

ECOSYSTEM SERVICES & DREDGING

WHAT IS AN ECOSYSTEM?

An ecosystem is defined as the animals and plants found in a particular location. Within the ecosystem, in a fragile balance, they depend on each other for survival and sustain one another by their interactions. Ecosystems can vary in size but in general a specific ecosystem is described within limited boundaries. Ecosystems which are in similar environments but in different locations in different regions of the world can and often do have very different characteristics and contain different species.

WHY IS THE PRESERVATION OF AN ECOSYSTEM IMPORTANT?

Ecosystems are dynamic and encompass diverse species. This biodiversity is crucial to a particular ecosystem and to the overall well-being of the environment. But ecosystems are subject to many pressures, both natural and human. Natural pressures include weather, climate in general and the topography of the region as well as the competition between species. Human pressures include the introduction of non-native species through global shipping traffic, the construction of maritime infrastructure, dredging and climate change caused by human activities.

Because of the interdependency of organisms in an ecosystem, disruption to one organism can have repercussions for all organisms within the ecosystem. This in turn affects biodiversity and directly or indirectly affects the natural balance and the so-called “services” upon which people depend.

WHAT IS THE ORIGIN OF THE ECOSYSTEM SERVICES (ES) CONCEPT?

Managing the ecosystem is a way of combatting the degradation of our planet’s biodiversity. In the early 1980s, environmental economists began expressing their concern for the diminishing biodiversity of the planet. The Washington-based research organisation Resources for the Future and David Pearce, a professor at University College London (UCL) in the UK, were amongst those trying to awaken policy makers and the public to the threat to the ecosystem, focussing at the time on the “big land grabs” by corporations. The idea arose to put “a price on nature”, that is, to make a financial comparison between a proposed project and the natural environment by giving the ecosystem at a specific site an economic value. Such a valuation could help determine the balance between a particular ecosystem in relation to a project and to human well-being. What were the gains, what were the losses expressed in monetary terms. What were the “services” that the ecosystem provided to people.

WHAT IS THE MILLENNIUM ECOSYSTEM ASSESSMENT?

Following these developments, in 2001 the United Nations launched a four-year study involving more than 1,300 scientists from 95 countries, to examine the issue of biodiversity and the ecosystem. In 2005 the Millennium Ecosystem Assessment (MA) was published. The MA marked a turning point because it provided a methodical, clear and compelling analysis of the state of the Earth’s ecosystems. It

Pictured above: Le coeur de Voh, New Caledonia, the world famous mangrove in the form of a heart located only a short distance away from the project site for a new port. In 2008, a large part of the lagoons surrounding New Caledonia were inscribed on the list of UNESCO-IUCN World Heritage sites.



Divers near the new port construction site in New Caledonia measuring the coral to check compliance with the thresholds outlined in the Environmental Management Plan. Monitoring was continuous.

described ecosystems as the Earth's "life-support system", providing humankind with essential "services" which were specifically enumerated. It also provided guidelines for decision-makers and people in general.

WHAT WERE THE FINDINGS OF THE MA?

That over the past half century ecosystems have been changing rapidly as a result of human actions resulting in significant losses to biodiversity. That these changes have brought improvement to human well-being economically, but at an increased cost to ecosystems which often have social and cultural consequences. That if society continues on the path it is on, considerable damage could be done to the planet and to resources for future generations. And that it is not too late to reverse course.

With changes in policies and practices, socio-economic advancements and the preservation of ecosystems are both achievable and can be brought back into balance. But this requires hard choices and the political will to change. These changes can be effected by the recognition of Ecosystem Services.

WHAT ARE ECOSYSTEM SERVICES AS DEFINED BY THE MA?

The MA defines four basic categories of Ecosystem Services. These are the services that the ecosystem provides to maintain the well-being of people and the planet:

- *provisioning*, products supplied from ecosystems, such as food, fresh air and water, and fuel;
- *regulatory*, the benefits that ecosystems provide because they help regulate water, erosion, flooding, climate and air quality;
- *life-supporting*, the long-term significance of nutrient cycles, photosynthesis and crop pollination; and
- *cultural*, such as educational, spiritual and recreational benefits.

Using these four categories as guidelines, the MA calculates the value of each of these services in monetary terms. By attributing a financial value to how beneficial these ecosystem services are to people, one can also, conversely, estimate how the loss of these services will impact long-term human well-being.

WHY HAVE ECOSYSTEM SERVICES BECOME SO IMPORTANT?

According to the MA, human activities are having a very significant and not-so-positive impact on the biodiversity of the world's ecosystems. This is quite often expressed in concerns for human-induced climate change. The consensus is that people, as individuals and as corporations, are contributing to the reduction and the lack of resilience and bio-capacity of ecosystems and the result is a growing loss of "natural capital".

WHAT IS NATURAL CAPITAL?

Natural capital is defined as the resources of the planet's lands, waters and its biodiversity. Ecosystem Services are the benefits which derive from natural capital. Basically this natural capital is critical for all aspects of human survival. It includes such obvious resources as clean water and fresh air, agricultural crops for food, wild life and plants as well as fossil fuels and minerals necessary for economic development. Loss of this natural capital will reduce the Ecosystem Services which benefit people and the planet.

WHAT FURTHER ACTIONS ARE BEING TAKEN?

Following the MA's report, a new global initiative was launched in 2007 by Germany and the European Commission and is now supported by the United Nations Environment Programme (UNEP) as well as a broad range of experts from the fields of science and economics. Known as *The Economics of Ecosystems and Biodiversity (TEEB)* (www.teebweb.org), it emphasises the global economic benefits of biodiversity, the worldwide impacts of biodiversity loss and the costs when ecosystems are degraded. In other words, it describes what it means to lose "natural capital".

TEEB offers an approach which assists decision-makers in recognising, demonstrating and capturing the monetary value of ecosystems and biodiversity. TEEB's aim is to help countries, policy makers and businesses incorporate these monetary values into their decision-making processes. One of their first reports, *The Economics of Ecosystem and Biodiversity (TEEB) for Water and Wetlands*, was launched in February 2013.

HOW DOES THIS AFFECT THE MARITIME INDUSTRY?

It has been said that the oceans are key to sustaining life on Earth and that they are a conduit for ninety per cent of the world's trade and for connecting people and markets. What happens in the water of course has direct consequences for

the maritime industry. Everything literally flows from one body of water to another. On the other hand, because of this “flow”, the maritime industry was identified as one of the factors that has significant impact on ecosystems.

TEEB is therefore developing a project focussed on “Oceans and Coasts”. This study will identify policies that benefit ocean ecosystems and biodiversity as well as observe and identify underlying drivers for change. It will attempt to make current and future knowledge available to stakeholders and to develop designs for possible solutions for framing ecosystem services in economic terms. In addition TEEB aims to improve research strategies and encourage stakeholders to implement recommended solutions.

WHAT REGULATORY ACTIONS HAVE ALREADY BEEN TAKEN?

Not surprisingly, although perhaps not always justifiably, ports and other maritime infrastructure construction projects regularly encounter resistance from stakeholders wishing to conserve valuable habitats. Internationally, this has led to the adoption of legislation – for instance the RAMSAR (Convention on Wetlands, signed in Ramsar, Iran, in 1971) – and in the European Union, the Habitat Directives to protect and conserve fauna, flora and their habitats. Various other countries such as Australia and the US and Canada have their own list of regulations guarding natural resources and assets as they interact with industry. But these regulations, as useful as they are, have proven to be insufficient. A new, bolder step is needed and that has given impetus to the Ecosystem Services approach.

HOW DO ECOSYSTEM SERVICES APPLY TO PORT DEVELOPMENT?

Consider the need for port maintenance and port development. In a market economy, the assets of the port are appraised in terms of job creation, GNP and import-export trade. They have a monetary value. But many ports are situated at the mouth of an estuary, or along a coastline, near valuable nature sites, wetlands or bird nesting areas. In particular estuaries and deltas are very valuable from a biodiversity point of view. The value of these natural assets is often intangible or invisible, yet any type of maritime construction is likely to have some impact on the ecosystem. The challenge is: how does one evaluate the balance between the social and economic value of a port and that of the ecosystem?

Ecosystem Services is a structured system to translate the value of ecosystem into a money-based commodity. By monetising the value of an ecosystem nearby the port, the stakeholders can evaluate if the increased advantages of the port – bigger ships, more commodities – are as valuable as the value of water recreation, such as swimming and boating as well as the fish and marine fauna essential to the food chain.



The Ilot bird island sanctuary at the mouth of the Seine near Le Havre Port 2000 was created to compensate for natural habitats lost during the construction of the port.

HOW ARE ECOSYSTEM SERVICES APPLIED TO A DREDGING PROJECT?

The dredging industry has often encountered the economics versus environment debate. Confronting the challenges to preserve ecosystems and biodiversity, the major international dredging companies have made long-term investments in “green” technologies and designs for executing projects sustainably– from the EcoShape Institute’s “Building with Nature” programme to PIANC’s “Working with Nature” to technological improvements in monitoring and equipment.

The Ecosystem Services concept, however, offers a new opportunity to advance dredging projects in a cost-efficient and ecologically sound way by assigning value to both the project and the ecosystem that may potentially be impacted.

CAN THE ES CONCEPT HELP THE DREDGING INDUSTRY?

Bear in mind that “dredging” is not one activity. Capital dredging, maintenance dredging, beach nourishment, remediation dredging and reclamation dredging are all quite different and require different considerations. The complexity of these considerations is obvious. Dredgers already have many technical means of measuring impacts such as surveys, modelling and monitoring. For instance, at the Maasvlakte II, construction, which took 5 years, was preceded by 15 years of studies.

The ES concept has added a new tool to help analyse the complexities inherent in executing these diverse dredging projects by taking them into consideration as part of an Environmental Impact Assessment (EIA). For instance, ES can be an element during the EIA. By assigning a monetary value to a specific habitat to determine its natural capital, ES can find a “financial” balance between services rendered by a human activity (dredging for port development or land reclamation) and the pressures that these activities put on the ecosystems.

ES encourages a dialogue and awareness amongst a wide variety of stakeholders and decision makers including project owners, contractors, regulatory agencies, residents and NGOs. This dialogue can result in timely solutions to avoid, mitigate or compensate for impacts.

WHAT ARE THE ESSENTIAL SERVICES OFFERED BY DREDGING?

Dredging offers essential services, such as coastal protection and port expansion. For instance, dredging can create artificial wetlands or restore wetlands that have been compromised. Sand replenishment and sand dune enhancement along beachfronts also provide the essential service of shoreline protection as well as create important recreational assets.

The proof is in the process. Although dredging may itself pose a potential threat to the habitat of a coastal area when a land reclamation or port development project is planned, using the best available scientific and technical practices, dredgers can find a balance compliant with the needs and values of stakeholders. By using Ecosystem Services valuation to quantify the importance of biodiversity, stakeholders have the capacity to weigh the “natural capital” against the dredging benefits. Ultimately, the dredging process can be adapted to achieve both goals.

HOW DOES DREDGING AFFECT MARINE ENVIRONMENTS IN GENERAL?

Not only wetlands, but also coral reefs and oyster beds for instance offer a degree of flood protection. With continuing climate change causing an increase in sea level rise, the role of these natural barriers has become better recognised. Although wetlands, coral reefs and other coastal habitats can be affected by dredging as well as by natural climatic forces, dredging can also remediate or recreate them.

Dredging can help restore wetlands, help manage the replanting of coral reefs and oyster beds and/or compensate for the removal of these by replacing them elsewhere in a nearby site so that they are not lost to the ecosystem. Constructed wetlands and nurtured or artificial coral reefs – just as the original ones – enhance biodiversity, encourage the growth of indigenous plants and prevent the spread of invasive plants. As well they may offer cultural added value such as parks, fishing, scuba diving and other recreational/cultural activities.

WHAT IS THE LONG-TERM PROGNOSIS FOR ECOSYSTEM SERVICES CONCEPT?

ES is a work in progress. The concept is relatively new, and often quite abstract. The more the ES concept is developed, the more considerations arise: Can and should all aspects of nature be monetised? Do we risk losing sight of the interconnection of ecology and humans? Can we single out one aspect separated from other environmental aspects? What are the risks and the opportunities afforded to the

dredging industry by adopting an Ecosystem Services approach? The ES concept is complicated and its implementation even more so. Clearly, research in valuing ecosystems and biodiversity and their relationship is just beginning.

WHAT IS THE NEXT STEP FOR THE DREDGING INDUSTRY AND ES?

Economic prosperity should be a shared value that reaches to all corners of the global community, at the same time taking into consideration all aspects of the shared global environment. The inner tension between economics and environment demands creative solutions that promote good policy choices. Ecosystems should not be sacrificed for economic advancements. Nor should dredging projects be hindered for superfluous reasons.

The concept of Ecosystem Services offers a better way to make informed decisions about projects and for evaluating the impact of commercial and industrial activities, for finding a way to fulfill society's economic needs whilst preserving other values such as the planet's future health. Policy makers in the dredging industry are paying close attention to scientific data and are initiating their own studies and project evaluations. Since dredging contractors already implement processes for project management which reflect a deep concern with ecosystem preservation, taking the next step to an Ecosystem Services approach is a natural extension.

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This brochure is presented by the International Association of Dredging Companies whose members offer the highest quality and professionalism in dredging and maritime construction. The information presented here is part of an on-going effort to support clients and others in understanding the fundamental principles of dredging and maritime construction.