200 people, either directly or indirectly, and provide an estimated total economic contribution of US\$ 270 million.

More broadly, Washington's seafood industry generates over 42,000 jobs and contributes at least US\$ 1.7 billion to gross state product through profits and employment at neighbourhood seafood restaurants, distributors, and retailers. In addition to the economic valuation, Puget Sound and coastal waters provide invaluable ceremonial and subsistence harvest to the Native American tribes of the state.

While still in early stages, the activities described above, taken at the local, national and global level, are expected to have beneficial impacts for marine ecosystems and coastal communities in the long-term. Conveying ocean acidification science to policymakers and non-scientific audiences is of crucial importance. Key activities include promoting information exchange between scientists, industry representatives, resource managers, and policymakers and organizing forums for interaction. The education of the general public and specific stakeholders to engage coastal resource users and managers in developing community-based solutions can be another integral part of addressing ocean acidification. This was done in Washington state through the Blue Ribbon Panel and town hall meetings.

Internationally, the OA-ICC works in close cooperation with the Ocean Acidification international Reference User Group,⁸ a group specializing in communicating ocean acidification to policymakers and other non-scientific audiences, by producing and disseminating factual bulletins and policy briefs in multiple languages for broad distribution.

iv. Lessons learned

The oceanographic conditions of the US Northwest coast, with CO₂-rich deep waters brought to the surface through upwelling events, were compounded by increasing concentrations of atmospheric CO₂. This resulted in a crisis for the local oyster industry and provided the first clear example of the potential effects of global ocean acidification on marine organisms and the communities that depend on them.

The following lessons learned can be formulated based on this case study:

- The primary mitigation measure for ocean acidification is the reduction of excess CO₂ in the atmosphere; therefore, reductions to the amount of CO₂ produced must be urgently sought and found in order to lessen the impact of ocean acidification in the coming years.
- Cooperation and corrective action should take place at several levels (local/national/regional/global) and involve all stakeholders (business/scientists/governments/UN system/public sector). United Nations organizations, such as the IAEA and IOC-UNESCO, are actively involved in ocean acidification efforts, and the IAEA is facilitating global cooperation on ocean acidification through its Ocean Acidification International Coordination Centre and other projects.
- Although a local and regional problem, the global dimension of ocean acidification requires increased international cooperation and coordination to address and prevent ocean acidification.

⁸ www.iaea.org/ocean-acidification/page.php?page=2198

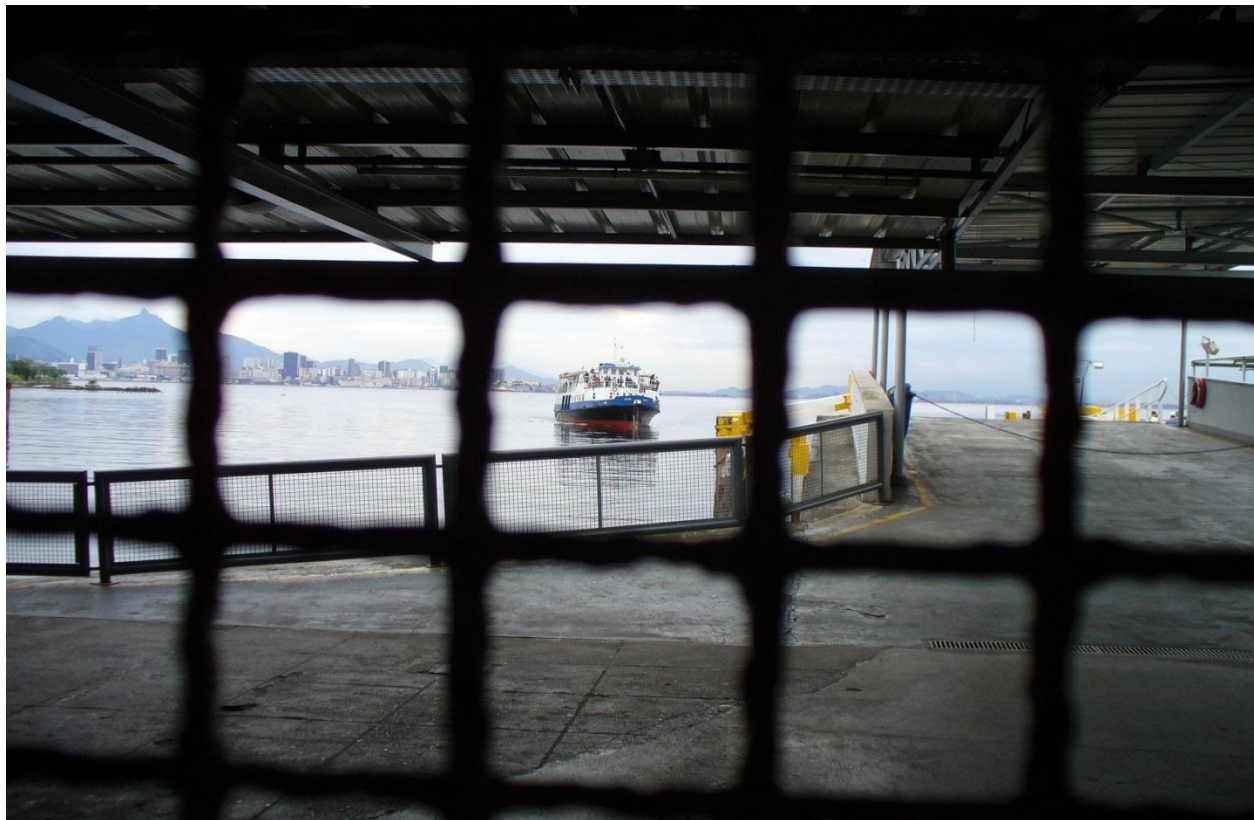
References

- Barton A, Hales B, Waldbusser G G, Langdon C and Feely R A (2012): The Pacific oyster, *Crassostrea gigas*, shows negative correlation to naturally elevated carbon dioxide levels: Implications for near-term ocean acidification effects. *Limnology & Oceanography* 57(3): 698–710.
- Bates N R and Peters A J (2007): The contribution of atmospheric acid deposition to ocean acidification in the subtropical North Atlantic Ocean. *Marine Chemistry* 107: 547–558.
- Caldeira K and Wickett M E (2005): Ocean model predictions of chemistry changes from carbon dioxide emissions to the atmosphere and ocean. *Journal of Geophysical Research*: 110, C09S04, doi: 10.1029/2004JC002671.
- Dore J E, Lukas R, Sadler D W, Church M J and Karl D M (2009): Physical and biogeochemical modulation of ocean acidification in the central North Pacific. *Proceedings of the National Academy of Science U.S.A.* 106: 12235–12240.
- Gattuso J-P and Hansson L (eds) (2011): *Ocean Acidification*., Oxford University Press. 326 pp.
- Global Carbon Budget 2013, by C. Le Quéré, G. P. Peters, R. J. Andres, R. M. Andrew, T. Boden, P. Ciais, P. Friedlingstein, R. A. Houghton, G. Marland, R. Moriarty, S. Sitch, P. Tans, A. Arneeth, A. Arvanitis, D. C. E. Bakker, L. Bopp, J. G. Canadell, L. P. Chini, S. C. Doney, A. Harper, I. Harris, J. I. House, A. K. Jain, S. D. Jones, E. Kato, R. F. Keeling, K. Klein Goldewijk, A. Körtzinger, C. Koven, N. Lefèvre, A. Omar, T. Ono, G.-H. Park, B. Pfeil, B. Poulter, M. R. Raupach, P. Regnier, C. Rödenbeck, S. Saito, J. Schwinger, J. Segschneider, B. D. Stocker, B. Tilbrook, S. van Heuven, N. Viovy, R. Wanninkhof, A. Wiltshire, S. Zaehle (2013): *Earth System Science Data Discussion*. doi: 10.5194/essdd-6-689-2013.
- González-Dávila M, Santana-Casiano J M, Rueda M J and Llinás O (2010): The water column distribution of carbonate system variables at the ESTOC site from 1995 to 2004. *Biogeosciences* 7: 3067–3081.
- NOAA Ocean Acidification Steering Committee (2010): *NOAA Ocean and Great Lakes Acidification Research Plan*, NOAA Special Report, 143pp.
- Ridgwell A and Zeebe R E (2005): The role of the global carbonate cycle in the regulation and evolution of the Earth system. *Earth and Planetary Science Letters* 234: 299–315.
- Santana-Casiano J M, González-Dávila M, Rueda M J, Llinás O and González-Dávila E F (2007): The interannual variability of oceanic CO₂ parameters in the northeast Atlantic subtropical gyre at the ESTOC site. *Global Biogeochemical Cycles* 21, GB1015. doi:10.1029/2006GB002788.
- The Royal Society (2005): *Ocean acidification due to increasing atmospheric carbon dioxide*. Policy Document 12/05. <http://royalsociety.org/document.asp?id=3249>.
- U.S. Department of Commerce, National Atmospheric and Oceanographic Administration (2011): *Fisheries Economics of the U.S. 2009: Economics and Sociocultural Status and Trends Series*.
- Washington Shellfish Initiative (2011): *White Paper*. December 9, 2011.
- Washington State Blue Ribbon Panel on Ocean Acidification (2012): *Ocean Acidification: From Knowledge to Action*, Washington State's Strategic Response. Adelman H and Whitely Binder L (eds) Washington Department of Ecology, Olympia, Washington. Publication 12-01-015.

3. International Maritime Organization (IMO)

a) Case study: Alien invasive species and ballast water management in Turkey

[By Murat Korcak, Antoine Blonce, Aïcha Cherif, Fredrik Haag and Edward Kleverlaan, Marine Environment Division, International Maritime Organization (IMO)¹]



The Republic of Turkey provides an interesting case study. It is situated between the Mediterranean Sea and the Black Sea and findings and initiatives presented will therefore also encompass these two areas.

i. The challenge

Ships carry sea water, called ballast water, in segregated tanks in order to manage their stability, balance and draft. This routine operation of ships provides an opportunity for aquatic organisms to be transported to locations which they would not usually be able to reach by natural means. Three to five billion tonnes of ballast water are transferred by ship worldwide each year. Ships calling into ports in developing countries are among the largest transporters of ballast water, due to the significant exports and imports of bulk commodities. Ballast water can carry thousands of different species of marine plants, microbes and animals at any given time, and when discharged into new environments, some of these exotic travellers quickly establish themselves and multiply in number. Ballast water can thus lead to biological invasions of so-called alien invasive species. Whereas the amount of ballast water is not a parameter that effects the invasions proportionally, the variability of the water quality is significant.

¹ E-mails: mkorcak@imo.org, ablonce@imo.org, acherif@imo.org, fhaag@imo.org, ekleverl@imo.org

Cases of exotic species being introduced into new areas by humans, either intentionally or unintentionally, date as far back as the 13th century. Over time, the increasing ease, speed and frequency of shipping operations have allowed more aquatic exotics to move across geographical boundaries. Today, the bulk of world trade (90% by volume) is transported by ship. The amount of goods loaded aboard ships worldwide has been continuously increasing since the 1970s, and seaborne trade is crucial for the distribution of goods around the world. However, with the significant rise in shipping traffic over the past decades, a number of pressing global environmental, economic and public health challenges has resulted from the introduction of alien invasive species. Box 1 illustrates one of the most devastating alien invasive species invasions to date.

Box1: Comb jelly invasion in the Black Sea

In the early 1980s, the North American comb jelly (*Mnemiopsis leidyi*) was introduced into the Black Sea through ballast water. The comb jelly rapidly established itself by 1989 and the famous peak values of its biomass were obtained in 1995. Weighing 1.5 to 2 kg/m², the comb jelly consumed vast quantities of fish eggs and larvae as well as zooplankton which are commercially important as fish feed. It created one of the worst marine species invasions known to date, causing the collapse of the entire fish stock and resulting in significant economic loss in the region.

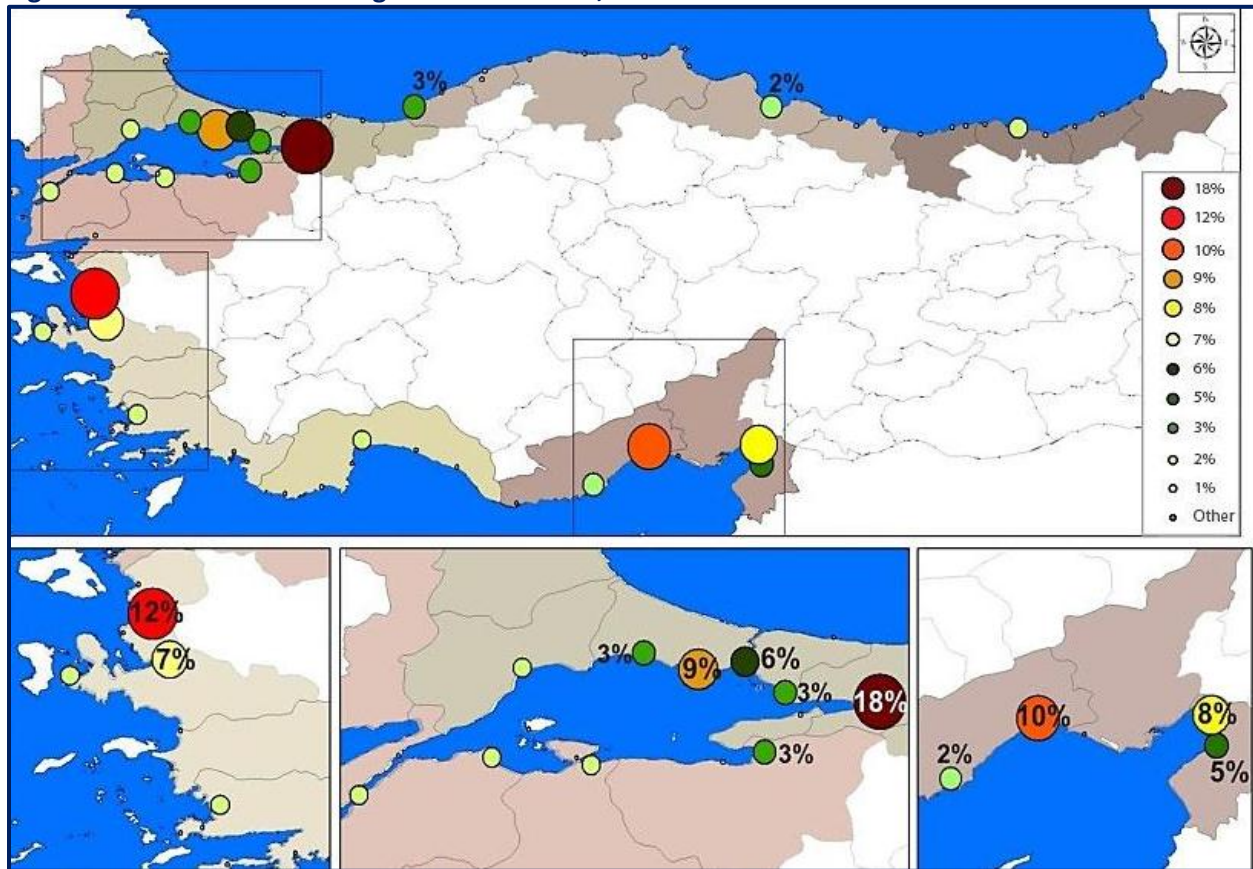
Source: Ministry of Transport, Maritime Affairs and Communications of Turkey, Ballast Water Status Assessment Report for Turkey, 2010.

The introduction of alien invasive species to new marine and freshwater environments through ships' ballast water and sediments is considered to be one of the greatest threats to the world's freshwater, coastal and marine environments. Alien invasive species can disrupt ecosystems; threaten local economies and livelihoods; and cause diseases and even loss of human life. The economic cost from such introductions is huge, currently estimated at US\$ 100 million per year. This underscores the critical importance of preventing the invasion of alien species from ballast water releases in the first place.

Alien invasive species in Turkish waters

Shipping is the main means of transport for Turkey's international trade, representing 87% of all its international trade-related transport. As a comparison, road transport is the secondary means of transport in Turkey representing some 10.7% of its total trade. Turkey is thus a maritime country with more than 175 major ports and 75,000 ship calls. 387.5 million tons of cargo are handled in Turkish ports annually, an increase by 53% over the past 10 years. Adding to this, 7.1 million TEU containers and 350,000 vehicles are annually handled in Turkish ports. Because of the intense marine traffic in Turkish ports, there is an estimated 23 million tons of ballast water discharged annually in Turkish waters. Figure 1 describes the concentration of ballast water discharge in different Turkish ports. The discharged ballast water comes from more than 800 different ports from all over the world; although most are located in the Black Sea and the Mediterranean Sea (see Figure 2). In this context, 66 different invasive species were identified to have been carried by ships to Turkish coasts, including 19 that can be categorized as harmful organisms. In particular, three notorious alien invasive species, namely the comb jellies *Mnemiopsis leidyi* and *Beroe ovate* from the North Atlantic and the sea snail *Rapana Venosa* from the Sea of Japan have been introduced in Turkish waters (see Box 2 for further information).

Figure 1: Ballast water discharge in Turkish Ports, 2010



Source: Ministry of Transport, Maritime Affairs and Communications of Turkey, Ballast Water Status Assessment Report for Turkey, 2010.

Figure 2: Origin of ballast water discharged in Turkey, 2010

Seas	Ballast Water (tonnes)	Percentage
Mediterranean	12,794,422	54%
Black Sea	6,271,615	27%
North East Atlantic Ocean	1,332,463	6%
North West Atlantic Ocean	755,201	3%
Indian Ocean	582,168	3%
South Atlantic Ocean	493,292	2%
North West Pacific Ocean	465,468	2%
East Pacific Ocean	261,882	1%
Red Sea	250,398	1%
Persian Gulf	223,239	1%
Others	160,771	0%
TOTAL	23,590,920	100%

Source: Ministry of Transport, Maritime Affairs and Communications of Turkey, Ballast Water Status Assessment Report for Turkey, 2010.

Box 2: The three most well-known alien invasive species invasions of Turkish coasts, 2010

Comb jelly (<i>Mnemiopsis leidyi</i>)	
Origin:	North Atlantic coasts, South America
Recorded:	Black Sea (1980) Azov Sea, Marmara Sea, East Mediterranean and Aegean Sea It was introduced in the Black Sea in the 1980s, where only one species of comb jelly, the small sea gooseberry <i>Pleurobrachia pileus</i> had been known until then. The first record of it in the Black Sea was in 1982. The most likely cause of its introduction is accidental, via merchant ships' ballast water. By 1989, the Black Sea population had reached the highest level. Subsequently, due to depletion of food stocks resulting in lower carrying capacity, the population dropped somewhat.
Impacts:	In the Black Sea, <i>M. leidyi</i> preys on eggs and larvae of pelagic fish. It caused a dramatic drop in fish populations, notably the commercially important anchovy <i>Engraulis encrasicolus</i> (known locally as <i>hamsi</i> , <i>hamsiya</i> , <i>hamsa</i> , etc.), by competing for the same food sources and eating the young fish and eggs. Biological control was attempted with <i>Beroe ovata</i> , another comb jelly, with some degree of success; it appears as if a fairly stable predator-prey dynamic has been reached.
Comb jelly (<i>Beroe ovata</i>)	
Origin:	United States, North Atlantic coasts
Recorded:	Caspian Sea, Black Sea, Marmara Sea, Azov Sea
Impact:	<i>Beroe ovata</i> is native to the same general region as <i>Mnemiopsis</i> . However, unlike most ctenophores, <i>Beroe</i> shuns crustacean zooplankton and prefers dining on other ctenophores. Interestingly, the primary food for <i>Beroe ovata</i> is <i>Mnemiopsis</i> . Considering that <i>Beroe</i> was first detected in the Black Sea in 1997, this relationship offers one explanation for why <i>Mnemiopsis</i> populations have declined in recent years. It is now thought that purposely introducing <i>Beroe</i> may be a potential solution to the problem of <i>Mnemiopsis</i> in the Caspian Sea.
Sea snail (<i>Rapana venosa</i>)	
Origin:	Japanese Sea, East Chinese Sea, Yellow Sea
Recorded:	France, United States (Chesapeake Bay), Uruguay, Argentina, Adriatic Sea, Aegean Sea, Black Sea
Impacts:	Due to its predatory impact, <i>R. venosa</i> is considered one of the most unwelcome invaders worldwide. <i>R. venosa</i> is an active predator of epifaunal bivalves, and its proliferation results in a serious limitation of cultivated and natural populations of oysters and mussels. <i>R. venosa</i> is a voracious predator, and it is blamed in the Black Sea for the decline of the native, edible bivalve fauna. They have caused significant changes in the ecology of bottom-dwelling organisms and have resulted in the near extinction of the <i>Gudaut</i> oyster. Although scientists are still studying the impacts of <i>R. venosa</i> , they are very concerned about the potential damage it could cause to native species. In the Black Sea, there is no predator for this species. After the 1970's, this species became economically important for Turkey and between 1988 and 1989, 10,000 tonnes of <i>R. venosa</i> were caught. In Turkey, 11 plants were established in order to process and export the meat of this species.

Source: Ministry of Transport, Maritime Affairs and Communications of Turkey, Ballast Water Status Assessment Report for Turkey, 2010.

The introduction of alien invasive species is a serious global challenge, with the potential to affect all three dimensions of sustainable development. It is particularly challenging to tackle a global environmental issue such as alien invasive species, due to the cross-boundary nature of shipping, which in many parts of the world is compounded by insufficient institutional and legal frameworks, a general lack of awareness, limited financial resources, and inadequate regional cooperation.

ii. Oceans-and seas-related measures undertaken

Global efforts

The International Maritime Organization (IMO) has been addressing the issue of alien invasive species since the late 1980s, with the most significant development to date being the adoption in 2004 of the IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments, or simply, the Ballast Water Management (BWM) Convention. The BWM Convention serves as a global legal instrument that helps to address the challenge of harmful aquatic organisms and pathogens in ships' ballast water. It offers a standardized regime for limiting and managing the transfer of harmful aquatic organisms and pathogens through ships' ballast water, by establishing standards and procedures for the management and control of ships' ballast water and sediments. As of April 2014, 38 member states have ratified this Convention, representing 24% of the world tonnage by ship; 35% is necessary for full adoption of the BWM Convention. Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to ship-specific ballast water and sediments management plans. All ships will also have to carry a ballast water record book and an international ballast water management certificate. The ballast water management standards will be phased in over a period of time. As an intermediary solution, ships should exchange ballast water mid-ocean. However, eventually most ships will need to install an on-board ballast water treatment system. Parties to the Convention are given the option to take additional measures which are subject to criteria set out in the Convention and to IMO guidelines.

The Global Environment Facility (GEF), the United Nations Development Programme and IMO, joined forces with IMO member Governments and the shipping industry to pilot the "GloBallast Project" in 2000, which has since evolved into its second phase, the GloBallast Partnerships Programme (also known as GloBallast or GBP).² GloBallast is a project to sustain global momentum in tackling the ballast water problem and to catalyse innovative global partnerships to develop solutions. The aim of GloBallast is to assist developing countries to reduce the transfer of harmful aquatic organisms in ships' ballast water. With the help of tools developed and lessons learned from the pilot project, this programme is working to:

- expand government and port management capacities;
- instigate legal, policy and institutional reforms at national level;
- develop mechanisms for sustainability; and
- drive regional coordination and co-operation.

The project also aims to spur global efforts to develop technological solutions, and to enhance global knowledge management and information exchange to support marine biosecurity initiatives.

² <http://globallast.imo.org>

Regional efforts

The Mediterranean Sea is known to be one of the sea areas that have suffered the most biological invasions of alien invasive species. Research indicates that 903 different alien invasive species have been identified in the Mediterranean Basin. The rate of biological invasions in the Mediterranean continues to be high, estimated at one new species entering the area every nine days. Of these invasions, 21% are believed to have arrived in ships' ballast tanks, but many more have most probably relied on intraregional shipping traffic for secondary spread within the Mediterranean region. The transboundary nature of the issue of alien invasive species requires a regional response, and in the context of GloBallast, countries have come together to enhance capacity-building efforts and awareness-raising, as well as to develop a harmonized regional approach to ballast water management.

A Regional Task Force, with representatives from all Mediterranean littoral states, developed a Draft Mediterranean Strategy on Ships' Ballast Water Management and Invasive Species, which contains a set of strategic priorities, as well as an action plan and a timetable for its implementation. A Mediterranean Harmonized Procedure for Compliance Monitoring and Enforcement was also developed. In 2011, the Mediterranean Strategy was endorsed by the 10th Meeting of Focal Points of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea³ and approved by the UNEP/Mediterranean Action Plan⁴ Focal Points Meeting.



Photo: Regional Task Force Meeting for the Mediterranean Sea, Istanbul, Turkey, 2010.

The Mediterranean Strategy document and its annexes is a good example of how national initiatives can contribute to regional activities and cooperation. Since the issue of alien invasive species, as well as shipping as an industry, is, as explained, truly cross-boundary in nature, the Mediterranean Regional Strategy is also harmonized with the related activities and initiatives in the adjoining regional areas, namely, in the North-East Atlantic (OSPAR)⁵ the Black Sea (Black Sea Commission)⁶ and the Red Sea and Gulf of Aden (PERSGA).⁷

³ www.rempec.org

⁴ www.unepmap.org

⁵ www.ospar.org

⁶ www.persga.org

⁷ www.blacksea-commission.org

Local efforts undertaken in Turkey

Turkey is one of the 15 Lead Partnering Countries of GloBallast and has been part of regional and global efforts to address the issue of alien invasive species. Capacity-building and awareness-raising efforts, and specific scientific studies and projects, have been carried out in Turkey, both under GloBallast and the national programme. Recognizing the impact of alien invasive species, and the need for a more informed risk-based decision-making, the Republic of Turkey initiated a national initiative, commissioning a US\$ 1 million project. This project was executed between the Ministry of Transport, Maritime Affairs and Communications of Turkey and the Scientific and Technological Research Council of Turkey and aimed to produce a synergy between these two public bodies to develop an operational ballast water management strategy and system in Turkey. The project was held in two phases, with the first phase being initiated in 2006, and the second phase in 2010.

Within the framework of the project, an inventory of the shipping activities on the Turkish coasts was developed in the form of a database system in order to quantify the amount of ballast water discharges into Turkish ports and to define the sources of the ballast water. An electronic ballast water reporting system was used for this purpose. In addition, ballast water risk assessment software was developed in order for all Turkish ports to be subject to a risk assessment process based on the GloBallast Risk Assessment Methodology (see Figure 3).

Figure 3: Snap-shot of the risk assessment software of Turkey



Source: Scientific and Technological Research Council of Turkey (Tübitak).

A Geographical Information System (GIS) was prepared and all parameters collected were projected as different layers in the GIS. Furthermore, an invasive species database was produced. All these activities also contributed towards Turkey's participation in GloBallast.

Turkey also organized a pilot implementation of a ballast water management plan in the Port of Botas between 2011 and 2012 with the scope to train Port State Control Officers, enhance the inspection capacity of the port and execute ballast water sampling in high risk ships. During the two years of the pilot implementation, 206 ships were inspected for their implementation of ballast water management plans and 37 of them were defined as high risk ships where ballast water samples were taken. With this pilot study, bottlenecks were identified regarding the national implementation of ballast water management regulations. Also, the capacity of local officers was increased through the training activities undertaken. As a result, the Republic of Turkey started the ratification process of the BWM Convention in order to create the legal basis for its implementation. Turkey prepared the draft national legislation to implement this international treaty, with the continuous support of the GloBallast Partnerships Programme. The Convention has been adopted by the Turkish Parliament in April 2014, opening the way to ratification.

iii. Impact on the three dimensions of sustainable development

It is important to reiterate that once introduced and established, alien invasive species are virtually impossible to eradicate, thus the prevention of the invasion of alien species from ballast water is crucial. Box 3 below illustrates a successful regulation measure undertaken in Canada.

Box 3: The Great Lakes Ballast Water Program, Canada

Costs of the introduction of alien invasive species in the Great Lakes amount to at least \$200 million per year. In 1993, it became mandatory for ships destined for the Great Lakes to exchange ballast water loaded at or near a port with salt water from mid-ocean (at least 200 miles offshore and in water at least 2,000 metres deep). A new measure was added in 2006, namely the requirement that empty tanks be flushed or rinsed in mid-ocean to make sure any leftover organisms were also given the salt water treatment. Intensive inspection and compliance efforts supported these regulations. The first scientific study of this Great Lakes Ballast Water Program reveals that the strategy of ballast water exchange is very effective at protecting waterways from the introduction of new aquatic invasive species, which can have devastating effects on natural ecosystems. Since the introduction of the current regulations in 2006, no new invasive species attributed to ballast water release and transoceanic shipping in general have been recorded in the Great Lakes.

Source: Bailey et al, Evaluating Efficacy of an Environmental Policy to Prevent Biological Invasions, 2011.

An economic assessment of the ballast water management plan for Turkey was carried out by the Maritime Administration of Turkey with support of the GloBallast Project. As summarized in Figure 4 below, the results indicate that the operational cost of implementing the management plan for BWM would be significantly cheaper than the estimated cost of the impacts from a potential bio-invasion.

Figure 4: Results of economic assessment of ballast water management in Turkey

Possible Economical Effect of AIS to Turkey	8.16 billion \$ (worst case)
Operating Cost of BWM to port state	40.9 million \$
Operating Cost of BWM to industry	781 million \$
Total Coast of BWM	821.9 million \$

Source: Ministry of Transport, Maritime Affairs and Communications of Turkey, Economic Assessments for Ballast Water Management in Turkey, 2010.

It should be noted that only the more direct economic loss from alien invasive species were calculated as the economical assessment methodology could not assess the indirect economic impact related to culture and other social aspects. If the loss of “cultural values” were to be included, then the difference between operating cost and the possible economic effects of a potential bio-invasion would increase even more. For an in-depth description of how the GloBallast Project and the BWM Convention have acted as a catalyst for ocean finance at the global level, please refer to the report “Catalysing Ocean Finance, volumes I and II” (UNEP and GEF, 2012).⁸

Successfully preventing and managing alien invasive species can provide long-term economic, social and environmental benefits, including conserving biodiversity and health of ecosystems and maintaining the services they provide to local communities and entire societies.

iv. Lessons learned

- Strategic investments in prevention measures are required — rather than post-invasion damage control — including ratification of the BWM Convention and development of necessary national strategies and policy frameworks.
- While national policy frameworks should not be unduly burdensome, they should meet standards set forth in the BWM Convention. Associated with the ratification of the Convention, this implies a certain cost in ensuring its compliance, related to, for example, planning, monitoring, enforcement and capacity-building.
- Economic assessment of alien invasive species, their possible impacts and different management options can support strategic decisions regarding suitable alien invasive species responses, and facilitate national planning. It can also be used for other decision-making support, including making a case for ratification of the BWM Convention.
- Specific partnerships should be developed at the regional level, such as the IMO- European Bank for Reconstruction and Development Marine Biosafety Initiative: two workshops dedicated to the private sector and the Bank’s clients were co-organized in Turkey to deliver specific advanced training on Compliance Monitoring and Enforcement of the BWM Convention. In addition, partnerships at the global level must be established, such as the Global Industry Alliance, a platform for the shipping industry to implement private sector dedicated activities.

References

- A.Zenetos, E. Meriç, M. Verlaque, P. Galli, C.-F. Boudouresque, A. Giangrande, M. E. Çınar and M. Bilecenoğlu (2008): Mediterranean Marine Science 9/1, 119-165.
- Bailey SA, MG Deneau, L Jean, CJ Wiley, B Leung and HJ MacIsaac (2011): Evaluating Efficacy of an Environmental Policy to Prevent Biological Invasions. Environmental Science and Technology , Vol.45(7), pg.2554-2561.
- Ministry of Transport, Maritime Affairs and Communications of Turkey (2010): Ballast Water Status Assessment Report for Turkey.
- Ministry of Transport, Maritime Affairs and Communications of Turkey (2010): Economic Assessments for Ballast Water Management in Turkey.

⁸ www.thegef.org/gef/pubs/catalysing-ocean-finance

4. Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO)

a) Case study: Marine ecosystem conservation: preserving the wealth of natural capital, Mediterranean region

[By Francesca Santoro¹, Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO)]



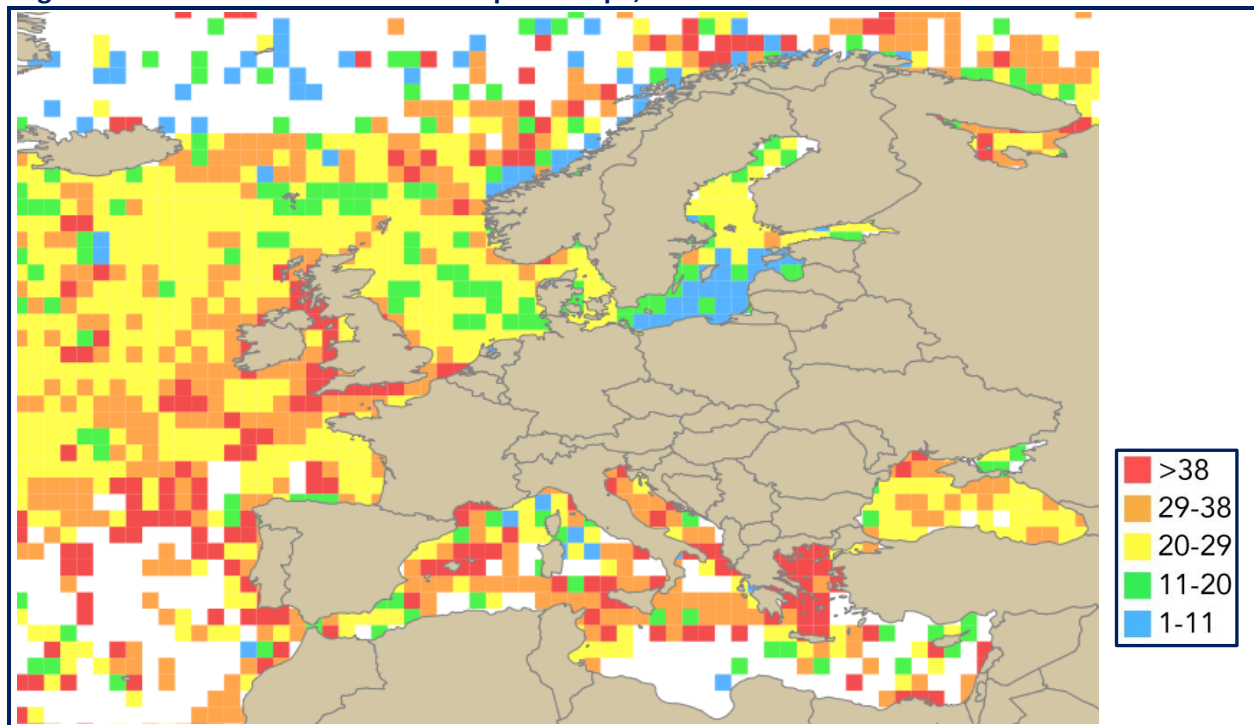
The Mediterranean: a biodiversity hotspot

The Mediterranean Sea is one of the world's biodiversity hotspots because of its large amount of endemic species. Many of them are of conservation concern such as sea turtles, several cetaceans and the endangered Mediterranean monk seal. Moreover, the Mediterranean region is characterized by high habitat diversity and uniqueness, including examples such as endemic seagrass meadows (*Posidonia oceanica*), vermeted reefs built by endemic gastropods (*Dendropoma petraeum*), coralligenous assemblages and deep-sea pelagic habitats. More than 150 wetlands of international importance for marine and migratory birds and 5,000 islands and islets can be found in the region as well.

¹ E-mail: f.santoro@unesco.org

Figure 1 shows the species richness in Europe with areas of high biodiversity in the Mediterranean. The biodiversity of the Mediterranean Sea is not uniformly spread throughout the basin, and distribution varies, in particular according to water depth, distance from coast, and the location on north-south or east-west axes.

Figure 1: Hulbert's index² shown on map of Europe, 2014



Source: Intergovernmental Oceanographic Commission of UNESCO, Ocean Biogeographic Information System (data consulted on 24/02/2014).

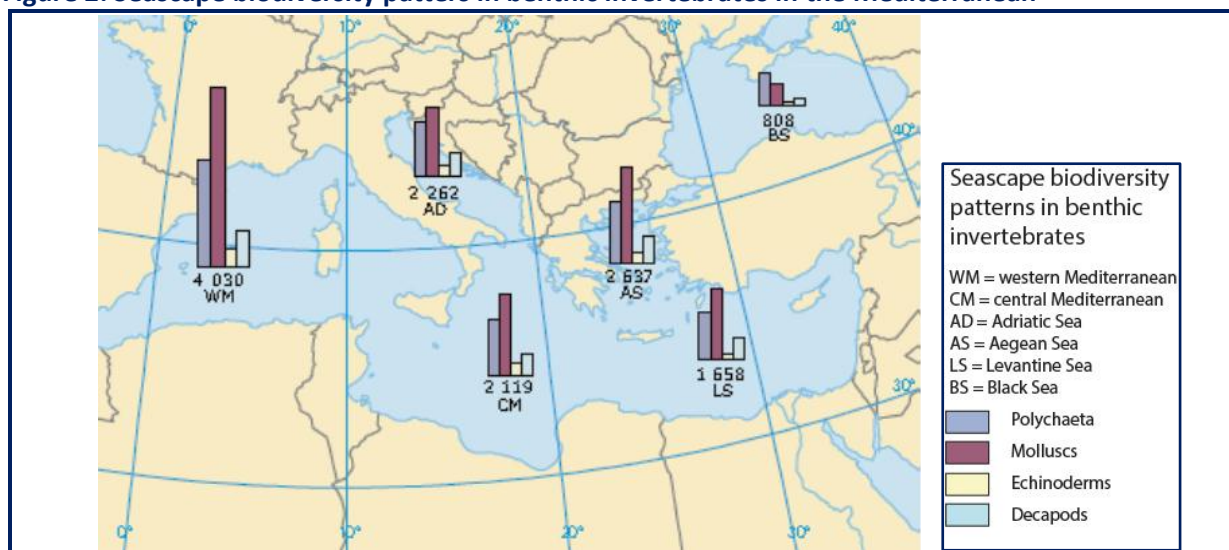
For instance, according to estimates from Koukouras *et al.* (2001) the number of benthic invertebrate species follows a decreasing west-east gradient and this pattern, closely correlated with geographic, climatic and trophic variables, is similar for many taxonomic groups³. The growth in oligotrophy from the west to the east of the basin explains, for instance, the reduction in the abundance of the zooplanktonic biomass. As a general rule, species diversity is essentially concentrated in the western Mediterranean basin with a general decrease from north-western to south-eastern regions.

The Adriatic Sea and Aegean Sea are also considered areas of high species richness (see Figure 2 for further illustration). According to Coll *et al.* (2010), marine biodiversity hotspot areas are primarily located in: coastal areas of Spain, France and Italy (including the Balearic Islands, Corsica, Sardinia and Sicily), the north-western coast of Africa, the eastern Adriatic Sea, and the coastal regions of the Ionian Sea and the Aegean Sea.

² Hubert's index is the expected number of species in a random sample of 50 specimens.

³ Taxonomy is the [science](#) of defining groups of biological [organisms](#) on the basis of shared characteristics and giving names to those groups. Organisms are grouped together into [taxa](#) (singular: taxon) and given a [taxonomic rank](#); groups of a given rank can be aggregated to form a super group of higher rank and thus create a taxonomic hierarchy.

Figure 2: Seascape biodiversity patterns in benthic invertebrates in the Mediterranean



Source: www.aquamaps.org

In economic terms the environment may be seen as natural capital composed by ecosystems delivering ecosystem services; attempts have been made to evaluate the economic value of services produced by Mediterranean marine ecosystems. A study produced by the UNEP-MAP Regional Activity Centre Plan Bleu has assessed the value of Mediterranean biodiversity, drawing on recommendations from the United Nations System of Environmental and Economic Accounts. The results show that the aggregated value stands at over 26 billion euros for 2005, which corresponds to 120% of Tunisia's GDP.

In the context of the PEGASO project⁴ of the European Commission another approach is followed. Since ecosystem degradation results in losses in the value of natural capital, the cost of degradation of ecosystems is calculated. Degradation can result from overuse, misuse or mismanagement of marine ecosystems and resources. Compared to other approaches (such as monetary valuation) the cost approach produces minimal but realistic values of degradation. An example of the use of this approach is presented in Box 1.

Box 1: Costs of ecosystem degradation of the French maritime borders⁵

i) Maintenance costs for French marine ecosystems in 2010

The total amount of maintenance costs is over 2 billion € per year. The most significant proportion of these costs (1.25 billion €) is spent on avoidance measures against microbiological contamination, mostly in the form of wastewater treatment (99%) for reaching sanitary standards. As a corollary of this result, the maintenance costs are the highest where urban density on the coast is the highest in the Mediterranean sub-region. Other important degradation costs are related to chemical pollution (347 million €), loss of biodiversity (148 million €) and the degradation of fishery resources (133 million €). The majority of chemical pollution costs are generated from avoidance measures (81%).

⁴ The People for Ecosystem-based Governance in Assessing Sustainability of Ocean and Coast project (PEGASO) is funded by the European Commission Directorate-General for Research and Innovation under the 7th Framework Programme.

⁵ Maritime borders, or façades maritimes, include the North/Channel, Atlantic/Biscay and Mediterranean.

Loss of biodiversity mostly generates costs related to monitoring and information (52%) which indicates a persistent lack of data in this field, while efficient positive actions (28%) may be difficult to implement. Fishery resource degradation mostly generates prevention costs (67%) in the form of management measures (enforcement and control for sustainable fishing, and also monitoring and information costs (27%).

ii) International comparisons with Member States applying a similar approach

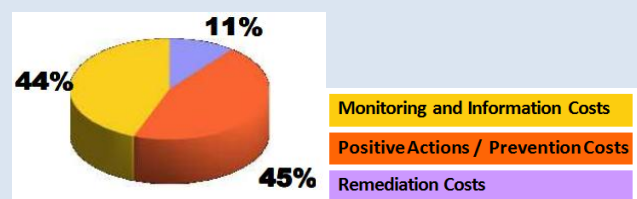
At a very large scale, the results obtained by the Netherlands, France and Spain follow similar patterns, but there are some inconsistencies:

- In the Netherlands, total expenditure amounts to 1.58 billion € a year, split into land-based costs (1.45 billion €) and marine-based costs (0.132 billion €).
- French estimates are fairly close to this, but for a coastline seven times longer in France than in the Netherlands.
- In Spain, total expenditures for the maintenance of marine natural capital was about 1.53 billion € in 2010, divided into seven thematic areas, where the cost of wastewater treatment accounts for only 38% (73% FR, 90% NL).

These comparisons highlight the need for consistent and standardized costs-assessment methods, in contrast to conventional monetary economic valuations which have evolved over decades and are more stable from a technical point-of-view. Ecosystem accounting can easily be improved if common criteria are adopted to define expenditures and to standardize use of referential.

iii) Costs associated with biodiversity loss in the French western Mediterranean

- Reduced marine biodiversity is a multifaceted issue as it is related to many different pressures and focuses on impacts which are not taken into account by the other degradation topics.
- Costs associated with biodiversity loss in the French Western Mediterranean:
Total = 57 million €.



Source: PEGASO project.

i. The challenge

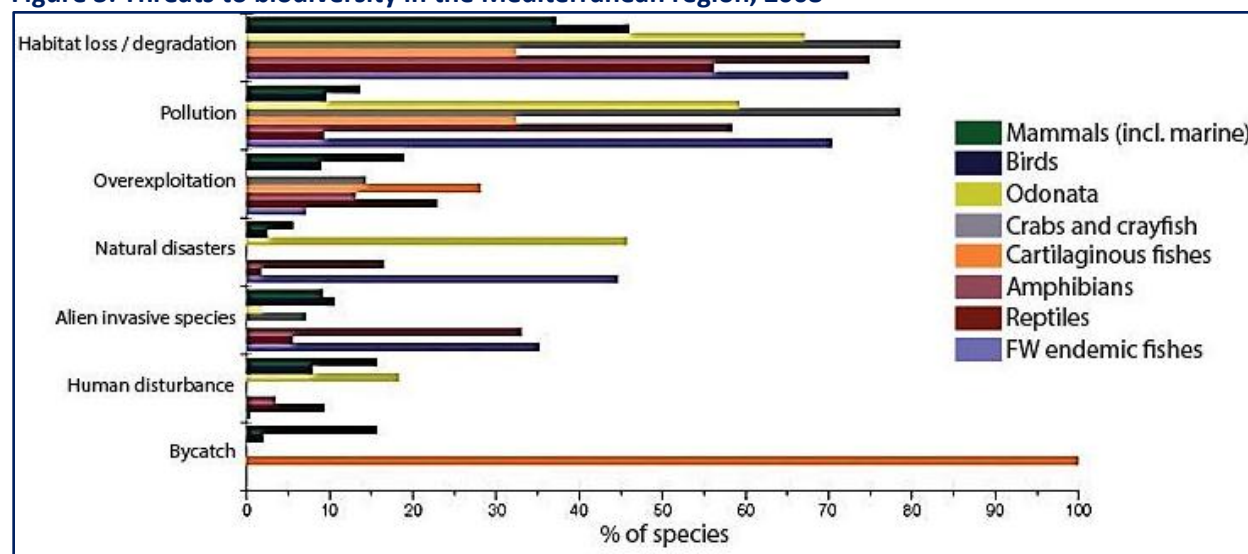
Marine biodiversity at risk: Major threats from land- and sea-based human activities

Although in most cases information is incomplete regarding Mediterranean biodiversity status and trends (in particular regarding marine biodiversity), enough data and observations are available to clearly demonstrate that biodiversity in the region is severely at risk. For the whole Mediterranean Basin, the International Union for Conservation of Nature (IUCN) estimates that approximately 19 per cent of all species is threatened with extinction and 1 per cent is already extinct at the regional level.

Five per cent of the Mediterranean species assessed are considered critically endangered; 7 per cent endangered and 7 per cent vulnerable. Under the Specially Protected Areas and Biodiversity Protocol (SPA/BD), a list of endangered or threatened species and a list of species whose exploitation should be regulated have been established, including a total of 306 species. According to Annex II of the SPA/BD and based on IUCN's recent assessments, 63 per cent of fish and about 60 per cent of the mammals are endangered species. Although no species is known to have totally disappeared from the Mediterranean Sea as a result of human activity, the status of some species is of great concern. In particular, some species have disappeared locally, especially in coastal zones affected by industrial and urban pollution, as is the case of the seagrass *Posidonia oceanica* which has been decreasing progressively during the last 30 years, particularly near urbanized coastal areas.

The pressures and threats to biodiversity in the Mediterranean are very diverse, not geographically uniform, and are recognized as mainly the result of human activities. However, classification of the most severe threats is not a straightforward issue and is still subject of debate in the literature. Threats of primary concern consequently vary according to the review or assessment considered. At the regional level, 149 different threats to biodiversity (marine and continental) have been identified in the Mediterranean countries. Human-induced habitat destruction and degradation are considered the most severe pressures, followed by pollution, by-catches and overexploitation, droughts, and alien invasive species (see Figure 3).

Figure 3: Threats to biodiversity in the Mediterranean region, 2008

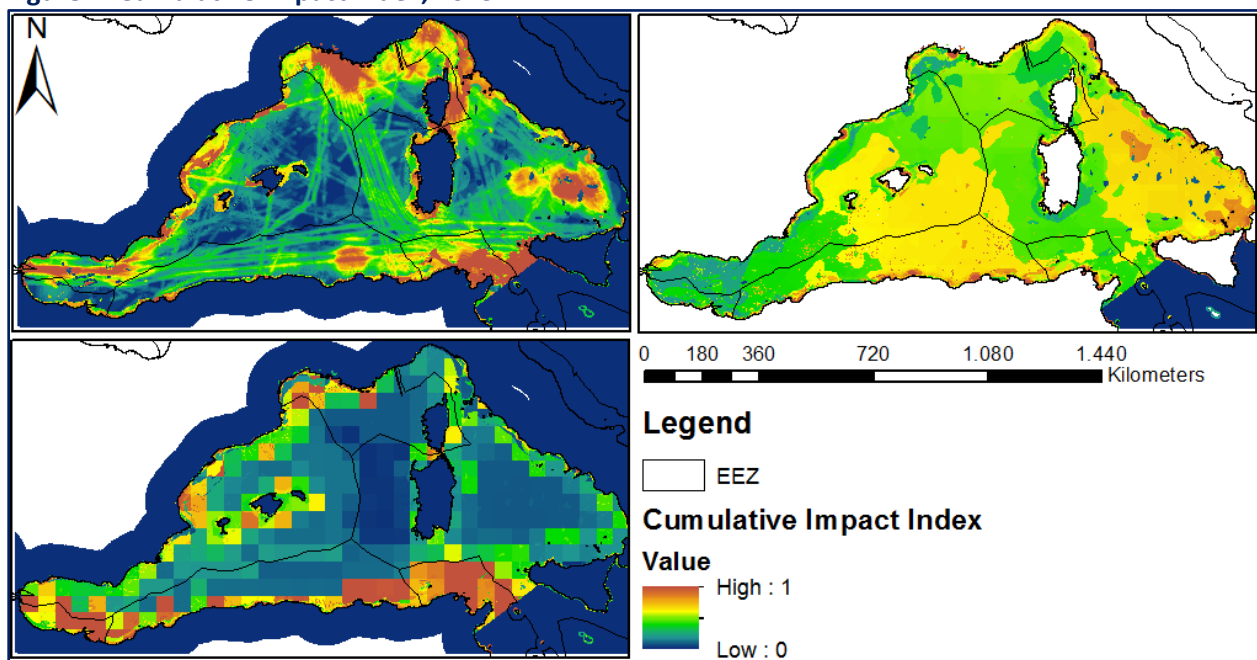


Source: Cuttelod et al., 2008.

These trends are also confirmed by Coll *et al.* (2010) who show that the overexploitation of living marine resources and human-induced destruction of habitats are the main drivers of historical changes caused by humans and the most visible consequences of human pressure. On the coasts, the most serious threat is posed by the growing amount of coastal artificialization. In addition, climate change and alien invasive species are other relevant threats that are expected to increase in the future and predicted to have an important effect on ecosystems and fisheries in the Mediterranean Sea.

In the context of the PEGASO project, and to support the development of an Integrated Regional Assessment of the Mediterranean Coastal and Marine Region coordinated by UNESCO-IOC, an innovative approach was applied to map the cumulative impact of human activities on marine ecosystems in the region. Cumulative impact maps (CIM) were created by overlaying individual threat maps and using vulnerability scores to estimate ecological impacts. Individual threat maps show individual human activities that have impacted marine ecosystems by estimating the ecological consequences of these activities and by quantifying the vulnerability of different ecosystems to these activities. Based on a methodology designed by Halpern *et al.* (2008), the cumulative impact maps provided critical information on the sustainability of human activities. Figure 4 shows the Cumulative Impact Index disaggregated in ocean-based impact, land-based impact and fisheries impact without considering climate change related stressors.

Figure 4: Cumulative Impact Index, 2013⁶



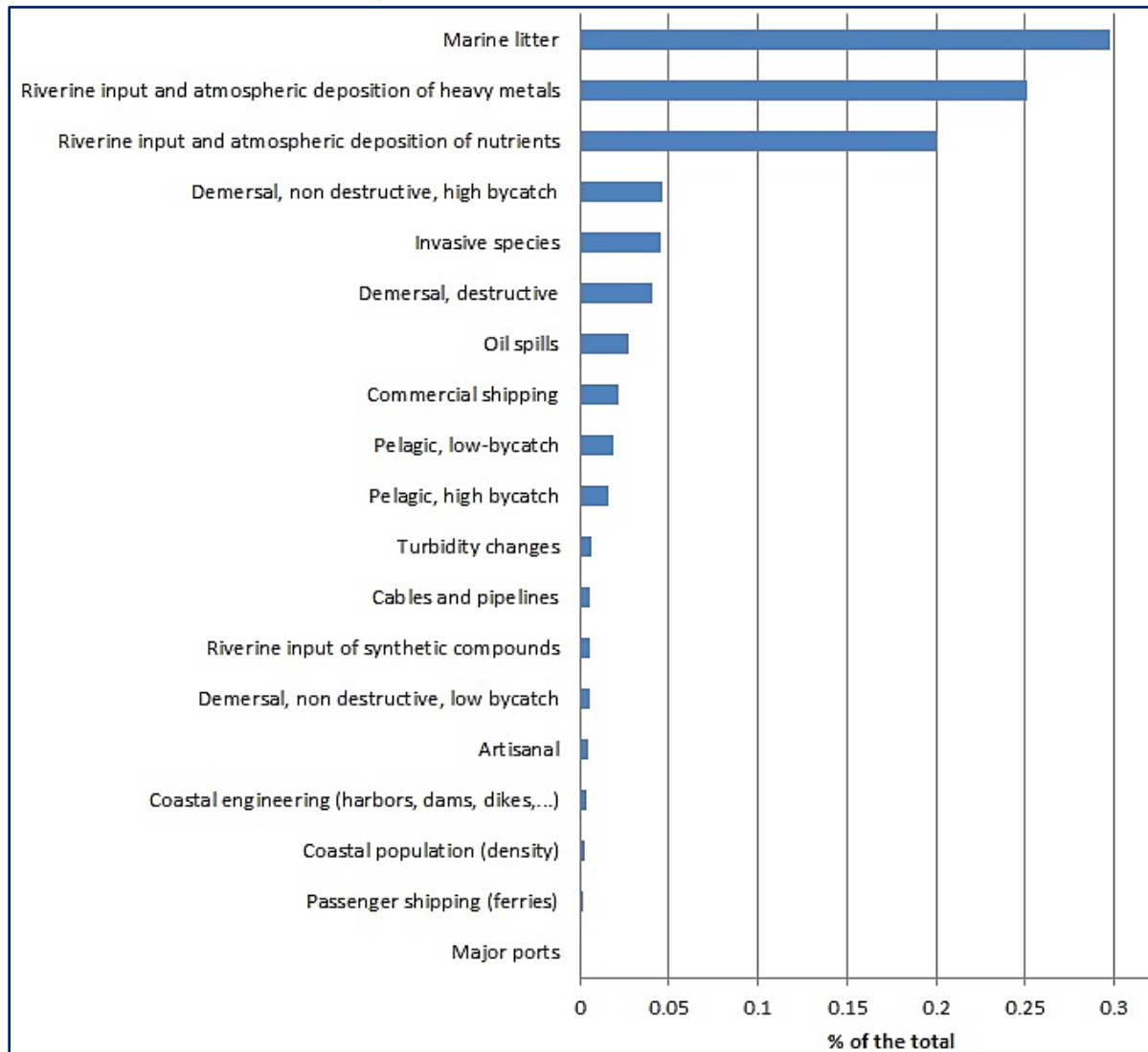
Source: Morrisseau et al., 2013

In the ocean-based layer, the high intensities near the coast are related to the presence of big ports and the associated maritime traffic. In the land-based layer, the medium high intensities north of Algeria and in the Tyrrhenian Sea (yellow areas) are mostly the results of marine litter accumulation, based on a 30 years accumulation model. In the fisheries layer, we can see that impacts are mostly concentrated over the continental platform and more concentrated in the North African coast. The Index can be put to practical use by evaluating where to continue activities with little effect on marine habitats, where to stop activities or move them to less sensitive areas, and where to focus efforts in order to protect the remaining pristine areas.

⁶ Note: Impacts are disaggregated in ocean-based impact (top left map), land-based impact (top right map) and fisheries impact (bottom left map).

Figure 5 shows the results of the application of the CIM methodology to the Mediterranean Sea and underlines the relative impact of anthropogenic stressors in the western Mediterranean Sea, excluding stressors directly related to climate change, such as ocean warming and increased UV radiation.

Figure 5: The relative impacts of land-based and marine-based human activities on marine habitats in the western Mediterranean Sea, 2013



Source: Morrisseau et al., 2013.

The most severe pressure in the region is marine litter, followed by riverine input and atmospheric deposition of heavy metals; riverine input and atmospheric deposition of nutrients; fisheries; and oil spills. This illustrates the important weight of land-based pressures that are clearly linked to the high urbanization that characterizes the Mediterranean coastal region.

The Mediterranean marine ecosystems are increasingly at risk. Their ability to provide ecosystem services is increasingly hampered by the degradation of the marine environment. In addition, the increasing demand for marine space to conduct economic activities creates conflicts among users.

ii. Oceans-and seas-related measures undertaken

Preserving marine biodiversity- A network of Marine Protected Areas in the Mediterranean region

In order to prevent the degradation of the marine environment as well as restore and sustain its critical economic, social and cultural ecosystem services, a framework for the integrated management of maritime activities is necessary. Marine spatial planning (MSP) is increasingly considered the appropriate framework to guide sustainable development of oceans and coasts. It is understood as “a promising way to achieve simultaneously social, economic, and ecological objectives by means of a more rational and scientifically-based organisation of the use of the ocean space”. One possible outcome of an MSP process is the identification and designation of a network of Marine Protected Areas (MPAs). These areas are designed to preserve marine biodiversity, but also to enhance the sustainable use of marine resources and to promote sustainable local economic activities, such as sustainable fisheries practices.

In 2004, the Contracting Parties of the Convention on Biological Diversity (CBD) set the objective to establish, by 2012, comprehensive, ecologically representative and efficiently managed national and regional protected areas systems. In 2010, the CBD Parties adopted the Strategic Plan for Biological Diversity 2011-2020, including Target 11 which states that “by 2020, at least 17% of terrestrial and inland water and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes”.

In the context of the Barcelona Convention, the Specially Protected Areas and Biological Diversity Protocol in the Mediterranean (SPA/BD Protocol) and the Strategic Action Plan for the Conservation of Biological Diversity in the Mediterranean represent the two main instruments for the Mediterranean region to implement the objectives of the CBD. Since 1990, a network of MPAs in the Mediterranean, called MedPan, was created to provide a coordination framework for conservation activities targeted at marine biodiversity in the region. Currently 170 MPAs, accounting for 4.56% of the total sea surface, have been established in the Mediterranean Sea. Moreover, two UNESCO World Heritage Sites and five Biosphere Reserves have been designated in the Mediterranean Sea.

iii. Impact on the three dimensions of sustainable development

The role and effectiveness of MPAs in the Mediterranean region have been extensively investigated in the context of different programmes and projects. MPAs are important for protecting the marine environment, but they can also have substantial socio-economic and cultural impacts. In the following section, various examples of the environmental and socio-economic impacts of MPAs in the Mediterranean region are presented.

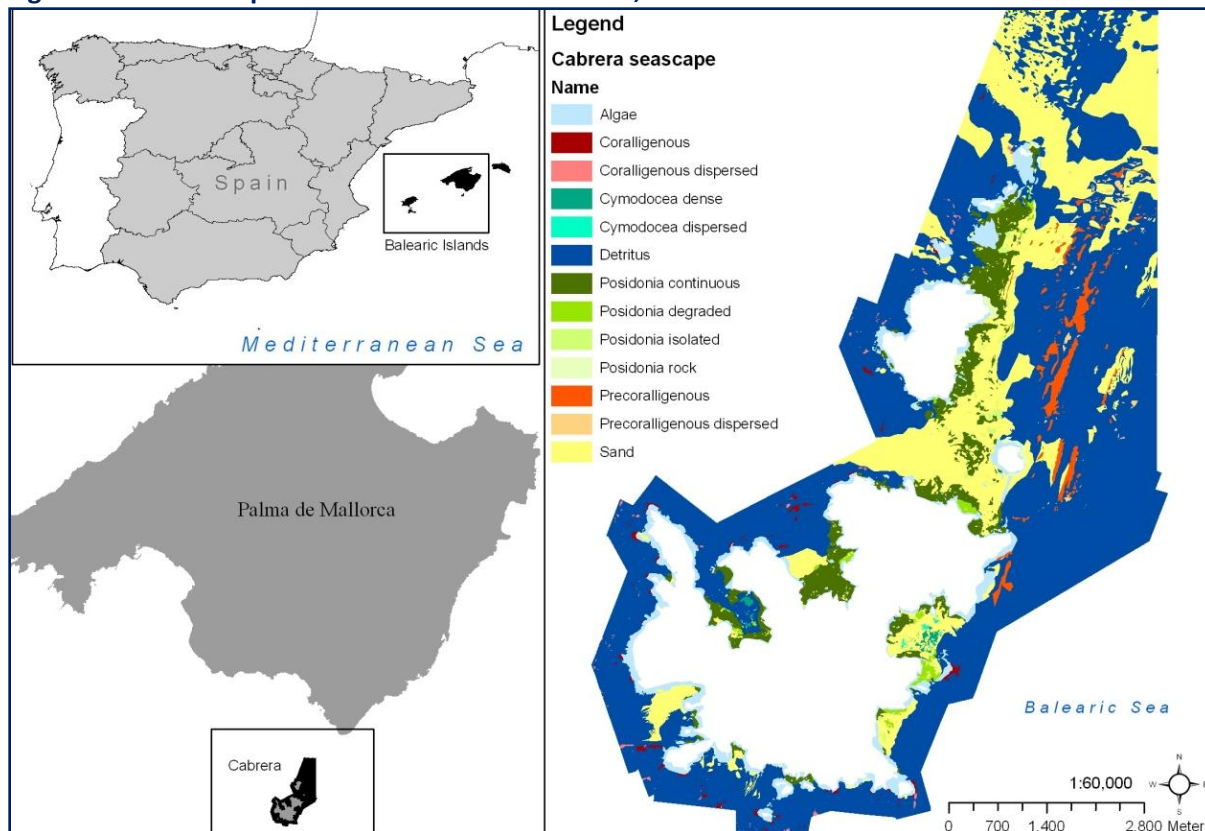
Environmental impacts

MPAs generally increase the diversity, abundance, and average size of exploited species. However, with the aim of adopting an ecosystem approach, MPAs should aim at rebuilding ecosystems rather than simply controlling fishing mortality for target species. As mentioned, that the Mediterranean Sea is characterized by high habitat diversity. Habitat structure is likely to drive a large part of spatial variability in the distribution and abundance of Mediterranean target species, and to influence the strength of protective measures.

By analysing habitat patterns and distribution, Nowell *et al.* (2013) have shown that disturbed seascapes consist of larger, fewer, and less complex patches of habitats,⁷ whereas protected areas were found to be more heterogeneous. Fractals were used by Kostylev *et al.* (2005) to explore the species-area relationship in intertidal zones. They found that complex habitats support more species.

One example of a marine protected area is the Cabrera Archipelago situated off the Southern tip of Mallorca and consisting of 19 small islands and islets covering around 10,000 hectares, of which nearly 9,000 hectares are marine environment (see Figure 6).

Figure 6: The seascape of the Cabrera National Park, 2013



Source: Nowell *et al.*, 2013.

⁷ Patch dynamics is a conceptual approach to **ecosystem** and habitat analysis that emphasizes dynamics of **heterogeneity** within a system (i.e. that each area of an ecosystem is made up of a mosaic of small “sub-ecosystems”). Diverse patches of habitat are seen as critical to the maintenance of biodiversity.

The Archipelago represents a high biodiversity area with significant sea grass meadows (*Posidonia oceanica* and *Cymodocea nodosa*) as well as a number of important benthic habitats, including coralligenous and precoralligenous communities. Human activities have been limited around the Archipelago since 1916 when it became a military zone. The Cabrera Archipelago was declared a National Park (IUCN Category II) in 1991 and a Specially Protected Area of Marine Importance in 2003 under the Barcelona Convention. It was protected in order to preserve the large-scale ecological processes and diverse array of coastal and marine habitats. Damage as a result of bottom trawling has been reported in the north and east of the Archipelago, resulting in a proposal to extend the national park.

In the case of the Balearic Islands, reducing disturbance in the coastal zone, for example by relocating commercial shipping routes away from the islands, would certainly influence seascape structure and therefore in consequence also biodiversity.

Socio-economic impacts

Although the main purpose of MPAs is to safeguard nature, they can also support economically valuable activities and have social impacts. Tourism, small scale sustainable fisheries, nursery grounds and recruitment habitats are examples of sources of economic revenues that are supported by the existence of MPAs. In the Mediterranean region, many of the MPAs are found in the southern part of countries or in remote areas, and small islands. In the majority of cases, the economies of these areas are based on agriculture and fishing. Tourism is seen as both a potential and fundamental source of income.

Some specific studies to evaluate the economic impact of Mediterranean MPAs have been carried out in Spain and Italy. In Spain, MPAs can be considered multiple-use areas, with different areas having variable degrees of protection. The Biosphere Reserves approach of the Man and the Biosphere Programme (UNESCO, 1971) was adopted there with the aim to achieve a sustainable balance between the goals of conserving biological diversity, promoting economic development, and maintaining associated cultural values. As a result, the Medes Islands were protected in 1983 as a no-fishing area. Economic activities in the small village on the mainland, as opposed to the islands, are exclusively related to tourism, and represent a direct income of about US\$ 7 million per year.

MPAs in Italy have a more recent history. At present, there are 15 MPAs in Italy and one marine area belongs to a National Park. A recent study has provided an estimation of natural capital by assessing the value of sea grass (*Posidonia oceanica*) in the smallest Italian MPA, namely the Isola di Bergeggi. In this particular case, ecological functions and the area's derived ecosystem services have been considered, instead of those ecosystem services having direct advantages for the local population, since the former benefit the ecosystem itself. One example of these ecosystem services is oxygen release and carbon fixation, the so-called "blue carbon".⁸

⁸ See also: www.marineclimatechange.com/marineclimatechange/bluecarbon_2.html

Degradation and restoration cost methods for sea grass (*Posidonia oceanica*) were also applied in other parts of Europe. The cost of restoration has an average value of 56 euros/m² and in some restoration experiences in Italy the cost ranged from 175 to 300 euros/m². Since the recovery of this degraded ecosystem was shown to be more efficient in MPAs where human activities were prohibited, the calculated degradation and restoration cost can indirectly provide an estimation of the economic impact of the establishment of MPAs.

Although only few data exists in the Mediterranean on the exact socio-economic impacts of MPAs, Badalamenti *et al.* (2000) draw the conclusion that a general increase in tourist activities and in the abundance of larger fish species is evident in the Mediterranean MPAs. The data also shows a large increase in the number of visitors and divers.

iv. Lessons learned

- Marine and coastal ecosystems provide valuable natural capital as well as economic and socio-cultural benefits.
- Ecosystem goods and services are being provided unsustainably in some areas, with irreversible detriment to the health of ecosystems. This can be masked by assessment methods that do not use an ecosystem-based approach. For example, if long-term sustainability of natural capital is not considered, the short-term benefits of depleted resources and services may appear to be economically advantageous, yet this is only a temporary strategy.
- Coastal and ocean management tools and approaches such as Integrated Coastal Management and Marine Spatial Planning are seen as essential mechanisms to promote sustainable development of marine ecosystems.
- It is clear that a deterioration in the health of an ecosystem significantly affects ecosystem functioning and production, and therefore the provision of ecosystem services to local communities. Since socio-economic data and information are essential to decision-making, it will be more and more important to provide reliable and realistic information on them.
- Research and management of socio-economic activities must adopt an ecosystem-based approach, with a more holistic consideration of impacts, in order to reach a sustainable equilibrium that will be of greater benefit to communities in the long-term.
- Degradation and restoration cost assessments represent promising tools to promote sustainable development in coastal and marine areas, since they rely on realistic and accountable values. More studies applying these types of methods should be undertaken.
- Data to describe the use of natural capital should include measuring natural and semi-natural areas, species and habitats of conservation importance, ecosystem vulnerability, natural capital degradation and the cost of natural capital depreciation and the benefits of protected areas.
- MPAs can safeguard nature, while also supporting economically valuable activities and having positive social impacts.

References

- Badalamenti, F., Ramos, A.A., Voultsiadou, E., Sánchez Lizaso, J.L., D'Anna, G., Pipitone, C., Mas., J., Ruiz Fernandez, J.A., Whitmarsh., D., and S. Riggio (2000): Cultural and socio-economic impacts of Mediterranean marine protected areas. *Environmental Conservation* 27 (2): 110-125.
- Capellà, J., Donaire, J.A., and Ullastres H. (1998): *Turisme Sostenible a la Mediteranis: Guia per a la Gestio Local*. Barcelona: Brau Educions: 156pp.
- Coll, M. Piroddi, C. Steenbeek, J. Kaschner, K. Ben Rais Lasram, F. et al. (2010): The Biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats. *PLoS ONE* 5(8): e11842.
- Cuttelod, A., García, N., Abdul Malak, D., Temple, H. and Katariya, V. (2008): The Mediterranean: a biodiversity hotspot under threat. In: J.-C. Vié, C. Hilton-Taylor and S.N. Stuart (eds). *The 2008 Review of The IUCN Red List of Threatened Species*. IUCN Gland, Switzerland.
- Elher Charles, and Fanny Douvere (2007): *Visions for a Sea Change*. Report of the First International Workshop on Marine Spatial Planning. Intergovernmental Oceanographic Commission and Man and Biosphere Programme. IOC Manual and Guides No.48, IOCAM Dossier no.4. Paris: UNESCO, 2007.
- Garcia Charton, J.A., Williams, I.D., Pérez Ruzafa, A., Milazzo, M., Chemello, R., Marcos, C., Kitsos, M.-S., Koukouras, A. and S. Riggio (2000): Evaluating the ecological effects of MPAs: habitat scale and natural variability of ecosystems. *Environmental Conservation* .27(2): 159- 178.
- Halpern, B.S., Walbridge, S., Selkoe, K.A., Kappel, C.V., Micheli, F., D'Agrosa, C., Bruno, J.F., Casey, K.S., Ebert, C., Fox, H.E., Fujita, R., Heinemann, D., Lenihan, H.S., Madin, E.M.P., Perry, M.T., Selig, E.R., Spalding, M., Steneck, R., Watson, R. (2008): A global map of human impact on marine ecosystems. *Science* 319, 948–952.
- Ivanov, E., Morrisseau F., Nowell M. (2014): Report, accompanying database and supporting materials on LEAC Methodology and how to apply it in CASES, PEGASO deliverable.
- Kostylev, V. E., Todd, B. J. , Oddvar Longva, P. C. V. (2005): *Benthic habitat and the effects of fishing*, Chapter: Characterization of benthic habitat on northeastern Georges Bank, Canada, Publisher: American Fisheries Society, Editors: Peter W. Barnes, James P. Thomas, pp.141-152.
- Koukouras, A. Voultsiadou, E. Kitsos, M.S. and Doulgeraki, S. (2001): Macrobenthic fauna diversity in the Aegean Sea. Affinities with other Mediterranean regions and the Black Sea. *Bios (Macedonia, Greece)*, 6: 61-76.
- Nowell, M.S., Salvati, L., Breton, F., (2013): Seascape metrics for the Mediterranean Sea: A case study, In: Ozhan, E. (Ed.), *Global Congress on ICM, Marmaris, Turkey*.
- Priority Actions Programme Regional Activity Centre (PAP/RAC) (2008).
- Portman, M.E., Notarbartolo-di-Sciara, G., Agardy, T., Katsanevakis, S., Possingham, H.P., Di-Carlo G. (2013): He who hesitates is lost: Why conservation in the Mediterranean Sea is necessary and possible now. *Marine Policy* 42, 270-279.
- UNEP/MAP-PlanBleu, 2009: *State of the Environment and Development in the Mediterranean*, Athens.
- Vassallo, P. Paoli, C., Rovere, A., Montefalcone, M., Morri, C., Bianchi, C.N. (2013): The value of the seagrass *Posidonia Oceanica*: A natural capital assessment. *Marine Pollution Bulletin* doi:10.1016/j.marpolbul.2013.07.044.
- Zenetos A., Todorova V. and Alexandrov, A. (2003): Marine biodiversity changes in zoobenthos in the Mediterranean Sea. Invited talk in: *Conference on Sustainable Development of the Mediterranean and Black Sea Environment*, Thessaloniki, 28–31/5/2003.

5. United Nations Development Programme (UNDP)

a) Case study: Economic, social and environmental benefits from sustainable management of tuna fisheries: The GEF/UNDP Pacific Islands Oceanic Fisheries Management Project, Western Pacific

[By Dalal Al-Abdulrazzak and Andrew Hudson, United Nations Development Program (UNDP)¹]



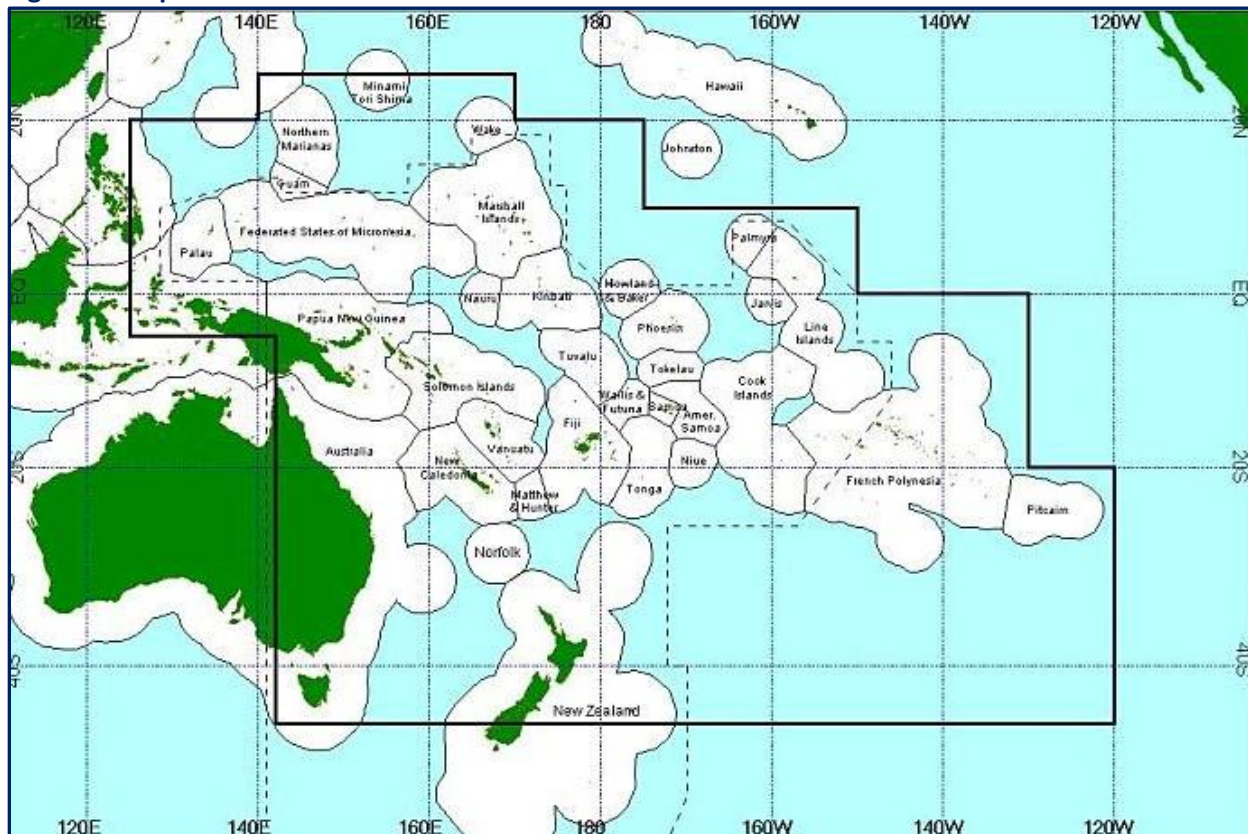
The focus of the Pacific Islands Oceanic Fisheries Management Project (OFMP) is the Western Pacific Warm Pool Large Marine Ecosystem, an area which covers around 40 million square kilometres, or about 8% of the Earth's surface area. The OFMP provides resources from the Global Environment Facility (GEF), through the United Nations Development Program (UNDP), to Governments in the Pacific Islands to support them in strengthening the management of their oceanic fisheries.

¹ E-mails: Dalal.al-abdulrazzak@undp.org; andrew.hudson@undp.org

i. The challenge

Through their Exclusive Economic Zones, the fifteen Pacific Small Island Developing States (SIDS)² share jurisdiction over the majority of the waters surrounding them (see Figure 1). They depend heavily on marine resources for their livelihoods, food security and government revenue.

Figure 1: Map of Pacific SIDS with Exclusive Economic Zones



Source: FAO Regional Office for Asia and the Pacific.

Western and Central Pacific tuna catches account for more than half of global tuna catches — over 2 million tonnes annually. In the Pacific region itself, tuna accounts for 90% of all fish caught and the fishery is worth over 6 times the value of all other Pacific Island fisheries combined. Two main tuna fisheries operate in the region:

- a longline fishery targeting mature bigeye tuna and yellowfin tuna for the Sashimi market as well as albacore tuna for canning; and
- a surface fishery, using purse seines and to a lesser extent pole and line, to target skipjack tuna and yellowfin tuna.

As of 2011, about 7% of all catch is taken by Pacific Islanders, and about 400 of the 1,300 tuna vessels are based in Pacific SIDS. The annual expenditure of these locally based vessels is estimated at about \$100 million.

² The Pacific SIDS are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tokelau, Tuvalu and Vanuatu.

Despite the scale and value of the tuna fishery, the management of trans-boundary stocks in the pockets of high seas areas between Pacific SIDS is a complex issue which has raised concerns over who benefits from the resource under the current management practices. Through a series of UNDP-implemented projects, the GEF has supported the Pacific SIDS in identifying methods of sustainable management of regional fish stocks, since that is one of the major environmental issues which all Pacific SIDS share. In this context, the GEF also promoted the adoption of an ecosystem-based approach to addressing marine resource management problems in large marine ecosystems.

Consistent with this framework and working with regional partners, including the South Pacific Regional Environment Programme, the Forum Fisheries Agency and the Secretariat of the Pacific Community, UNDP-GEF supported the Pacific SIDS in developing an agreed regional Strategic Action Programme (SAP) for International Waters of Pacific Islands which was completed in 1997. It represented a pioneering effort by Pacific SIDS to integrate national and regional sustainable development priorities with shared global environmental concerns for protecting international waters.

The SAP identified over-exploitation of the region's oceanic fishery resources as one of the major threats to the environmental integrity of marine ecosystems of the Western and Central Pacific, which could negatively affect economic growth, food security and sustainable livelihoods in Pacific SIDS. Deficiencies in management, governance, and incomplete understanding of the ecosystems were also recognized. On a national level, the key weaknesses in governance that were identified was the lack of management arrangements compatible with those in other zones of the region, and a lack of political commitment to regulating catches. Regionally, the lack of a legally binding institutional arrangement governing cooperation in managing shared stocks meant that industrialized tuna fleets, particularly foreign fleets, were completely unregulated. These and other barriers to sustainable fisheries management in the Western and Central Pacific are summarized in Figure 2 below.

Figure 2: Principal barriers to sustainable management of fish stocks in Western and Central Pacific

Type of Barrier	Barriers	Stakeholders		
		Consumers/ Users	Policymakers	Local & Multilateral Financiers
Regulatory	Unregulated fishing on the high seas undermining in-zone efforts to ensure sustainable fisheries.	✓	✓	✓
	Lack of compatible management arrangements between zones.	✓	✓	
Institutional	Lack of a legally binding institutional arrangement governing cooperation in the management of the region's commercial oceanic fisheries.	✓	✓	✓
	Lack of national capacity and systematic monitoring of catches.	✓	✓	✓

Financial	Cost of managing oceanic fish stocks largely financed by Pacific SIDS directly or using donor funds. Need to develop a financing mechanism that places the burden of management on States that fish.	✓	✓	✓
Economic	Illegal fishing eroding economic benefits for resource owners, contributing to overfishing and avoiding the cost of management.	✓		
Informational	Information and knowledge gaps of the main target species in oceanic fisheries.	✓	✓	✓
	Insufficient awareness and understanding of the kinds of measures that need to be taken and the legal, policy and institutional reforms needed to ensure sustainability.	✓	✓	✓
	Lack of strategic information for decision making and timely information on the current status of major physical oceanic features.	✓	✓	✓
Technological	Poorly resourced national oceanic fisheries management functions for enforcement and compliance, which are not established to cover the high seas pockets.	✓	✓	✓
	Absence of detection systems (i.e. vessel monitoring system) covering high seas areas.	✓	✓	✓
Political	Well-developed cooperation between Pacific States but relatively little coordinated management cooperation with other States in the region and distant water fishing nations.	✓	✓	
	Lack of political commitment to take necessary decisions to limit fishing and catches.	✓	✓	✓

Source: UNDP, 2014.

ii. Oceans-and seas-related measures undertaken

Initial strategies to help the Pacific SIDS address these threats were supported by a UNDP-GEF pilot project implemented from 2000-2004, wherein they assisted Pacific SIDS to conclude negotiations and adopt the Western and Central Pacific Fisheries Convention, which entered into force in June 2004, and to establish in-country fishery monitoring programmes to close the information gaps in science and compliance. Assistance was also given in the form of regional scientific support to assess fish stocks and apply an ecosystem-based approach to managing the region's tuna resources.

Following the completion of the GEF pilot project, UNDP-GEF began implementing a new phase of assistance for sustainable ocean fisheries management in the Western Pacific region, again in partnership with regional organizations and NGOs.

The OFMP was created to support Pacific SIDS in the successful establishment of the Western and Central Pacific Fisheries Commission, which commenced operations in late 2005, and in the reform, restructuring and strengthening of their national fisheries laws, policies, institutions and programmes. Specifically, this project was developed to:

- Achieve ratification and implementation of the West and Central Pacific Fisheries Convention;
- Facilitate the establishment of the West and Central Pacific Fisheries Commission and Secretariat;
- Support the Pacific SIDS in engaging with and meeting their legal obligations of membership in the West and Central Pacific Fisheries Commission;
- Contribute to the knowledge and understanding necessary for the Commission and its members to assess fish stocks and make informed and responsible management decisions.

This support enabled the Pacific SIDS to better prepare for new opportunities emerging from the West and Central Pacific Fisheries Commission and to discharge the new responsibilities required by the Convention.

In addition, the Commission included the design of a comprehensive set of regional compliance programmes including the transfer of funding for core scientific assessment programmes from UNDP-GEF to the Commission. The OFMP identified that US\$ 79 million in investment would be needed to implement the Convention, which would be split evenly between Pacific SIDS and external fishing States and fleets. The total cost allocated to the UNDP-GEF support to sustainable fisheries management in the West and Central Pacific, including the GEF pilot project, full project design and OFMP implementation was US\$ 15.1 million.

UNDP-GEF support lead to a number of major institutional, legal, and policy outcomes which included:

- a comprehensive set of monitoring and compliance programmes, including the establishment of the world's largest on-board observer programme, applying 100% coverage to the 1.5 million tonne purse seine fishery from January 2010, with lesser coverage rates across all regional tuna fisheries by 2014;
- the establishment of the world's only regional satellite-based vessel tracking system requiring direct reporting to a regional fisheries management organization; and
- the first regional high seas boarding and inspection programme established in accordance with the UN Fish Stocks Agreement.

All of these outcomes were implemented largely at the cost of those who fish and their governments, including Pacific SIDS. A comprehensive set of measures aimed at conserving target stocks and reducing the impact of fishing on non-target species was implemented, which included catch, fishing effort and fleet size limits; gear restrictions; closures of large areas of the high seas to purse seining; and mandatory use of a range of mitigation procedures, devices and fishing practices to avoid incidental catches of non-target species such as sharks, turtles and seabirds.

iii. Impact on the three dimensions of sustainable development

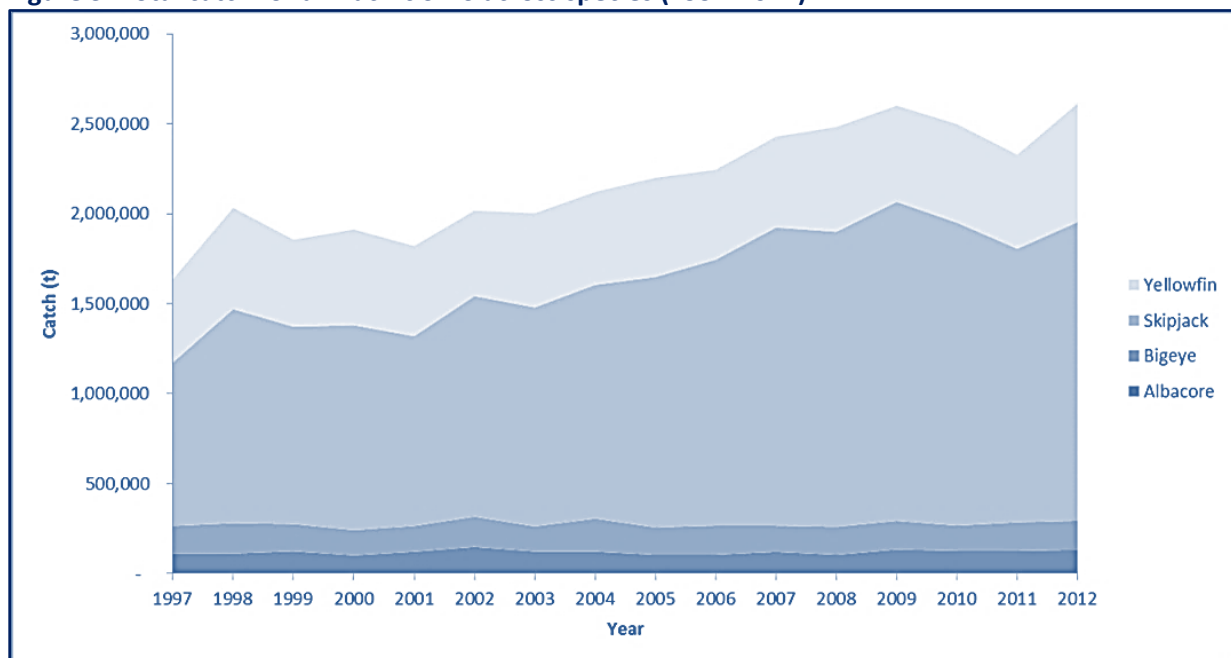
Environmental benefits

The enhanced conservation and sustainable management of transboundary oceanic fishery resources in the Western Tropical Pacific Warm Pool Large Marine Ecosystem has brought about a number of environmental benefits. Fishery stock assessments for bigeye, albacore, and yellowfin tuna indicate that current catches are at or below the maximum sustainable yield, meaning that stocks are at a lower risk of being overfished. In addition, improved management measures have decreased the rates of discarding, a wasteful practice whereby non-target species unintentionally captured by fishing gears are “discarded” at sea. Discard rates for longliners targeting albacore, bigeye, and yellowfin tuna have decreased from an average of 12.4%, 3.5%, and 3.85%, respectively, to nearly 0% in 2012 for all species. Similar decreases were seen for the purse seine fishery.

Economic and social benefits

Measures adopted by the West and Central Pacific Fisheries Commission and Pacific SIDS have increased catches by a factor of 2 in national waters from 1,635,926 tonnes in 1997 to 2,613,555 tonnes in 2012 (see Figure 3).

Figure 3: Total catch for all Pacific SIDS across species (1997-2012)

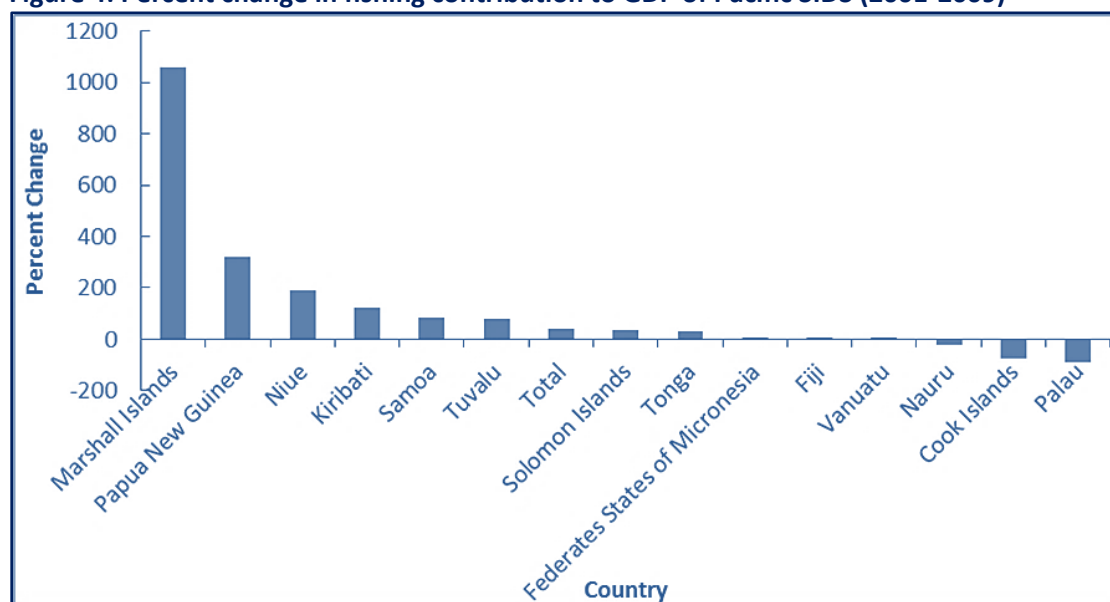


Source: UNDP, 2014.

Skipjack tuna experienced the largest increase in catch (121%), followed by yellowfin (43%), albacore (17%), and bigeye (6%) tuna. This increase has also led to “spillover” benefits for non-SIDS countries, where regional catches in national waters have increased by an average of 27,864 tonnes annually over the same time period. The improved management of transboundary oceanic fishery resources has also made significant contributions to the economic development of Pacific SIDS.

Improvements in tuna catches have led to a 50-1,000% increase in fishing contribution to GDP in seven countries over the project period (See Figure 4). The greatest increases were seen in the Marshall Islands, due to the establishment of a locally based offshore fleet, and in Papua New Guinea, due to increased activity of the locally based offshore fleet.

Figure 4: Percent change in fishing contribution to GDP of Pacific SIDS (2001-2009)



Source: Redrawn from Gillett (2009).

On average, tuna catches make up 10% of the regional GDP for Pacific SIDS. However, these contributions exclude postharvest activities and are therefore likely to substantially underestimate the economic importance of the broader fisheries sector. While fishing contributions to GDP decreased slightly in some countries, these decreases are thought to be a result of changes in other fishery sectors, such as the decrease in pearl farming in the Cook Islands. Tuna fishery-related jobs provide 6-8% of all wage employment in the region. About 10,000 Pacific Islanders are formally employed on tuna vessels, whereas an estimated 21,000-31,000 people are employed in direct and indirect tuna-related employment. In terms of sustainable livelihoods, the number of people employed by local inshore tuna processing facilities in Pacific SIDS doubled from 5,555 people in 2002 to 11,116 people in 2008 (see Box 1 for an example).

Box 1: Tuna processing in the Solomon Islands

In the Solomon Islands, SolTuna, the country's tuna loining and canning processing facility, employs about 1,700 people, 65% of whom are women. Over 100 tonnes of tuna are processed daily, allowing for a greater share of the tuna value chain to be captured locally. In addition to enhancing food security and boosting exports, SolTuna provides subsidized housing and free commuter transportation, allowing people from nearby rural villages to also gain access to decent work.

Source: UNDP, 2014.

In addition, the total value of Pacific SIDS fishery exports has increased by US\$ 134 million from 1999 to 2007 (see Figure 5), a third of the region's total exports.

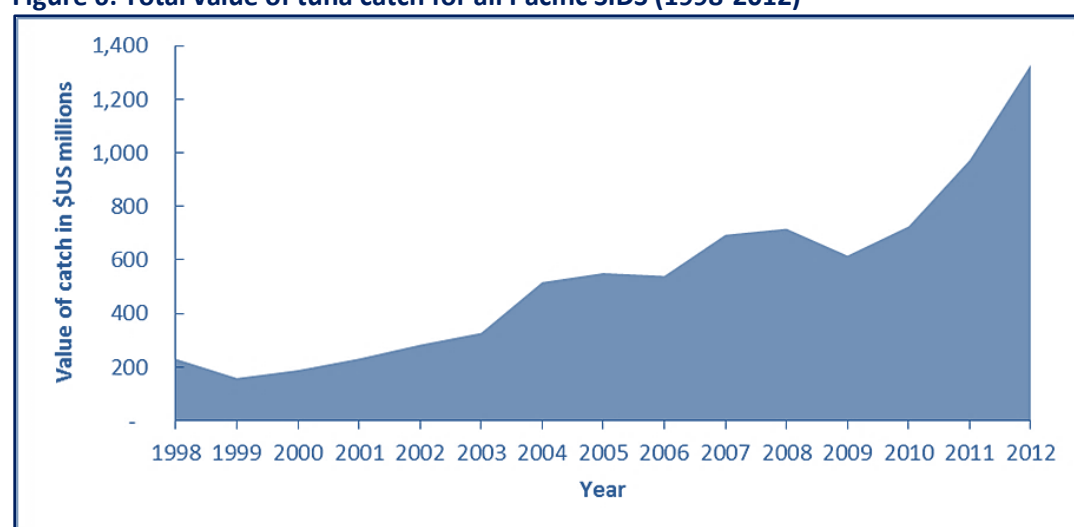
Figure 5: Change in value of fishery exports for Pacific SIDS, 1997-2007³

Country	1997	2007	% change
Cook Islands	\$2,919,136	\$4,120,828	+ 41%
Fiji	\$29,193,745	\$63,217,953	+ 116%
Federates States of Micronesia	\$4,878,387	\$12,301,318	+ 152%
Kiribati	\$1,483,871	\$1,893,375	+ 28%
Marshall Islands	\$473,000	\$37,342,000	+ 779%
Nauru	0	0	0
Niue	N/A	N/A	N/A
Palau	\$2,213,419	\$19,000,000	+ 758%
Papua New Guinea	\$48,106,666	\$101,000,000	+ 110%
Samoa	\$10,785,287	\$7,634,000	- 29%
Solomon Islands	\$35,472,033	\$19,784,631	- 44%
Tonga	\$2,573,670	\$4,861,780	+ 89%
Tokelau	N/A	N/A	N/A
Tuvalu	\$4,233	\$4,216	- 0.4%
Vanuatu	\$394,954	\$1,230,189	+ 211%
Total	\$138,498,401	\$272,390,290	+97%

Source: Redrawn from Gillett (2009).

Foreign fishing access fees were another benefit. Between 1999 and 2007, Pacific SIDS experienced a 24% increase in access fees on average. As a contribution to overall Government revenue, foreign access fees make up an average of 7.4% across all Pacific SIDS, with five countries having access fees that represent 10% or more of their Government revenue. This represents an increase from 3% compared to previous years. Market prices have greatly improved due to capacity reductions via the Vessel Day Scheme (VDS) under the Parties to the Nauru Agreement (PNA) to which eight Pacific SIDS are party, and, due to seasonal closures by the purse seine fleets. The value of all tuna species regionally has increased by over 500% from 1998 to 2012 (see Figure 6).

Figure 6: Total value of tuna catch for all Pacific SIDS (1998-2012)



Source: UNDP, 2014.

³ Note: N/A = data not available

In addition, the VDS, where vessel owners can purchase and trade days fishing at sea in places subject to the PNA, has quadrupled revenue for its members in four years. For example, total skipjack tuna revenue has increased from US\$ 60 million in 2010 to US\$ 249 million in 2013 and is expected to continue to increase.

iv. Lessons learned

- The location and geography of Pacific SIDS present unique challenges which underscore the critical linkage between sustainable management of regional fish stocks and sustainable livelihoods, economic development, and food security in the region.
- The vast scale and complex ecology of the Pacific Warm Pool Large Marine Ecosystem, coupled with the expense of tuna fishing practices and their management in the high seas, makes the application of an ecosystem-based management approach particularly important but also challenging.
- The capacity-building elements of the UNDP-GEF project have empowered Pacific SIDS fishery managers and enabled them to present and negotiate their positions at Commission meetings and to work cooperatively to ensure sustainable management of the fishery resources as well as leverage greater economic benefits.
- The availability of strategic and timely fisheries data and scientific monitoring is essential to achieve science-based fisheries management and socio-economic welfare decisions in Pacific SIDS.
- Sustainably managed local fisheries for migratory fish stocks can promote long-term employment opportunities, enhance food security, and provide an opportunity to reduce poverty in Pacific SIDS.
- Given the significant environmental, social and economic gains that can be made through improved management of tuna fisheries, replicating some of the strategies that have been successful in the West and Central Pacific in other regions should be considered.

References

- Aqorau, T. (2013): PNA expects 2014 to show increased benefits for islands. PNA News.
- Gillett, R. (2009): Fisheries in the Economies of the Pacific Island Countries and Territories Asian Development Bank.
- Hoyle, S., Hampton, J. & Davies, N. (2012): Stock Assessment of Albacore Tuna in the South Pacific. In: Commission, W. A. C. P. F. (ed.).
- Hoyle, S., Kleiber, P., Davies, N., Langley, A. & Hampton, J. (2011): Stock Assessment of Skipjack Tuna in the Western and Central Pacific Ocean. Western and Central Pacific Fisheries Commission.
- Langley, A., Hoyle, S. & Hampton, J. (2011): Stock Assessment of Yellowfin Tuna in the Western and Central Pacific Ocean. Western and Central Pacific Fisheries Commission.
- Peterson, E. (2006): Institutional economics and fisheries management- The case of Pacific tuna, Northampton, MA Edward Elgar Publishing.
- Sumaila, U. R., Dyck, A. & Baske, A. (2014): Subsidies to tuna fisheries in the Western Central Pacific Ocean. Marine Policy, 43, 288-294.

6. United Nations Environment Programme (UNEP)

a) Case study 1: Marine litter, regional seas in Europe

[By Heidi Savelli¹, United Nations Environment Programme (UNEP)]



i. The challenge

Solid material anywhere in the environment can be delivered to marine areas (washed, blown or via nearby waterways) and become marine litter if no mechanisms are in place to intercept it. Marine litter, or marine debris, includes any anthropogenic, manufactured, or processed solid material (regardless of size) which was discarded, disposed of, or abandoned and which ended up in the marine environment. Marine litter may result from activities on land or at sea. The problems caused by marine litter are multifaceted and essentially rooted in: product designs that do not consider life-cycle impacts; consumer choices; inadequate solid waste management practices and the lack of waste management infrastructure; accidental loss or intentional dumping of fishing gear or ship-generated waste; littering; and a poor public understanding of the potential consequences of marine litter.

Marine litter affects all coastal and upland communities, including inland waterways, and is closely linked to the protection and conservation of the marine and coastal environment and sustainable development. The marine litter problem is global in scale and intergenerational in impact, as the duration of the problem extends well beyond the generations of current ocean users and inhabitants.

¹ E-mail: Heidi.savelli@unep.org

In 2010, an estimated 98.6 billion plastic carrier bags were placed on the EU market, which amounts to every EU citizen using 198 plastic carrier bags per year. About 89% were lightweight bags which are more likely to be used once. About 8 billion ended up as litter. Mandating the use of biodegradable (polylactide-PLA) and compostable bags poses additional concerns, since many of these products can only be effectively composted in professionally-managed, large-scale composting facilities with mature compost, constant temperature under normal thermophilic conditions and specific relative humidity for good biological growth. In addition, the mixing of biodegradable plastic with recyclable plastic items during the recycling process would contaminate the reprocessed materials, thus destroying their usability.

Negative impacts of marine litter

Some forms of marine litter have resulted in the adsorption, onto plastics for example, and concentration of environmental pollutants in the aquatic environment. Persistent Organic Pollutants (POPs) for example are attracted to plastic in seawater. This is the basis for several POP sampling techniques, including passive sampling. Post-consumer plastic fragments, along with pre-production plastic resin pellets, collected in the Pacific Ocean, tested positive for the presence of persistent organic pollutants such as dichlorodiphenyltrichloroethane (DDT), polycyclic aromatic hydrocarbons, and aliphatic hydrocarbons. Additional studies show that these same pollutants can be detected in wildlife. However and notably, these pollutants in the marine environment derive from many non-point sources,² and this makes it difficult to determine the contribution of plastic litter pollutants to concentrations of pollutants in marine species. However, evidence indicates that chemicals adsorbed onto plastics, as well as those chemicals utilized within the plastic structure, can be incorporated into living tissues.

Marine litter can lead to loss of biodiversity (e.g., through entanglement and ingestion), loss of ecosystem functions and services, and marine habitat alteration, degradation, or destruction. Plastic and other solid waste from land- and marine-based sources, lost cargo, and abandoned, lost or otherwise discarded fishing gear (ALDFG) directly and negatively impact aquatic species and habitats. Various items such as ALDFG, including nets, lines, and traps, as well as plastic packing bands, are often responsible for entanglement and entrapment. Entanglement of animals by various types of marine litter can lead to restricted movement and limited mobility that may lead to laceration and subsequent infection, starvation, suffocation, and possible mortality for the affected marine species. Abandoned or lost traps continue to capture both target and non-target species and can do so for many years. Ingestion of indigestible marine litter, primarily small or degraded plastic items, is a common problem that has been documented in many marine animals. It can result in physical obstruction of the mouth, digestive tract, and stomach lining of various species.

Much of the available literature concentrates on the occurrence and effects of ingestion of plastic by seabirds as they forage for food on the ocean surface where plastic floats. In studies of the Northern Fulmar, a bird of the northern oceans, 95% of the 1,295 dead birds collected on beaches from 2003 to 2007 had plastic in their stomach, containing an average of 35 plastic items, weighing a total of 0.31

² A non-point source indicates that waste is not released at one specific point.

grams. Marine litter can also lead to marine habitat alteration, degradation, or destruction through physical interference such as obstruction of sunlight, surface scoring, and abrasion. Corals can become damaged by ALDFG and smothered by plastic bags, fabric, or sheeting.

Marine litter can cause a broad spectrum of impacts that reduce the economic benefits derived from marine and coastal activities and/or increase the costs associated with them. It can negatively affect the economic development and food security of countries by leading to reduced fisheries catch and tourism revenue, resulting in loss of revenue and increased costs due to marine litter removal activities (e.g., beach clean-ups) and damage to nautical equipment.

ALDFG continues to catch, injure, and kill marine life in a process referred to as “ghost fishing” which adversely impacts fishing industries. When fish populations are decreasing or depleted, commercial fisheries can suffer economic losses, and recreational fishing opportunities can decrease (Macfadyen *et al.* 2009). Lost equipment also entails the direct costs of repair and replacement and the indirect cost of lost fishing time. Lost nets, ropes, and other objects can get caught in boats’ propellers and rudders, causing operational problems and posing a navigational hazard. Plastic bags clogging and blocking water intakes commonly cause water pumps in recreational crafts to burn out, leading to costly engine repairs and disablement.

- Research in 1998 found that 230 rescues of vessels with fouled propellers occurred in United Kingdom (UK) waters at a cost of US\$ 3,600 to US\$ 9,600 per incident, depending on the type of lifeboat required. This amounted to an overall cost of between US\$ 767,000 and US\$ 202,000 for that year.
- A study published in 2002 demonstrated that the UK fishing industry loses over US\$ 31 million a year due to marine litter and ghost fishing.
- In 2005, the U.S. Coast Guard made 269 rescues in incidents involving marine litter — resulting in 15 deaths, 116 injuries, and USD 3 million in property damage.

Marine litter is very costly to remove, and it is usually not the polluters that cover this cost. The following figures illustrate the high cost associated with marine litter:

- Modest estimations indicate that the cost related to marine litter is up to US\$ 1.3 billion per year for the 21 Asia Pacific Economic Cooperation (APEC) countries alone.
- The total cost reported by local authorities in Denmark, Sweden, UK, and Norway for beach clean-ups was US\$ 4.42 million.
- The estimated cost to effectively remove litter from South Africa’s wastewater streams is US\$ 279 million per year.
- Estimates suggest that the total cost of marine litter removal carried by all UK local authorities is approximately US\$ 25.65 million per year.
- Cleansing the Swedish Skagerrak coast in 2006 was estimated to cost US\$ 2 million (OSPAR Commission, 2009).
- Research in Sweden found that the cost of removing marine litter from the shoreline of two ports amounted to US\$ 795,000.

Marine litter negatively affects human health and safety. Intrinsic and social values associated with coastal and marine environments are also affected by marine litter, including the “non-use value” (knowledge that quality coastal ecosystems exist) and the “option value” (ability to use the coastal environments). Another social value affected is the aesthetic value. Litter is an eyesore, and it reduces the attractiveness of coastal areas and of near-shore and open water areas. This leads to lower beach user enjoyment and decreased surrounding property values. These socioeconomic impacts provide helpful insight into the public’s concern and should not be ignored.

Similarities and differences between the regional seas in Europe

There are four Regional Seas Conventions and Action Plans in Europe: (1) the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area, (2) the Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), (3) the Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution, and (4) the Convention on the Protection of the Black Sea Against Pollution. Key similarities and differences between the European regional seas regarding marine litter are as follows:

- The share of plastics in marine litter surveys is high in all European regional seas, clearly exceeding 50%, and in all marine compartments (sea floor, open water, coasts/beaches), thus making plastics the predominant fractions of marine litter materials.
- Various kinds of packaging materials — from plastic bottles, caps, lids and food wrappers to plastic bags — form an important part of marine litter items in all four regional seas.
- Micro-particles are not routinely covered in-depth by current monitoring techniques; their emergence in European waters is therefore not fully understood.
- Although cigarette butts are an item found in great numbers in all regional seas, they are very prominent in the Mediterranean, indicating that smoking-related littering is a significant problem.
- On the European scale, recreational and tourism activities (mostly land-based) are the most significant sources of marine litter. Land-based litter, including recreational and tourism-related waste, seems under control only in the NE Atlantic, whereas in parts of the Mediterranean, the Baltic and Black Seas, mismanagement of landfills, improper handling, illegal dumping and malfunctioning sewerage systems seem to be major sources of marine litter.
- In the regional seas, sea-based litter is not as important as land-based litter except in the NE Atlantic, where maritime activities account for approximately 40% of marine litter.

ii. Oceans-and seas-related measures undertaken

Whereas there are numerous examples of recovery and removal of marine litter once waste has entered the marine environment, it is clear that, even though they are necessary, these activities are very costly, time consuming and in the case of micro-plastics an impossible endeavor with current technologies. It is therefore essential to focus on preventive measures rather than end-of-pipe solutions.

Prevention through awareness-raising and market-based instruments

Micro-plastics stem from: (1) macro-plastic that breaks down into smaller pieces; (2) industrial sources such as loss of plastic pellets during transportation or handling; or (3) personal care and cosmetics products where they have replaced natural products such as crushed seeds or pumice (e.g., facial scrubs). Unless clearly stated on the container, it can be very difficult for consumers to identify the presence of such micro-plastics, which, once having entered the drain, cannot be separated by conventional wastewater treatment methods and are therefore discharged into waterways or included in sludge for agricultural use.

Some personal care and cosmetics manufacturers have committed to phasing out micro-beads and replacing them with naturally biodegradable alternatives. Two Dutch NGOs, namely the North Sea Foundation and the Plastic Soup Foundation, launched a smartphone application (app) in 2012 as part of their Beat the Micro-bead campaign. The app “allows consumers in the Netherlands to scan personal care products to check for the presence of plastic micro-beads. UNEP partnered with these foundations in 2013 to further increase awareness of the issue of microbeads in personal care and cosmetics products worldwide by further developing the app and translate it to various languages.”³ It is now available in various languages. Over 40 NGO’s are now part of the beat the microbead campaign which is still growing.

With regard to plastic bag reduction, measures banning — or taxing — shopping bags and other single-use bags are multiplying around the world. Denmark pioneered a tax in 1994. Ireland has a plastic bag tax, with Belgium, England, Germany, Spain and Norway following suit. Ireland introduced a levy in 2002 on general purpose plastic bags of €0.15 per bag (increased to €0.22 in 2007). In 2002, Bangladesh banned all plastic bags based on the fact that plastic bags blocking gutters contributed to the flood in 1998. In Togo, plastic bags have been banned since the beginning of 2011. Wales introduced a charge for single use carrier bags on 1 October 2011. In October 2012, Haiti banned plastic bags and polystyrene packaging nationwide, in order to protect, said Prime Minister Laurent Lamothe, the island’s coast and mangroves that risked being asphyxiated by the detritus. Mauritania and Mali, following in the path of other countries, made plastic bags illegal as of 1 January 2013. In the US, Los Angeles introduced a ban on single-use plastic bags from 1 January 2014 for large stores and from July 2014 for smaller stores. Shoppers will now have to bring or purchase a reusable plastic bag or paper bag.

The International Conference on Prevention and Management of Marine Litter in European Seas took place in Berlin, Germany, from 10-12 April 2013, and was co-organized by the German Federal Environment Agency on behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the European Commission Directorate-General for the Environment. The major message of this Conference was the need to take actions on the ground to prevent marine litter generation and reduce its impact. The Conference recommended the preparation and implementation of regional plans on marine litter by the European regional seas.

³ www.beatthemicrobead.org

UNEP has encouraged and supported the preparation of Regional Seas Action Plans and Marine Litter Action Plans since 2005. The last meeting of Contracting Parties to the Barcelona Convention⁴ in December 2013 adopted the Regional Action Plan for the Management of Marine Litter. This plan goes even further than former plans, as its implementation will make the Mediterranean the first regional sea with legal commitments to address the major concern of marine litter through concrete actions and measures at regional and national levels.

Some of the measures and targets related to plastic in the Mediterranean envisaged in the plan are:

- To implement by the year 2019 adequate waste reducing/reusing/recycling measures to reduce the plastic packaging waste that goes to landfill or incineration without energy recovery. (Art. 9.2)
- To explore and implement by the year 2017 to the extent possible the following measures (Art.9.3):
 - Extended Producer Responsibility for producers, manufacturers, brand owners and first importers, with the aim to encourage companies to design products with long durability for reuse, recycling and materials reduction in weight and toxicity (eco-design);
 - Establishment of voluntary agreements with retailers and supermarkets to set an objective of the reduction of plastic bags consumption as well as selling dry food or cleaning products in bulk and refilling special and reusable containers;
 - Fiscal and economic instruments to promote the reduction of plastic bag consumption;
 - Establish procedures and manufacturing methodologies together with the plastic industry, in order to minimize the decomposition characteristics of plastic and to reduce micro-plastic.

In November 2013, the European Commission published proposals to amend the EU packaging waste directive by requiring Member States to reduce consumption of lightweight plastic bags using measures such as taxes, national reduction targets or bans. The consultation on plastic bags was completed, however, a quantitative value was not approved and no further specification was made.

International frameworks, partnerships and activities

The Fifth International Marine Litter Conference co-organized by the U.S. National Oceanic and Atmospheric Administration and UNEP, held from 20-25 March 2011 in Honolulu, Hawaii, brought together 440 participants from 38 countries. Conference participants refined and endorsed by acclamation the Honolulu Commitment, which outlines 12 actions to reduce marine litter, and revised the Honolulu Strategy, a global framework strategy for prevention and management of marine litter.

The idea behind the Honolulu Strategy is to create a broad framework for actions that can be taken at the local, regional, national and global level by individuals, civil society, governments and international organizations. Strategies to prevent and reduce the impacts of marine litter are organized under three overarching goals: (1) Goal A: Reduced amount and impact of land-based sources of marine litter introduced into the sea; (2) Goal B: Reduced amount and impact of sea-based sources of marine litter including solid waste, lost cargo, ALDFG, and abandoned vessels introduced into the sea; (3) Goal C: Reduced amount and impact of accumulated marine litter on shorelines, in benthic habitats, and in pelagic waters.

⁴ Convention for the Protection of the Mediterranean Sea Against Pollution (*Barcelona Convention*).

Strategies under Goal A and B focus on preventing, reducing, and managing land and sea-based sources of marine litter. These strategies are critical to solving the marine litter problem because they tackle the source. Strategies under Goal C focus on removing the continuing accumulation of marine litter. These strategies are equally important because they reduce the impacts of marine litter on marine life and ecosystems, human health and safety, and the economy. UNEP introduced the Honolulu Strategy to the Third Intergovernmental Review Meeting (IGR-3) on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) held from 25-26 January 2012, as a framework that can be adopted and used by Member States and organizations. Representatives of 64 Governments and the European Commission emphasized the relevance of the Honolulu Commitment and the Honolulu Strategy.

Under the GPA, marine litter was highlighted as a priority source category for 2012-2016, giving UNEP a strong mandate to continue its work on this issue over the next 5 years. UNEP's marine litter related activities feed into the workplan of the UNEP-led Global Partnership on Waste Management (in the focal area Marine Litter), which will ensure that marine litter issues, goals, and strategies are tied to global efforts to reduce and manage waste. The Manila Declaration of the IGR-3 on the GPA also recommended the establishment of a Global Partnership on Marine Litter, which was launched at a Rio+20 side-event on 18 June 2012, where key stakeholders working in the field of marine litter and other litter discussed how to coordinate their activities and pool resources to develop and implement a concrete international partnership which would advance, inter alia, the Honolulu Strategy.

This launch complemented paragraph 163 of the Rio+20 Outcome document⁵, *The future we want*, wherein Member States among others, noted “with concern that the health of oceans and marine biodiversity are negatively affected by marine pollution, including marine debris, especially plastic, persistent organic pollutants, heavy metals and nitrogen-based compounds, from a number of marine and land-based sources,” and committed “to take action to reduce the incidence and impacts of such pollution on marine ecosystems, including through the [...] follow up of relevant initiatives such as the [GPA], as well as the adoption of coordinated strategies to this end.” Member States further committed “to take action to, by 2025, based on collected scientific data, achieve significant reductions in marine debris to prevent harm to the coastal and marine environment”.

iii. Impact on the three dimensions of sustainable development

Awareness of the negative impacts of marine litter and concern for the sustainability of the environment has increased in recent years, as greater value is now placed on the Earth's natural resources. Each year in September, millions of volunteers come together around the world to collect litter, including from beaches and rivers. These volunteers are the driving force behind International Coastal Clean-up (ICC) Day which is coordinated globally by the Ocean Conservancy.⁶ In 2012, 561,000 volunteers removed 10 million pounds of trash from the coastlines and waterways in 97 countries around the world. Box 1 illustrates the implementation of ICC Day in Jamaica.

⁵ A/RES/66/288 (2012): The Future We Want – Outcome Document of the Rio+20 Conference.

⁶ www.oceanconservancy.org

Box 1: International Coastal Clean-up Day in Jamaica, 2013

In Jamaica, the Tourism Enhancement Fund (TEF) and the RBC Blue Water Project partnered with the non-governmental organization Jamaica Environment Trust and national coordinators to organize an island-wide beach cleanup on 21 September 2013. This International Coastal Clean-up day in Jamaica inspired about 6,500 Jamaicans, coordinated by 56 groups, including non-governmental and community based organizations, schools, government agencies, hotels, service clubs and private sector groups, to remove 65,650 pounds of trash from 90 sites across the island. Out of the collected items from 62.7 miles of coast, 62% were plastic items, most of which were plastic bottles (115,400), plastic bottle caps (44,674), plastic pieces < 2.5 cm (29,119) and plastic bags (22,623). The volunteers collected data about the different sources and types of trash harming the oceans and waterways. This data was later used to raise awareness, inspire recycling efforts and shape policy decisions on the local to the international level.

Source: International Coastal Cleanup Day Jamaica Report, Jamaica Environment Trust (2013).⁷

Reduction of marine litter such as plastic items through market-based instruments, including levies or taxes, not only generates resources, but can also provide an incentive for target groups, including consumers, producers and distributors, to modify their behavior and reduce the influx of waste into the marine and coastal environment. Ireland introduced a levy in 2002 on general purpose plastic bags in the amount of €0.15 per bag (increased to €0.22 in 2007) to reduce the consumption of single-use plastic bags and increase awareness of their negative impacts. The effect on consumer behaviour was substantial, with a decrease in plastic bag usage from an estimated 328 bags per capita to 21 bags per capita. According to data from the National Litter Pollution Monitoring System, plastic bags constituted 0.25% of marine litter pollution nationally in 2010, compared to an estimated 5% in 2001 prior to the introduction of the levy. By June 2013, the levy had generated a total of €203 million which was channelled to an environmental fund to support anti-litter initiatives undertaken by community groups and others for the protection of the environment as well as research and development activities of the Environmental Protection Agency.

China announced that the plastic bag ban that they launched in 2008 has cut consumption by at least 67 billion bags, saving the equivalent of 6 million tons of oil.⁸ The rules ban the manufacturing or use of the thinnest types of plastic bags. They also prohibit supermarkets, department stores, and grocery stores from giving away thicker varieties, requiring them to charge customers for the bags. Wales introduced a charge for single use carrier bags on 1 October 2011. The government wanted to encourage people to use their own bags to promote sustainability, conserve limited resources, and reduce waste and litter. The money raised is collected by the retailer and the retailer is encouraged to pass these monies on to environmental good causes in Wales. Since the initiation of the programme and the launch of the carrier bag charge, a summary received from 13 retailers shows reductions of plastic bag usage by 35-96%.

Reducing the influx of marine litter such as plastic bags into the marine environment reduces the risk of environmental and ecological impacts. In Ireland, after the introduction of the levy, there was a 90%

⁷ www.jamentrust.org

⁸ Source: National Development and Reform Commission (NDRC).

drop in plastic bag consumption from 1.2 billion to 230 million per year, which resulted in dramatically reduced littering. Data from Coastwatch indicates that in 2001 (prior to the levy), around 17 plastic bags were found per 500 m of coastline surveyed; this fell to around 10 bags in 2002 (the year the levy was introduced), 5 bags in 2003 (one year after the levy's introduction), and 2 bags in 2012. Furthermore, it is suggested that a plastic bag ban or phase out is both a climate change mitigation measure and a disaster risk reduction response (e.g., prevention of floods caused by plastic bag blockage in gutters) and has proven effective in many countries.

iv. Lessons learned

- Prevention of marine litter is generally more effective and efficient than remedial action.
- Marine litter is a global problem and mitigation actions should be developed around a global framework, coordinated at the regional level and implemented at the national level through the development and implementation of national action plans or strategies.
- National action plans or strategies should be based on the: development, implementation and enforcement of national legislation for waste management that includes marine litter; enhancement of institutional mechanisms; strengthening of public, governmental and private sector partnerships; expanded outreach and education campaigns aimed at raising public awareness; and development of frameworks for engaging key stakeholders and partners.
- Through partnerships and alliances, and by pooling comparative advantages, chances for success are increased.
- Education and public awareness campaigns in particular are essential tools for environmental protection, as raising public awareness and encouraging people to change their attitudes and behaviours related to solid waste management are essential components in efforts to mitigate marine litter.
- Market-based instruments can be used to encourage a behavioral change or to generate revenue to address marine litter issues. These include fines, penalty charges and non-compliance fees based on the costs of the damage.
- Incentives and technical or financial support, such as programmes for fishermen to retrieve litter or report on problems (including fishing gear) while at sea, can be very helpful. For example, the campaign Fishing for Litter, initiated by the Dutch Government, has now been expanded to Belgium and Scotland.
- Adequate quantitative and qualitative knowledge of the sources of marine litter is extremely important to serve as the basis for management decisions on actions to prevent, reduce and control problems caused by marine litter.
- The costs associated with marine litter are largely borne by parties different from those causing the problem; there is insufficient liability of the entities responsible for the source of the problem.
- Reducing and controlling marine litter in the world's oceans is a significant but achievable challenge. Existing solutions must be tailored and replicated for specific regions, comprising innovative economic incentives to prevent litter and encourage the clean-up, prevention and management of abandoned, lost or otherwise discarded fishing gear, harmonization of monitoring and assessment systems, and establishment of adequate reception facilities for maritime garbage and wastes.

References

- Commission Staff Working Document (2013): Executive Summary of the Impact Assessment-Accompanying the document "Proposal for a "Directive of the European Parliament and of the Council" amending Directive 94/62/EC on packaging and packaging waste to reduce the consumption of lightweight plastic carrier bags.
- Doyle, T. K. and O'Hagan, A. (2013): The Irish Plastic Bag Levy: A mechanism to reduce marine litter?, International Conference on Prevention and Management of Marine Litter in European Seas, Berlin.
- Environment Agency (2004), cited in OSPAR Commission (2009).
- Hall, K. (2000): Impacts of Marine Debris and Oil: Economic and Social Costs to Coastal Communities. Kommunenenes Internasjonale Miljøorganisasjon (KIMO).
- International Conference on Prevention and Management of Marine Litter in European Seas (2013): Issue Paper. Berlin, Germany, 10-12 April 2013.
- Lane, S. B., Ahamada, S., Gonzalves, C., Lukambuzi, L., Ochiewo, J., Pereira, M., et al. (2007): Regional Overview and Assessment of Marine Litter Related Activities in the West Indian Ocean Region. Report to the United Nations Environment Programme. (pp. 91).
- McIntosh, N., Simonds, K., Donohue, M., Brammer, C., Mason, S. and Carbajal, S. (2000): Proceedings of the International Marine Debris Conference on Derelict Fishing Gear and the Ocean Environment, Honolulu, Hawaii.
- McIlgorm, A., Campbell H.F. and Rule M.J. (2008): Understanding the economic benefits and costs of controlling marine debris in the APEC region (MRC02/2007). A report to the Asia-Pacific Economic Cooperation Marine Resource Conservation Working Group by the National Marine Science Centre (University of New England and Southern Cross University), Coffs Harbour, NSW, Australia.
- Moore, C. J. (2008): Synthetic polymers in the marine environment: A rapidly increasing, long-term threat. *Environmental Research*, 108(2), 131-139.
- National Research Council (2008): Tackling Marine Debris in the 21st Century. Washington, DC: The National Academies Press.
- Naturvårdsverket. (2009). What's in the Sea for Me? (Report 5872, pp. 40) Ecosystem Services Provided by the Baltic Sea and Skaggeak.
- Mouat, J., Lopez Lozano, R. and Bateson, H. (2010): Economic Impacts of Marine Litter. Kommunenenes Internasjonale Miljøorganisasjon.
- Ofiara, D. D. and Seneca, J. J. (2006): Biological effects and subsequent economic effects and losses from marine pollution and degradations in marine environments: Implications from the literature. *Marine Pollution Bulletin*, 52(8), 844-864.
- Rios, L. M., Moore, C. and Jones, P. R. (2007): Persistent organic pollutants carried by synthetic polymers in the ocean environment. *Marine Pollution Bulletin*, 54(8), 1230-1237.
- Ten Brink, P., Lutchman, I., Bassi, S., Speck, S., Sheavly, S., Register, K., et al. (2009): Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter. (pp. 60) Institute for European Environmental Policy (IEEP), Brussels, Belgium, and Sheavly Consultants, Virginia Beach, VA, USA.
- Van den Brink, N. W., van Franeker, J. A., Riddle, M. J. and van den Heuvel-Greve, M. (2011): Contrasting time trends of organic contaminants in Antarctic pelagic and benthic food webs. *Marine Pollution Bulletin*, 62(1), 128-132.

b) Case study 2: Ecosystem Health Report Card for Managing Chilika Lake of Odisha State: a collaborative approach, India

[By: Anjan Datta¹, United Nations Environment Programme (UNEP)]



Oceans, seas, islands and coastal areas together form an integrated and essential component of the Earth's ecosystem. They are critical to global food security; sustaining economic prosperity and the well-being of many national economies.

The “importance of the conservation and sustainable use of the oceans and seas and of their resources for sustainable development, including through their contributions to poverty eradication, sustained economic growth, food security and creation of sustainable livelihoods and decent work, while at the same time protecting biodiversity and the marine environment and addressing the impacts of climate change” was stressed by Heads of State and Government and other High-level Representatives attending the United Nations Conference on Sustainable Development, Rio+20 in 2012, and featured prominently in the outcome document, *The future we want*². Management of coastal and ocean resources calls for a shared vision and contribution from all stakeholders.

¹ E-mails: anjan.datta@unep.org or anjandatta@gmail.com

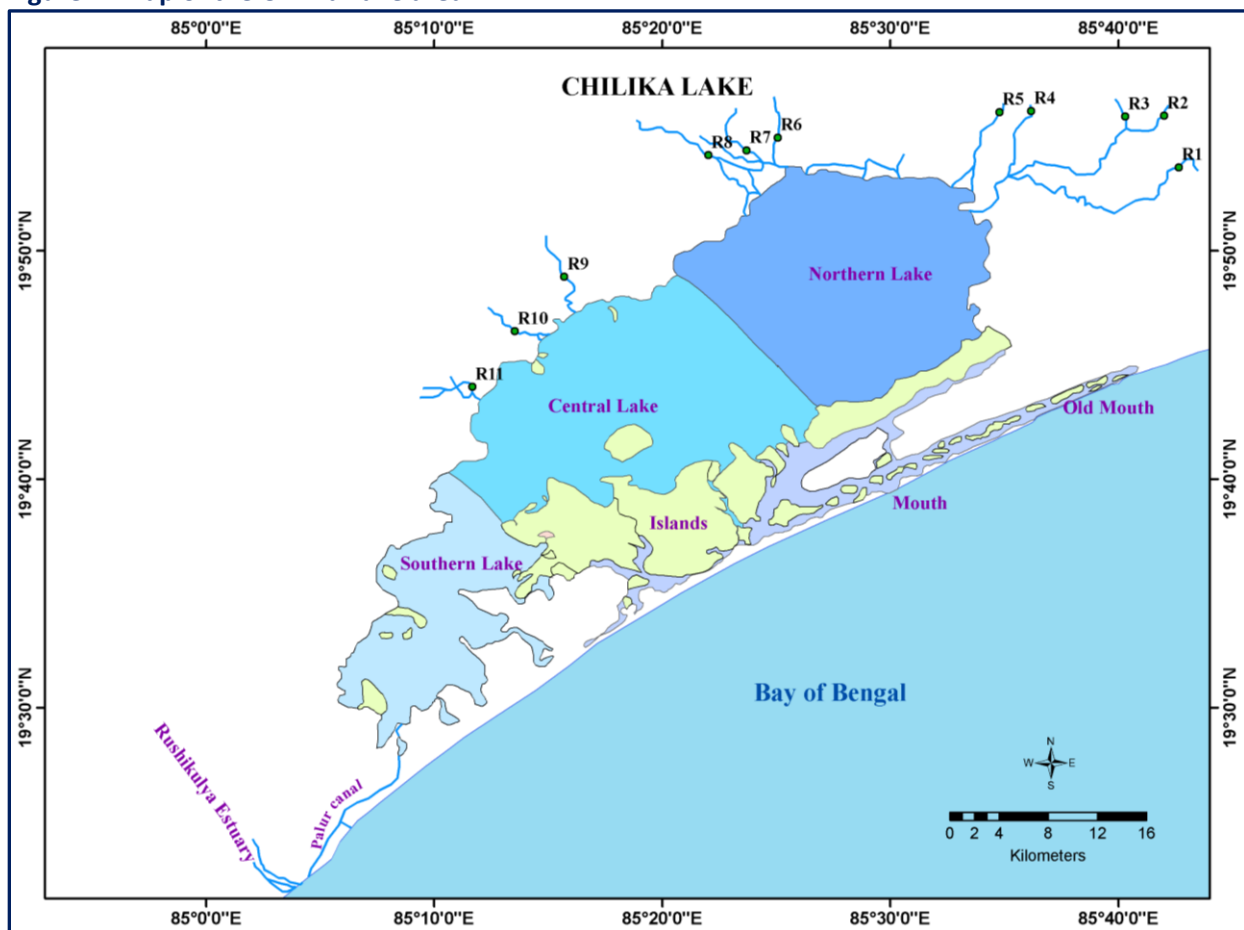
² A/RES/66/288 (2012): The Future We Want – Outcome Document of the Rio+20 Conference.

UNEP, in collaboration with the Chilika Development Authority (CDA), the Government of Odisha and the National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment and Forests, Government of India, began to lay the foundation for an institutional infrastructure for facilitating dialogues and building consensus on a shared vision for the sustainable management of Chilika Lake in Odisha State, India.

i. The challenge

Chilika Lake, a semi-enclosed coastal lagoon on the east coast of India, is the largest brackish water coastal lagoon in India (1,100 km²). It is a shallow coastal body of water separated from the Bay of Bengal by a long sandbar extending about 180-275 m wide. The Lake is a unique assemblage of marine, brackish and fresh water ecosystems with estuarine characteristics (see Figure 1).

Figure 1: Map of the Chilika Lake area



Source: Lake Chilika Development Authority, Report on the expert group meeting and inception workshop held to develop indicators to assess coastal ecosystem health, 2012.

Chilika Lake is a biodiversity hotspot that houses: 211 bird species; nearly one million migratory birds during the winter period; the largest Irrawaddy dolphin population; 217 fish species; as well as supports the livelihood base of 0.2 million fishers.

On account of its rich biodiversity, in 1981 Chilika Lake was designated a “Ramsar Site”, which is a wetland of international importance — the first of its kind in India. The Chilika system, in addition to the 1,100 km² area of the Lake, receives run-off from 2,325 km² of agricultural land, 525 km² of forests, 190 km² of permanent vegetation (predominantly used for plantations), 70 km² of swamps and wetlands and 90 km² of grassy mud flats. About 52 small rivers and streams are draining to Chilika Lake and the large Mahanadi River enters the lake in its north-eastern end. Due to natural processes and human activities, the lake ecosystem deteriorated, and in 1993, the Ramsar Convention listed Chilika Lake in the Montreux Record³ due to changes in its ecological characteristics.

ii. Oceans-and seas-related measures undertaken

The Chilika Development Authority (CDA) adopted a restoration strategy based on the ecosystem approach, and several targeted studies were undertaken to have a better understanding of the complex ecosystem and the root causes of the degradation in order to define appropriate technological and management measures. A strategic partnership with a wide array of organizations was established and a robust monitoring protocol was put in place. In 2000, a new outlet was created to link the lake with the Bay of Bengal. Given the geophysical characteristics of Chilika Lake, its ecological and economic significance and the management challenges faced, the CDA agreed with UNEP and NCSCM to develop an Ecosystem Health Report Card that aimed at providing coastal communities and other stakeholders with the knowledge, understanding and forecasting needed to allow them to respond accordingly to ecosystem-related changes and challenges. A key part of this approach was to foster linkages between agricultural and fishing communities as well as coastal communities and policymakers.

The Report Card methodology draws from the established methods of “EcoCHECK”⁴ of the University of Maryland, USA. To prepare the Report Card, key indicators are identified and assessed. In this approach, the ecosystem is divided into different segments which are further divided into several stations, based on specific physico-chemical parameters such as salinity and nutrient concentrations. The Report Card provides rigorous scientific assessment of key parameters based on well-defined threshold values which can also be used to develop communication products for a wide group of audiences on a regular basis.

An Ecosystem Health Report Card is designed to enhance and support the scientific evaluation, management and restoration of any coastal ecosystem. It builds on the circular relationship between assessment and forecasting. Assessments provide the data and questions from which quantitative forecast models are developed. Continued assessment enables the forecast models to be tested and refined. Further, the Report Card, based on a pressure-state-response framework, recommends management and policy options and outlines key messages. These messages can form the basis for developing a communication strategy and outreach materials to engage stakeholders for the sustainable management of the ecosystem that is being studied. The Report Card is an effective means of tracking and reporting the health of an ecosystem at both local and regional scales.

³ The Montreux Record is a register of wetland sites on the List of Wetlands of International Importance where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference. It is maintained as part of the Ramsar List.

⁴ <http://ian.umces.edu/ecocheck/>

Chilika Lake Report Card development process⁵

The CDA (with technical inputs from the Institute for Ocean Management at Anna University, Chennai, India) NCSCM and UNEP organized an expert group meeting in June 2012 to develop indicators and values for establishing ecological thresholds to determine the Chilika Lake Report Card. The overall focus of the work was on understanding the biogeochemical processes and fluxes of nutrients in Chilika Lake using the LOICZ⁶ Biogeochemical Model, and estimating the overall water quality, biodiversity and fish production status of Chilika Lake.

At the expert group meeting, there was a broad consensus that data on physical, chemical, biological and microbiological parameters and human activities (e.g. fish harvest) that was collected on a regular basis from different ecological sectors by CDA would form the basis for the generation of the Report Card. The identified values and thresholds were then presented to fishers and other professional groups as well as non-governmental organisations that were working in the Chilika Lake command area for their review before the guidelines were endorsed.

The first expert group meeting was followed by a science workshop in February 2013, bringing together local, regional, and international experts⁷ and stakeholders, who together identified 10 indicators of ecosystem health, organized under three main indices:

(1) *Water Quality index:*

Indicators: (a) total “chlorophyll a”, (b) dissolved oxygen, (c) water clarity;

(2) *Biodiversity index:*

Indicators: (a) bird species count and richness, (b) dolphin abundance, (c) phytoplankton diversity and (d) benthic infauna diversity;

(3) *Fisheries index:*

Indicators: (a) total fish catch, (b) commercial species diversity, including finfish and shellfish, and (c) size of species.

Together, these indicators represented the ecosystem features of Chilika Lake that were of value (e.g., for fishing, tourism, and biodiversity) while also reflecting threats to these values (e.g., overfishing and illegal aquaculture, pollution, and sedimentation). For each set off indices, a threshold value was defined based on:

(a) Regulations (e.g., Indian and/or internationally recognized standard);

(b) Biological limits;

⁵ This exercise in the Chilika Lake was undertaken within the framework of the *UNEP/GEF Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of the Global Nutrient Cycle project*. Financial and technical support were provided by the GEF Secretariat, the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), the Chilika Development Authority, Government of Odisha, India, the National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Government of India, the Institute for Ocean Management, Anna University, Chennai, India and other valuable partners of the project.

⁶ LOICZ stands for *Land-Ocean Interactions in the Coastal Zone*. The LOICZ project is an international research project and global expert network exploring the drivers and socio -environmental impacts of global environmental changes in coastal zones.

⁷ The meeting was also attended by several experts from the Integration and Application Network of the University of the Maryland Center for Environmental Science, USA.

- (c) Socio-economic requirements;
- (d) Reference conditions (e.g., another location with similar characteristics);
- (e) Professional judgment; and
- (f) Reference site within the system.

Finally, all the values were summed up into one value to give the ecosystem a final grade in a scale of 0 to 10 and were presented with coloured maps and graphics for easy visualization.

After each meeting and workshop, the main conclusions were shared with the senior policymakers of the CDA, the Ministry of Environment and Forests and the Government of Odisha to keep them informed on the process and steps that were taken to move it forward. In the light of the workshop outcomes, the CDA and NCSCM scientists carried out analyses of existing data, collected relevant data to fill the gaps and conducted a modelling exercise to assign scores for different ecological zones of Chilika Lake, as well as an determined the overall score for Chilika Lake.

2012 Chilika Lake Report Card

Chilika Lake was divided into four reporting zones, each of which received a Report Card grade. The grades were calculated from the average of: water quality, fisheries, and biodiversity indices, based on data collected over the 2011-2012 period. The grades were defined as follows:

A (80–100%): All water quality and biological health indicators meet desired levels. Quality of water in these locations tends to be very good, most often leading to very good habitat conditions for fish and shellfish.

B (60–80%): Most water quality and biological health indicators meet desired levels. Quality of water in these locations tends to be good, often leading to good habitat conditions for fish and shellfish.

C (40–60%): There is a mix of good and poor levels of water quality and biological health indicators. Quality of water in these locations tends to be fair, leading to fair habitat conditions for fish and shellfish.

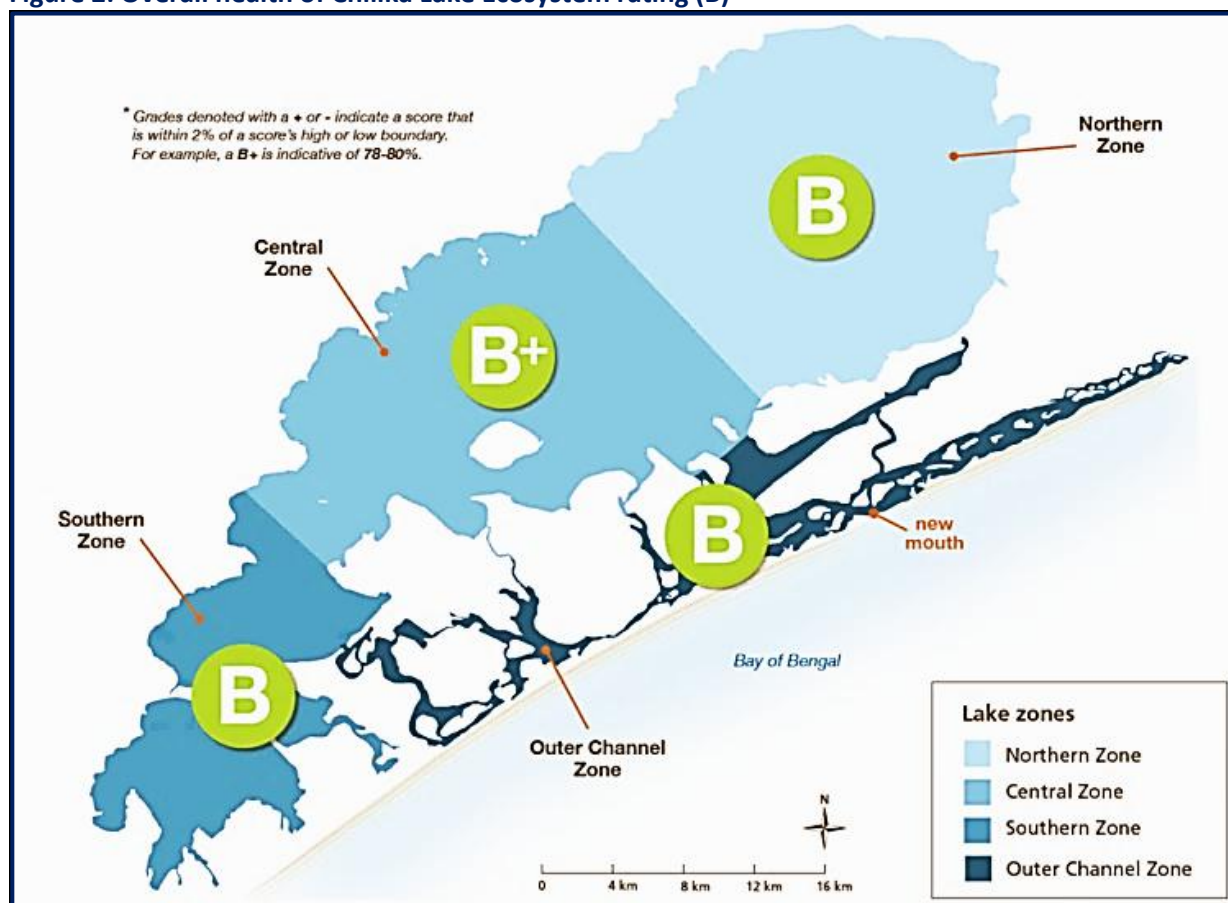
D (20–40%): Some or few water quality and biological health indicators meet desired levels. Quality of water in these locations tends to be poor, often leading to poor habitat conditions for fish and shellfish.

F (0–20%): Very few or no water quality and biological health indicators meet desired levels. Quality of water in these locations tends to be very poor, most often leading to very poor habitat conditions for fish and shellfish.

On-going monitoring would allow grades to be updated on a periodic basis, providing a means to track change over time. The Lake as a whole displayed excellent (A) dissolved oxygen concentrations, water clarity, total fishery catch and size, and benthic infauna diversity. The Lake failed, however, for total chlorophyll concentrations (F), based on desired conditions.

Of the ten indicators that were assessed within the categories of water quality, fisheries, and biodiversity, 79% (B+) was achieved in the Central Zone, followed by 76% (B) in the Southern Zone, 71% (B) in the Outer Channel Zone, and 69% (B) in the Northern Zone. Overall, Chilika Lake scored a (B) for ecosystem health as shown in Figure 2.

Figure 2: Overall health of Chilika Lake Ecosystem rating (B)



Source: Chilika Lake Ecosystem Health Report Card, 2012.

The results of this exercise were visually displayed in the Chilika Lake Report Card in terms of graphics and illustrations. The Report Card was an important step in enhancing stakeholder understanding of how human activities were affecting the state of Chilika Lake and what responses were called for. The Report Card and its production process also created a learning network through the sharing of skills and techniques that ultimately contributed to inclusive consensus building for developing a shared vision for the sustainability of Chilika Lake and enhancing the well-being of people who depended on it.⁸ It is worth noting that the Chilika Ecosystem Health Report Card was the first of its kind in Asia.

The Governing Body of the CDA, headed by the Chief Minister of Odisha, India, approved the 2012 Chilika Lake Report Card in its meeting on 13 November 2013. Upon its approval, the CDA organized a policy workshop with senior policymakers from Odisha and other states of India to work out a response

⁸ See: www.gpa.unep.org; www.nutrientchallenge.org; www.Chilika.com; www.ncscm.org

plan which envisaged ecosystem conservation, sustainable resource development and livelihood improvement supported by institutional development, communication, education and public policy as the key management response components. The government of Odisha, in view of the recommendations of the Report Card, decided to allocate human and financial resources to CDA to start implementing the key recommendations of the Report Card.

Replication of the Report Card in India and beyond

The NCSCM, the Ministry of Environment and Forests and the Government of India through the Indian National Coastal Zone Management Programme are facilitating the replication of the Report Card process in several other coastal states of India. The state of Gujarat organized, for example, an expert group meeting and started collecting relevant data for a Report Card in June 2013. The governments of Madhya Pradesh, Jammu and Kashmir, Kerala have also shown interest in starting a similar process based on the methodology that was tested with regard to Chilika Lake. In addition, the Laguna Lake Development Authority (LLDA) of the Philippines expressed interest in using the Report Card approach in order to understand and manage the country's largest lake, Laguna de Bay. The LLDA hosted the first expert group meeting in Manila on 12-13 December 2013 with the participation of CDA and NCSCM and other key national stakeholders from India. Finally, the CDA Chief Executive presented the Chilika Lake Report Card at the Asia Regional Workshop on Scientific and Technical Support for Implementation of the Ramsar Convention held from 7-11 October 2013 in Changwon City, Republic of Korea. The Committee welcomed this approach and decided to replicate the Report Card methodology in order to assess the ecosystem health of designated sites.

iii. Impact on the three dimensions of sustainable development

Before the development of the Chilika Lake Report Card, the restoration strategy adopted by CDA, and supported by management actions, resulted in numerous benefits. Among others, there was an eightfold increase in annual fish and prawn landings with a consequent increase in the monthly family income of fishermen. In addition, invasive species decreased and, in 2002, Chilika Lake was removed from the Montreux record. In fact, Chilika Lake was the first site to be removed from the Montreux record due to its successful restoration.

The Chilika Lake Report Card itself provided a transparent, timely and regionally detailed integrated ecosystem health assessment by setting the ecological thresholds for the Chilika Lake system based on the review of published scientific literature and technical reports. It enabled resource managers, policymakers and local communities to anticipate problems, take remedial or avoidance actions, and develop comprehensive management strategies for Chilika Lake. The Report Card fostered linkages between agricultural and fishing communities as well as coastal communities and policymakers.

Further, the Report Card, based on a pressure-state-response framework, recommended management and policy options and outlined key messages that could form the basis for developing a communication strategy and outreach materials to engage stakeholders for the sustainable management of Chilika Lake. Finally, the Report Card allowed for tracking and reporting on the health of Chilika Lake.

Some other immediate impacts of the Report Card that merit attention were the following:

- In consideration of the recommendations, the government of Odisha allocated additional human and financial resources to the CDA for revising the Chilika management plan and supporting implementation of the recommendations. The government also initiated a process to revise the mandate of the CDA to address the management challenges outlined in the Report Card.
- The CDA launched an adaptive restoration plan through a consultative process.
- The management of Chilika Lake was placed within the wider ecological framework of integrated management of the micro watershed as a functional ecological unit of the Lake command area. With engagement of the local community, rainwater harvest systems and water retention structures were built to manage the discharge of water from the upper reaches to downstream areas. These changes have resulted in recharging the aquifers,⁹ rejuvenating local ecosystems, reducing waterlogging of the rice fields, particularly around the 50,000 km² of fields in the northern periphery of Chilika Lake, and reducing the silt load into the Lake.
- To keep the momentum of the Report Card and ensure its sustainability, the CDA developed strategic partnerships with a number of government agencies and civil society organizations in order to empower local communities through capacity-building activities and to create adequate institutions to take the process forward. Watershed associations were established at each micro watershed as the key institutions to manage the natural resources and ensure equitable distribution of the benefits. They were also used as extension agents for planting mangroves along the coast to promote less intensive agriculture with low chemical inputs. The watershed associations were formalized through registration under the Societies of Registration Act.
- In the region, the use of organic manure was encouraged to maintain the ecological balance.
- The restoration of wetland and its drainage basin was highlighted as playing a significant role in protecting the marine environment from land-based activities.
- The CDA also embarked on a number of supporting activities to diversify livelihoods. Training opportunities and credit facilities were provided to fisher communities to support the development of community-based ecotourism. Currently around 850 boats are being used for dolphin watching and 500 boats for bird watching and all are operated by local fisher groups. Each boat provides employment for 3-4 people. These new avenues of employment reduce the pressure on fisheries and ensure the commitment of the fisher community to protect the birds and dolphins.

iv. Lessons learned

- The continuous dialogues and open engagement with all stakeholders and partners were the key success factors for the development of the Chilika Lake Report Card and for securing government and other stakeholders' endorsement for the process and the conclusions derived.
- Transparent communication with local stakeholders supported the mobilization of actions for collection and sharing of data that were fundamental for the production of the Report Card.

⁹ An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a water well.

- Periodic reporting on the progress made in developing the Report Card, together with the explanation that it was being designed as a tool for sustainable management of Chilika Lake and its basin rather than being a purely scientific exercise, drew the attention of policymakers and resulted in the necessary political support.
- The Report Card not only provided a transformative assessment of Chilika Lake ecosystem health but also ingredients for developing communication products for a wider audience in order to mobilize them to take responsibility to protect, restore and enhance the health of Chilika Lake.
- The development process clearly demonstrated the merits of creating a triangular relationship between research, management and monitoring and how to use data and information for the generation of knowledge that can be applied to policymaking, the engagement of communities, and pursuing a collective agenda for sustainable management of natural resources and supporting livelihoods.

Acknowledgments

I would like to thank and acknowledge the following persons for their valuable inputs and suggestions: Dr. Ajit Pattnaik, Chilika Development Authority, Government of Odisha, India and Prof. R. Ramesh, National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Government of India.

c) Case study 3: Climate change adaptation in Lami Town, Fiji

[By Gabriel Grimsditch, United Nations Environment Programme (UNEP), Tim Carruthers, Secretariat of the Pacific Regional Environment Programme (SPREP), Sarah Mecartney, United Nations Human Settlements Programme (UN-Habitat)¹]



2014 has been declared the International Year of Small Island Developing States (SIDS).² As stakeholders prepare for the Third International Conference on Small Island Developing States³ in Apia, Samoa (1-4 September 2014), it is worth remembering that SIDS are some of the world's most vulnerable countries. Often remote, with limited resources and small but growing populations, they face a myriad of development challenges. They are particularly vulnerable to external economic shocks, natural disasters that could potentially become more frequent and intense, and a large range of impacts from climate change.

¹ E-mails: gabriel.grimsditch@gmail.com; timc@sprep.org; mecartney-unhabitat@un.org

² www.un.org/islands2014/

³ www.sids2014.org/

i. The challenge

Lami is a coastal town in Fiji that is subject to many of the vulnerabilities and developmental and environmental challenges associated with SIDS. Located on the southeast coast of the island of Viti Levu, the largest and most densely populated island in Fiji, Lami Town has a population of approximately 20,000 people and an area of about 680 hectares. It is a residential (including informal settlement areas), commercial and industrial centre characterized by both low-elevation coastal areas and hilly terrain. As for many coastal cities around the world, threats from climate change, including sea-level rise, flooding and coastal erosion, are a constant concern for Lami Town. In addition, tropical cyclones are projected to be fewer in number, but more severe.

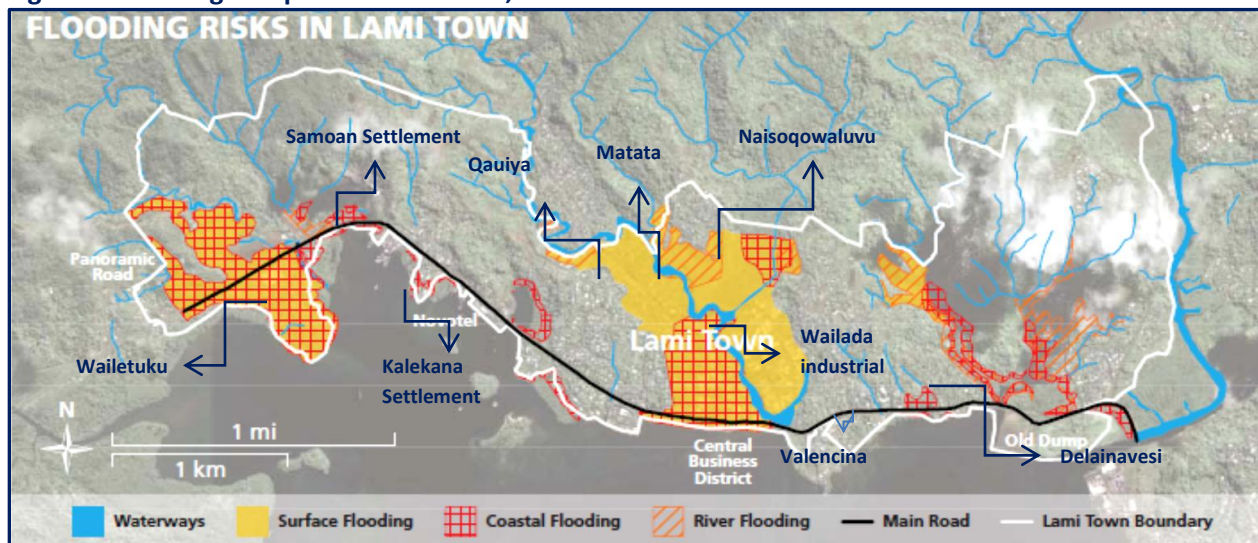
Flooding risk

A vulnerability assessment conducted by the United Nations Human Settlements Programme (UN-Habitat), the United Nations Environment Programme (UNEP), the Secretariat of the Pacific Regional Environment Programme (SPREP), the World Wildlife Fund (WWF) and the Lami Town Council showed that the town experiences three different types of flooding:

- coastal flooding as a result of storm surges or large waves from Suva Harbour;
- river flooding as a result of overflowing water from the three rivers that run through the town; and
- surface flooding from water that gathers in low-lying areas during periods of excess rainfall.

Much of Lami Town's industrial area is located on reclaimed mangrove swamps and, along with the central business district and several of the informal settlements, is situated in low-lying, flood prone areas (see Figure 1).

Figure 1: Flooding hotspots in Lami Town, 2013



Source: SPREP, An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands, 2013.

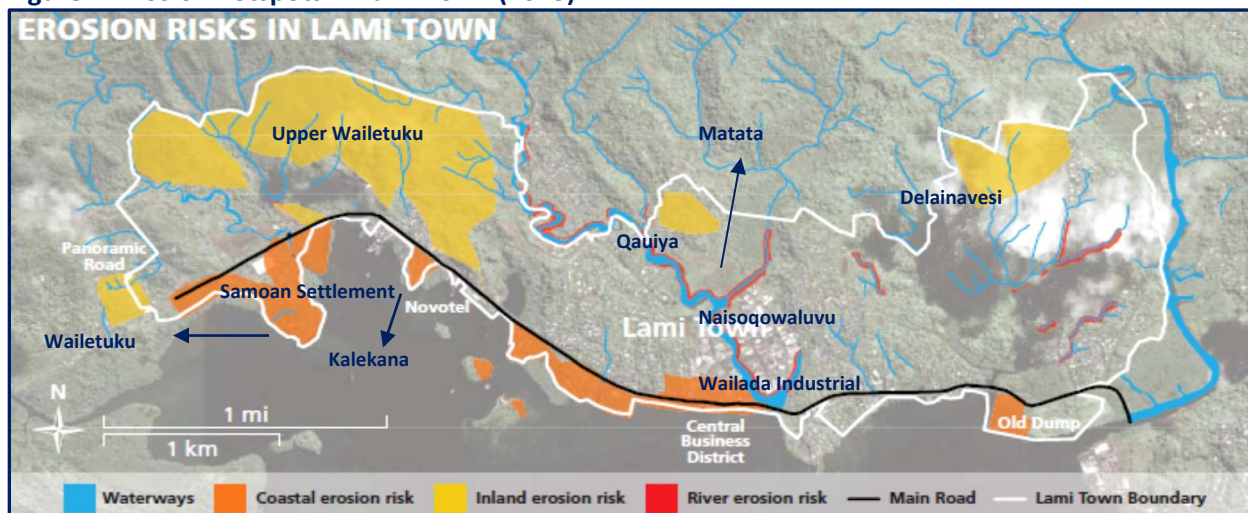
The risk of floods affecting the economy is high, and many people making a livelihood in the informal sector are unable to undertake income-generating activities when basic infrastructure becomes flooded. The February 2014 flood affected over 3,000 people in Lami Town, particularly those located in the Qauia settlement, through disruptions to water and power supply. The economic cost of this flood is estimated to be over US\$ 1,652,086 (FJD\$ 3,000,000) across Fiji, including damage to crops and infrastructure.

Climate models forecast an increase in rainfall for Fiji over the coming decades, as general circulation models predict increased intensity of rainfall and an increase in wet season rainfall. It is therefore estimated that surface and river flooding will continue to be major threats to the industrial, commercial and residential areas in Lami Town, and are likely to be exacerbated by the predicted increase in rainfall intensity as was the case during the February 2014 floods. Sea level in Fiji has been rising 6 mm per year since 1993 and climate models predict a sharp rise in sea level that would further exacerbate coastal flooding.

Coastal erosion risk

In addition to flooding, Lami Town experiences several types of coastal erosion. This erosion is exacerbated by sea level rise and related flooding, and endangers infrastructure in low-lying coastal areas. Land and riverbank erosion is also intensified by increasing rainfall, and endangers many settlements built on the hills and along the rivers that flow through Lami Town (see Figure 2).

Figure 2: Erosion hotspots in Lami Town (2013)



Source: Ibid.

As the flooding and coastal erosion risks affecting Lami Town are only predicted to increase in magnitude, innovative and effective solutions are necessary to ensure the sustainable development of local communities and safeguard their livelihoods and housing.




ii. Oceans-and seas-related measures undertaken

To support sound decision-making, SPREP, UNEP, UN-Habitat and Conservation International worked with the Lami Town Council to analyze the costs and benefits of a range of adaptation options. This analysis helped to determine the most cost-effective measures for the town to safeguard its infrastructure and citizens.

Two major approaches were analyzed and compared. First, the costs and benefits of adaptation measures using more traditional hard engineering, such as building sea walls, digging dykes, reinforcing rivers, elevating infrastructure, or reclaiming land, were analyzed. Second, “softer” ecosystem-based approaches that use coastal ecosystems as natural “bioshields” to protect the coast were examined, such as for example rehabilitating mangroves and vetiver grass beds, reducing upland logging or protecting coral reefs.

The results showed that over the long term (20 years), using coastal ecosystems as bioshields to protect populations and infrastructure would be more cost-effective than using hard engineering as the high initial capital investment and the maintenance costs were making hard engineering much more expensive than ecosystem-based actions. For example, building and maintaining a seawall was calculated to cost approximately US\$ 1,120 (F\$ 2,050)⁴ per square metre over a 20-year time period, compared to approximately US\$ 2.7 USD (F\$ 5) for planting and maintaining a square metre of mangrove over the same time period (see Figures 3 and 4). In this context, mangrove forests are well known as natural coastal stabilizers that protect coastal areas from flooding and erosion.

Figure 3: Predicted cost of selected adaptation actions (hard engineering vs. ecosystem approach)

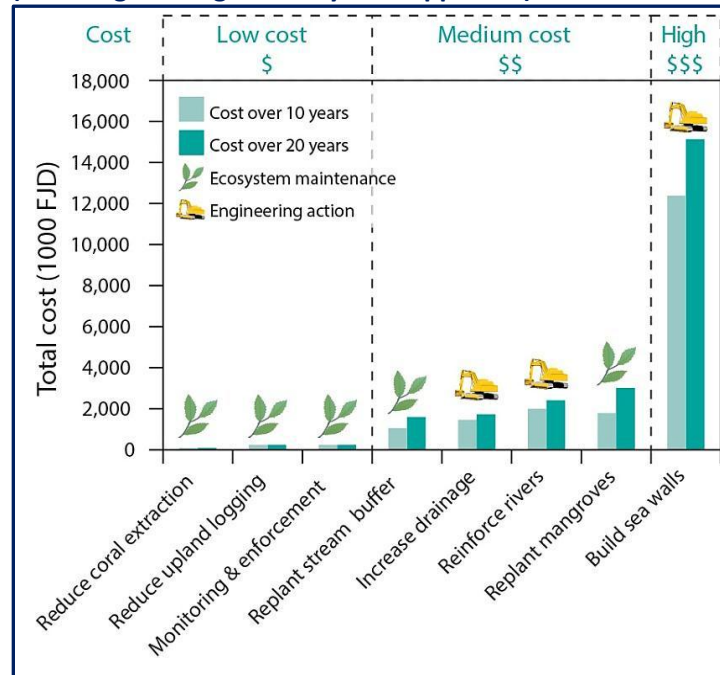
Adaptation action	Unit cost	Cost in FJD		Adaptation action	Unit cost	Cost in FJD	
		10y	20y			10y	20y
 Replant mangroves	m ²	\$2.76	\$4.67	 Reinforce rivers	-	-	-
 Replant stream buffer	m ²	\$2.88	\$4.87	 Protect river banks	m	\$1,144	\$1,404
 Increase drainage	m	\$16.29	\$20	 Dredge rivers	m ³	\$18.52	\$22.72
 Build sea walls	m	\$1,670	\$2,050	 River realignment	m	\$923	\$1,133

Source: Ibid.

In addition, intact and healthy coastal ecosystems can provide many additional services that hard engineering solutions cannot offer. These range from water quality maintenance to food production from fisheries to aesthetic and cultural values. Mangroves are for example nurseries for many commercially valuable fish and invertebrate species. Coral reefs offer a multitude of economic, social and environmental benefits such as shoreline protection, recreational tourism activities, as well as livelihood, income and food provision.

⁴ Conversion rate 1 FJD = 0.54 USD

**Figure 4: Total predicted cost of adaptation actions
(hard engineering vs. ecosystem approach)**



Source: *Ibid.*

Projections show that ecosystem-based adaptations in Fiji could be more cost effective in the long run than hard engineering approaches. Over a 20 year time frame, every Fijian dollar spent on ecosystem-based actions, such as mangrove replanting or stream bank re-vegetation, could result in up to US\$ 10.4 (F\$ 19.50) saved in damages avoided⁵ and ecosystem services supplied, whereas a similar investment in only engineering based actions, such as building seawalls, would only result in US\$ 4.9 (F\$ 9) in return. This includes estimates of costs saved due to the non-occurrence of health issues or damage to infrastructure, houses and businesses, and estimates of the benefits of ecosystem services that are maintained or enhanced (see Figure 5).

The above-mentioned comparative projection with regard to ecosystem-based measures and hard engineering solutions has not yet been tried and tested, and assumptions are being made solely on the foreseen effectiveness of both solutions in actually reducing flooding and erosion.

Ecosystem-based adaptation options may in fact be highly cost-effective while also offering benefits by reducing vulnerability of local infrastructure and populations. Nevertheless, a hybrid approach using both hard engineering and ecosystem-based solutions is recommended, as in some circumstances, appropriately designed hard infrastructure will be more effective in reducing potential damages than ecosystem-based alternatives. This hybrid approach is now being implemented in Lami Town to maximize the adaptive capacity of infrastructure and local communities, maintain and enhance ecosystem services and ensure the effectiveness of protection from coastal erosion and flooding.

⁵ Avoided damages are calculated as the damages that could be incurred when no action is taken.

Figure 5: Return on \$1 invested in adaptation actions, in terms of damage avoided and ecosystem services supplied (over 20 year time frame; 3% discount rate)

Scenario	Benefit-to-cost ratio (FJD)	Assumed damage avoidance
Ecosystem-based options	\$19.50	10–25%
Emphasis on ecosystem-based options	\$15.00	25%
Emphasis on engineering options	\$8.00	25%
Engineering options	\$9.00	25–50%

Source: Ibid.

The Lami Town council is already working with NGOs to restore and rehabilitate mangrove ecosystems in strategic locations as a first line of defense against overflowing rivers and flooding. In tandem with these physical processes of flood protection, supplementary adaptation actions that bolster the resilience of local communities and ecosystems are either planned or already implemented in Lami Town including: (1) disaster risk reduction strategies as part of the strategic planning for Lami Town; (2) improvement of solid waste management; (3) development of an early warning system; (4) implementation of a system to monitor the effectiveness of adaptation interventions; and (5) an additional complete analysis of the entire watershed, including the development of measures such as the reduction of upstream logging. These measures can help to increase the resilience of Lami Town to face an uncertain future. Lami Town may be a vulnerable SIDS coastal town, but it is thinking outside the box and searching for sustainable, cost-effective, green solutions to ensure the safety and well-being of its residents. UNEP, UN-Habitat, SPREP and WWF are working closely with the Lami Town Council to achieve this aim and effect positive change.

iii. Impact on the three dimensions of sustainable development

The tropical ecosystems that surround Lami Town, including coral reefs, mangrove forest, mudflats and seagrass meadows, and upland forest, support a diverse range of ecosystem services (direct and indirect use), such as fishing opportunities and storm protection, as well as non-use values which include the potential for use by future generations (see Figure 6).

Ecosystem-based adaptation measures in Lami Town aim, among others, at maintaining these significant services provided by intact coastal ecosystems which have an important economic value for the town and its inhabitants (see Figure 7).

Use values	Use values	Non-use values
Direct values	Indirect values	Existence & bequest values
Fishing	Nutrient retention	Cultural heritage
Aquaculture	Nutrient recycling	Resources for future generations
Transport	Flood control	Existence of specific, important species
Water supply	Storm protection	Existence of wild places
Recreation	Habitat for species	
Genetic material	Nursery ground for fisheries	
Scientific opportunities	Shoreline stabilization	
Wild resources		

Figure 6: Values and services provided by the natural ecosystems surrounding Lami Town

Source: Ibid.

The restoration and rehabilitation of mangrove ecosystems in strategic locations in Lami Town have already generated additional benefits and alternative finance streams, as the surplus mangrove seedlings produced are being sold to other areas around the island. The overall effectiveness of adaptation measures in Lami Town nevertheless remains uncertain, and further spatial analysis will help improve this initial analysis.

Figure 7: Value of ecosystem services for Lami Town over a one-year time frame

Ecosystem	Type of value	Value (FJD)	Unit/year		Benefits (FJD year ⁻¹)
			Hectare	Household	
Mangroves	Direct	\$41	-	200	\$8,200
	Indirect	\$471	320	-	\$150,720
Ecosystem benefits of mangroves					\$158,920
Coral reefs	Direct	\$521	-	10	\$5,210
	Indirect	\$471	1,387	-	\$653,277
Ecosystem benefits of coral reefs					\$658,487
Mudflats/seagrasses	Direct	\$123	-	200	\$24,600
	Indirect	\$139	330	-	\$45,870
Ecosystem benefits of mudflats/seagrasses					\$70,470
Upland forests	Indirect	\$7	1,151	-	\$8,057
Ecosystem benefits of upland forests					\$8,057
Streams	Direct	\$60	32.5		\$1,950
Ecosystem benefits of streams					\$1,950
Total ecosystem benefits for Lami Town					\$897,884

Source: Ibid.

Apart from having environmental and economic impacts, adaptation measures can have numerous positive social effects such as health benefits, awareness-raising and enhanced engagement of the general public. The adaptation cost-benefit analysis report has directly or indirectly catalyzed additional adaptation activities in Lami Town, including sanitation improvements (mainly upgrading septic tanks) and the introduction of waste management measures (separating organics and composting) that are having positive impacts on public health.

iv. Lessons learned

- Taking action to protect the coastal community from storms and other threats — either through ecosystem-based adaptation or engineering solutions — is preferable to not taking any action.
- The protection and maintenance of intact ecosystems, such as mangroves, forests, seagrass, mud flats, and coral reefs, as a priority action, represents the cheapest option with great benefit-to-cost ratio.
- An adaptation plan focused on ecosystem-based options, while also including targeted engineering options, can provide a high benefit-to-cost return in terms of avoided damages as well as provision of secondary ecosystem services. Engineering options should hereby be targeted that protect priority areas of built capital.
- High resolution elevation maps should be developed as a basis for further identification of priority sites for adaptation action, and to enable storm surge and flood modelling. Specific flood height-damage curves should be developed to inform site-specific adaptation action plans. The economic analysis for Lami Town should be refined using flood height damage curves, elevation maps, watershed analysis, and costs for policy and social options as estimated by local economists.
- The relative effectiveness of ecosystem-based and engineering adaptation options should be examined to determine which benefit-cost-ratios to use as a part of decision-making, alongside other non-economic analyses of vulnerability, risk, social and political issues.
- Planning and prioritizing of adaptation action strategies should be supported by determining the recipients of benefits from different measures, as well as identifying potential co-benefits such as local employment.
- Social and policy initiatives should be included into integrated adaptation plans to complement ecosystem-based and targeted engineering options. The involvement of all stakeholders in the development and implementation of adaptation measures is crucial, including through the creation of partnerships between communities, government officials, and/or local and international contractors.

References

Rao N.S., Carruthers T.J.B., Anderson P., Sivo L., Saxby T., Durbin, T., Jungblut V., Hills T., Chape S. (2013): An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands. A technical report by the Secretariat of the Pacific Regional Environment Programme. Apia, Samoa. SPREP 2013.

7. World Tourism Organization (UNWTO)

a) Case study: Tourism development in coastal areas: promoting sustainability through governance and management mechanisms, Africa

[By Marcel Leijzer¹, World Tourism Organization (UNWTO) and Richard Denman², Tourism Company, United Kingdom]



From 2011 to 2013, UNWTO undertook desk and field research on the mechanisms for sustainable tourism governance and management in coastal areas of Africa. The research was carried out as part of the GEF funded Collaborative Actions for Sustainable Tourism (COAST) project.³ The project, implemented in collaboration between the United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO) and the United Nations World Tourism Organization (UNWTO), has the aim of supporting and enhancing the conservation of globally significant coastal and marine ecosystems and associated biodiversity in sub-Saharan Africa, through the reduction of negative environmental impacts, which may be caused as a result of coastal tourism.

The following nine countries are involved in the project: Cameroon, The Gambia, Ghana, Nigeria and Senegal (in West Africa), and Kenya, Mozambique, Seychelles and Tanzania (in East Africa). Each country has one or more demonstration sites, where the context of sustainable tourism on the ground can be more clearly understood and the impact of various policies, structures and actions can be observed and tested.

¹ E-mail: mleijzer@unwto.org

² E-mail: rdenman@thetourismcompany.com

³ Further information on the COAST project can be found at: <http://coast.iwlearn.org/>.

Global tourism

Global tourism has witnessed massive growth over the past twenty years. In 2013, total international arrivals were 1,087 million, more than double the figure for 1990. Tourism has demonstrated a strong ability to recover from short term setbacks. Whereas 2009 saw a decline in global arrivals as a result of the global economic recession, the years 2010 to 2013 recorded notably strong growth. Despite possible future fluctuations, the World Tourism Organization (UNWTO) has maintained its forecast of overall growth in arrivals, averaging 3.3% per annum to 2030, with an even higher average forecast for Africa of 5%.

Sustainable tourism is increasingly recognized as a driver for sustainable development. World leaders meeting at two major summits in 2012, the United Nations Conference on Sustainable Development (Rio+20) and the G20 summit, agreed that sustainable tourism can make an important contribution to many of the world's most pressing challenges. The UNEP Green Economy Report identified sustainable tourism as one of the ten sectors that are vital to greening the global economy.

In many countries, coastal areas provide the main tourism resource, with the greatest concentration of tourism investment and facilities. One of the main reasons is that visitors are strongly attracted by coastal environments (e.g., beaches, fine landscapes, coral reefs, birds, fish, marine mammals and other wildlife) and by associated cultural interests (e.g., coastal towns, villages, historic sites, ports, fishing fleets and markets and other aspects of maritime life).

Tourism in selected African countries

Individual countries and destinations in Africa are at different stages in the development of coastal tourism, but many of the challenges they face are similar. There are significant differences between the nine countries of the COAST project in terms of the scale of tourism and its relative contribution to the national economy (See Figure 1).

Figure 1: Tourism in selected African countries

	Tourism % GDP Direct	Tourism % Export of services 2011	International Tourist Arrivals 2011 (in thousands)
Seychelles	44.3 (2009)	61.5	194
The Gambia	7.8 (2008)	66.8	106
Senegal	3.6 (2010)	44.3 (2010)	1,001
Kenya	4.2 (2010)	37,6 (2009)	1,470 (2010)
Tanzania	6.6 (2005)	62.9	795
Mozambique	2.3 (2007)	35.7 (2010)	1,718 (2010)
Ghana	2.2 (2010)	47.8 (2010)	931 (2010)
Cameroon	1.3 (2006)	14.8 (2010)	573 (2010)
Nigeria	0.4 (2010)	20.3	715

Source: UNWTO tourism compendium.

Tourism is very important to the economy of all above-mentioned countries. Even in Nigeria, a 0.4% contribution to the total GDP is significant for an individual sector and, in this case, amounts to a large total value, given the size of the country and the number of international arrivals. There is a lack of correlation between total arrivals and contribution to GDP, mainly due to the considerable difference in size between the countries. The volume of tourism in Mozambique reflects the land border with neighbouring South Africa. Seychelles stands out as a small country with a very significant dependency on tourism.

The relative importance of coastal tourism to the total tourism performance in the countries cannot be quantified. However, in Seychelles and The Gambia, the tourism sector is almost entirely made up of leisure-based coastal tourism. Coastal tourism also dominates in Senegal and Mozambique and accounts for a significant proportion of tourism in Cameroon. In Ghana and Nigeria, the proportion of tourism that occurs on the coast is high, partly owing to the coastal location of Accra and Lagos, even though coastal tourism as a product is not highly developed in these countries. The situation in Kenya and Tanzania is rather different, owing to a long established tradition of safari tourism. In both countries, however, there is significant and developed coastal tourism.

Research undertaken as part of the COAST project

The study undertaken as part of the COAST project took its approach and direction partly from the UNWTO and UNEP publication, *Making Tourism More Sustainable, a guide for policy makers*, which contains guidelines on governance structures, sustainability aims and management instruments relevant to all types of destination. The field research was based on a series of missions to the nine COAST partner countries conducted between March 2011 and February 2013, with repeat visits made to Ghana, Kenya and Tanzania, where specific attention was paid to the issue of economic incentives for sustainable tourism governance. Each mission lasted approximately seven days and involved time in the capital city, consulting with each country's respective Governments and other national level bodies as well as making visits to demonstration sites to consult with local stakeholders and observe the situation on the ground. In all cases, the views of both the tourism and environment ministries and agencies were obtained, together with those of private sector representatives, relevant NGOs and community groups. Existing policy documents, legislative frameworks and other background material were also studied.

Prior to the field missions in each of the nine countries, national experts identified all relevant national and local policy documents, regulations and other relevant written material relating to the research, as well as relevant governance structures at the local and national level, including multi-stakeholder bodies. During this initial step, it became clear which organisations and representatives it was essential to meet during the field missions, and a detailed programme for each of these missions was prepared. A regional workshop was organized in Nairobi in May 2013 where the research findings were presented and validated. The purpose of the field and desk research on sustainable tourism governance and management was to determine whether the nine countries' policies facilitated the long-term sustainability of tourism — including how these related to national policy frameworks and regional development plans — and to identify gaps, needs and options for sustainable tourism governance and management.

The research aimed to: (1) provide direction and recommendations for the most appropriate type of mechanisms for sustainable tourism governance and management; (2) provide strategic guidance for coastal destinations and key stakeholders in each of the nine countries on the reform of sustainable tourism governance and management as it related to coastal tourism, where necessary; and (3) influence tourism development, the operation of tourism enterprises, and the behaviour of visitors.

The field and desk research looked particularly at policy aims related to: *environmental impacts* such as biological diversity, physical integrity and environmental purity. This reflects the GEF funding and ultimate project aim of conserving coastal and marine ecosystems and biodiversity. It relates to, among others, coastal landscapes, terrestrial and marine habitats, waste management and pollution control; and *sustainable livelihoods*, including local prosperity, social equity and community well-being. This recognises the positive and negative impacts of tourism on coastal communities and the interrelationship between poverty alleviation and conservation. Particular attention was paid to: *tourism policies*, which may be contained within national tourism strategies and may or may not embrace sustainability aims; *environmental policies*, which may or may not have specific references to tourism but should provide a basis for influencing sustainable tourism development and management; *sustainable development policies* and, more specifically, poverty reduction strategies, which may or may not have direct references to tourism; and *policies and programmes aimed specifically at coastal management*, including integrated coastal zone management strategies and plans.

The study investigated the presence and working of governance structures for the development and implementation of policies and for the management of sustainable tourism. The field research considered not only the presence of structures but also sought to assess their effectiveness and long-term sustainability. Particular attention was paid to: tourism governance structures, including the degree of support and engagement by national governments at a high level and the provision for private sector and civil society participation; intra-governmental structures linking tourism, environmental management and sustainable development; and local area structures for tourism and coastal area management, including the role of local authorities and the engagement of tourism, conservation and community stakeholders.

The research addressed mechanisms for sustainable tourism governance and management at both the local (demonstration site) and the country level. It started from the understanding that the fundamental requirement for sustainable tourism governance is to effectively engage key public and private stakeholders whose policies and actions can impact tourism. In this vein, coordinating the involvement of tourism, environment, community and wider development partners at the local level — where much of the necessary planning, networking, capacity-building and information delivery occurs and where tourism needs to be effectively integrated in local sustainable development strategies — was seen as being essential.

The manner in which national policies and governance processes were reflected in the selected countries and implemented at the local level may be influenced by decentralization and devolution policies and actions as well as local governance capacity and community engagement structures.

i. The challenge

Many countries' coasts are used for tourism while also containing important habitats and a very rich biodiversity, and this special environment is sensitive and fragile. Land, water and other natural resources are often scarce on the coast, partly as a result of the focus and pressure of development and activity in these areas. Challenges and issues faced in coastal regions include physical destruction and loss of amenity, loss of habitat and biodiversity, marine and land-based pollution, resource consumption and competition, climate change, limited community engagement and benefit, property development patterns and motives, and seasonality and sensitivity of demand.

Taking the group of the nine African countries of the COAST project as a whole, some common issues are apparent in the relationship between tourism, the environment and communities on the coast; all countries are seeing a degree of new development for tourism on the coast. The pressure is particularly strong in Seychelles. Tourism projects may involve a mix of hotels, resorts, apartments and activities. In many countries, there is a general spread and pressure of urbanisation on the coasts, which can be a threat to the environment and to the natural amenities of the coastline for tourism.

Land- and marine-based pollution, including debris

Some of the coasts are suffering from poor solid waste management. The presence of strewn waste on and behind beaches and in other locations on the coast is a major problem in most of the countries, and it is seriously degrading their appeal for tourism while at the same time being generally unsanitary and polluting the environment. The waste is most often locally generated, accumulating over time. Tourism operations can themselves be a source of marine and terrestrial pollution on the coasts, but the extent varies considerably from one country to another. In general, there appears to be very little data on the actual levels of coastal pollution attributable to the tourism sector in the nine countries.

Resource use

Hotels and resorts are often quite heavy users of water and energy, but the extent will depend on their size, nature and management. The seriousness of the impact of the tourism sector depends on the particular circumstances of the location but, generally, there is a need to improve efficiency of resource use in the interests of local communities, the environment and operational cost saving.

Coastal erosion and related drivers

Coastal erosion is a threat to coastal integrity, livelihoods and tourism, notably in West Africa, but also in some coastal areas in East Africa. It is threatening both the short- and long-term appeal of the coast for tourism. Damage to ecosystems and habitats, such as through the cutting of mangroves, is occurring quite extensively. The cutting of mangroves and other trees on the coastal belt is a serious problem in most of the countries considered in this case study. The damage appears to be mainly caused by the local population extracting the timber for firewood and other purposes but may also be related to illegal trading, land clearance and development.

Informal trading

Informal trading on Africa's beaches is providing a source of income for local populations. Many people attracted to beach selling come from the poorer communities. The situation, however, creates a considerable management challenge, as informal trading practices are sometimes considered harassment and have resulted in some visitors not returning. Harassment from beach trading is primarily a problem in The Gambia and Kenya, but it also occurs in other countries.

Relationship with local communities

Poverty is widespread on the African coast, notably in fishing communities. The tourism sector already contributes significantly to income flow into the coastal areas, but more could be done to strengthen the linkages to the local community. Most coastal areas are relatively well populated and therewith comes a potential pool of laborers. In some areas, however, a low level of awareness of opportunities, and interest in employment in the tourism industry within the community exist together with skill gaps, sometimes caused by a lack of provision of hospitality sector skills training available in these coastal destinations.

Monitoring and enforcement

Despite the existing monitoring procedures for making tourism more sustainable, in some countries there are still many concerns about awareness, enforcement and the ongoing impacts of unsustainable behaviour. A number of common weaknesses in the regulatory and inspection process have emerged, including:

- requirements may not be well known;
- criteria and procedures used in inspections may be too insubstantial;
- insufficient consideration of labour conditions;
- monitoring may be too infrequent;
- the process is fragmented; and
- some enterprises and activities are not inspected.

In general, both environmental and tourism bodies emphasize the lack of financial and human resources as hindering them from fulfilling the inspection requirements and from ensuring effective enforcement of the regulations.

Institutional challenges

A number of countries have undertaken reviews of their tourism activities which have pointed to a number of institutional weaknesses, including duplication of efforts, inefficiency and insufficient stakeholder engagement.

The possible benefits, issues and challenges underline the need for implementing policies and actions in coastal areas that deliver sustainable tourism. This means tourism that "takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities".

ii. Oceans-and seas-related measures undertaken

The impacts of tourism on the environment, and also of the environment on tourism, are often interrelated. Some direct measures taken to maintain the quality of the coastal environment in its own right, which has also served as an essential resource for tourism, include: solid waste management, fighting coastal erosion, and conserving ecosystems and biodiversity. Tourism appears not to be a major direct cause of many of the challenges facing the coasts, which instead result from the activities of local communities over time, among other causes. There are, however, situations where tourism is harmful to biodiversity, such as the disturbance of turtle nesting sites on beaches. In all nine countries, protecting areas with different designations of endangerment is important for both conservation and tourism; tourism is increasingly seen as an important source of income for these largely under-funded areas.

A number of initiatives to address the problem of waste have been pursued in different countries, often supported by the government and with active involvement of local NGOs and communities. In 2013, UNWTO together with the Gambia Tourism Authority organized a tourism and biodiversity seminar in the coastal destination of Kartong, which resulted in the creation of a local group of “champions for biodiversity conservation of Kartong”. As one of their activities, the group regularly organizes clean-up campaigns in the village and at the beach.

Hotels and resorts should be seen as key stakeholders in any actions taken to combat coastal erosion, and sometimes they are the initiators of action. Any intervention, however, needs careful consideration and planning along the whole length of the coastline, since action taken in one place can have serious consequences elsewhere and over time. There is a strong need for collaboration between stakeholders, especially between the hotels and the responsible public authorities.

Regarding informal trading on Africa’s beaches, there has been some progress towards addressing the problem, through a combination of dialogue, zoning, licensing, infrastructure provision and capacity-building. Useful tools have been: the preparation of agreed codes of conduct for visitors, hotels and beach operators, so that they have a better idea on how to treat each other and a basis for identifying and rectifying bad practices; and the introduction of specific management measures to help local traders, including giving them the opportunity to sell products within certain hotels.

Policies for sustainable tourism

In most developing countries, government policies in different sectors are strongly influenced by top level policies on development and poverty reduction. All nine African countries set out their development aspirations and policies in either a Vision Framework or a Poverty Reduction Strategy (frequently both), with the latter providing a roadmap for achieving the vision. In a few countries, separate sustainable development policies exist or are being prepared, highlighting environmental and societal priorities and challenges, with a common emphasis placed on good governance, including the provision of an enabling environment for businesses.

The need for a positive relationship between the public and private sectors is understood by all countries. In addition, in many of the countries, there is an emphasis on community engagement in governance aspects and the need for business expansions to create opportunities for local people. More formally, the policies are often providing a basis for decentralisation programmes, placing more power and responsibility in the hands of local governments, and recognizing the parallel need for institutional strengthening and capacity-building.

All nine countries have specific tourism policies that focus on achieving significant growth in tourism volume, while also upholding sustainable development principles and the economic, social and environmental dimensions of sustainable development. An interesting approach adopted in The Gambia and in Senegal was to formally adopt principles of responsible or sustainable tourism as a separate commitment upon which subsequent tourism policies were based.

Governance structures and stakeholder involvement

All nine countries have Ministries of Tourism, which often handle other responsibilities, such as culture or natural resources. All tourism ministries have the responsibility to formulate and oversee tourism policies and, in all cases, there is a separate tourism agency, usually called a Tourism Board or Tourism Authority is responsible for marketing. Patterns are changing in the national-level tourism structures due to reviews which have pointed to institutional weaknesses, including duplication, inefficiency and insufficient stakeholder engagement. In general, there has been a move towards further devolution of functions to separate agencies and away from ministries, and towards splitting marketing from tourism control and development.

A strong feature of tourism in all nine countries is the presence of active private sector membership bodies which support the coordination of individual tourism enterprises, communicate with them, and represent their views. These bodies provide a good vehicle for discussing and promoting causes and have shown an interest in sustainable development concerns. In most countries, various structures and processes are in place that provide for joint governance and initiatives between the public and private sector. Most of the tourism boards have Boards of Directors with representatives from the private sector alongside the Ministry of Tourism.

The establishment of effective structures for delivering and managing sustainable tourism at the local level is very important for the sustainable development of the sector and for tackling issues of planning, development, control, enterprise engagement and community benefits. In several countries, there has been a strong tendency to increase decentralisation of governance to local authorities operating at country- or district-level. The level and nature of decentralisation, and the degree of local democracy and self-governance, varies between countries.

Whereas decentralization processes tend to lead to a specific identification of responsibilities at different levels in the fields of planning and environmental protection, in the nine reviewed countries, the situation with respect to tourism is often less clear. In some countries various functions relating to tourism, including the licensing of enterprises, is likely to be undertaken at the regional or provincial

level. In Mozambique, for example, provincial directorates of tourism have this responsibility, but they have limited capacity to deliver these services over large and highly dispersed areas.

Multi-stakeholder structures for tourism management that bring together local governments, the private sector, NGOs and community bodies may exist at different levels for different purposes. Local destinations can be quite small areas with a clear identity and tourism potential, and this makes it more practicable for local stakeholders to work together on management issues. If viewed as part of larger destinations, certain functions might be facilitated, for example delivery of expertise and marketing.

Tourism Master Plans

Five of the nine countries have Tourism Master Plans or equivalent sector development or structure plans. These are detailed documents, based on the analysis of resources, markets, opportunities and the various challenges facing the delivery of tourism policies. The plans recognise the need to embrace social and environmental sustainability, but sometimes these aspects are not fully integrated in the proposals put forward. When referring to opportunities in different zones, environmental circumstances are considered in general, and in some cases this influences proposals for the scale and nature of possible development in coastal areas. Most of the master plans point to the considerable weaknesses in capacity to plan and deliver results. They underline the need for effective regulations, professionalism and transparency, calling for measures such as objective environmental impact assessments for tourism development and better land use planning. They also emphasise the need for good governance and engagement of the private sector, with reforms of agencies such as tourism authorities, where necessary. A significant weakness identified in most of the reviewed countries is the relative lack of sustainable tourism policies, strategies, master or action plans at the sub-national level.

Integrated coastal zone management

Coastal zone planning requires a coordinated approach, taking into account current resources, future change and the needs of different sectors and communities in order to achieve economic, social and environmental sustainability. The need for an integrated coastal zone management (ICZM) process and plan is recognised in all nine countries. Different players should work together to agree on and implement an ICZM plan, which considers the various pressures and opportunities for development on the coast from a range of sectors that may be competing for land and resources and whose impacts can affect other sectors as well as the integrity of the coastal environment. In some respects, tourism may be regarded as more environmentally benign than other sectors. However, it is also recognised that tourism developments bring their own impacts, and part of the requirement of coastal planning is to ensure that tourism developments on the coast are located and designed to be sustainable and preserve and protect local environmental conditions.

A specific site requirement for coastal developments is the setback of buildings from the high water mark. In most countries, a minimum setback has been identified but this standard may not be enshrined in regulations, can often be surprisingly vague, and is not always necessarily being met. There is considerable variation between the countries as to the extent of the requested setback, ranging from 150 meters in The Gambia and Nigeria to 60 meters in Tanzania and 25 meters in Seychelles.

The need for a larger setback on the Atlantic coast compared to the Indian Ocean is understandable, owing to the sea conditions and extent of erosion in West Africa. However, this is an area that could benefit from greater clarity, backed up by firm evidence and taking into account climate change predictions.

The experience in selected countries in Africa has illustrated that ICZM should be seen not only as the production of a plan, but as a process to facilitate and maintain stakeholder engagement. Bringing stakeholders together has often proved possible, but maintaining commitments over time has been more of a challenge. ICZM processes and plans tend to be quite broad in their treatment of different coastal activities and the balance between them, including how the competing use of resources will be addressed. They may contain a spatial element involving zoning of the coast for preferred types of use. However, in order to provide details and a legal basis for the spatial differentiation of land for different types of development and activity, a land use plan is needed. Plans have been developed in some of the nine countries for parts of their coasts, although the availability of plans appears to be patchy and quite limited.

Destination management plans

ICZM plans and land use plans are both important for shaping development on the coast and identifying where it should occur. However, the delivery of successful sustainable tourism also requires tourism destination management planning, which should provide direction for sustainable tourism development based on careful assessment. Such a plan is well suited for a local destination level, but should reflect any national tourism policies and master plans. The key inputs to a destination management plan are:

- Resource assessment, including physical and cultural attributes/assets as well as the nature, quality and performance of tourism facilities.
- Market assessment, including considering new markets coming to the area, ongoing trends and future opportunities, and proposing marketing activities.
- Environmental, social and other constraints which may determine capacity.
- Structures for effectively planning and coordinating tourism in the destination.

Destination management plans should be informed by and inform wider ICZM and land use plans, ensuring that both reflect tourism needs and realities. In the nine countries, relatively few destination management plans in coastal areas have been forthcoming so far. Challenges in drawing up such plans relate, in particular, to human resource and financial constraints within the destinations and to a lack of data and evidence for planning.

Approval of coastal tourism development, including Environmental Impact Assessments

The extent, size, nature and location of new tourism development on the coast have a fundamental impact on the coastal environment and local communities. Selecting and using management tools effectively to influence development is of utmost importance to the sustainability of coastal tourism.

All nine countries have as a requirement that any development which is likely to have a significant environmental impact should be subject to an Environmental Impact Assessment (EIA), leading to a report or statement that is taken into account in the determination of approval of the project. EIAs are therefore a potentially powerful instrument in ensuring sustainable tourism development.

Although they are called Environmental Impact Assessments, it is common for EIAs to also cover a range of potential socio-economic and cultural impacts. They not only make an objective assessment of impacts but also identify mitigation actions to be taken by the project. There is considerable variation between the nine countries regarding the requirement for an EIA for tourism investments. In some countries, for example, all hotel development projects over 10 bedrooms appear to require a full EIA, while in others the threshold is 100 bedrooms. Especially for small scale tourism enterprise development, the EIA requirements are often unclear. It would therefore be helpful to clearly set out a scalable EIA procedure that is appropriate to the size of project and also practical to deliver.

An important issue in the EIA process is the extent of consultation with the local community. Generally, it is a requirement for communities to be consulted and for the EIA report to be made available for public reading. While this requirement may be met, there is a feeling in certain countries and destinations that insufficient effort is made to consult and engage with the local community. Further, although systems for conducting EIAs are in place in the nine countries, in many countries stakeholders feel that the application of EIAs has not been fully effective and too many tourism projects may have been developed and are operational that should have been prevented or modified by the EIA. Possible reasons for this are that EIAs may take place too late in the cycle and the results emerge after projects have already received approval. In addition, government agencies and local authorities tend to have limited capacity to monitor the performance of development projects and the resulting operations to ensure that they are complying with the approach and mitigation measures that were proposed and approved through the EIA.

The EIAs also include other management aspects such as licensing and planning approval, and specific site requirements for coastal development. Some countries are clearer than others about where and how to obtain a license. In Tanzania for example all requests are channelled to the Tanzania Investment Centre, which is a one-stop-shop for investors. This centre then brings together government ministries and agencies and facilitates contact between them and the developer. In general, in countries where procedures are clear and good coordination mechanisms are in place, there appear to be fewer problems with developments being given approval without complying with correct procedures and scrutiny.

Monitoring and enforcement

Despite the existing monitoring procedures, there are still many concerns in some countries such as awareness, enforcement and ongoing impacts, all of which are addressed in the COAST project. All nine countries have some form of regulatory framework in place concerning the performance of tourism enterprises in managing impacts on the local environment and on the welfare of visitors, staff and local communities, using a system of auditing, reporting and inspection.

Environmental monitoring includes inspection of hotels and other premises, and/or self-auditing of environmental management with a report submitted to the environment agency, which is then subject to a verification visit. In addition, external monitoring of water and air quality may take place. The manner in which this monitoring takes place appears to vary quite widely between the different countries and locations, partly based on expected or reported incidents. In Nigeria, for example, water quality monitoring was stepped up owing to concerns about sewage discharge into the lagoons, including from restaurants, and has been combined with increased frequency of inspections of the premises.

The lack of financial and human resources hindering environmental and tourism bodies to fulfil the inspection requirements and to ensure effective enforcement of the regulations needs to be addressed, which could be done by strengthening collaboration between agencies and inspectors. In most countries, the inspection by the tourism authorities for an annual licence to operate is the most frequent inspection, and it occurs more often than inspection by environment agencies. A particular opportunity may rest with extending the scope and coverage of the tourism inspection to make sure that it is better placed to pick up any major violations or weaknesses concerning environmental management or staff and local community relations. Another opportunity may arise from holding more joint inspections, with inspectors from different disciplines working together, which is happening in Seychelles and Mozambique.

Voluntary regulations and certification schemes

Increasingly, many hotels and resorts have their own quite strict sustainability policies and targets which may exceed those stipulated in regulations. These are found both in individual companies and in international chains, whereas some relate directly to company corporate social responsibility (CSR) policies. In addition to their own policies, providers of accommodation, catering and recreational activities are heavily influenced by the standards defined by international tour operators who are contracting jobs from them. These standards may relate to customer safety, in particular, but international operators are also increasingly taking note of environmental and community impacts and are integrating these aspects into their own CSR policies, brand positioning and communication. International tour operators are themselves influenced by certification, such as the Travel Life scheme supported by the Association of British Travel Agents and other European operator associations. The influence of tour operators is particularly strong in The Gambia, Senegal and Kenya, where the travel trade accounts for much of the market. Giving greater exposure in marketing campaigns to enterprises meeting sustainability criteria, such as those holding a sustainable tourism label, can be a valuable economic incentive.

Mandatory government inspection tends to cover a relatively small number of key impacts that are reflected in regulations, such as waste management and pollution control. Wider sustainable tourism issues are not covered by government inspection, but are addressed by voluntary certification schemes offered by bodies operating globally or at the national level. Voluntary certification has advantages in addressing a full range of sustainability issues. However, many enterprises making use of such certification are likely to be already well motivated towards the environment and local communities.

Nevertheless it has proved to be a good tool to encourage enterprises to be more comprehensive in their approach and to go further in their efforts. The weakness lies in the difficulty to reach the majority of businesses, including those less predisposed towards sustainability. Box 1 below displays the example of a voluntary certification label in Seychelles.

Box 1: Seychelles Sustainable Tourism Label

The Seychelles Sustainable Tourism Label is a voluntary label, which was developed by the Seychelles Tourism Board in consultation with the Seychelles Hotels and Tourism Association and launched in 2011. It aims to encourage hotels to mainstream sustainability practices into their business operations to safeguard the biodiversity and culture of Seychelles. The label is based on a standard scoring and inspection process, set out in a manual, which contains helpful material on the benefits of the scheme and on how to approach the work and the communication of results. The components of the standard cover: management, including policy, monitoring, health and safety; waste; water; energy; staff; conservation; community; and guests. There are some minimum obligatory criteria, whereas others are optional. The criteria enable enterprises to score points, reflected in the label. In 2013, the first five hotels received the label and the aim is to encourage many more hotels to join the scheme and integrate sustainability practices in their business operations. An officer has been appointed by the Seychelles Tourism Board to manage the scheme, and training of inspectors has taken place.

Source: UNWTO, 2013 and www.seychelles.travel/sstl.

Investments in sustainable tourism

All nine countries have an Investment Promotion Agency to promote the country to investors and guide and help them in the various processes involved therewith. The agencies can be seen as a form of economic instrument for development, taking into account that a reduction of delays in approving investments can have a significant economic value for investors. The length of time that procedures may take can also have a bearing on the chances of securing long term sustainable development, since awareness of likely delays and hold ups can prompt developers to circumvent the procedures.

Securing sustainable forms of tourism development should not only require planning and control, but an approach through development promotion, assistance and economic incentives, to encourage the right kind of projects.

In some countries, relevant ministries and NGOs provide verbal and/or written advice to developers. A good example are the guidelines for coastal tourism development in Tanzania, endorsed by the Ministry of Tourism, that provide guidance on site selection, design of facilities, landscape and resource management, community relations, and carrying capacity. The provision of financial incentives, such as tax relief or reduction in import duties, can also be used to encourage investments that meet sustainability criteria. A good illustration is the tax relief offered in Senegal, which applies when local employment is created outside the capital.

iii. Impact on the three dimensions of sustainable development

Tourism literature has pointed out the possible benefits of sustainable coastal tourism for the economy, society and the environment and has highlighted issues and challenges related to coastal tourism development. The positive benefits often mentioned focus on revenue generation, local job creation and achievement of economic prosperity; the creation of infrastructure and community facilities; awareness-raising regarding the need for conservation; the increase in investments in the environment and cultural heritage; and the contribution to sustainable community livelihoods.

Protecting the environment through sustainable tourism

Coastal ecosystems, including habitats, landscapes and a rich marine and terrestrial biodiversity, are very important to tourism, which itself can provide a motivation and source of revenue to support conservation. A number of examples of situations where ecosystems are threatened, requiring management solutions, and where direct action to support conservation related to tourism was undertaken, can be found in the nine countries. The cutting of mangroves and other trees on the coastal belt remains a serious problem in most of the countries. The presence of designated protected areas on the coast, in the form of national or marine parks and reserves or other designations, is very important both for conservation purposes and for sustainable tourism. Yet, the role of such areas is undermined in many cases by the lack of resources for the conservation, management and enforcement of the protection of such areas. Sustainable tourism can play a part as a source of support for protected areas. Admission fees and charges may be used directly as a source of revenue for conservation and management, especially if the budget is retained locally. Income from tourism can also support local communities within and around the areas, encouraging and enabling them to support conservation.

Supporting community livelihoods through sustainable tourism

A key requirement for sustainable coastal tourism is for local communities along the coast to benefit from the industry, thereby helping to alleviate poverty, improve livelihoods and encourage better management and conservation practices by the communities. It is recognised that employment in tourism enterprises, especially hotels and resorts, is one of the main ways in which local people living on the coast can benefit from tourism. It is also through direct employment that the largest volume of local people will be reached. However, the conditions need to be right for this to happen, which in many coastal areas is a question of both demand and supply.

In some countries, there is a government policy oriented at strengthening the level of engagement of local people in tourism enterprises. In Seychelles, for example, encouraging Seychellois to work in the tourism sector at all levels, including in management, is a high priority. Consultation with the local private sector suggests that there is generally a willingness to employ local people, partly as it makes sense in terms of cost and housing. Most coastal areas have a reasonable population level and hence a potential pool of laborers. Box 2 gives an example of benefits of the tourism sector for local communities in Watamu, Kenya.

Box 2: Tourism value chain analysis and eco-tourism activities in Kenya

In 2010, a tourism value chain analysis (VCA) was carried out in Watamu, Kenya, to assess income flows from the tourism sector, and to identify opportunities for local people to generate more income from tourism. Watamu is a village located on the Kenyan Coast, with a population of approximately 20,000 people, and tourism as the main economic sector. The VCA estimated the total annual turnover of hotels and restaurants in the destination at US\$ 17.5 million, with approximately 10% of this amount flowing to local people, mainly in the form of salaries for over 1,000 local people employed in the enterprises. Further, “curios and craft” and “transport and excursions” were identified as other important sub-sectors, with an estimated annual turnover of US\$ 585,000 and US\$ 1 million, respectively, and with a significant part flowing to the local people: 50% for curios, and 90% for excursions. The VCA concluded that local income could further increase by strengthening local excursions and related ecotourism activities and by providing training to the local people involved. Subsequently, the COAST project planned and implemented various project activities to support local people to: manage a mangrove boardwalk with a local restaurant, organize canoe tours, perform traditional dances, engage in beekeeping and crab-farming to supply restaurants, and sell curios made from recycled waste materials. A total number of 150 local people are earning a direct income through these various products and services provided to tourists and tourism enterprises, with an additional 350 local people receiving financial or other benefits from it in an indirect manner.

Source: COAST project, Internal project documents, Watamu Kenya.

In most of the coastal areas of the nine countries, only limited attention is paid to the opportunity to channel more economic benefit to local communities by strengthening the local supply chains to the hotels and resorts, even though the opportunity to do so does exist in many places. Some of the coastal areas are low-lying and relatively fertile, with an established local agriculture.

A successful initiative to address the supply chain opportunity is the Gambia is Good project that linked coastal hotels with small local farmers, by giving the hotels confidence that the produce supplied is of a good quality and reliably available (see Box 3 for further information).

Box 3: Gambia is Good project: Linking coastal hotels with small local farmers

The food supply chain initiative Gambia is Good (GiG) was established in 2004 with support from the British NGOs Concern Universal and the Travel Foundation. The project provides market opportunities for small-scale Gambian farmers, and has addressed the issue of giving hotels confidence that the produce supplied will be of a good quality and reliably available. The initiative involved developing a central farm, employing local people, as well as establishing a trading arm (GiG), enabling some produce to be grown or purchased in bulk supplementing the produce supplied by the individual local farmers. In 2011, the scheme was supplying 17 hotels. GiG purchases from nearly 1,000 growers, 90% of whom are women. The initiative has enabled the farmers to make the transition from subsistence to commercial agriculture, with monthly earnings of US\$ 250 for women who previously had virtually no cash income. An independent evaluation stated that in three years' time, GiG growers increased their income by an average of 500%.

Source: UNWTO, 2013 and www.concern-universal.org/gambia_is_good.

The experience in The Gambia underlines the importance of delivering the right quality, quantity and continuity when trying to strengthen local supply chains. Hotels often prefer buying agricultural products from one supplier and it can be useful if local farmers can establish linkages with these suppliers or establish their own association or enterprise to supply the hotels. A particular opportunity relating to the supply chain in coastal locations is the supply of fish and seafood to local hotels and restaurants. This is already happening to a certain degree, but generally little priority has been given to understanding the relationship between fishing and tourism, and further research would be required to study opportunities and constraints.

Informal trading on Africa's beaches has provided a source of income for local populations. Nevertheless, this form of income is also resulting in some challenges as previously explained. In addition, in all nine countries, there are examples of coastal communities providing community-based tourism experiences. Members of local communities, acting cooperatively, are offering services, including: interpretation of local biodiversity, culture or village life; personal guiding; provision of simple catering; and occasionally, accommodation. Box 4 highlights an example of successful community involvement in Tanzania.

Box 4: Community involvement in tourism and conservation activities in Tanzania

The small, uninhabited Bongoyo Island near Dar es Salaam, Tanzania is part of a marine reserve managed by the Marine Parks and Reserves Unit (MPRU). It has beautiful sandy beaches and a forested interior, and is highly accessible from Dar es Salaam, at a distance of around 30 minutes by open boat. The MPRU has enabled a community group from Dar es Salaam to work there during the day. Visitors arrive from the mainland in hired boats, on trips organized by operators or hotels, amounting to an average of around 100 visitors per week (5,000 per annum). The group members collect admission fees from visitors on behalf of the MPRU while also providing guided tours into the interior of the island and on the shore for visitors, selling souvenirs, renting out snorkelling equipment, and providing catering for visitors. In addition, group members physically manage the island, keep it clean, undertake conservation work in the forest, maintain trails, engage in coral replanting, and provide surveillance against illegal activities in the surrounding waters. Through all these activities, group members are able to earn a modest income. There are currently 16 members in the group who have been designated as Honorary Wardens by the MPRU, provided with identity cards and trained in basic guiding, coral management, sea rescue and cooking. The group has the ambition to expand their business activities through obtaining diving equipment and a boat, and receiving further training in conducting guided tours in English.

Source: UNWTO, 2013.

iv. Lessons learned

- Tourism operations should pursue sound environmental management practices and tourism related actions should improve the attractiveness and conservation of coastal environments. Several coastal management issues, including waste management, coastal erosion and biodiversity conservation, can be addressed by generating resources from tourism to support conservation and management and by raising awareness and facilitating community engagement in conservation and management.

- The delivery of benefits to local communities from tourism should be seen as an important sustainability goal in its own right and actions should be undertaken to deliver more benefits to local communities. This can be encouraged through strengthening supply and demand conditions for growing local employment, building and maintaining local supply chains, managing informal local trading and fostering community-based initiatives that meet conditions for sustainability and success.
- Responsibility for actions to improve governance and management for sustainable coastal tourism should largely rest with governments, which should provide the policy and legislative framework for protection and sustainable development, and ensure that effective management processes are in place. At the same time, tourism enterprises and their associations should also commit to acting responsibly towards the environment and communities, backing this up with appropriate action.
- Effective governance of sustainable coastal tourism requires a coherent policy framework to guide and drive action and the appropriate bodies to ensure that the policies are implemented.
- Policies are required in the overall areas of sustainable development, sustainable tourism and environment which are relevant and coherent across government entities. To strengthen policy frameworks for sustainable coastal tourism, development policies should accurately identify the role of sustainable tourism and sustainability aims should be mainstreamed in updated tourism policies. Similarly, coastal tourism opportunities and challenges should be clarified in national tourism policies and strategies.
- A primary requirement for governance structures for sustainable coastal tourism is the effective engagement of different stakeholders at all levels, while clarifying roles and responsibilities and ensuring sufficient capacity to deliver. Government ministries, including departments and agencies on tourism and environment issues, should maintain strong liaison and coordination mechanisms. The private sector should be encouraged to engage on the path towards sustainable tourism, for example through public-private coordination bodies.
- The development and operation of multi-stakeholder destination management bodies can be seen as key to effective sustainable tourism governance and management at destination level.
- Specific emphasis needs to be placed on destination-level sustainable tourism planning and action, and wider policies and legislation are to be pursued to support transparent land-use planning and tourism development processes.
- The sustainability of coastal tourism can further be enhanced by integrating planning for tourism in a wider coastal management context, strengthening the assessment of tourism development projects and improving the monitoring and management of tourism enterprises. Sound planning and integrated management of coasts, including coastal tourism, should be applied.
- Effective processes to assess and influence new tourism development should be established. EIAs for coastal tourism developments can be strengthened by clarifying and being consistent about EIA requirements and procedures for tourism projects while also strengthening community consultation and engagement in EIAs.

- Practical guidelines should be drawn up by tourism ministries on the kinds of development considered most suitable to particular types of locations, including guidance on design, impact on biodiversity, energy, water and waste management.
- Developers should be provided with a single point of contact that can provide guidance on the procedure and provide advice on requirements. In some countries, development promotion agencies can fulfil this function.
- There is a need to significantly strengthen procedures in place for the assessment and control of development on the coast to make the process more effective, while also encouraging positive sustainable tourism development outcomes. To improve the monitoring of the operation of tourism enterprises, the reach and potency of inspection processes should be strengthened and enterprises should be stimulated and assisted to improve their environmental and sustainability management.
- There is potential to use financial incentives, such as conditional tax relief, to influence both the development and operation of tourism businesses.
- NGOs and civil society bodies have potentially a very important role to play in the areas of facilitation and capacity-building. A key opportunity is the involvement of local NGOs in destinations to bring together different interest groups and provide assistance and expertise.
- Academic and research bodies, training institutions and local consultants can provide highly valuable knowledge and services.
- International agencies should continue to support countries in the planning and management of tourism on their coasts. They should recognise tourism as a key sustainable development issue, which links the economy, the society and the environment, relevant to international programmes in these fields.
- International assistance can help by providing both financial and technical support, and by enabling the sharing of experience and knowledge between countries.
- Sustainable tourism can serve as a positive force to conserve coastal environments and biodiversity, minimising environmental impacts and contributing to the well-being of local communities.

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References

- Anilkumar, P., Varghese, K. and Ganesh, L.S. (2010): Formulating a coastal zone health metric for landuse impact management in urban coastal zones, *Journal of Environmental Management*, 91, pp 2172-2185.
- Becken, S. and Moreno, A. (2009): A climate change assessment methodology for coastal tourism, *Journal of Sustainable Tourism*, 17 (4), pp. 473-488.
- Bramwell, B. (2004): *Coastal Mass Tourism: Diversification and Sustainable Development in Southern Europe*, Channel View Publications, Clevedon.
- Brown, K. et al. (2002): *Making Waves: Integrated Coastal Conservation and Development*, Earthscan.
- Brunnschweiler J. (2010): The Shark Marine Reserve: a marine tourism project in Fiji involving local communities, *Journal of Sustainable Tourism*, 18 (1), pp. 29-42.
- Caffyn, A. and Jobbins, G. (2003): Governance Capacity and Stakeholder Interactions in the Development and Management of Coastal Tourism: Examples from Morocco and Tunisia, *Journal of Sustainable Tourism*, 11 (2), pp. 224-245.
- Cater, C. and Cater, E. (2007): *Marine Ecotourism: Between the Devil and the DeepBlueSea*, CABI, Wallingford.
- CESD (2007): *Global Trends in Coastal Tourism*, Centre on Ecotourism and Sustainable Development, WWF, WashingtonDC.
- CBD (2007): *Managing Tourism and Biodiversity*, Convention on Biological Diversity and UNEP, Montreal.
- Daby, D. (2003): Effects of seagrass removal for tourism purposes in a Mauritian bay, *Environmental Pollution*, 125 (3), pp. 313-324.
- Dowling, R. and Pforr, C. (2009): *Coastal Tourism Development*, Cognizant Communication Corporation, New York.
- Eagles, P. et al. (2002): *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management*, IUCN, Gland.
- Jennings, S. (2004): Coastal Tourism and Shoreline Management, *Annals of Tourism Research*, 31 (4), pp. 899-922.
- Powell, R.B. et al. (2009): Overcoming Governance and Institutional Barriers to Integrated Coastal Zone, Marine Protected Area, and Tourism Management in Sri Lanka, *Coastal Management*, 37 (6), pp 633-655.
- Simpson, M.C., Gössling, S., Scott, D., Hall, C.M. and Gladwin, E. (2008): *Climate Change Adaptation and Mitigation in the Tourism Sector – Frameworks, Tools and Practices*, UNEP, University of Oxford, UNWTO, WMO: Paris, France.
- Sullivan-Sealey, K. and Cushion, N. (2009): Efforts, resources and costs required for long term environmental management of a resort development: the case of Baker's Bay Golf and Ocean Club, The Bahamas, *Journal of Sustainable Tourism*, 17 (3), pp. 375-395.
- UNEP (2005): *Forging Links Between Protected Areas and the Tourism Sector*, United Nations Environment Programme, Paris.
- UNEP (2005b): *Integrating Sustainability into Business: An Implementation Guide for Responsible Tourism Coordinators*, United Nations Environment Programme, Paris.
- UNEP (2009): *Sustainable Coastal Tourism: An integrated planning and management approach*, United Nations Environment Programme / PAP-RAC, Paris.
- UNWTO (2004): *Indicators of Sustainable Development for Tourism Destinations: A Guidebook*, World Tourism Organization, Madrid.
- UNWTO (2004b): *Tourism and Poverty Alleviation: Recommendations for Action*, World Tourism Organization, Madrid.
- UNWTO (2005): *Making Tourism More Sustainable: a guide for policymakers*, UNEP and World Tourism Organization, Madrid.
- UNWTO (2006): *Poverty Alleviation Through Tourism – A Compilation of Good Practices*, World Tourism Organization, Madrid.
- UNWTO (2007): *A Practical Guide to Tourism Destination Management*, World Tourism Organization, Madrid.

UNWTO (2010): *Joining Forces: collaborative processes for sustainable and competitive tourism*, World Tourism Organization /UNWTO Business Council/SNV, Madrid.

UNWTO (2010b): *Manual on Tourism and Poverty Alleviation*, World Tourism Organization and SNV, Madrid.

UNWTO (2010c): *Tourism and Biodiversity, Achieving Common Goals Towards Sustainability*, World Tourism Organization, Madrid.

UNWTO (2011): *Tourism towards 2030, Global Overview*, World Tourism Organization, Madrid.

UNWTO (2013): *Sustainable Tourism Governance and Management in Coastal Areas of Africa*, World Tourism Organization, Madrid.

8. United Nations Department of Economic and Social Affairs (UNDESA)

a) Recommendations from Expert Group Meeting on “Implementing Rio+20: Integrated Planning for Sustainable Coastal Area Management in the Caribbean Region”¹



Photo: Expert Group Meeting participants, ECLAC Subregional Headquarters for the Caribbean, Trinidad and Tobago, 2014.

The Expert Group Meeting on “Implementing Rio+20: Integrated Planning for Sustainable Coastal Area Management in the Caribbean Region” was organized by the United Nations Department of Economic and Social Affairs (DESA) in collaboration with the Economic Commission for Latin America and the Caribbean (ECLAC) Subregional Headquarters for the Caribbean and UNESCO Intergovernmental Oceanographic Commission and its Regional Secretariat for the Caribbean and Adjacent Regions Sub-Commission IOCARIBE. It was held at the ECLAC Subregional Headquarters for the Caribbean, Port of Spain, Trinidad and Tobago on 17-18 March 2014. The Meeting was attended by 29 participants from 12 countries. Special invitees from the Pacific and AIMS regions also attended to facilitate inter-regional information exchange and peer learning. The presentations made during the meeting are available under the topic “Oceans and Seas” at United Nations sustainable development knowledge platform: <http://sustainabledevelopment.un.org>.

The ocean territories of Small Island Developing States are often significantly greater in size than their land territories, making them highly dependent on the oceans and their coastal and marine resources, while having a large concentration of people, economic and environmental assets in coastal areas. They are therefore particularly vulnerable to the numerous challenges facing oceans and coasts, including increased population density and economic activity in coastal areas, climate change, ocean acidification, alien invasive species and pollution from a number of marine and land-based sources. Therefore, Agenda 21, the JPoI, the Barbados Plan of Action and the Mauritius Strategy of Implementation, among others, called for the integrated management and sustainable development of coastal areas.

¹ Contact: Julie Ritz, UNDESA – E-mail: ritz@un.org; Birgitte Alvarez-Rivero, UNDESA - E-mail: alvarez-riverob@un.org.

The following recommendations were considered for the integrated planning and sustainable management of coastal areas. While region specific, these were seen as being transferrable to other countries.

- SIDS concerns and issues must form an integral part of, and inform, the global deliberations on sustainable development, including the OWG SDGs, the post-2015 development agenda and specifically the Third International Conference on SIDS to be held in Samoa.
- Integrate coastal zone management strategies into national sustainable development strategies or their equivalents taking into account national priorities and the challenges of sustainable development. Adequate land use planning strategies should hereby also be implemented.
- Implement and enforce strong, supportive, adequate and effective policies, regulations and legal frameworks, which are periodically reviewed (e.g. land use policies, permits, fines for littering), and conduct legislative reforms if necessary (e.g. outdated legislation).
- Establish strong institutions with effective institutional coordination mechanisms among entities engaged in coastal area management under the highest possible authority (e.g. linked to national strategy under Prime Minister's office, or President's office). Institutionalize engagement with budget and planning entities to ensure proper consideration in context of national priorities.
- Apply a human-centered approach to integrated coastal area management in an effort to balance economic development, social needs and environmental protection, while also taking into account cultural aspects.
- Make disaster risk reduction and management an integral element of integrated coastal area management, including by determining and enhancing the resilience and adaptive capacity of coastal communities, ecosystems and infrastructure (e.g. required setbacks, shoreline protection measures).
- Effectively apply an ecosystem-based approach and the precautionary approach, utilizing the best available scientific information, in the management of activities that impact on the coastal areas and the marine environment.
- Apply a spatial approach to integrated coastal area management in order to support policy integration and coherence among sectors within coastal areas with the aim of promoting sustainable activities.
- Take into account the land-sea interface, including watershed management practices, hillside development and hillside squatting, as activities on land are affecting the coasts and marine ecosystems (e.g. marine pollution from land-based sources).
- Implement water quality management and monitoring as well as sustainable waste water management and solid waste management systems and provide related incentives (e.g. "give value to rubbish" such as bottle refund mechanism).
- Support the development of sustainable tourism, including the increased emphasis on familiarizing tourists with cultural aspects of visited countries and the implementation of different forms of sustainable tourism (e.g. eco-tourism, World Heritage site tourism).
- Use legislation that calls for environmental impact assessments (EIAs) to ensure compliance with integrated coastal zone management strategies.
- Involve all relevant stakeholders, including local government and town planners, public and private sector, local communities and youth, to promote ownership and accountability, in the development and implementation of integrated coastal area management plans through multiple means suitable for the specific target group (e.g. public hearings) and support building of capacity where required.

- Strengthen the science-policy interface in order to support evidence based decision-making. Building on existing available statistics and indicators and taking into account local/traditional knowledge, collect area-specific, timely and accurate data, statistics and indicators on a regular basis and make modelling tools (e.g. simulation of storm surges) available. Maintain records and data continuously (e.g. coastal inventories) so as to keep them updated and have information readily available and accessible. In this regard, countries will require financial resources and tools for the generation and updating of information, including GIS, cartography and mapping.
- Strengthen the involvement of the private sector in particular in the area of innovative and eco-friendly solutions to sustainability challenges.
- Take into account the rights and concerns of local communities when approving new development projects (e.g. guarantee access to beaches).
- Promote local ownership and awareness raising through the provision of incentives (e.g. official recognition for environment-friendly actions), the implementation of community measures (e.g. “adoption” of beaches, community clean-up of beaches) and effective communication strategies, which use social media, TV and radio and are based on collected data and indicators (e.g. State of the Environment Reports).
- Promote public education and awareness on integrated coastal management nationally, including through the inclusion of an environment component in school curricula from early childhood education to university.
- Address challenges facing oceans and coasts, which are oftentimes cross-boundary in nature, not only at national but at regional and global levels in a coordinated manner, to efficiently utilize limited resources and develop technical capability.
- Enhance marine scientific research efforts and promote ongoing research to improve knowledge and understanding of the oceans and coastal areas.
- Conduct economic evaluation of the value and benefits of ecosystem services, and not only of economic losses due to destruction of ecosystems, in order to support decision-making and reinforce arguments targeted at conservation.
- Enhance the sharing of national data within countries as well as regionally and inter-regionally (free of cost where feasible) and maintain (collective) databases in order to minimize costs and enhance effective decision-making. Promote networking, sharing of best practices/experiences and peer learning at the national and regional level through multiple means such as online learning, face to face meetings and workshops, when feasible.
- Urgently enhance the building of local capacity (e.g. coastal engineers) and provide sufficient financial and technical resources, including for the implementation, monitoring and enforcement of existing regulations as well as climate change mitigation and adaption measures, while making use of different forms of financing, including innovative ways (e.g. debt-swap for climate change mitigation activities).
- Make better use of existing regional programmes, financing mechanisms, initiatives and networks in order to access information and resources as well as encourage the networking of existing institutions to achieve synergies.
- Develop genuine partnerships and networks to support integrated planning and sustainable management of coastal areas at the national and regional level (e.g. sharing of knowledge and human capacities such as coastal engineers) in order to allow for the pooling of resources, which is particularly important as some countries might be unable to address challenges independently, and to avoid duplicative efforts.

