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Human Interaction with the Environmental Ecosystem: A Review, Some Notes and Insights

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Abstract

The present review focused on the human interaction with the environmental ecosystem. Based on the present review, it is concluded that human interaction on our ecosystem is broadly reported in the literature. By using the model of human interaction with the environment that was firstly recommended by Hammond (1995), the Life Support interaction is focussed and discussed. From the negative picture from the human interaction on the ecosystem concept, a lot of human activities from the past and future are involved. These anthropogenic activities include deforestation depleting food and medicinal resources, the growing world energy demand on non-renewable sources, active transportation, point and non-point sources that create environmental pollution and contaminating the ecosystem in terms of food and clean water supply. In addition, enrichment of the hazardous chemicals in our environmental ecosystem is inarguably contributed by human interactions as the root cause. This is related to human behaviours that have impacted on human welfare which is a prevalent predicament to be solved nowadays.

Keywords: Human interactions; Anthropogenic activities; Aquatic ecosystem

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Introduction

Literature on the impacts of human invention and interactions in the aquatic ecosystem can be found many such as chemical pollution, manganese pollution, inorganic nitrogen pollution, mercury pollution, persistent pollutants and heavy metal pollution [1-9]. Most of these published literatures end up with the human risk assessment which has been the major concern to the public [10].

According to a review by Ramade, over 75,000 chemicals are in common use today and several thousands of new compounds are added to this figure each year [11]. Wastewaters entering aquatic ecosystem become one of the main sources of pollution of natural waters. This is because the wastewaters potentially could change the chemical properties of water and bottom sediment and alter the biological balance of the self-cleaning processes [6].

Heavy metal pollution on aquatic ecosystem

For metal pollution, Moiseenko et al., studied the relationships of metals between surface water and fish [8]. They reported that the enriched levels of metal in waters are contributed by local releases from the metallurgical and mining industries and indirect metal leaching by acid precipitation. Rai, investigated the Hg levels in water, sediments, plants and fish collected from different sampling points that potentially receiving the emission of chloralkali effluent [5]. Wali et al., reported that heavy metal contamination in the sediments of the Sebkha of Moknine that was due to catchment urbanization and industrialization [9].

Based on the above literature review, therefore, it can be concluded that 1) human social factor is important as part of human interaction with the environment, 2) human interaction with release of hazardous chemicals is complicated with cycle of nutrients from the ecosystem point of view. This will be further discussed on the following sections.

The Model of Human Interaction with the Environment

The model of human interaction with the environment was firstly recommended by Hammond et al. [12]. This article has been cited more than 1004 times based on google.com searched on December 31, 2018. Therefore, this greatly shows the significant impact of this article in the related field of study including ecotoxicology and human social sciences since 1980s.

This model depicts four interactions between human activity and

the environment. Even though it was a conceptual proposal in 1980s, the model looks still applicable and relevant in 2010s and in the forthcoming 2020s. In this paper, according to Hammond et al., there are four interactions [12]. In this paper, the Life Support is discussed since it is important from aquatic ecosystem point of view.

Life support

The earth's ecosystems-especially unmanaged ecosystems-provide essential life-support services, ranging from the breakdown of organic wastes to nutrient recycling to oxygen production to the maintenance of biodiversity, as human activity expands and degrades or encroaches upon ecosystems, it can reduce the environment's ability to provide such services' [12].

As seen in an ecosystem concept for an ideal ecosystem, without human interaction on the environmental ecosystem, the cycles of nutrients on the essential elements (nitrogen, oxygen, carbon, hydrogen, phosphorus and sulphur) under of the perfect sunlight to empower the flow of energy, would be expected to be healthy and perfect rate of decomposition after the dying of producers and consumers. Undoubtedly, consumers play the very important role the in the ideal cycle of nutrients. The trophic food chains and food webs concepts drive the elemental transfers from one trophic level to a higher trophic level through the transformation of energy of about 10%.

The negative picture can be imagined from the intervention and interactions by humans on the aquatic ecosystem. According to the review by Camargo et al., the Inorganic Nitrogen Pollution (INP) is largely caused by anthropogenic activities [3]. This INP is directed to the ground and surface waters (as nutrient pool as depicted in Figure 1a) and results in inducing harmful effects on human health and economy of a nation. HNO_3 is now playing an increasing part in the acidification of freshwater ecosystems [3]. Thus, it can impact negatively on primary and secondary producers. This involves fishes and invertebrates (benthos) in many atmospherically acidified aquatic ecosystems such as lakes and streams **(Figure 1)**.

According to Moiseenko et al., high metal levels (Ni and Cd) in water could cause a metal bioaccumulation in organs and kidneys in the fish [8]. The high Ni accumulation in the fish kidney could cause the development of nephrocalcinosis and fibroelastosis in the fish [8]. In addition, the transfer of Hg from abiotic (water and sediments) to biotic (algae, aquatic macrophytes and fish) components can initiate unfavourable ecological and toxicological influences via processes of Hg biomagnification [5]. Human exposure to this neurotoxin can be resulted from consumption of Hg contaminated fish and thus could pose a worrying hazard to humans [4].

Point source pollution such as industrial activities can contaminate the water quality supply and degrade the food quality and food safety will be a public issue. Besides point source, non-point sources such as diffused sources from surface water runoff and husbandry wastes can also potentially enrich the hazardous chemicals such as heavy metals, DDT, PCB and persistent organic chemicals into our aquatic ecosystem.

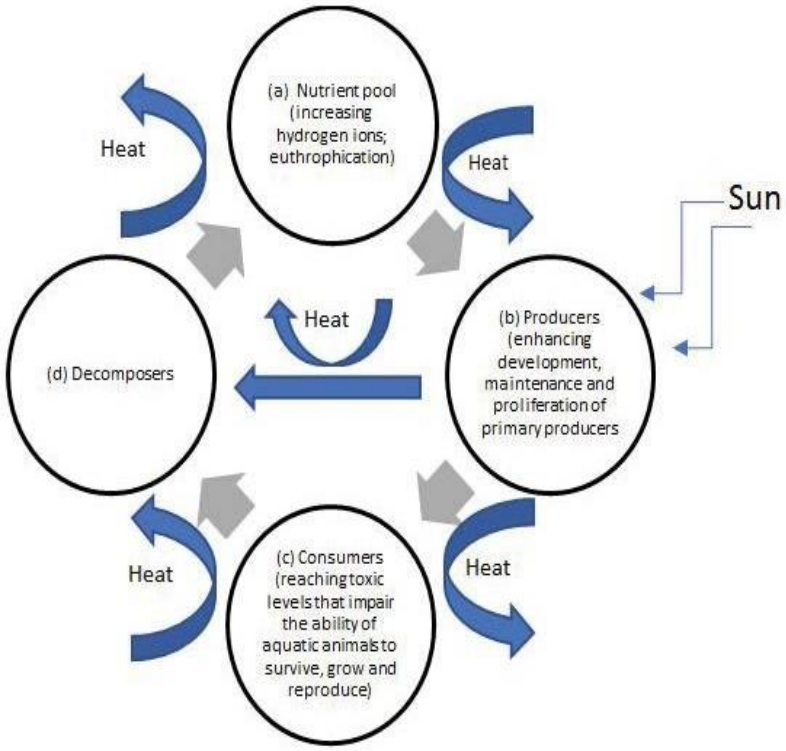

Figure 1 Cycle of nutrients under the flow of energy in an aquatic ecosystem. Example of human interaction is that on the ecological and toxicological effects caused by inorganic nitrogen pollution in aquatic ecosystems (Camargo et al., 2006).

Population growth in connection to urbanization will demand more food supply in future. This is going un-parallel with the creation of food production and food safety will be placed in the headline of daily news due to contamination of biological agents and hazardous chemicals. Finally, climate change due to increase of atmospheric greenhouse gases such as methane is one of the major factors of global warming. The global temperature rise could cause the world species' biodiversity be gone in the foreseeable future.

Concluding Remarks

All the above human interactions, related to human behaviours, have impacted the human welfare which is the biggest issues to be discussed and prevalent predicament to be solved nowadays. Enrichment of the hazardous chemicals contributed by anthropogenic activities or human factors into our environmental ecosystem is inarguably the major root cause. 'Prevention is better than cure', so let do our part to safeguard, conserve, maintain and improve our environmental ecosystem.

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