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Ocean Sustainability

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GLOBAL POLICY RESEARCH INSTITUTE COURSE POLICY ANALYSIS PAPER
OCEAN SUSTAINABILITY

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PROBLEM DEFINITION

Oceans cover over 70% of the Earth's surface area. They provide more than 90% of the world's oxygen production, account for 200 billion pounds of food each year, regulate the global climate, and are the primary mode of global shipping traffic ("www.marinebio.org"). With such social, economic, and environmental value, there is a clear need to enact sustainable policies and practices concerning marine zones.

Current policies are not sufficient to provide for sustainable ocean use. Although significant policies and attempts to control marine pollution have been enacted, it is nearly impossible to enforce every rule. Some of the major roadblocks that governments and non-governmental organizations (NGOs) face when combating marine pollution are economic in nature. These include agricultural runoff and mining waste, dredging harbors for shipping, and enforcing laws that stem from international conventions on vessels in international waters.

As with any international policy, there must be some form of enforcement. Usually, signatory states will enact domestic policies to follow suit with the international protocol or convention. Problems arise when some states lack the political, economic, or social potency to enforce these domestic policies. The port authorities may be bribed or lack the resources to ensure shipping vessels are complying with the law, or industries may be lax in following environmental regulations. One of the most prominent issues in marine pollution includes high levels of mercury from human development, which enters the food chain in the oceans and is returned to land in the form of food on our table. This is a much more visible and salient issue than the Great Pacific Garbage Patch or the Atlantic Garbage Patch - two large areas of marine litter that have coalesced due to the ocean currents.

Alternatives for new policies must find a better way to collect and dispose of waste. The value of investing in sustainable practices can only profit the human population in the long term, due to the significant benefits that the ocean provides. Current policies do not take into account the long-term sustainable use of the oceans, but focus merely on mitigating the current problems.

In order for a policy to be effective, it must take into account the points of marine pollution. These include direct points of pollution (e.g. a highly polluted river emptying into the ocean), land pesticide and herbicide runoff, ship waste, mining and oil pollution, as well as environmental factors (e.g. rising carbon dioxide levels, ocean acidification, etc.). As shown, sustainable ocean practices must be implemented outside of the ocean as well. Environmentally friendly mining practices can reduce the amount of ocean pollution and decreasing the amount of carbon dioxide in the atmosphere will aid the ocean. Implementing all natural and eco-friendly pesticides and herbicides on farms and in commercial and residential

settings will allow for a healthier, more valuable ocean. In addition, dredging is a popular process used across the globe to remove sediment from waterways. Sediment suspended in the water ultimately settles to the bottom where it accumulates. Thus, dredging must be performed in order to maintain navigable waterways and for port development.

To many, the issue of marine pollution and ocean sustainability is not an issue. Many scientists prior to the second half of the 20th century thought that the ocean was so vast the ability to dilute was unlimited ("Marine pollution"). However, as can clearly be observed today, this is not the case. By 2010 nearly 80% of the world's population lives within 60 miles of the coast. Of that population, 40% lives within 37 miles of a coastline (Laden). This simple fact alone shows that the ocean affects a vast majority of the over 7 billion people on Earth. As previously stated, the oceans provide for nearly 90% of the world's oxygen and over 100 million tons of food. Coupled with the climate regulatory mechanism, the need for sustainable ocean policies is clear. Every human in the world is a stakeholder in clean ocean practices, and this must be taken into account along with the economic, environmental, and social benefits of a healthy marine ecosystem.

SUMMARY OF CURRENT POLICIES

The majority of the oceans are considered international waters. Therefore, while there are many policies and regulations that govern the coastal waters of individual nations, there are very few international treaties on this issue. The majority of policies that exist regarding ocean pollution regulation only attempt to make ships more environmentally friendly. The major issue that is not addressed in international ocean sustainability treaties is waste that is created on land and, through leakage into waterways, makes its way into the ocean.

One of the most important international policies that address marine environmental conditions is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the protocol of 1978 (commonly referred to as Marpol 73/78). The stated objective of Marpol is to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharges of such substances (MARPOL 73/78). Currently 150 countries, representing 99% of the world's ship tonnage are members of the convention (MARPOL 73/78). A ship that is flagged under a member country of Marpol must abide by the guidelines, even if the ship travels to a non-member country. Each signing country is responsible for enacting its own domestic laws that comply with the regulations set forth by the convention.

Marpol contains 6 annexes that address different forms of pollution from ships. From one to six the annexes are oil, noxious liquid substances carried in bulk, harmful substances carried in packaged form, sewage, garbage, and air pollution. However, for a country to be a Marpol member it is only required to abide by annexes I and II. Despite the remaining four annexes being optional, over 90% of the world's ship tonnage abides by all but annex VI, air pollution (EPA). Another aspect of the majority of annexes is that they make a distinction between special areas (protected) and non special areas. This ensures there is more stringent control on dumping (mostly garbage and sewage) by ships in an environmentally fragile area.

Marpol is a strong international environmental policy that can be changed and amended to keep up with new information and the world's changing environment. The biggest weakness of this policy is that it is very difficult to enforce. It is almost impossible to prevent ships crossing international waters from dumping banned materials like plastics. If a country that a ship visits

finds it is in violation of Marpol, it can only refer cases back to the ship's flag country. These cases usually are not dealt with properly (MARPOL 73/78).

The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) was devised by the United Nations to address environmental damage from pollutants that originated on land. GPA "aims at preventing the degradation of the marine environment from land-based activities by facilitating the realization of the duty of States to preserve and protect the marine environment" (GPA). Unlike Marpol, this is not meant to be an international treaty. Rather, it is a set of guidelines that can be used to help national and regional authorities devise strategies to develop policies that address marine sustainability (GPA). The aim is also different than that of Marpol. Instead of setting standards for regulation, GPA hopes through education that individual countries and regions will see the need to self regulate.

While there are no widely adopted international treaties regarding land-based pollution, there are regional treaties aimed at protecting environmentally sensitive areas. One of the most successful regional treaties is The Protocol Concerning Pollution from Land-Based Sources and Activities (LBS Protocol). This agreement between the United Nations member states in the wider Caribbean area attempts to protect the sensitive marine environment and diversity from harmful land based pollution. Guidelines set forth from GPA were used to devise this policy and the protocol only recently went into force (2010) (LBS Protocol).

The LBS Protocol does not encounter some of the enforcement problems that Marpol faces. Land-based pollution is much easier to track, and the persecution of violators is carried out by the country that collected the evidence against them for the violation (LBS Protocol). There is also emphasis put on the regional areas to implement the necessary policies that comply with the LBS Protocol (as was the focus of the GPA guidelines). While still relatively new the LBS Protocol can be used as a basis in the future to develop a widely adopted international policy on land-based pollution.

As noted, dredging is a major source of pollution. Every nation around the world has its own policies on dredging, and there are a variety of reasons for practicing it beyond maintaining waterways, including collecting sediment (especially sand) for construction uses and providing material for filling eroding beaches. Most dredged material does not reach international waters. Many nations find uses for dredged material that is free of contamination. In the United States, for example, 350 million tons are dredged annually, while only twenty percent of this material is returned to the ocean in designated sites (Engler). The sheer amount of dredged material globally demands attention, however. Upwards of eighty percent of all materials dumped in the world's oceans are dredged materials ("www.marinebio.org"). In addition, 7-10% of all dredged material is considered contaminated and must be handled and disposed of with special care. This contamination takes many forms, including heavy metals, hydrocarbons, nutrients, and organochlorines (found in pesticides). The majority of contaminated substances from dredging are restricted from being dumped into the ocean by existing legislation, both international and national, and must be dealt with via expensive land-based methods of disposal. All dredged material must be tested to determine its levels of contamination.

Problems which arise from dredging are numerous and vary from place to place. The dumping of "clean" dredged material can cause physical problems. Concerns include high turbidity in the water column, changes in grain size, the smothering of bottom dwelling organisms, and damage to fisheries. These problems are typically local or regional in scale and are not of the greatest concern on a global scale. Dumping contaminated sediment, though, can have more

far-reaching effects. Many contaminants are fed upon by oxygen-depleting bacteria, creating an environment that kills marine life – a process known as eutrophication ("www.marinebio.org"). Contaminants can also lead to the biomagnification of pollutants and genetic disorders in organisms (possibly in the food chain). Simply dumping toxic dredged material into deep-ocean deposits may not be sufficient, since evidence has shown that the materials will move and drift. Those locales are also subject to disruption from the earth's natural physical changes.

In summary, the international community recognizes the importance of a sustainable marine environment and has enacted policies aimed at mitigating environmental damage. Marpol addressed pollution that originated on ships, GPA attempts to educate and help set guidelines to mitigate land-based pollution, and the LBS Protocol is a regional international policy that attempts to mitigate environmental damage from land based pollution in a sensitive area.

INTERCONNECTEDNESS OF THE ISSUE

Like most international issues, the scope of the marine environment contamination problem is very broad and affects the scientific, social, and economic aspects. All of these aspects are interconnected, and together they help to shed light on the true nature of the problem. With ocean pollution, sea products and food are affected, which impacts the economics of the market and how society reacts.

In terms of scientific effects from this problem, pollutants can lead to many negative effects in the ocean. For example, in oil and gas spills some components are toxic to marine plants and animals even at low concentrations, leading to cancer, mutations, or birth defects. This can also lead to behavioral changes in shellfish and fish, and can also produce discoloring and bad taste in the flesh of fish. Dust and sediments, caused by erosion during construction and urban runoff, reduces the amount of oxygen in affected waters. This in turn lowers the water quality, clogs the gills of fish, and buries the habitat, food, and organisms present. These are just a few of the effects that pollution, from its immense amount of sources, has on ocean life and habitats. These environmental and scientific issues that arise from ocean pollution require new technologies that aim to help fix these problems. For example, there is still not a way to efficiently clean up after an oil spill, and there needs to be better technology to prevent further oil spills such as the BP oil spill in the Gulf of Mexico.

Social effects from this problem can be a direct result of the scientific effects and facts that are shown to the public. If people see that pollutants in certain parts of the ocean are affecting ecosystems and the creatures that live in them, then there will be a social reaction. If there is any concern at all that the seafood is becoming contaminated, then the public will stray away from it and as a result choose another type of food to eat. This affects coastal communities especially, since local fisheries make up a large portion of the economy. Ocean pollution can also lead to negative connotations for companies or industries that may be linked to the source of the pollution. For example, after the BP oil spill in 2010, people saw offshore drilling and oil companies in a very negative light, even though people rely on them for everyday life. This can greatly change the social perception of many large companies, which can even have social impacts on the way people make future decisions. People who saw the destruction and impacts of the oil spill might have made it a point to consume less gasoline by driving less, or even look into utilizing other means of transportation.

The social and scientific impacts of this policy issue also lead to direct economic effects. Boating pollutants in the water and sediment affect marine life and human health. These

pollutants can reduce the availability of quality seafood, raise health care and dredging costs, and affect industries which need clean water, like tourism, fishing, and water sports. If there is less quality seafood and public awareness is raised about ocean pollution and contamination, then people will begin to buy less fish, and this has a very large impact on the local economy of the fisheries. For example, the commercial value of halibut and White Sea bass for California in 2009 was $3.44 million. These fish live in bays when they are young, which is where a large majority of boat and sediment pollution spawn from, and these fish can contract diseases that can be shared between aquatic animals and the humans that consume them. If a decline in the market for these fish occurs, then this could cost the fisheries millions of dollars. Another important thing to consider is the cost of dredging. Harbors need regular dredging to maintain water depth, and clean sediments are much cheaper to drain and dispose of. The cost of this seems small per cubic yard, but thousands of cubic yards are removed when an average boat basin is dredged. The cheapest option for dredging is to dispose of the removed sediment in another location on the beach or in the ocean. This of course is a source of pollution, so there is a constant economical struggle between cheaper services and more expensive, ethical removal of wastes. Below is a chart that shows the various prices of the different types of dredging and disposal methods.

Dredge and Disposal Type	**Cost/Cubic Yard**
Dredge/dispose on beach or in ocean	$5 -$10
Dredge/dispose as contaminated waste, e.g. construction fill.	$17.50 - $35
Dredge/dispose as hazardous waste	$40 - $60

POLICY ANALYSIS AND ALTERNATIVES

It is a known fact that there exists a trade-off between economic development and environmental welfare. It is also an established fact that industrialization has its negative repercussions to the ecosystem since it produces waste by-products. The ocean, because of its vastness and uninhabited by humans, has been the dumpsite of most of these industrial wastes. Not that industrialization is entirely bad, but policies and technologies should go hand in hand in order to buffer and minimize the adverse effects it has on the environment (Fribbance 49). Since the discovery in 1970s of the harms wastes pose to the oceans, and consequently to man, many policies and practices have been introduced and developed in order to address such concerns. In 1972, the U.S. Congress ratified the Marine Protection, Research and Sanctuaries Act (Ocean Dumping Act or ODA) and the Federal Water Pollution Control Act amendments (Clean Water Act or CWA) in order to restore, protect, and maintain the marine environment. It also prohibited the dumping and disposal of waste by-products into the ocean and regulated waste discharge through sewages into the ocean.

As an alternative for material dumping in the oceans, incineration became a common practice in order to get rid of the waste products. There are two kinds of incineration practices: land-based or ocean, wherein the burning of the materials are done on ships bound for the ocean so as not to affect societies with the smoke and gasses it produces (which is also another pollutant, to note) (“Ocean Incineration” 9). The release of the wastes from these incineration practices should be essentially just the same, but considering that land-based incinerations are closer to human civilization, the impact of its operations are risking the society more. The ocean incinerations on the other hand furnish more of their risks to the marine environment. Uncontrollable risks are also present such as spills and major accidents of such vessels for ocean incineration that would further the damage to the ocean (“Ocean” 15). Considering that

blunders in ocean incineration are difficult and even impossible to cleanup, and effects on the marine environment affect a wider scope of population (considering how the ocean is connected to the bodies of water supporting nations), it is deemed that ocean incineration possesses more threats and risks than its land-based counterpart. Incineration is not viewed as a true disposal method, because it reduces the organic products to water vapor and carbon dioxide while the inorganic materials are turned into ash. Incinerating material waste reduces the volume to twenty percent and the ash must also be disposed of or used. The United States mainly uses two types of incinerators: the multiple hearth furnace and the fluidized bed incinerator. The multiple hearth furnace, which is the most prevalent furnace used globally, is comprised of five to nine different hearths where gravity is used to push down the waste material from one hearth to the next. The fluidized bed incinerator uses a bed of sand where the waste material is injected. Incineration occurs once the waste has entered into the sand and the waste is dried using this method. The Clean Air Act places air quality regulations on these incineration plants where emissions standards must be met.

An alternative for sewage and wastewater dumping is land application. This method is viewed as a relatively environmentally friendly method for disposing of sewage waste. In the process of land application, sewage material is injected into or onto the soil surface in a "watered-down" form. This liquefied material acts as a fertilizer to provide nutrients for the soil and crops, and most importantly, it has no negative environmental impact. There are several different methods of land application. The first method is to spread sewage on agricultural land as a conditioner for the soil. The second method is to inject it into forest and park lands to increase tree and other plant growth. A third method is to inject it into current wastelands to increase future reclamation possibilities. Before applying land application methods, the Resource Conservation and Recovery Act of 1976 requires that the land be analyzed to make sure that it was not on a flood plain or near an underground water source. If the applied sewage material were to seep through the ground and enter the underground stream or be washed out by a flood into a clean water source, it would pose a huge threat to human life, wildlife, water sources, and even land. The Clean Water Act also plays a part in regulating how land application is done. Section 405 of the Clean Water Act states that for a person to practice land application, that person must receive a permit from the Environmental Protection Agency for the National Pollutant Discharge Elimination System. Dredged material can also be used in similar manners as sewage. Currently, it is used for many different construction purposes, including filling eroding beaches, land reclamation, and building dikes to protect ports and harbors from flooding. Even contaminated material can be reprocessed and used in the making of concrete, plastics, and other polymers. All of these methods, however, require advanced technologies and are often prohibitively expensive.

A third option for allaying pollution from ocean dumping (and perhaps the most obvious) is to ban all dumping in international waters. The London Convention of 1972 was "…the first global convention to protect the marine environment from human activities…" ("www.imo.org") and its following London Protocol of 1996 was an effort to modernize the rules put into place in 1972 ("www.imo.org"). The two currently list three levels of materials (Annex I, II, and III) and restrictions on dumping those described materials. Materials not listed by Annexes I and II have no restrictions applied on them, as their dumping is not seen as terribly harmful to the world's environment. This constitutes the majority of discarded substances. By eliminating all acts of dumping, the oceans would be saved from any harmful effects. This solution, however, is really unrealistic. Many nations do not possess the space or the technology to dispose of wastes on land. In order for many to comply with such a restriction would require them to completely alter their patterns of production and consumption. Other less developed states would be completely reliant on advanced nations for their waste management and disposal.

Industrial, passenger, and military ships at sea would also be forced to find ways of storing wastes while in transit, requiring a redesigning of the world's entire sea-going fleet. To enact such a ban would also necessitate its enforcement, and the ability to police all the world's oceans would remain a physical impossibility for any organization.

The most viable solution for mitigating the pollution of the world's oceans is to build a strategy based on reusing many of the substances currently being dumped as waste. More developed nations have already begun finding ways to reutilize these materials. Among these strategies are recycling sewage as fertilizer, developing habitats and beaches, strip mine reclamation, and using contaminated materials in the construction of concrete or polymers. Many of these processes require money and technology not accessible to many less developed nations. Providing an international framework for sharing and developing these technologies is a feasible activity for an organization such as the United Nations Environmental Programme (though not limited to only this organization). Financial or trade incentives could be provided to nations willing to share their expertise in waste management. The institution of such practices by individual nations also delivers benefits beyond the environmental. There are currently over one hundred designated disposal sites in United States' waters ("What is Dredging?"). Reusing waste materials can alleviate much of the taxpayer cost which finances establishing and managing these expensive locations, as well as saving capacity for wastes which cannot be easily reprocessed.

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