

Committee: Environmental Committee

Issue: Exploitation of sea-based resources and acidification

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Position: Deputy President

PERSONAL INTRODUCTION

My name is Debbie Kavouna and as you have probably seen I will be serving as your deputy president in the Environmental Committee for the 1st session of the ACGMUN. This will be my sixth conference and my first time chairing. I have always looked forward to MUNs, whether that was for discussing and debating on prevailing issues or for having the opportunity of meeting other students from all over the world. After five conferences I am extremely honored to be co-chairing the Environmental Committee in this session. I am anticipating the productive debates and resolutions we will devise.

The Environmental Committee will examine and debate on two extremely prominent issues, one of them being the exploitation of sea-based resources and the other being acidification. I have faith that we will be effective and efficient as a committee and will tackle the issues successfully.

Best Regards,
Debbie Kavouna

TOPIC INTRODUCTION

Exploitation of the deep sea when in search of renewable resources has been an increasing concern over the past 15 years. Raw material resources are acquired through a relatively new process called deep sea mining, which occurs on the ocean floor. Deep sea mining takes place over 1400m below the ocean's surface and usually around areas of polymetallic nodules and on areas of active or extinct hydrothermal vents. Like other mining operations, deep sea mining has been questioned by several environmental organizations on the extent of potential damage they cause to deep sea ecosystems and pollution. The significance of oceans justifies concerns posed by environmentalists. The ocean is extremely significant in removing carbon from the atmosphere and providing oxygen. The ocean also regulates the Earth's climate. Therefore, any form of disturbance to its ecosystems may have severe consequences on the environment.

The issue of the exploitation of sea-based resources also includes overfishing. This has been an issue of utmost importance in the last decade due to the fact that a significant amount of coastal communities, who depend on fishing to sustain themselves, are substantially affected by the continuous surplus in stocks of fish around the globe. Measures have been taken, however very few have been adequate enough to successfully combat this problem and thus overfishing unfortunately remains a prevailing issue.

Ocean acidification is another part of this topic and is directly linked to the exploitation of the oceans' resources. Ocean acidification is the continuous decrease of the oceans' pH. However, seawater is slightly basic and therefore its acidification would mean moving towards pH-neutral (pH 7) conditions. Marine organisms are increasingly affected by the acidification of water, which is caused by the carbon dioxide in the air.

DEFINITION OF KEY TERMS

Sea-based resources

The term sea-based resources includes both fish and metals found in the ocean. There are many different metals available for extraction. Some of them include: gold, silver, copper, zinc, manganese and cobalt.

Polymetallic Nodules

These are also called manganese nodules, and they are rocks on the sea bottom, which chemically speaking, are formed of aligned layers of iron and manganese hydroxides around a core. Through crystallization they are used to form manganese

minerals.

Hydrothermal vents

This is a fissure (a tear) in a planet's surface from which geothermally heated water issues.

Sediment Plumes

Sediment plumes are clouds of residue that spread as water currents pass.

Exclusive Economic Zone

It is a sea zone prescribed by the United Nations Convention on the Law of the Sea¹ over which a state has special rights regarding its exploration and the use of its marine resources, including the energy produced from water and wind. A nation's EEZ starts from its baseline to 200 nautical miles from the coast.

Overfishing

Overfishing is a form of over exploitation of sea resources, where fish stocks are below acceptable levels.

Biomass

Biomass is the term given to define the size of living matter in a habitat, either through their weight per unit of area, or as their volume per unit volume of habitat.

BACKGROUND INFORMATION

Deep Sea Mining and Mineral Exploration

Even though the concept of deep-sea mining was first introduced in the 1960s, it has been progressively used over the past 5 years. For the past decade, the demand for rare and precious metals has increased tremendously due to our advancing technology, making deep-sea mining an attractive proposal for many commercial operators. These operators seek and target areas of polymetallic sulphides, manganese nodules and cobalt-rich ferromanganese crusts.

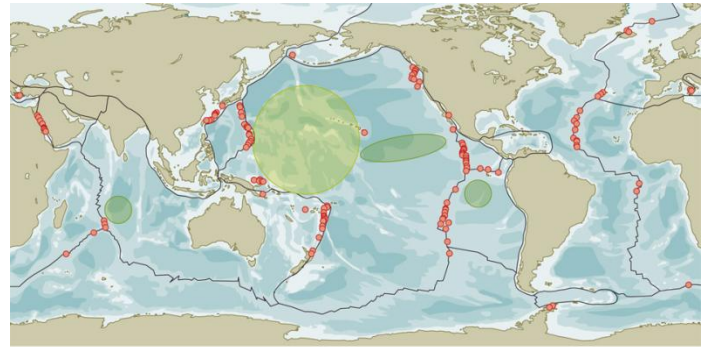
METHOD: Deep sea mining is a relatively new extraction process which occurs 1400-3700 m below the ocean's surface. This process often takes place around hydrothermal vents as they create sulfide deposits² that contain valuable metals.

¹ " United Nations Convention on the Law of the Sea of 10 December 1982." *United Nations*. United Nations, n.d. Web. Fall 2017.

² "Seafloor massive sulfide deposits." *Wikipedia*. Wikimedia Foundation.

These deposits are then mined using hydraulic pumps or bucket systems³ in order to collect ore on the surface and process it.

Mineral exploration, unlike deep-sea mining has already taken place in areas beyond national jurisdiction of the respective countries, such as in the Clarion-Clipperton Zone in the Pacific Ocean, in parts of the Indian Ocean and along the mid-Atlantic Ridge. In order to explore these regions, licenses were taken from the International Seabed Authority. Japan, China, Korea and India are some of the countries which are in search of resources due to a rise in the demand for precious metals. This has pushed them towards the exploration of hydrothermal vents.⁴



— Continental plate margins Depth below sea level - 2000 m
 ● Distribution of cobalt crusts - 4000 m
 ● Occurrences of manganese nodules - 6000 m
 ● Occurrences of black smokers deeper than 6000 m

1: The sea floor contains extensive resources. They are concentrated in certain regions depending on how they were formed.

Moreover, commercial activity has progressed more rapidly, with a company called Nautilus Minerals, starting excavations in one year, in the waters off Papua New Guinea, in the Bismarck Sea. The project is called Solwara 1 Project, and will commence in 2018 due to a delay following a dispute with the government of Papua New Guinea. They have found the best potential deep-sea site, with a high grade of copper-gold resource, which is the world's first Seafloor Massive Sulphide (SMS).⁵

Consequences:

Polymetallic nodules and more importantly, hydrothermal vents, are able to sustain a vast number of organisms due to their mass provision of minerals. When the vents issue hot hydrothermal fluids and they mix with close to freezing seawater, sulfide minerals are formed. As the minerals cool they solidify and form chimneys. These chimneys are either “black smokers”, deposits of iron sulfide, or “white smokers”, deposits of barium, calcium and silicon (hence the names). The chemoautotrophic bacteria, around these hydrothermal vents, are therefore supported by its minerals. The organisms in the ocean depend on the chemoautotrophic bacteria around the hydrothermal vents and therefore the bacteria provide a perfect environment for them. Removing parts of the sea floor will ultimately disturb the ecosystems of these organisms. That being said, experts in the field are still unsure of the extent of damage caused by such a disturbance.

³“Deep Sea Mining.” *Mission 2016: Strategic Mineral Management*. N.p., n.d. Web. Fall 2017.

⁴*World Ocean Review*. N.p., n.d. Web. Fall 2017.

⁵“Seafloor massive sulfide deposits.” *Wikipedia*. Wikimedia Foundation, n.d. Web. Fall 2017.

Excluding the direct impact that deep-sea mining might induce, researchers and environmental activists are concerned about the corrosion, leakage and spills that may impact the chemical composition of the seawater. Any leakages from underwater vehicles or ships used may make the seawater more acidic, contributing to the already existing issue of ocean acidification.

Impacts of deep-sea mining include the creation of sediment plumes which affect marine life greatly. These plumes are caused by the residue from mining, once it is dumped back into the ocean. This creates a cloud of particles either on the surface of the water or on the seafloor. Near-bottom plumes occur when the particles are pumped back down to the bottom of the ocean, where the mining site was. Surface plumes have a greater impact since, due to water currents, the particles will float and spread out over a vast area of ocean surface.

Overfishing

Overfishing can be encountered in water bodies of different sizes and can cause resource depletion, sufficiently diminished biological rates and depressed biomass levels. Constant overfishing may culminate and in effect cause large-scale damage, to the extent where the fish population will no longer be able to sustain itself.

Overfishing will not only affect marine ecosystems, but also coastal communities whose economies depend on the fishing industry. With a greater supply of fish, market prices will drop, therefore limiting the profits in the industry.

To put the aforementioned in numbers, “around 85% of global fish stocks are overexploited, depleted, fully exploited or in recovery from exploitation.”⁶ Vast areas of ocean floor such as the Mediterranean and the North Sea have been affected the most. According to the UN Food and Agriculture Organization, all West-African seas have been over-exploited, with coastal fisheries having declined by 50% in the past 30 years. Around 400 million people depend on fishing in Africa and South-East Asia, who will be badly hit by the further 40% decrease in coastal fisheries, by 2050.

Ocean Acidification

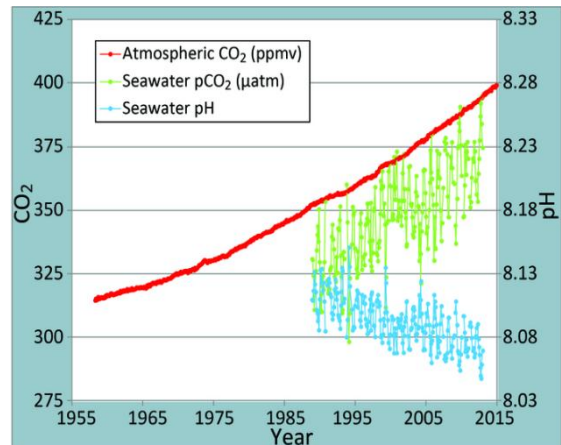
Ocean acidification is the name given to the constant decrease of the oceans' pH. Due to the fact that seawater is basic, ocean acidification would cause its pH to move closer to the neutral pH of 7. This has arisen because of the consistent dissolution of carbonate into the sea. Around 30-40% of the carbon dioxide released into the atmosphere by the burning of fossil fuels, is absorbed by the sea. Some of this carbon dioxide reacts with water to form carbonic acid. Excess molecules of carbonic acid, then react with a water molecule to form a bicarbonate ion and a hydronium

⁶ Vince, Gaia. "How the world's oceans could be running out of fish." *BBC News*. BBC, 21 Sept. 2012. Web. Fall 2017.

ion. This increases ocean acidity due to the surplus of H^+ ions⁷.

From 1751 to 1996 there was an increase in the concentration of H^+ ions of 35%, with the pH dropping from 8.25 to 8.14. As the oceans absorb more carbon dioxide produced by humans, the pH is predicted to drop by a further 0.3-0.5 pH units by 2100.

As you can see on the graph by the American Meteorological Society, as the CO_2 in the atmosphere increases, the pH of the seawater decreases. The two are linked directly. This is why ocean acidification is referred to as “the evil twin of global warming”. Both are consequences of the continuous increase of CO_2 in the atmosphere.



This graph shows the correlation between rising levels of carbon dioxide (CO_2) in the atmosphere at Mauna Loa with rising CO_2 levels in the nearby ocean at Station Aloha. As more CO_2 accumulates in the ocean, the pH of the ocean decreases. (modified after R. A. Feely, Bulletin of the American Meteorological Society, July 2008).

Consequences:

One of the greatest consequences ocean acidification has on organisms and habitats, concerns the production of shells and plates from calcium carbonate, which is referred to as calcification. Calcification is crucial for the survival of marine organisms. This process includes the precipitation⁸ of dissolved ions into solid $CaCO_3$ structures, which are then also vulnerable to dissolution, if surrounding water does not contain saturating concentrations of carbonate ions.

Ocean acidification causes an extensive impact on marine organisms. It has the ability to decrease metabolic rates and immune responses on certain organisms, as well as cause coral bleaching. If the pH of oceans keeps on decreasing at the same rate, the greatest impact will be seen on coral reefs and the Southern Ocean. An extensive number of marine organisms rely on an equilibrated chemical conditions and pH levels in order to build their shells. This is where the impact on the process calcification, can be seen on living organisms. The extent of the impact on different organisms cannot be predicted, however, calcifying species will most probably be affected the most by ocean acidification.

With reference to the fact that deep-sea mining is a relatively new process and the first project will commence in 2018, we do not yet know the exact impact it will have on marine life. There is a risk of leakages and spills which might cause imbalance in the marine ecosystems. This imbalance might intensify or reinforce the

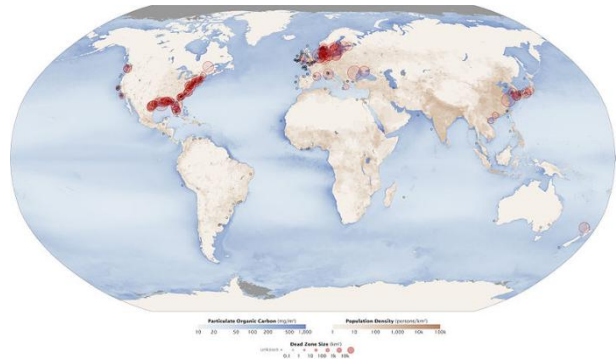
⁷ $CO_{2(aq)} + H_2O \leftrightarrow H_2CO_3 \leftrightarrow HCO_3^- + H^+ \leftrightarrow CO_3^{2-} + 2H^+$

⁸ The formation of a solid from a solution.

already existing issue of ocean acidification, and simultaneously with overfishing, marine ecosystems will collapse. By creating greater problems for marine life, we are risking the extinction of a variety of different species.

DEAD ZONES

Dead zones are areas in the world's oceans and lakes which are low-oxygen or hypoxic. These occur due to a process called "eutrophication". This takes place when too many chemical nutrients are absorbed by the sea. This leads to redundant blooms of algae that reduce the underwater oxygen levels to the extent where the oxygen is no longer enough to sustain the underwater marine life.



#3: Red circles show the location and size of many dead zones.

Eutrophication is caused by accelerated rise in agricultural and industrial activities or a rapid population growth. Nitrogen and phosphorus from agriculture are the main causes, however sewage and emissions from vehicles and the chemical industry are also factors of which contribute to the creation of dead zones. An example of a large dead marine zone is the Baltic Sea, which contains 7 of the world's 10 largest dead zones.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED

Papua New Guinea

Papua New Guinea is the world's first country with a license to commence operating a deep-sea mine. The operation called Solwara 1 will begin in 2018, in the territorial waters of the country.

Japan

Due to Japan's great industrial growth over the past decade, it has been increasingly evident that the pH of seawater is strictly decreasing. Japan's coral reefs have been affected by this and their redistribution is evident. Tokyo bay's marine life is already facing problems due to eutrophication and hypoxia. Thus, ocean acidification will only present an additional stress to the already existing one on the East coast of Japan.

Peru

Many villages and towns in Peru rely greatly on the resources provided by the oceans. 70% of the world's scallops come from Peru. Therefore, the impact of ocean acidification will be huge on Peru, keeping in mind that it is a country with a coast on the Pacific. Marine life in this region will also be affected, especially the species which require calcite in order to build their shells.

Nautilus Minerals Inc.

Nautilus Minerals is a company that focuses on the exploration of underwater minerals. Its headquarters are in Toronto, Canada, and it has been granted the first license to mine the deep-sea for metals. Nautilus Minerals is also creating a new production system which will enable it to extract these Seafloor Massive Sulphides on a commercial level.

International Seabed Authority

The ISA is an intergovernmental group which aims to coordinate and monitor all mineral-related activities. It is mainly concerned with activities taking place beyond national jurisdiction, in the international seabed area. It is based in Kingston, Jamaica and was established by the "Law of the Sea Convention".

The World Bank

The World Bank has expressed its stance clearly, in 2016, concerning deep-sea mining in the Pacific Ocean. The World Bank report, *Pacific Possible: Precautionary Management of DeepSea Mining Potential in Pacific Island Countries*⁹, recommends that all island countries in the Pacific, proceed with deep-sea mining with caution.

Natural Resources Defense Council(Nrdc)

NRDC has been working in order to combat ocean acidification and has managed to make progress concerning research and collection of data in coastal areas. It was founded in 1970 and is a non-profit international environmental advocacy group. One of NRDC's programs is the Water and Ocean's Program which deals with the quality of the water, fish populations, wetlands and oceans.

⁹ "Precautionary Management of Deep Sea Mining Potential in Pacific Island Countries." *World Bank*. World Bank, n.d. Web. Fall 2017.

TIMELINE OF EVENTS

Date	Description of event
1973-82	UNCLOS III (UN Convention on the Law of the Sea) history of sessions is released.
1976	Magnuson-Stevens Fishery Conservation and Management Act was first passed.
1994	Law of the Sea is put in force.
1996	Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks-Signed by 59 states in 1996.
1997-98	Agreement concerning the Relationship between the United Nations and the International Seabed Authority.
2015	United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources for Sustainable Development.

PREVIOUS UN RESOLUTIONS

2030 Agenda For Sustainable Development (A/69/L.85) Goal 14

Goal 14 states: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. The goals set out by the UN were to be achieved by 2020-30. They revolved around the prevention and reduction of marine pollution, the minimization of ocean acidification and the regulation and control of overfishing. Goal 14 also dealt with the subsidies placed on fisheries which contribute to the overcapacity of fish stocks, as well as the increase of economic benefits for small islands dependent on fishing.

Resolution A/C.2/65/L.28/Rev.1 on the "Protection of Coral Reefs and for Sustainable Livelihoods and Development"¹⁰

This resolution was devised on the 65th session of the Economic and Financial Committee, and takes all the necessary steps in order to protect coral reefs and take immediate action and respond to the issues of climate change and ocean acidification.

¹⁰ "Resolution A/C.2/65/L.28/Rev.1 ." *United Nations*. United Nations, 22 Nov. 2010. Web. Fall 2017.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

The UN Convention on the Law of Sea (UNCLOS III), concluded in 1982 was the foundation to dealing with the ongoing issue of the exploitation of marine ecosystems. This convention however, was not as effective as expected. Even though it did establish a strong foundation for the national sovereignty beyond land, it did not deal with the specific issue entirely effectively. The NRDC, or the Natural Resources Defense Council, has made significant advances on the problem of ocean acidification. The NRDC has encouraged the funding for research and monitoring of coastal areas. They were successful as the US Congress increased funding for research from \$6 to \$10 million. The US has also been successful in rebuilding areas of the ocean that were overfished. With the implementation of the act called Magnuson-Stevens Fisheries Conservation and Management Act, the US has successfully rebuilt around 40% of its overfished populations. This act focused on preventing overfishing, rebuilding overfished stocks and ensuring a safe and sustainable supply of seafood. The International Seabed Authority was also established by the UN, with it being the main negotiator with countries launching deep-sea mining operations outside their EEZs.

POSSIBLE SOLUTIONS

In order to attain effective solutions to the wide range of issues raised by this topic, we need to separate each section and consider individual measures. Overfishing, deep-sea mining and acidification should be addressed separately in order to form a complete and sufficient resolution. Also, it would be beneficial to consider different measures for waters under national and international jurisdiction.

Overfishing will probably be the issue easiest to combat. However no previous attempts have been deemed as successful, with an increasing number of deep-sea ecosystems continuously suffering. Solutions for this may include limiting the subsidies on fisheries provided by governments, on an international level in order to curb overcapacity and overfishing. By subsidizing the industry, supply and profits have increased and prices have fallen. With an increased supply of fish, the problem of overfishing has escalated. Nevertheless, LEDCs should be taken under consideration, whose economies depend on fishing, who would be horribly affected by such a measure. A different approach could be establishing Safe Catch Limits accordingly to the specific fishing areas. Annual Safe Catch Limits are the amount of each species of fish allowed to be caught in one year. This will ensure that no excessive fishing will be done and that fish stocks will be limited. A monitoring and enforcement system should also be authorized in order to ensure that fishermen do not defraud and overfish.

The establishment of a monitoring system through an organization would also be an effective measure for the case of deep-sea mining. Due to the increasing interest in this new metal-extraction process, commercial organizations have taken over most of the projects. An organization, such as the ISA, could aid by overseeing procedures, ensuring that all equipment is sufficient and that there is no hostile behavior during negotiations with individual states.

Acidification is a more complex issue that will require more drastic measures. By creating more stringent laws and regulations regarding the quality of the water, we can preserve oceanic ecosystems before it is too late. You should also consider implementing measures which will limit the amount of sulfur oxides and nitrogen oxides released into the atmosphere, near the coasts. Member States should also consider enforcing laws in order to legally prosecute polluters. Appropriate measures that deal with the impact of carbon dioxide on the oceans, should also be included in the resolutions. This could be dealt with through restrictions on fuel burned or by encouraging the use of public transport and bicycles. Educating the public on making informed decisions as a consumer, concerning “green electricity” and buying energy and water efficient appliances ought to also be considered.

It is in the interest of all member states to endeavor to combat these global, environmental issues. Raising public awareness would also be effective due to the lack of knowledge on these specific topics, thus being very constructive for a resolution.

ANNEX

When doing your research you should also visit the following sites:

- <http://www.abc.net.au/catalyst/stories/3240156.htm>
- <http://www.bbc.com/future/story/20120920-are-we-running-out-of-fish>
- <https://www.nrdc.org/issues/reduce-ocean-acidification>

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