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Ocean, Environment, Climate Change and Human Migration

The ocean's role in climate regulation is at the heart of climate change economic and social issues, especially those related to environmental migrations. Although the ocean curbs global warming, it is considerably affected by the major disruption that is climate change. Both its regulation role and the ecosystem services it provides are threatened. Sea-level rise and the increasing frequency of destructive climate phenomena, such as cyclones or spring tides, impact human communities and as a result may trigger migration movements. Anticipating these climate phenomena could reduce the vulnerability of natural environments and the communities relying upon them.

The ocean is crucial to natural equilibriums which enable life on our planet. The importance of the ocean in climate regulation places it at the heart of climate change economic and social issues, and namely environmental migration-related issues. Whilst the ocean limits global warming, it is also affected by the latter. It changes when it is hotter, more acidic and less oxygenated. The ocean's regulation role and the ecosystem services it provides are threatened. The planet and populations' capacity to absorb climate impacts and their modes of adaptation to disequilibrium are affected.

The modifications it endures also contribute to sea-level rise and the increase in frequency of destructive climate phenomena such as huge cyclonic storms or spring tides. These major modifications of the marine environment have consequences on safety and vulnerability of human communities (floods, coastal erosion) but also economic consequences and can cause migrations.

A KEY ROLE IN CLIMATE REGULATION

The ocean constantly exchanges gas, water and heat with the atmosphere and redistributes them around the globe. These mechanisms are decisive for global climate. The ocean is also a regulator that limits global warming. In fact, the sea absorbs over 90% of excess heat generated by the greenhouse effect. The ocean also absorbs a quarter of CO₂ emissions generated by human activity. The global ocean controls climate fluctuations which would be much more abrupt if they were only regulated by the atmosphere.

However the ocean's storage capacity is not indefinite and its ability to absorb tends to decrease in certain oceanic regions. The "carbon pump" mechanisms provided by oceans are biological and physical. If the distribution of marine biodiversity, including phytoplankton, or if physical parameters (temperature, salinity, pH) endure abrupt variations, this regu-



lation role may be affected. The global ocean is experiencing consequences of this warming, even though impacts vary from one region to another. Scientific observations show that waters are becoming warmer, more acidic and less oxygenated. Not only does this affect the ocean's ability to keep its regulation role and resilience to face climate disruptions but this also has direct and immediate consequences on coasts and marine ecosystems.

A healthy ocean is a protected climate: State representatives gathered in Paris for COP21 in 2015 have agreed upon this statement.

A CHANGING OCEAN: CLIMATE CHANGE IMPACTS ON HUMAN COMMUNITIES

Climate change-related modifications that affect the global ocean have direct consequences on island and coastal populations, but their repercussions go beyond these regions: the environment, the economy and the social life of many communities can be affected.

Sea-level rise

According to the 2014 IPCC Report, the global mean sea-level rose by nearly 20 cm in the 1901-2010 period. It is likely that extreme levels (during

storms for instance) have risen since 1970. The most recent modeling reports a nearly 2 meters sea-level rise by the end of the century. If this increase is not identical in all regions, its pace may accelerate in the years to come.

This rise of the mean sea-level causes coastal erosion, which results in loss of arable land and water reserves due to salinized soil and groundwater. Coastlines have been receding and floods intensifying during spring tides or severe storms – these extreme weather events tend to increase.

Coastal facilities (housing, infrastructures, industries...) are particularly vulnerable to these weather phenomena which can cause important loss of human lives and considerable economic loss. Yet, the majority of world metropolises are located on the coast – including in South Asia and South East Asia. Lower coastal areas, such as delta great plains, are particularly attractive and the most populated areas in the world because of the resources they provide and their access to the sea. Consequently, according to the OECD, 40 million people living in major cities are threatened by submersion; this figure can only increase with the growing world population and urbanization.

Small Island States are also on the frontline against global warming. Erosion, salinization and loss of land are already a reality for those nations with limited habitable and cultivable surface area.



The overpopulated Island of Male, capital of the Maldives, is protected by dikes. Two raised artificial islands were built 2 km away by filling the lagoon with tons of sand and dead coral. They accommodate buildings, a hospital, a mosque and an airport.



Affected Marine Biodiversity: what are the impacts on livelihood?

Warming, acidification and deoxygenation of global waters also affect marine species and disrupt the ocean food web.

If some species adapt, others migrate to cooler deeper waters or to the North, or even disappear. Displacements of marine fauna have an impact on fisheries and aquaculture. Acidification affects phytoplankton with calcium based skeletons, fish larva growth, some mollusks' shell-building process or even the development of coral reefs which provide shelter to millions of marine species.

Deoxygenation (warmer waters contain less oxygen and increasing stratification due to warming surface waters which reduces ventilation) affects both coastal areas and the high seas. It could also have a major impact on shellfish farming, aquaculture and fisheries.

In addition, marine ecosystems, already threatened by pollution and a non-sustainable management of resources and human activities, are overexploited, which accelerates their degradation.

Economic activity such as fishery or tourism experience productivity loss in many regions. The Least

Developed Countries (LDC) are generally the most impacted: their coastal infrastructures are more fragile (many are located in areas affected by tropical storms), and populations' subsistence is usually highly linked to fishery. For some countries such as the Small Island Developing States (SIDS), the entire economy is threatened. Other countries face increasing coastal populations migrating inland to find more safety and alternative livelihoods. Traditional communities may be confronted to radical change to adapt to major disruption in their living conditions. This phenomenon can cause a loss of cultural and identity landmarks, a feeling of insecurity, and erosion of traditions and indigenous knowledge. For some communities, migration is the only solution to climate change.

Displacement of vulnerable populations

Since 1990, The IPCC had noticed that climate change could increase population displacements, in particular in developing countries and the poorest communities, and especially in coastal areas and low islands. In fact, migrations and displacements linked to the impacts of climate change on the ocean and on the degradation of marine ecosystems are already a reality in many regions throughout the world.

Forced displacements due to floods or coastal erosion have already happened in many countries. Some

COP21 and the Paris Agreement

On December 12th, 2015, a historical agreement to combat climate change was adopted in Paris by 195 countries. For the first time since 1992, the ocean is mentioned in an additional text of the Climate Convention. This reference in the final text preamble ("*Noting the importance of ensuring the integrity of all ecosystems, including oceans...*"), shows global acknowledgement and awareness regarding the importance of the links between Ocean and Climate. In order to reinforce the consideration of the ocean's role, the Intergovernmental Panel on Climate Change decided in April 2015 to produce a Special Report dedicated to interactions between Climate, Ocean and the Cryosphere.

The Paris Agreement shows major progress regarding the acknowledgement of connections between human migration and climate change by referring to migrants in the final draft preamble¹, for the first time, and by requesting the establishment of a special task force to "*develop recommendations for integrated approaches to avert, minimize and address displacement related to the adverse impacts of climate change*"².

1 UNFCCC Decision 1/CP.21, preamble p.2: "Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights [...] (and) migrants [...]"

2 UNFCCC Decision 1/CP.21, Loss and Damage – articles 49 and 50, p. 7



governments, (for instance in Vietnam, Vanuatu and Papua-New Guinea) have implemented relocation strategies for vulnerable populations.

Migration can also be a collective strategy for communities whose livelihood mainly depends on threatened marine resources. For instance, in Senegal, the loss of halieutic productivity forces coastal populations to migrate to cities to find new sources of income.

Migration and forced displacements due to climate change impacts on the ocean and on the deterioration of marine ecosystems are already a reality in many regions of the world.

The IPCC 5th Assessment Report (2015) highlighted that populations with insufficient means to plan their migration are more exposed to extreme weather events, in particular in low incomes developing countries. In this context, it is important to insist on the fact that migration is a strategy of reinvention and regeneration of ways of life and livelihood.

POTENTIAL SOLUTIONS TO ADAPT

However, some marine ecosystem deteriorations and population forced displacements scenarios can be anticipated. A more sustainable management of natural marine resources, implementation of ecosystem protection and restoration projects, disaster mitigation initiatives, adaptation policy for climate change, creation of alternative jobs, or even planned and facilitated migration, could be propositions dedicated to reducing the vulnerability of natural habitats and communities which depend upon them.

Sustainable management of ecosystem services and resources

The importance of marine ecosystems for human populations is measured in terms of services and resources. They are crucial for mitigation policy (actions to reduce greenhouse effect) as they absorb CO₂ and for adaptation to climate change policy. Conservation, restoration and sustainable management of these ecosystems, including relying on

indigenous know-how, can contribute to protecting the communities who depend upon them, reinforce their livelihood and prevent forced migrations.

Conservation, restoration and ecosystem services

For instance, seagrass beds, coastal wetlands, mangroves and coral reefs act as carbon sinks. They also play a role in coastal conservation by forming a buffer zone with the sea: they absorb approximately 75 to 90% of waves and swell and reduce considerably their erosion power. Finally, these ecosystems are a source of food and materials, and generate economic activity. In December 2015, during COP21, Secretary General for the Indian Ocean Commission (IOC), Jean Claude de l'Estrac, co-signed with the European Union a joint declaration acknowledging *"the importance of threats and challenges created by climate change, in particular the sea-level rise, natural risks increase, loss of biodiversity and their economic and financial impacts"* (source: IOC press review provided by IOC library). Conservation, sustainable management and restoration of these ecosystems participate in combating climate dangers and poverty.

The development of Marine Protected Areas could allow biodiversity conservation while preserving traditional livelihood activities by relying on local populations' know-how and types of governance. Many restoration projects have been initiated, including those by Small Island Developing States and along coastlines and particularly fragile estuaries around the world. Reef rehabilitation by developing artificial reefs (coral transplantation onto a structure), mangrove restoration and wetlands conservation have an immediate impact. In fact, these actions participate in the protection of land and populations by providing resources to coastal communities, which improve their livelihood. For instance, a program for the replanting of mangrove trees in American Samoa – funded by UNDP (United Nations Development Program) - has enabled the development of commercialization channels of mangrove and generated goods such as crabs, mangrove tree bark tannin extraction for dye used for the production of sarongs and arts and crafts.



In 2010, UNDP launched in Bangladesh an important program to plant mangrove trees along the coastline, in partnership with national authorities and local communities. In 2012, over 6000 ha of mangrove trees were replanted. In the Maldives, reef rehabilitation projects – consisting in coral transplantation onto an artificial structure – are paired with the development of eco-tourism infrastructures.

Support vulnerable populations

Evidently, when facing a risk of extreme events, risk management policies and programs must be reinforced. They should consider more the needs of the most vulnerable populations, in order to better plan and manage “forced” population displacements (displacements following floods or extreme storms for instance).

Preparing populations to coastal risks by developing training program and awareness campaigns appears to be a priority to help these populations to better address these disasters, better adapt to climate change and better manage resources (water, food, etc.).

Also these migrations caused by flood risks or soil and freshwater salinization can be anticipated and guided by planning relocation zones. Other solutions should be considered to anticipate a lack of space.

In order to reduce the vulnerability of communities exposed to risks, related to sudden disasters or slow deteriorations (soil and freshwater salinization for example), a population relocation can be considered as a solution if it is anticipated and conducted by policy and long term plans. These plans should take into consideration specific needs of affected populations. They can designate rehousing areas, or consider other solutions when the surface area is limited. For example, in the Maldives, artificial islands have been built by filling the lagoon to set up an airport, a hospital, housing and schools. Due to partial submersion and salinization, the Republic of Kiribati has already purchased some land in Fiji (28 km²) to grow food crops and provide for part of the population in case of poor soil fertility and extreme risks.

Other countries such as Tuvalu, Papua-New Guinea, Tonga and the Cook Islands are considering, in the more

or less long term, relocating their communities. These countries now include in their national adaptation to climate change plan, planned migration and relocation.

Some States are starting to acknowledge the benefits of migration and migrants’ potential in disaster risk management and adaptation, including through the transfer of competencies or targeted fund transfers. By removing transfer fees or even by creating special funds, Samoa and Indonesia have facilitated fund transfers from their diaspora. Some of these financial aids are intended to help rebuild after natural disasters. Other countries innovate in investment mechanisms in order to attract their diaspora’s capital towards adaptation to climate change projects (for instance projects which could include marine ecosystems restoration or the development of sustainable fisheries techniques).

Others, including SIDS, develop bilateral or regional migration agreements, which could allow populations, affected by damaging consequences of climate change, to diversify their resources by working abroad.

Collaborate to move forward

In April 2016, for the signature of the Climate Agreement at the United Nations, many heads of States and heads of Governments shared their hopes and expectations. Mr. Ahmed Ali Silay, Minister Delegate in charge of International Cooperation of Djibouti declared: *“Desertification, soil depletion, droughts, wells drying up, floods and sea-level rise are recurring risks that our populations are combating as best as they can with their limited resources. Also, we must place mitigation and adaptation to climate change at the center of our actions to combat poverty in all of our countries.”* Representatives from many developing countries also highlighted the fact that their greenhouse gas emissions are very low but their populations are nevertheless the most exposed to climate disasters. Consequently, they are unanimously calling for international solidarity. In fact, international mobilization, establishment of partnership and cooperation for development policies, technology transfers, releasing international funding to develop mitigation and adaptation policies are essential to limit climate change impacts and population displacements.



As for the Ocean, on June 8th 2016 during the World Ocean's Day, UN Secretary General, Mr. Ban Ki-moon, stated that ocean health is a priority for implementation measures of the Paris Agreement, to mitigate and adapt to climate change.

The growing acknowledgment of links between Ocean, Climate and Human migrations has impelled the International Organization for Migration (IOM) and the Ocean & Climate Platform to unite in order to improve comprehension and awareness of the interactions between these three fields.

The International Organization for Migration (IOM) is an intergovernmental organization with 165 Member States. Established in 1951, IOM is the leading intergovernmental organization in the field of migration. IOM works to help ensure the orderly and humane management of migration, to promote international cooperation on migration issues, to assist in the search for practical solutions to migration problems and to provide humanitarian assistance to migrants in need, including refugees and internally displaced people. For over 20 years, IOM has been exploring the links between migration, environment and climate change through research, political relations and fieldwork.

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