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A Sea of Troubles

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A Sea of Troubles

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The Changing Relationship

If it were not for the sea, the Earth would just be one more small, dead planet, another desert island adrift in the limitless black ocean of space. Life began in its waters, and no animal could clamber out of them onto dry land before algae in the primaeval oceans released oxygen to provide a welcoming atmosphere. And without the water from the sea that falls as rain, the continents would become barren again.

The world's cultures also owe much to the seas. They nurtured its early civilisations, clustered around their shores, and spread trade and ideas in the ships that came to ply them. Wealth and knowledge continued to travel mainly by water until the very dawn of the modern era, and the oceans still retain enormous, if largely unrecognised, economic importance. They cover 71 per cent of our planet's surface, regulate its climate, and provide its ultimate waste disposal system, yet our myopic, terrestrial species still insists on naming it after the land.

Humanity's future, just like its past, will continue to depend on the oceans, on the intricate interchanges between land and water. Yet the relationship has changed. Over most of human history it has been dominated by the sea's influence on people. But from now on humanity's effect on the state of the sea is probably at least as important. And, by and large, this is getting worse.

The state of the world's seas and oceans is deteriorating. Most of the problems identified decades ago have not been resolved, and many are worsening. New threats keep emerging. The traditional uses of the seas and coasts - and the benefits that humanity gets from them - have been widely undermined.

All this is happening because human activities are increasing and extending over ever wider areas. The closer the seas come to people, the greater is the damage. Ill-planned (and often unplanned) coastal development is one of the main driving forces behind the environmental problems of the oceans. Apart from overfishing, the greatest harm is caused by what we do on land - and particularly at the coasts - rather than at sea.

The picture is not universally bleak. There has been considerable progress, in some places, in reducing harm to the marine environment. But this is continually being outstripped by the pace and scale of the deterioration.

More hopefully, perhaps, there is a dawning realisation that neither individual problems, nor the crisis of the seas as a whole can be dealt with in isolation. They are intricately interlinked both with themselves and with social and economic development on land. Policy decisions, research, and management programmes are all shifting their focus accordingly.

PRESSURES AND EFFECTS

The nearer you get to land, by and large, the greater is the hurt to the sea, its life and resources. The crisis is deepest where the waters are shallowest. It is here that pollution is at its worst, habitats are most readily destroyed, and much of the depletion of fisheries takes place.

The open oceans suffer some contamination and ecological damage, but compared to coastal areas they are still in a relatively healthy state. Pressures have been increasing on the seas above continental shelves, as drilling for oil and gas has ventured into deeper waters, and fisheries have expanded. But it is the waters nearest to the shores - and particularly those in estuaries and in semi-enclosed seas and bays - that have suffered the steepest decline over the last decade.

More and more of the narrow strip of land along the world's coasts - and its habitats - has been ruined by a host of poorly planned and badly regulated activities, from the explosive growth of coastal cities and towns to the increase in tourism, from industrialisation to the expansion of fish farming, from the development of ports to measures taken to try to control flooding. The pressures are particularly exacerbated along the coasts of many developing countries, where rapid population growth combines with persistent poverty, and there is little capacity to manage the situation. But developed country coastlines are often overdeveloped too, as people and businesses demand ocean-front properties.

Vulnerable areas and systems - and the sources of their problems

The intensity of pressures vary from place to place, as does the vulnerability of different ecosystems

- *Coral reefs* - eutrophication, sediments, overfishing, destructive fishing, reef mining, the aquarium and curio trade, diseases.
- *Wetlands* - reclamation and development, including landfills.
- *Seagrass beds* - siltation, coastal development, eutrophication, physical disturbance.
- *Coastal lagoons* - reclamation, pollution.
- *Mangroves* - excessive exploitation, clearing for reclamation, development and aquaculture.
- *Shorelines* - development, modification of habitats, erosion.
- *Watersheds* - deforestation, soil erosion, pollution, loss of habitats.
- *Estuaries* - reduced water flows, siltation, pollution.
- *Small islands* - changes in sea level, waste management, pollution.
- *Continental shelves* - pollution, fishing, dredging, navigation.
- *Semi-enclosed seas* - pollution, coastal development, fishing.

Nevertheless, the seas and coasts worldwide are being used more and more to provide the basics of life, and for commerce and recreation. Growing demand is putting increasing pressure on the resources of the oceans. The burden of waste sent out to the sea is growing worldwide, even though it has been lightened in some places by better technology and practices. The use of pesticides, fertilisers and other agrochemicals is rising worldwide, as is the amount of them that is washed and blown off the land into the oceans. Fisheries are a shambles, grossly mismanaged and overexploited almost everywhere. Coasts are overdeveloped. Habitats are increasingly being destroyed. And the introduction of species, either intentionally or accidentally, to habitats far from their own is now taking place on a large scale, often disrupting both ecosystems and economies.

On the positive side, there is convincing evidence that better management in some areas has cleaned up beaches and bathing waters and made seafood safer to eat. Concerted national and international action has cut the amount of oil discharged from tankers in their ballast waters. Shipping is believed to have reduced its pressure on the health of the oceans over the past decade - major oil spills now occur infrequently. In some countries, many coastal industries - such as oil refining, pulp and production, and chemical and food manufacturing - have made major strides in controlling discharges to the sea. On the other hand, coastal developments, such as expanding and maintaining harbours, damage and destroy habitats and have important effects on the environment. Even the increase in ports taking wastes from ships - a welcome development - often raises problems over what to do with the wastes afterwards.

The nature and extent of pressures on the seas differ from place to place, and can arise far inland. But, apart from the threats arising from predicted global warming, the most serious ones worldwide are:

- **The destruction and alteration of habitats** is common and widespread. Rivers, lakes, estuaries and coastal waters are the hardest hit - and wetlands, mangroves, seagrass beds and coral reefs are particularly vulnerable. At least half of the world's mangrove forests have been lost over the last century, for example, and 70 per cent of coral reefs are threatened. Pollution is not the only culprit, or even the greatest one. Reclaiming land, felling forests, mining, building on coasts and other activities that directly damage and destroy the land are just as important, as are destructive ways of fishing, such as using poison, explosives, or catch-all nets.

- **Overfishing and the effects of fishing on the environment.** Overfishing has brought an end to 40 years of increases in the harvest from the seas, and now threatens to cut world catches sharply over the next decade. It denudes both seas and freshwaters. Intensive fishing removes vast amounts of biomass from the middle of the food chain, with largely unknown effects. Destructive fishing methods add to the crisis, as do poor management and social and economic measures in support of unsustainable practices.

- **The effects of sewage and chemicals on human health and the environment.** The amounts of some pollutants have been reduced, and some forms of pollution are now thought to pose less of a threat than before. But new work, reported in these pages, suggests that sewage pollution has a massive effect on health worldwide, ranking with some of the most feared diseases afflicting humanity. And some chemicals are suspected of causing cancer, disrupting reproduction and altering behaviour.

- **Increasing eutrophication**. The excessive growth of marine plant life, is seriously disrupting ecosystems and threatening health throughout the world: coral reefs, seagrass beds and other vital habitats are suffering. And it can trigger explosive blooms of toxic algae which can blight tourism, contaminate seafood and poison people.

- **Changes to hydrology and the flow of sediments** - caused by such developments as building dams and causeways, creating reservoirs, establishing large-scale irrigation schemes and changing the way land is used - often seriously degrade habitats and significantly change ecosystems. These developments change the flow of rivers, and so cut the amount of sediment being carried down them which, in turn, can alter coastlines. Felling forests, by contrast, can increase their sediment burden, damaging wetlands, deltas and coral reefs.

CHANGING PERSPECTIVES

Over the last decade - since GESAMP last produced a report of this kind - the emergence of new issues has placed the protection of the seas in a new perspective, and heightened their economic value. There has also been a new realisation that the problems of the oceans can only be tackled in an integrated way, rather than piecemeal.

Global warming, predicted by the scientific community over the last decade, will both be heavily influenced by the oceans, and have profound effects upon them. The seas' massive ability to store heat will do much to govern the rate at which the Earth warms up, and will make the process, once started, extremely hard to stop. Meanwhile the climate change is expected to alter the pattern of currents, with far-reaching effects both on sea and land, to disrupt fisheries, change ecosystems and cause the seas to rise, inundating low-lying islands and coastal areas.

Some contaminants - such as lead, mercury and oil - are now seen as much less threatening than in the past. Similarly radionuclides pose a relatively minor threat to health and the environment, even though the public often sees them as a major one. By contrast, other pollutants - like sewage - have now been found to damage health much more than had been realised.

It has become ever clearer that activities on land (or based on it) are the major source of pollution - and that the main problems may come less from fixed points, like factories, on the coasts than from diffuse practices like agriculture. However, pollution - the introduction of substances that damage the environment or human health - is now recognised to be not the only, or even necessarily the most severe, threat to the oceans. Direct physical damage to ecosystems and habitats, and overexploitation of the resources of the sea, have even greater worldwide effects.

There is also a new appreciation of the rich biodiversity of the sea, and a new realisation that it has so far suffered much less from destructive human activities than the land. Until now this has been a relatively neglected field; there are powerful arguments for paying much more attention to it.

As new understanding of the environmental problems of the seas has grown, so has the recognition that they cannot be tackled in isolation. Many authorities have been arguing for decades that the seas and coasts - and the river basins that run down to them - must be protected and managed together in an integrated way. Some countries practice this successfully, but it has taken longer for this vital principle to be enshrined in international agreements.

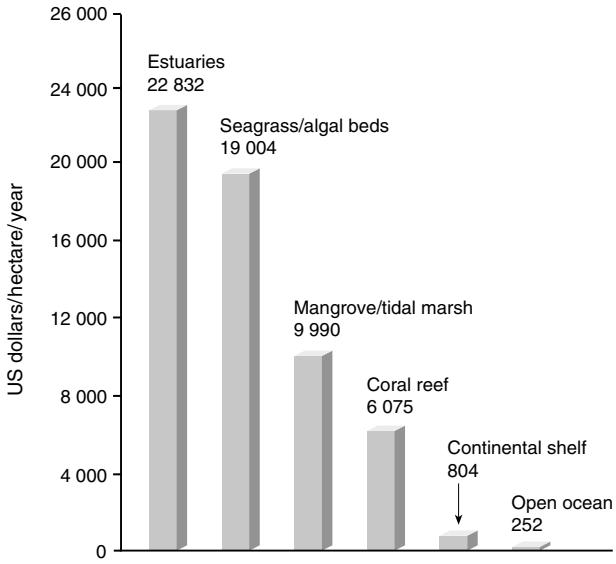
In many ways, the greatest progress has been made in some regional and subregional programmes, which have recognised that one of the best ways of solving the environmental problems of the seas is to manage development on the coasts, and their hinterlands, properly. The signing of the UN Convention on the Law of the Sea, in 1982, marked the first major - if timid - political step towards extending this worldwide. But the crucial global turning points came only with the adoption of Agenda 21 at the 1992 Earth Summit (the United Nations Conference on Environment and Development - UNCED) and, three years later, of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. Both recognise that freshwater (including groundwater), the coasts and the seas are inseparably linked. And they specifically ask that conflicting interests over the seas, coasts and river basins be resolved through integrated management of resources and environmentally sound economic development.

Regional successes

Over the last few decades, several regions - the Baltic, the Mediterranean and the North East Atlantic - have developed successful programmes to use and protect the environment of their coasts and seas. They conduct scientific assessments, identify causes of environmental problems, set standards and objectives for emissions and the environment, find and eliminate hot-spots, employ managerial tools for using and developing coastal regions and resources, build administrative and technical capacity, develop public awareness and participation, and pursue sustainable development. They demonstrate that, despite difficulties, groups of countries can take concerted and effective multinational action to protect and develop coastal regions and their seas. The experience gained from their achievements and failures should be used to develop new programmes and improve existing ones.

FIGURE 1

Estimated mean value of some marine biomes



Source: Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. V. O'Neill, J.Paruelo, R. G. Raskin, P. Sutton, and M. van den Belt. 1998. The value of the world's ecosystem services and natural capital. Ecological Economics 25:3-15.

Even more importantly, perhaps, managers and policy makers are gradually recognising the value of the services that the oceans provide for the Earth and its people. In the past, the worth of the seas has usually been weighed in the resources it provides, whether sand and gravel, oil and gas, or fish. But these *resources* are dwarfed by the value of the unrecognised *services* that the oceans provide, from recreation to regulating the earth's climate, from supplying rainfall to receiving and treating waste. Many lie outside the conventional market economy, but life on Earth could not continue without them.

The value of these services, it is generally agreed, must be brought into mainstream economic and social calculations. Ways of valuing them are improving, but still have limitations - though not as great as the reluctance of existing institutions to take them into account. The best estimate from one recent calculation, which drew on over 100 studies over the past two decades, suggest that ocean services may be worth about US $23 trillion a year, only slightly less than the world's GNP. It suggests too, that the seas and oceans provide two thirds of the value of all the natural services provided by the entire planet. Whatever the exact figure, it is clear that the health of the oceans is vital for the world's economic - as well as its ecological - well being.