Forum: Environment Commission

Issue: Preventing degradation of aquatic food systems through the regulation of urban and aquaculture pollution

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Section One: Introduction Of The Issue

Introduction

The world's water food chains are crucial for the sustainability of the world's food, economy, and biodiversity. The chains are also vital sources of food proteins for the world's populations, represented by billions of human beings who are sustained by food from the water food chains' products, including fish from the world's fishing activities, also referred to as the world fishing chains or food chains. However, due to the world's fast pace of urbanization, industrialization, and increased production, there is immense water pollution being channeled into the freshwater or marine food chains, causing the sustainability of these world food chains to be endangered due to the reduction in their populations.

To stem the continued deterioration, there is also a great need for countries to embrace integrated policies that cover both city pollution and aquaculture waste. Cities must be planned with sustainability in mind, wastewater must be treated, while aquaculture must be done in eco-friendly ways if the world is to save its aquatic food production systems for the future generations. The Environment Commission also needs to prioritize the development of policies, the promotion of clean technology, and even the conduct of research aimed at the development of eco-friendly aquaculture if the world is to save its aquatic food production systems.

Marine ecosystems are intricate systems that require harmonious interactions between physical, chemical, and biological processes in order to remain productive as aquatic systems. The introduction of pollutants from urban areas in cities, which could include heavy metals, plastics, untreated sewage, as well as toxic chemicals from fertilizers, into river systems, lakes, as well as coastal areas, affects such ecosystems by causing oxygen depletion as a result of eutrophication, massive deaths of fish, as well as habitat destruction

that impacts critical biological diversity of aquatic systems, which in turn sustain food chains in aquatic ecosystems. Furthermore, toxic substances, as well as microplastics, in aquatic systems get bioaccumulated, thus ending up in food consumed by human populations in those regions, which may include regions in Sub-Saharan Africa that derive significant protein from aquatic systems as an essential source of food for sustenance.

Besides urban runoff, another factor which, although deemed eco-friendly as a replacement for sea catch, has grown at an unprecedented rate to threaten aquatic ecosystems, is aquaculture. Intensive aquacultures lead to nutrient enrichment, antibiotics, and disease transmission to natural fish species. Furthermore, in cases where waste is inadequately treated, fish feed as well as waste from fish in aquaculture pens ends up in water bodies, resulting in aquatic ecosystems' degradation due to pollution, in addition to significant harm to the aquatic food chain. As a means to reverse this trend, integrated approaches in sustainable aquacultures, besides advancements in sustainable fish feeds, hold much potential for ensuring that aquatic food systems symbiotically coexist with urban development as productive, thriving ecosystems of aquatic food production systems in a sustainable manner.

Definition of Key Terms

Aquatic Food Systems

The type of networks that involve food production, processing, as well as the distribution from freshwater or marine sources, including fish and aquatic plants. Such networks are vital components of the global food chain or food security system.

Urban Pollution

The pollution of air, land, and, more critically, water resources caused by urban activity, including industrial effluent, sewage, plastic waste, and chemical runoffs from urban areas.

Aquaculture

The controlled cultivation of water organisms, starting from fish, crustaceans, mollusks, to aquatic plants, is often referred to as “fish farming.” Although the activity is linked with food production, the possible negative impacts include environmental pollution.

Eutrophication

A process that involves the entry of an excessive amount of nutrients, nitrogen or phosphorus being the prominent nutrients which come from fertilizers or domestic waste, into the water body. This then leads to the growth of algae or plants in large numbers.

Sustainable Management

This process involves the usage, management, or conservation of natural resources in such a manner that the current needs are met without undermining the future needs of the generations yet to come, especially by the application of eco-friendly technologies.

Background Information

The decline in aquatic food systems has become a key global issue, especially in parts of the world where fish, crustaceans, mollusks, and other aquatic products are the source of food and livelihood. Urbanization, industrial waste, and a rapid increase in aquaculture are all contributing to declining quality of marine and freshwater ecosystems. Dependency on rivers, lakes, coastal lagoons, and fish farms for feeding and livelihood is producing pollution vulnerabilities. As urbanization expands and populations continue to grow, this stress is adding to already stressed aquatic systems where the capacity for regeneration is in a race with ecological destruction. Forward thinking in sustainable management is now an urgent need for sustaining food security and ecological balance.

Another central concern about degradation of aquatic food systems is the discharge of urban wastewater that is both untreated and partially treated into natural water systems. A large number of developing areas do not have sufficient sewage treatment facilities, and as a result are discharging chemically charged wastewater, microplastics, pharmaceuticals, and organic waste into rivers and coastal areas. This results in eutrophication, algal blooms, and hypoxia which have a direct adverse impact on fish stocks and disrupt reproductive cycles. Conversely, heavy metals and factory waste tend to bio-accumulate, threatening not only the public health of biodiversity in aquatic ecosystems but the health of humans eating them i.e. parents feeding children seafood from urban waterways. Urban pollution control is clearly important to protect the integrity of human food systems based on the aquatic environment.

In addition, aquaculture which was marketed as a more sustainable alternative or supplement to capture from the wild (e.g., fishing), can now be contributing to some of the same degeneration it set out to

address. Like capture fishing, aquaculture can vary in strict regulations. For example fish farms can also be very poorly regulated, resulting in excess feed, ongoing antibiotics, and high density stock rearing, all resulting in nutrient runoff, bacterial infection, and disturbance to habitats, this is particularly true in coastal and delta regions where shrimp farming is linked to mangrove clearing, salinity intrusion, etc. The end result, aquaculture in many cases is both a victim and the cause of environmental deterioration, the water pollution hurting farm productivity and farm practices encroaching on natural ecology. Further, with a lack of sound regulation and framework of monitoring, many of these issues only become exacerbated, raising questions about sustainability and ecological ethics.

Urban pollution and wastewater discharge

A major problem related to the degradation of aquatic food systems refers to discharges of untreated or poorly treated urban wastewater to natural waters. Many developing regions lack the infrastructure to treat wastewater, so sewage is discharged directly into rivers and coastal areas alongside chemical pollutants, microplastics, pharmaceuticals, and organic waste. This leads to eutrophication, algal blooms, and hypoxia, which leads to decreases in fish stocks and disruption of reproductive cycles. In addition, heavy metals and industrial waste can accumulate in aquatic organisms through bioaccumulation, presenting long-term health risk to both humans and aquatic life. It is clear that pollution at the urban source is a focus for protecting aquatic food networks.

Nutrient loading and ecosystem imbalance

High concentrations of nitrogen and phosphorus through agricultural runoff and sewage from cities accelerates the growth of algae, which reduces sunlight and reduces oxygen leading to "dead zones" where no life can exist. Once a dead zone has formed it may take decades or longer for recovery.

Aquaculture and internal pollution cycles

In addition to this, aquaculture, originally meant to be a sustainable replacement to wild capture fishing - has now started adding on to the problem that it was supposed to solve. Fish farm regulation is also bad, with poor farms using excess feed, antibiotics and high-density stock rearing resulting in nutrient runoff, bacterial contamination and habitat destruction. This is most evident in coastal and deltaic areas, where shrimp culture has been connected with mangrove destruction and salinity ingress. The net effect is that aquaculture itself comes to both suffer and contribute towards environmental destruction: contamination of the water stream put farmed asset at risk, while farming activities aggravate the deterioration of spaces around them.

The antibiotic contamination loop

When antibiotics that are mixed into fish feed build up in water, they can fuel antimicrobial resistance, an expanding global health threat with consequences beyond the aquatic realm.

Climate change and ecological destabilization

These pressures are further exacerbated by climate change, which warms waters, changes salinity gradients, and alters the migratory behavior of aquatic animals. Warmer temperatures also increase the growth of algae, raise disease rates, decrease dissolved oxygen, and degrade the suitable habitat for both wild and cultivated aquatic species. Extreme weather events, such as weather shocks from floods and cyclones, will move fish farms and imbalance sewage systems, all within a short duration, releasing high pollutant loads. These phenomena, coupled with unsustainable removals of aquatic species, jeopardize the long-term resilience of aquatic food systems. Thus, regulation and adaptive management strategies are an important topical focus of study to prevent catastrophic resurgence in the environment.

Changing salinity and habitat loss

Within estuarine and deltaic environments, sea level rise causes salt water to move inland, destroying freshwater breeding sites and reducing species diversity.

Economic dependence and food system vulnerability

Aquatic food systems provide vital nutrition and economic stability to developing and coastal economies. In many areas, fish provides more than 20% of animal protein consumption, and entire communities depend on fisheries, processing, and aquaculture for their livelihood. As pollution impacts spawning cycles and fish stocks collapse, these livelihoods become more precarious. Small-scale fishers face unique vulnerabilities and often lack adequate capital to adapt, relocate, or diversify into other livelihoods. Additionally, rising health risks from contaminated seafood entering local markets and export supply chains amplify the economic clout of immediate issues.

Market disruptions and inequality

When polluted waters affect crop yields, large-scale producers can adjust operations accordingly, smallholder Farmers can suffer income losses, undue debt, and displacement.

Governance and regulatory failures

Governance is one of the most persistent barriers to preventing aquatic degradation due to its intense fragmentation, and often lack of capability. Urban wastewater infrastructure is usually under municipal approaches, industrial regulation is not continual, and operation of aquaculture farms does not often meet any environmental standards. In many areas, environmental laws exist on paper but not stringently monitored, or none, sufficient funding or political support to enforce standards. Furthermore, unregulated expansion and corruption exacerbate compliance challenges, allowing many employees to externalize, and cost bearers to hold poor compliance with no need for accountability with degrading ecosystems or other vulnerable community members.

Transboundary governance gaps

Rivers and coastal areas frequently flow across borders, but there is little cooperation concerning pollution mitigation, resulting in polluted discharge in one location polluting food systems downstream.

Global patterns and shared vulnerability

The challenges presented by aquatic food systems are not restricted to a single region of the world; they are a global trend of environmental loss due to industrialization, urbanization, and population growth. From Southeast Asia to West Africa to the Mediterranean and Latin America, we see polluted rivers feeding toxic deltas, collapsing aquaculture due to disease, and coastal ecosystems under pressure from becoming displaced. Our shared vulnerabilities show the importance of coordinated international response, mutual sharing of resources, and the promotion of long-term sustainable alternatives.

Lessons from comparative policy models

Some regions have demonstrated the ability to turn around the decline in ecosystems through integrated pollution control with regulation, monitoring, and investment to suggest a way forward if political will is aligned with scientific recommendations.

Section Two: United Nations and International Involvement

Major Countries and Organisations Involved

China

China is one of the largest producers and consumers of aquatic food and more than 60% of total production in the world comes from aquaculture. However, this rapid growth has led to severe environmental damage. Industrial effluent, agricultural runoff, and aquaculture in dense populations in coastal systems have led to eutrophication in typical water bodies like the Yangtze River and the coastal areas of the South China Sea. On the other hand, in China, there are attempts to implement stronger regulations, such as "red lines" for water protection areas and mandatory upgrades for wastewater treatment systems. Unfortunately, the potential for effective enforcement has not yet been achieved in China, and even with some progress, pollution in aquatic environments and food safety remains a serious threat to ecosystems and human health.

India

India's rivers, including the Ganges and Yamuna, support millions of people dependent on freshwater fisheries and inland aquaculture. Urban sewage, plastic pollution, and industrial discharge have taken a large toll on the water quality in these river systems. In many urban centers, over 70% of wastewater is discharged untreated in natural water systems, negatively influencing fish health and reproductive capacity. Coastal aquaculture, especially for shrimp farming, has placed undue stress on mangroves and estuarine habitats. Although it involves planning for sustainable aquaculture through the National Programme for Organic Aquaculture, progress too often stalls due to ongoing issues with weak regulations and uneven institutional accountability.

Bangladesh

Bangladesh is one of the most aquaculture-intensive countries in the world, with fish contributing to over 50% of the country's animal protein consumption. However, polluted rivers, especially near Dhaka, are now recognized as biologically “dead” as a result of untreated industrial waste from tanneries, textiles and chemical factories. Coastal areas are also threatened due to saline intrusion and agricultural run-off in the region's aquatic food systems. Although Bangladesh has increased its number of hatcheries and has promoted fish farming throughout the country, environmental safeguards are not well developed, and fish farming remains unsustainable because water pollution persists.

Vietnam

Vietnam's rapid growth in aquaculture — mainly in shrimp and pangasius aquaculture — has made the country a significant exporter, but, conversely, has caused significant water pollution issues. Water bodies in the Mekong Delta, for example, are becoming more and more contaminated with excessive feed, antibiotics, and chemicals used for treatment. Changes to upstream water flow and saline intrusion have worsened these issues. Although Vietnam has developed environmental regulations for aquaculture zones, real enforcement, especially for small scale/producer aquaculture, is limited.

Food and Agriculture Organization (FAO)

The FAO is a key actor supporting sustainable fisheries and aquaculture through technical advice that includes water management, pollution management, and ecosystem-based food production advice on. It also supports countries in applying the best practices in wastewater monitoring and the use of antibiotics in aquaculture. However, this is not applied consistently across regions and is often contingent on national capacity.

United Nations Environment Programme (UNEP)

UNEP tracks global trends in aquatic pollution and engages with governments to manage water pollution generated by urban and industrial sectors. Its scientific assessments have been crucial for drawing attention to the contributory links between pollution, biodiversity collapse, and food insecurity. UNEP also supports regional conventions and frameworks for marine litter reduction but countries differ widely in compliance.

World Bank

The World Bank supports significant investments in pollution control infrastructure with wastewater treatment plants, river clean-up projects, and programs to modernize aquaculture towards sustainability. It also works with governments to transition to cleaner production. However, the outcome for long-term sustainability often relies on governments overcoming the governance reform challenges that generally fall outside the scope of financing technical.

Global Environment Facility (GEF)

The GEF offers funding for initiatives that result in the reduction in nutrient loading, remediation of degraded aquatic ecosystems, or protection of coastal ecosystems. It works in multiple sectors (e.g., agriculture, industry, and fisheries) in order to bolster integrated solutions. Funding limitations mean successful pilot projects will not always result in scaling across regions.

Relevant UN Treaties and Events

- **Convention on the Law of the Sea (UNCLOS), 10 December 1982** (A/CONF.62/122) This convention establishes a legal basis for sustainability and conservation of marine resources. It outlines state obligations to take action to prevent pollution of the marine environment, which can occur from land-based, seabed, and vessels. The Convention on the Law of the Sea (UNCLOS) is still one of the most topical, comprehensive frameworks for managing the world's aquatic ecosystems.

- **UN Watercourses Convention, 21 May 1997 (A/51/869)** This convention outlines principles of equitable and sustainable management of international rivers and lakes. It requires states to take action to prevent water pollution that would negatively impact ecosystem health downstream, including aquatic food systems, which is particularly relevant in areas where urban wastewater flows across borders.

- **Stockholm Convention on Persistent Organic Pollutants, 22 May 2001** (UNEP/POPS/CONF/2) This treaty supports the elimination or limitation of hazardous substances that accumulate or accumulate in

aquatic ecosystems. It addresses the negative effects of substances such as dioxins, poly chlorinated biphenyl (PCBs) and some pesticides that are hazardous to fish and human health. It establishes global instruments for monitoring, regulation, and cooperation among countries to minimize toxin accumulation.

- **Minamata Convention on Mercury, 10 October 2013 (UNEP(DTIE)/Hg/CONF/4)** This treaty supports the limitation of global anthropogenic mercury emissions or levels that bioaccumulate in and become concentrated in aquatic ecosystems, particularly fish and shellfish. Mercury exposure contaminates and reduces the safety and viability of the global aquatic food supply, which makes this treaty central to efforts to limit or prevent pollution of aquatic food systems from hazardous substances.

- **2030 Agenda for Sustainable Development, 25 September 2015 (A/RES/70/1)** Some Sustainable Development Goals (SDGs) such as SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), and SDG 14 (Life Below Water) are all noted frameworks for tackling water pollution, wastewater treatment, and restoring aquatic ecosystems. All of these SDGs take a unified stance on sustainable and regulated aquaculture.

Section Three: Solving The Issue

Previous Attempts to Solve the Issue

International and Regional Frameworks Addressing Aquatic Pollution

International conventions, regional agreements, and United Nations (UN)-led initiatives have all played an important role in regulating aquatic pollution and protecting food systems in both freshwater and marine environments. While they have provided a basis for the development of environmental monitoring systems, reduction of pollution, and governance of ecosystems, their implementation has not been consistent among Member States. The United Nations Environment Assembly (UNEA) has passed numerous resolutions that urge efforts to reduce marine debris, industrial discharges and nutrient contamination, which include general recommendations regarding waste management and monitoring methods. Likewise, agreements from the Convention on Biological Diversity (CBD) have promoted ecosystem management through a holistic approach supporting sustainable fisheries development as an example of how aquatic resources are used sustainably while helping to promote food security through winter-spring fish harvests.

Limitations in enforcement

Although these frameworks exist to support aquatic resource use, there is no legally binding mechanism to ensure compliance; therefore, they cannot be effectively implemented. Most of the agreements require voluntary reports for implementation by each Member State, which leads to a significant disconnect between policies and the implementation of those policies. Furthermore, many nations that are rapidly urbanising or have an over-reliance on aquaculture often find it challenging to meet the recommended financial and infrastructural criteria of these agreements.

National Pollution Control Regulations and Water Quality Standards

Countries throughout Asia, Africa, and Latin America have adopted various regulatory measures that seek to reduce the amount of urban wastewater discharged into water bodies as well as the amount of agricultural wastewater, while also increasing the number of environmental licenses required for aquaculture and industrial farms and also by municipalities in these countries. China's Water Pollution Prevention and Control Law, India's National Programme for Sustainable Aquaculture and regulations on aquaculture from the Indonesian Ministry of Marine Affairs are all examples of policies developed by governments seeking to balance the growth of food production with the need to protect the environment. These policies include: establishing water quality standards and nutrient runoff limitations; requiring municipal wastewater treatment prior to discharging it into rivers, lakes and estuaries; and prohibiting the use of certain chemicals in aquaculture that do not meet the water quality standards.

Shortcomings in implementation

Although these policies represent important steps toward sustainability in both aquaculture and urban development, many of these regulations have not been successfully implemented because of insufficient enforcement, lack of modern sewage treatment plants, outdated treatment processes and poor oversight of the implementation of these regulations in secondary cities. Many existing municipal wastewater treatment plants are operating below capacity or do not include tertiary treatment, and therefore, only partially remove nitrogen, phosphorus and chemical contaminants from effluent before it is discharged into surface waters. In addition, many small-scale aquaculture farmers in areas where aquaculture is prevalent do not have the training or financial resources necessary to comply with the current regulations, resulting in an inconsistent level of compliance among them.

Aquaculture-Specific Sustainability Initiatives

In recent years, aquaculture pollution has gained momentum in our society and with this increasing concern, there are now many programs available to help address aquaculture pollution using a variety of methods including improved design of farms as well as feed management and effluent management. The FAO Code of Conduct for Responsible Fisheries, along with its accompanying aquaculture guidelines, have supported the promotion of better management practices including the use of integrated multi-trophic aquaculture (IMTA), recirculating aquaculture systems (RAS) and reducing antibiotic applications to name a few. Several nations have piloted IMTA operations combining multiple species, including shellfish, seaweeds and finfish, to assist with the natural absorption of nutrients thereby reducing ecosystem impacts.

Mixed results across regions

The ecological benefits associated with these advanced systems have not yet fully realised due to the economic barriers preventing large-scale implementation and insufficient technical knowledge available to farmers operating aquaculture farms. Many aquaculture farmers continue to rely heavily upon opening, commonly referred to as Open-water or Open-net pens or High Density Ponds, despite the fact that these types of systems greatly contribute to the environmental impairment of our oceans via Eutrophication, algal blooms and degradation of habitat. Although global standards have improved through private certification programs, such as those created by the Aquaculture Stewardship Council (ASC), many small-scale aquaculture producers do not have access to these certification programs due to lacking the financial resources necessary to complete the certification auditing process.

Urban Water and Waste Management Projects

International donors, development banks, and national governments are responsible for implementing several urban water projects for reducing city generated pollution. As one of the primary sources of aquatic degradation, many urban water projects have been developed and supported by the World Bank, the Asian Development Bank, and UN-Habitat to assist cities with: The expansion of sewer systems; the development of modern wastewater treatment facilities; the development of solid-waste management strategies. The overall goals of these efforts are to reduce the amount of untreated sewage, microplastics, and industrial waste being discharged into aquatic ecosystems.

Persistent challenges

In many urban areas of developing countries, however, despite substantial amounts of investment in the activities mentioned, rapid urban population growth; continued and increasing development of informal settlement areas and low maintenance operating budgets create tremendous and ongoing problems. Refitting of existing pipe infrastructure, inadequate sludge disposal, unstable electrical power supply, etc. are common causes of the failure of these systems. Further, stormwater discharges, frequently mixed with household waste, are generally not treated and contribute to the degradation of aquatic food chains by introducing pollutants directly into aquatic environments such as rivers and other coastal waters.

Regional River Basin and Coastal Management Initiatives

There are various projects that have attempted to coordinate pollution reduction between countries in river basins, which recognises that many aquatic systems do not respect country borders. Examples include the Mekong River Commission, the Bay of Bengal Large Marine Ecosystem Programme, and the Danube River Protection Convention. These projects promote data sharing and joint monitoring efforts to establish compatible water quality targets amongst the various participating countries. In addition, many of these projects support ecosystem restoration efforts, including the reforestation of riparian zones, the rehabilitation of wetlands, and sediment management to restore natural filtration functions.

Gaps in long-term sustainability

While these types of activities provide valuable scientific information regarding the health of ecosystems and have increased regional cooperation, they largely rely upon external funding cycles, and therefore do not guarantee continued long-term maintenance. In addition, differing political views and economic conditions among participating countries hinder coordinated enforcement of agreed-upon water quality standards and allow for continued pollution to reach levels above those set forth in agreements.

Possible Solutions

Strengthening Pollution Regulation and Enforcement Frameworks

To manage both urban wastewater and aquaculture wastewater efficiently, legal structures must be improved and complemented by methods to enforce them in practice. The government could consider changing the standards of water quality according to the new scientific criteria for nitrogen, phosphorus, certain heavy metals and antibiotic waste found in the water. If the environmental regulations required aquaculture farms, especially those that are operating as either high-density ponds or cages, to have a mandatory environmental license, then the monitoring and management of the effluent released could occur.

Enhanced monitoring and compliance mechanisms

Real-time water quality monitoring devices in areas of high risk would enable regulatory agencies to

quickly identify any large spikes in pollution so that they can take immediate measures to remedy the situation. In addition, improving detection of illegal discharge and enabling the regulatory agencies to enforce the regulations would be possible through investment in technology that enables the use of remote sensing, GPS-located discharge points and automatic sample collectors. Gradually increasing penalties for noncompliance with regulations or illegal dumping may help to deter these activities, and revenues from penalties can be used to assist with restoring the environment.

Improving Urban Wastewater and Solid-Waste Management Systems

Urban sewage and domestic refuse remain the most significant sources of chemical and nutrient pollution in rivers and coastal areas. Therefore, extending sewerage networks to cover rapidly expanding urban areas, along with upgrading existing treatment facilities to include advanced treatment such as nutrient recovery and filtration of microplastics, will greatly reduce pollutant loadings and improve aquatic ecosystems. Besides developing centralised municipal systems, municipalities could also consider providing decentralised treatment options in informal settlements and peri-urban areas that presently do not have access to centralised municipal systems.

Integrated solid-waste and stormwater management

By increasing efficiency of solid waste collection services, prohibiting open dumping near water bodies, and developing community-level recycling stations to segregate waste types, municipalities can substantially reduce the quantities of plastics, organic matter and toxic substances entering our oceans. Existing storm sewer systems could also be improved by installing sediment traps or creating vegetated wetlands or swales to remove contaminants from stormwater before they are released into the ocean or rivers. The use of these types of nature-based solutions would provide improvements to the long-term health of aquatic ecosystems, create opportunities for restoration and sustainability, and reduce reliance on heavy engineered systems.

Promoting Sustainable and Low-Impact Aquaculture Practices

The implementation of various types of aquaculture systems, such as recirculating aquaculture systems (RAS), biofloc technology, and integrated multi-trophic aquaculture (IMTA), will drastically eliminate water pollution and contamination associated with using chemicals in aquaculture, along with reducing habitat

degradation. Support from governments for transitioning to these types of aquaculture systems could come in forms of financial or technical assistance. Training programs that help smallholder aquaculturists develop skills to transition to these methods of aquaculture would be a way to enhance the sustainability of the livelihoods of these small-scale farmers.

Reducing chemical dependency in aquaculture

To protect ecosystems downstream from aquaculture, regulation of the use of antibiotics, chemical additives, and pesticides in aquaculture is imperative. Establishing a system that requires veterinary prescriptions and promoting the use of probiotics in the farmed species as well as the implementation of vaccination for farmed animals in order to decrease contamination of the aquatic food chain is a way to prevent the emergence of antimicrobial resistance. Adoption of high-efficiency, low-phosphate feeds, and other feed-management practices aimed at limiting excess nutrient runoff and still maintaining production levels would have a positive impact on improving the environmental sustainability of aquaculture.

Restoring and Protecting Critical Aquatic Habitats

The primary means of reducing pollution impacts is to restore natural ecosystems. Wetland Restoration, Mangrove Restoration, Floodplain Restoration, and Estuarine Buffer Restoration can all help through the enhancement of the natural filter system that enables these ecosystems to take in nutrients, sediments, and contaminants before they enter bodies of water that produce food products. Reforestation of Riparian Zones is yet another method which provides additional value by providing for the stabilisation of soil and decreasing erosion, and providing additional ecosystem functions.

Ecosystem-based management approaches

By implementing a watershed-scale approach to the management of pollution, these activities will not only reduce pollution at the site but will provide an integrated approach that works on the entire river basin. Such activities include consideration of ecological flow needs, establishing and protecting migratory fish corridors, and controlling the development of industrial areas through the establishment of high-sensitivity zones. With the proper level of coordination, an Ecosystem-based approach will allow the restoration of the ecological balance to aid in the maintenance of Aquatic Food Security for the most Vulnerable Communities.

Community-Level Engagement and Public Awareness

Habitually, local communities are reliant on the localhost for their livelihood (fishing), but there is a lot of aquatic degradation occurring and the community based monitoring programs allow residents of the area to be directly involved in water quality assessments and in reporting instances of pollution in their area. There are others like educational campaigns, plastic-as recycling programs to reduce the amount of plastic imported and for education regarding how to properly dispose of plastic waste, and responsible disposal of agricultural chemical usage to reduce the residual amounts in the environment thus having the potential for greater effect on long-term behaviour change.

Incentivising sustainable participation

Incentives from the local/state/federal level can be introduced to facilitate community involvement; such as subsidies for environmentally friendly machinery, tax credits for aquaculture farms that are certified as sustainable, and/or grants for community based waste management programs. Therefore, it's important that the combination of opportunities for government support and the establishment of strong regulatory frameworks are necessary to achieve and maintain long-term water quality improvement through increased community involvement.

Guiding Questions

- Most pollutants come from cities. Pollutants associated with urban wastewater, industrial discharges, and aquaculture wastes are distinct in many ways.
- The development of cities has significantly deteriorated the quality of rivers, lakes, and coastal waters that are used by the fishing and aquaculture industries.
- What aquaculture practices now result in the greatest quantities of nutrients being released into the environment, chemicals being added to the environment, and habitat destruction? What, if any, regulations exist to mitigate this problem?
- How much of a contribution to nutrient run-off and the release of microplastics, pharmaceutical waste, and other chemical pollutants into our waterways is due to insufficient municipal wastewater treatment facilities?

- How much enforcement of water pollution regulations exists in your country, and what are the institutional and financial limitations that restrict the enforcement of these regulations at the local level?

Section Four: Youth Involvement

THIMUN-Qatar heavily advocates for Youth Voice and Youth Action, in this section we will be highlighting how you as students can be involved in your community tackling these issues. This logo made by THIMUN-Qatar represents Youth Action and shows that you as young people can get involved in such activities. We have curated a SDG Booklet to help you plan any initiatives or ideas you have and with G.A.I.A.

The Ocean Conservancy

https://oceanconservancy.org/

The Ocean Conservancy, a global organisation, works to maintain clean and healthy oceans by addressing marine pollution, as well as protecting marine ecosystems. It has programs that monitor water quality; support environmentally managed fishery resources and ecosystem-based approaches to management; assist in community-based conservation programs; and provide opportunities for youth to engage in many of these programs, including educational programs on ocean conservancy; community clean-up activities; digital education projects; and the International Coastal Cleanup, which enables youth to collect information about the types of pollution that negatively affect aquatic food sources. In addition, the Ocean Conservancy has developed educational materials to help youth understand the relationship between pollution and food safety, as well as the role of responsible waste management in protecting ocean biodiversity. Thus, these educational resources empower young people to take leadership roles in local environmental projects, as well as to advocate for sound waste management practices in their communities.

Waterkeepers Alliance

https://waterkeeper.org/

The Waterkeepers Alliance is a worldwide network of environmental advocates dedicated to safeguarding freshwater bodies from pollutants, including rivers and coasts. They focus primarily on how urban runoff and aquaculture are regulated, as well as supporting communities affected by pollution through monitoring the quality of water in their watersheds. Waterkeeper volunteers can participate in monitoring various water quality parameters, coordinating events to raise awareness, and engaging in legal advocacy campaigns designed to hold polluters accountable for their actions. The organisation provides students with youth-specific toolkits to start environmental monitoring clubs in their schools or local communities. The goal of these clubs is to teach young people about the importance of protecting aquacultural food systems.

United Nations Environment Programme (UNEP) – Youth and Education Alliance

https://www.unep.org/youth

UNEP's Youth and Education Alliance aims to involve young people from around the world in environmental protection through a strong emphasis on the sustainable management of freshwater and the reduction of pollution. Initiatives like the Tide Turner Plastic Challenge and Youth Adaptation Network allow students to participate in hands-on projects focused on plastic pollution, creating resilience to climate change, and developing sustainable aquaculture. UNEP provides leadership training, courses on learning about the climate, and fellowship programmes to prepare young people to influence environmental policies where they live. Through these programmes, young people can use their voices to advocate for environmental change and work towards protecting their aquatic environments for future generations, as well as the health and well-being of the communities in which they live.

Section Five: Resources

Appendix

I. https://www.unep.org/explore-topics/oceans-seas (United Nations Environment Programme – Oceans and Seas Programme)
II. https://www.fao.org/in-action/globefish/en/ (FAO GLOBEFISH Platform – Global Fisheries and Aquaculture Trade Data)
III. https://www.oceanconservancy.org/trash-free-seas/ (Ocean Conservancy – Trash Free Seas Initiative)
IV. https://waterkeeper.org/ (Waterkeeper Alliance – Global Water Defender Network)
V. https://www.worldwildlife.org/initiatives/freshwater (World Wide Fund for Nature – Freshwater Conservation Initiatives)
VI. https://www.unep.org/explore-topics/water (UNEP – Global Water Pollution and Wastewater Resources)

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