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Make every day an Earth Day!

The Effects of Biodiversity on Human Health Part 1

What is biodiversity?

Biodiversity is defined by the amount of variation present in different ecosystems [1]. This variety can come from a large number of different organisms like animals, plants, and other life forms too. Ecosystems are made up of biotic and abiotic factors (e.g., soil), and usually represent a community found in a set area. For example, rainforests, savannas, deserts, and coral reefs are all distinct ecosystems.

Biodiversity is important in all ecosystems as it benefits the species living in them, including humans [2]. Essentially, the more biodiverse an ecosystem is, the better services it has to offer. These services include benefits like food, clean water, climate regulation, pollination, soil formation, and much more [1].

Why should you care about coral reefs and polar bears?

Aside variation, species composition is another factor that influences biodiversity [3]. This means that the types of organisms present in an ecosystem is extremely important as some species represent essential species. Such species are also labeled as “keystone species” as their absence would cause entire ecosystems to fall apart. Keystone species include predators, prey, ecosystem engineers (e.g., beavers), plants, etc. [4]

These species maintain the solid foundations needed to sustain their ecosystems. They are also known to interact with other species; thus, their removal can have a domino effect on non-keystone species. For example, many flowering plants



depend on pollinators (e.g., bees) to reproduce [5]. Consequently, the elimination of pollinators can cause plant populations to diminish in number over time and possibly push them towards extinction. One study predicted that the complete removal of pollinators could cause 71 million people in low-income countries to face malnutrition [6]. In sum, keystone species are crucial to the maintenance of biodiversity along with safeguarding human populations.

SOME KEYSTONE SPECIES & THEIR IMPORTANCE	
<i>Sharks</i>	Sharks regulate fish population sizes that would otherwise grow exponentially in a marine environment that lacks resources to sustain all. Without sharks, many fish populations would face extinction [7].
<i>The African Elephant</i>	Elephants maintain grasslands for the herbivores in the savannah by preventing the growth of woodland through the consumption of saplings. Without them, herbivores like hares and zebras would slowly disappear and so would their predators like lions, cheetahs, and leopards [8].
<i>Coral Reefs</i>	Corals can offer shelter to other organisms and serve as food for many fish species [9]. Without them, fish biodiversity can decrease by as much as 60%, which also affects predator numbers.
<i>Polar Bears</i>	Polar bears keep seal populations in control by hunting them [10]. If seals increase in number, this can reduce the number of crustaceans and fish available for other wildlife and human populations living in the Arctic.

A common misconception is that the loss of species does not affect humans [11]. Biodiversity loss can have both direct and indirect effects on humans. The loss of ecosystem services like clean water or food can have direct effects on human health. Indirectly, these losses can create social and political conflict as individuals will eventually be forced to fight for basic needs.

A more significant concern is the loss of potential treatments for human diseases and illnesses [11]. For example, many drugs are derived from plants; therefore, the loss in plant species can limit pharmacological discoveries that may otherwise help cure various ailments. Additionally, recent studies also claim that the lack of biodiversity reduces the diversity of the human gut microbiome which can result in a deficit in health [12]. One study by Evans and colleagues [13] showed that individuals who live in biodiverse environments faced fewer illnesses regardless of their socioeconomic status.



Direct Causes of Biodiversity Loss

- **Fishing** affects the biodiversity of oceans and causes many fish populations to collapse.[1].
- **Introduction of invasive species** (non-native species) disturbs native species [1].
- **Irrigation and industrial use of water** exhausts freshwater systems [1].
- **Climate change** affects the habitat of many species such as polar bears [14].
- **Pollution** can change the chemical structures within ecosystems and affect the health of various organisms (e.g., accumulation of toxins within tissues) [14].
- **Conversion to cropland** by deforestation causes habitat and resource loss for many species living in that ecosystem [1].

Indirect Causes of Biodiversity Loss

- **Growth of the global population** increases the demand for food and energy, which in turns abuses the services offered by ecosystems, causing them to crumble [1].
- **Economic expansion** due to globalization increases the use of resources (e.g., fossil fuels; food; water) and destroys ecosystems (e.g., deforestation) [1].
- **Technological developments** can both create solutions for biodiversity conservation and harm ecosystems through resource use [1].

Current Predicted Scenarios for Biodiversity Change

Researchers predict that from now to 2050, biodiversity loss will continue to occur at high rates [1]. The *Global Assessment Report on Biodiversity & Ecosystems Services* projected that in the next decades, between 500,000 to 1 million species will go extinct [15]. Most of these losses are predicted to occur in mixed forests, savannas, tropical forests, and tropical woodlands [1]. As the



human population continues to grow, the need for land for human activities (e.g., agriculture) will upsurge.

These predictions are alarming, but researchers suggest that the implementation of sustainable solutions could help protect biodiversity. In the second part of this article, the topic of sustainability will be discussed along with solutions to help conserve ecosystem structures.

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