

Forum: United Nations Environment Programme

Issue: Evaluating solutions to tackle rising sea levels whilst ensuring a healthy sea climate for marine wildlife.

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Introduction

Everything is connected, a full circle. Each organism, movement, element - they are all crucial for the ecosystem. However, with the excess use of natural resources, many of the biotic factors are endangered and are on the verge of extinction. At the cost of advancements in technology and inventions, the environment and its inhabitants are being harmed.

Marine wildlife is integral to the ecosystem and climate change is pushing them to extinction. Recently, a heatwave in Canada killed over 1 billion sea creatures including barnacles, crabs, clams, intertidal anemones, and sea stars. This heatwave was prevalent due to increasing temperatures each year due to climate change, significantly grown by unsustainable human activity. In Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) found ingesting plastic was responsible for killing animals across 80 different species. Whales, dolphins, and turtles were especially at risk from eating plastic film, with seabird deaths linked more with ingestion of hard plastic pieces and balloons, while nets and lines from the fishing industry were found to be most lethal to seals and sea lions.

To prevent further damage, scientists are using the help of technologies such as artificial intelligence, natural resources, and sources of power to slow down the rising of sea levels, which could realistically take centuries. Several nations are attempting to aid the issue by building sea walls, modeling cities, and developing them to ensure the marine wildlife is also not disturbed and planting trees and mangroves.

Definition of Key Terms

Extinction

The extermination of a species, family, or other groups of organisms due to environmental forces such as habitat fragmentation, global changes, natural disasters, overexploitation, or evolutionary changes.

Endangered Species

The extermination of a species is due to environmental forces such as habitat fragmentation, global changes, natural disasters, overexploitation, or evolutionary changes.

Thermal Expansion

The general increase in the volume of a material as the temperature is increased, usually expressed as a fractional change in the length or volume per unit temperature change (a linear expression).

Global Warming

A gradual increase in the overall temperature of the earth's atmosphere is generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants.

Climate Change

A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Marine Wildlife

The plants, animals, and other organisms that live in the saltwater of the sea or ocean, or the brackish water of coastal estuaries.

Fossil Fuels

A natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.

Biotic Factors

Any living component that affects another organism or shapes the ecosystem. This includes both animals that consume other organisms within their ecosystem and the organism that is being consumed.

Overfishing

Biological overfishing occurs when fishing mortality has reached a level where the stock biomass has negative marginal growth (slowing down biomass growth). This leads to depletion in cases of subsidized fishing, low biological growth rates, and critical low biomass levels.

Key Issues

Thermal Expansion

Warm water takes more space and area than colder water, hence as the ocean warms up, the sea water tends to expand and occupy a larger volume, which is known as thermal expansion. Atoms and molecules in a solid, for instance, constantly oscillate around its equilibrium point. This kind of excitation is called thermal motion. When a substance is heated, its constituent particles begin moving more, thus maintaining a greater average separation with their neighboring particles.

The degree of expansion divided by the change in temperature is called the material's coefficient of thermal expansion; it generally varies with temperature (*Boundless*). This thermal expansion is one of the main reasons for one third of the sea levels rising and is directly linked to global warming caused by any form, mostly human activity.

Melting Glaciers

Naturally, in warmer seasons such as summer, snow melts from glaciers into the sea. However, this is then compensated for in the colder weather when snowfall occurs from evaporated sea water. However, in the recent century, persistently higher temperatures have caused more than average melting of glaciers, resulting in an imbalance between runoff and ocean evaporation, causing one third of sea levels to rise.

Even if we significantly curb emissions in the coming decades, more than a third of the world's remaining glaciers will melt before the year 2100. When it comes to sea ice, 95% of the oldest and thickest ice in the Arctic is already gone. (*Why Are Glaciers and Sea Ice Melting?*)

Loss of Greenland and Antarctica's ice sheets

Along with the melting glaciers, the increased heat is causing the massive ice sheets that cover Greenland and Antarctica to melt faster and break off into the warm ocean, speeding the process of melting Greenland's ice sheets. This shows that the Arctic is warming more quickly than the Antarctic, which explains why the ice there is thinning more quickly. Ice is melting 7 times faster than it was in the 1990s and currently, Greenland is losing 234 billion tons of ice per year. Another example similar to Greenland is Permafrost in the Arctic Tundra.

Researchers were amazed to discover that melt ponds at the surface of the ice can disappear entirely in an hour or two. The water drains from the pond to the bottom of the ice sheet via chutes through the ice called moulins. Glaciologists suspect that melt water that flows to the bottom of the ice sheet through the moulins reduces friction, allowing the ice to move more quickly over the rocky surface. Researchers have noticed that the number of moulins is increasing.

As the glacier accelerates, it pushes ice into the ocean. The meltwater draining to the bottom of the ice through moulins causes the ice to slip more quickly towards the ocean - a bit like slipping on a banana peel. Outlet glaciers, the routes that ice takes

towards the sea, are moving more quickly now than they were in the past. For example, a large outlet glacier on the west side of Greenland, called the Jakobshavn Glacier, has nearly doubled its speed in the last decade. The flow velocity of other glaciers has increased by up to 50% during the summer melt period.

Thus, the meltwater contributes to rising sea level in two ways: (1) water from the ice surface finds its way to the ocean, contributing directly to sea-level rise, and (2) the water's ability to speed flowing glacial ice towards the ocean also contributes to sea-level rise. If all the ice that is on Greenland were to melt or calve into the ocean, the global sea level would rise 7.2 meters (21 feet.) (*Greenland's Ice Is Melting*).

Major Parties Involved and Their Views

Jakarta

Jakarta is surrounded by water, hence any rise in sea levels will damage land and resources. It is assumed that due to rising levels and floods, the majority of Jakarta could be flooded by 2050, and hence, Indonesia pleaded \$40 billion for a project which would aim to protect the city with an 80-foot-high seawall.

The New Ocean Economy for Indonesia would provide a foundation for a new, widely-accepted narrative that economic and social development for Indonesians at present and in the future can go hand-in-hand with sustainable stewardship of the ocean, in which conservation, restoration, and sustainable management of Indonesian seas are seen as critical.

The goal of the Indonesian Marine Pollution Database is to translate powerful data into online interactive maps and decision-support tools for various stakeholders who can take action, such as marine park rangers, law enforcement officers, fishermen, environmental journalists, campaigning organizations, corporate sustainability officers, and policymakers. Integrating restoration and conservation into sustainable coastal management. WRI Indonesia aims at developing and testing out Restoration Opportunities Assessment Methodology (ROAM) for mangroves.

Denmark

The Global Center on Adaptation has offered a model to other cities seeking to combat flooding and land loss. The country has attempted to build barriers (such as the Maeslant barrier), drainage, water squares, and temporary ponds. Denmark has also considered planning legislation on reducing the negative socio-economic consequences of climate change as well as implementing regulations for coastal zones and careful construction.

The Danish Society for Nature conservation and the Danish Fishermen Producer Organisation have come to a decision that 10% of the sea will be untouched, and no Marine Protected Areas will be accessible in the North Sea, Skagerrak, and the Baltic Sea. This will definitely help the conservation of wildlife and prevent the endangerment of all species.

India

India's more than 7500 square kilometers of coastline are at high risk of sea-level rise. To prevent cities in the East of India from submerging, scientists have proposed creating drains directly connected to large water bodies, to prevent flooding or water related issues, but also for rain-water harvesting to reuse the rain water and washed up water to reduce the carbon emissions and waste of natural water, slowly declining the rising sea levels.

As a signatory nation to the Convention on Biological Diversity-1992, India has committed to protecting at least 10% of its marine areas by the year 2020. WCS-India (Wildlife Conservation Society - India) aims to bridge this gap by working closely with coastal communities and government agencies to realize the notification of MPAs across the country.

United States of America

The USA has made immense progress to prevent severe damage from high tides and sea levels rising. Alongside planning about flood protection, insurance, and reconstructing, the government and organizations are elevating houses and buildings. They are also building seawalls (in New York), raising roads in coastal areas such as Miami, building stormwater pumps, and upgrading sewage systems.

The United States Environmental Protection Agency (EPA) works on marine litter reduction and prevention through the Protocol concerning Pollution from Land Based Sources and Activities to the Cartagena Convention. Alongside the protocol, they have been investing their resources and time into creating treaties, conventions, and committees to prevent severe issues such as ocean dumping, ballast water discharges, and antifouling paint, all of which would harm the ecosystem of the ocean and its inhabitants.

China

To reduce its exposure to rising seas, Shanghai has constructed 520 kilometers of protective seawalls, stretching across the Hangzhou Bay and encircling the islands of Chongming, Hengsha, and Changxing. Shanghai has also installed massive mechanical gates to regulate overflowing rivers, similar to barriers established in Rotterdam.

Due to the rising sea levels, since June at least 150 people have died and around 1.8 million people have been evacuated, according to the Ministry of Emergency Management. Direct losses attributed to flooding are estimated at over RMB49 billion (*Rising Sea Levels*) and to prevent further issues, the government is trying to continue researching sustainable ideas and solutions for the betterment of the residents.

Thailand

Thailand has planned to make a natural barrier from the high tides from mangroves by the city administration. Alongside the barrier, Thailand planned to

construct “Super Levees”, a high river embankment with a broad width that can withstand overflow, to an existing highway to become a flood dike.

Nearby the highway, an 88-kilometer watergate was also proposed which would open and close with the tides. Alongside that, since Thailand is an island and would be severely affected by rising sea levels, they plan to plant more natural resources such as plants and construct habitats for organisms around the borders of the nation who live in close proximity to the sea to retain a well maintained ratio of organisms in the ecosystem.

United Nations

The United Nations formed Sustainable Development Goals in 2015, of which SDG 14 is geared towards “Life below water”. It is meant to conserve the species, reduce pollution, harvesting and overfishing, and by 2020 to conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information. The UN has assigned this SDG to the United Nations Environmental Programme (UNEP) and the main initiative they plan to have is planting mangroves and explaining the importance to citizens.

They are also attempting to promote international cooperation on the issue, promote science-based and ecosystem-based management approaches, support regional and global assessments, develop best practice manuals, and support conservation and restoration projects on the ground. Alongside working with other organizations of the UN, they plan to work with GRID-Arendal, International Seagrass Expert Network, Edinburgh Napier University, Kenya Marine and Fisheries Research Institute, and the World Conservation Monitoring Centre (WCMC) to name a few.

Development of Issue/Timeline

Date	Event	Outcome
26,500 years ago	Earth's latest glacial period	26 million square kilometers of ice covered the Earth. The Laurentide ice sheet covered Canada, the USA, and partially Europe. The Patagonian ice crept from Antarctica to parts of Chile and Argentina. The climate was colder and drier globally; rain was scarce, but pockets of rainforest survived in the tropics. This caused a globally lower sea level, 400 feet lower than current.
20,000 years ago	Sea levels rise	Sea levels climb and start to rise. Climate starts to warm up, resulting in melting ice and glaciers retreating until ice sheets remained only at the poles and at the peaks of mountains.
7,500 years ago - 2000 years ago	Sea levels tame and slowly normalize	Due to control in human activity and natural causes, the sea levels slowly normalize with a natural and gradual increase in sea level.
1900 - 2000	Global sea levels rise faster than in the past 6000 years	The global sea level rose between 0.05 inches and 0.07 inches per year on average (1.2 mm - 1.7 mm). This number then rose to 3.2 mm per year in the 1990s due to burning coal, gas, and other fossil fuels for energy. When burned, these high-energy fuel sources send carbon

		dioxide up into the atmosphere. Carbon dioxide absorbs heat from the sun and traps it, warming the atmosphere and the planet leading to global warming.
20th April 2010 - September 2010	Deepwater Horizon	In April of 2010, in the Gulf of Mexico, it was the largest marine oil spill. A surge of natural gas blasted through a concrete core which was likely too weak to withstand much pressure. This caused a severe impact on the marine wildlife which caused increased pollution levels, deaths, and endangerment of the species.
April 2014 - 2019	The Flint Crisis	In 2014, the crisis in Flint, Michigan began when the city began taking water from the Flint River without treating it properly, contaminating it with lead which leads to a severe increase in body lead levels of children. This started in 2013 when the city decided to end the city's five-decade practice of piping treated water for its residents from Detroit in favor of a cheaper alternative: temporarily pumping water from the Flint River until a <u>new water pipeline</u> from Lake Huron was built. Although the river water was highly corrosive, Flint officials failed to treat it, and lead leached out from aging pipes into thousands of homes.

August 2018	#FridaysForFuture	A movement started by 18-year-old Greta Thunberg, to save the environment, camped out in front of the Swedish Parliament, holding a sign painted in black letters on a white background that read Skolstrejk för klimatet: “School Strike for Climate.” Through this movement, she has been able to meet monumental figures including members of the UN, the Pope, and the President of the USA.
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Previous Attempts to Solve the Issue

Fielding engineering projects

More economically developed countries have attempted to build long lasting solutions to aid the citizens of their respective countries such as sea walls, surge barriers, water pumps, and overflow chambers to keep water out. This is to prevent economical and social issues such as relocation, damage of construction and buildings, competition in jobs, and inflation in retail prices. By investing their resources, nations have been able to save citizens, marine life and reduce climate change to some extent, and as a further extension continue to modify their pre-existing models.

Adopting environmental approaches

To ensure the safety of marine wildlife, reduction of greenhouse gases and carbon emissions, countries are taking approaches involving land recovery and the restoration of mangroves and wetlands to help cities cope with flood water inundation. This reduces the rising sea levels by enhancing soil accretion through soil organic matter accumulation as a result of high root production. Mangroves may directly or indirectly influence soil accretion processes through the production and accumulation of organic matter as well as the trapping and retention of mineral sediment. However, due to the force of the rising sea levels, mangroves could be ripped out from their roots,

and hence, carefully planned construction would have to be initiated and planted around the planted mangroves.

Mangroves and seagrass meadows are coastal ecosystems that cover a small portion of the total ocean area but collectively are widely distributed on every continent except Antarctica. Mangroves are found in 123 countries worldwide with an estimated area of 15.2 million hectares while seagrasses occur in 159 countries covering over 30 million hectares. These ecosystems are highly productive and form biologically rich habitats that play a major role in providing highly valuable ecosystem goods and services for human well-being.

Human oriented measures

Urban and more environmentally conscious designs, using environmentally friendly resources to reconstruct buildings for safer and viable options for everyone. With the help of science and architecture, structural components can be used to build stronger buildings that would be more resilient to water and natural damages, decreasing the possibility of collateral damage, which would eventually damage the marine wildlife (dangerous materials being disposed of or fallen into the seas and oceans). New construction can be built near river banks or in close proximity to water sources, but in the reasonable distance that if there were any damage to occur, manually or naturally that the marine wildlife would not be severely impacted and heavy materials and parts of the construction would not result in falling or being disposed of in the large and vast water sources.

Possible Solutions

Imposing taxes and increasing prices on non-renewable sources

Non-renewable sources including fossil fuels are a large percentage of carbon emissions, which causes an increased temperature in the ocean, causing a chain reaction of quickly melting glaciers. If taxes and inflated prices are imposed on these resources, it would encourage users to find cheaper yet sustainable alternatives, and the extra money from the users could be used to start and continue programs for teaching,

manufacturing sustainable solutions within their nations (reducing the import and export fuel and carbon emissions in the sea) which would result in a beneficial society and environment.

Encouraging renewable sources and subsidizing initial costs of solar panels

Renewable energy requires certain circumstances, and can initially be quite expensive. To encourage the use of renewable resources, the governmental authorities could subsidize the costs of long term energy sources such as solar panels and use them in public places. They can also promote the transition from petrol and diesel based cars to electrical vehicles. This solution would result in an increase in consumption of electricity, however, it would result in lower consumption and wastage of non-renewable fossil fuels burned through coal and fuel.

Reduce the carbon footprint and control the release of greenhouse gases by recycling and finding sustainable alternatives

An individual's carbon footprint can easily be reduced by performing simple tasks such as saving water and electricity, insulating communities and homes, and using technology more than paper can reduce a home's carbon footprint, which will reduce the exposure of carbon in the atmosphere to decrease, which will result in less carbon being inhaled by organisms and flowing to the oceans and seas, allowing cleaner air for respiration and growth of populations.

Educating people about the causes and consequences of sea levels rising

Educating people, especially workers and the younger generation about how sea levels rise will make them more cautious and aware about their actions and will encourage sustainable decisions. With the help of technology and meetings, younger generations can learn about how they can reduce their and their families' carbon footprints which can help the Earth in the long term. This is a long term solution that will take time to implement, however, it would have equally better effects on future generations and would aid in preventing sea levels due to more environmentally

conscious decisions, which would prevent any natural or manual destruction of the habits (such as corals) of the marine wildlife.

Switching to plastic-free alternatives

A main issue that acts as a danger to marine wildlife is the amount of pollution disposed into seas and oceans, which comes into contact and consumption by marine wildlife which results in the reduction in the marine wildlife due to the death of the organisms. By switching to glass, paper, and other reusable and recyclable materials, the products can be biodegradable and can be used as fertilizer or other alternatives outside of the ocean. This change may not only be required in industrial sectors or sectors producing the highest amount of carbon dioxide in the air (such as factories) but also in everyday lives such as the current implementation of reusable bags at grocery stores, for example.

Signing international environmental agreements

Encouraging nations to sign international environmental agreements which consist of clauses and solutions to combat climate change and safely preserve the marine wildlife by setting realistic goals and deadlines can encourage non and governmental organizations to take actions to create environmentally conscious yet sustainable communities which would positively react to any changes made for the betterment of the environment. These agreements could be given a time frame of 10-15 years and every 2-3 years, monitors of committees could check on the progress made and record them to ensure stability and constant growth.

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