MARINE ECOSYSTEM CRISIS CAUSED BY PLASTIC POLLUTION

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Кризис морской экосистемы, вызванный загрязнением пластиком

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Currently, the world's oceans are becoming increasingly polluted with plastic. Focused specifically on microplastics, a cause of marine pollution, which is a rapidly surfacing crisis with an adverse impact on the survival of marine ecosystems and human health, this study aims to examine the importance of smart environmental education as a driving force for change in human awareness, in order to prevent the undesirable knock-on and cyclical effects of microplastics on marine ecosystems and human society.

Keywords: Plastic pollution, marine ecosystems, SDGs, smart environment education

В настоящее время мировой океан все больше загрязняется пластиком. Сфокусированное конкретно на микропластике, являющимся причиной загрязнения моря и представляющим собой быстро развивающийся кризис, оказывающий негативное влияние на выживание морских экосистем и здоровье человека, данное исследование направлено на изучение важности разумного экологического образования как движущей силы для изменения сознания людей, чтобы предотвратить нежелательные побочные и циклические эффекты микропластика на морские экосистемы и человеческое общество.

Ключевые слова: пластиковое загрязнение, морские экосистемы, цели устойчивого развития, интеллектуальное экологическое образование

Introduction

The Earth is a planet of life. Over a long period of time, life forms born in the oceans have created a diversified ecosystem in the sea and on land, while growing and interconnecting with each other, by repeating a cycle of differentiation and evolution. This ecosystem so created has provided humankind with a wealth of blessings to this day. Such immense benefits brought from the ecosystems of the blue Earth will continue in the future.

However, this ecosystem now faces a crisis of survival. This is due to the fact that since the Industrial Revolution, human society has expanded its economic and social activities by consuming in abundance at the cost of natural resources. As this trend is rapidly growing, the ecosystem as a shared basis for human existence is on the brink. Furthermore, global warming and pollution are progressing simultaneously, and these major factors combined are accelerating the risk of ecological collapse. Immediate actions to promote the recovery of such ecosystem is therefore vital, in order to ensure sustainability of the Earth and human activities.

In light of the present status of the Earth's crisis mentioned above, this study aims to consider ideas and measures to conserve and regenerate the global environment, by focusing on plastic pollution and marine ecosystems in order to avoid the risk of ecological collapse.

Trends concerning plastic use and disposal

Plastic has many advantages such as being light in weight, easy to process, long-lasting, and inexpensive. Taking advantage of these factors, the application of plastics has rapidly expanded from industrial products to household goods, by replacing wood and metals. Examples include construction materials and beverage containers. For this reason, plastics are now being produced in massive quantities throughout the world and are pervasive in every corner of human society. In proportion to the quantity of plastic produced, the volume of its disposal is also drastically increasing. Specifically, it is reported that since 1950, the amount of plastic produced worldwide totals more than 8.3 billion tonnes, 6.3 billion tonnes of which becomes waste. If the use of plastics continues at its current level, it is anticipated that 25 billion tonnes will be generated as waste by 2050, more than 12 billion tonnes of which will be used as landfill or discarded into the natural environment.

In response to the ever-increasing use and disposal of plastics, there have been moves recently to replace them with natural materials, promote the use of bio-based plastics, and legally reduce the use of plastics, in addition to their reuse. Here are some examples. Plastic beverage containers are being replaced with metal materials such as steel and aluminium, which are easy to recycle. A reuse method involving so-called 'horizontal recycling' has been introduced, for example, aluminium containers are recycled as aluminium containers. In Japan, this horizontal recycling is being increasingly practiced in the apparel industry. In addition, charging for plastic shopping bags has been adopted to discourage consumers from the use of plastic as a money-saving measure. Meanwhile, the Japanese government is preparing to enact a new law; the Act on Promotion of Resource Circulation for Plastics. All of these represent part of global environmental protection actions to prevent plastic pollution from the perspective of resource conservation and recycling.

Plastic pollution and its impact on marine ecosystems

When plastic shopping bags and containers are no longer needed and discarded, their waste flows into the ocean through waterways, resulting in pollution of the oceans. Some of these plastics drift in the oceans, some are washed ashore, and others sink to the bottom. A number of surveys have found that plastics were spreading not only on the surface of the ocean but also to the deep seabed. As Japan is surrounded by the sea, a lot of plastic waste is washed ashore. The collection of such drifted litter is carried out by volunteers as part of activities to preserve the excellent coastal landscape and protect fishery resources.

In recent years, however, unrecoverable fine plastic particles have emerged as an environmental risk issue concerning the global environment and marine ecosystems. These microplastics are microscopic plastic particles of less than five millimetres in size that are degraded by ultraviolet rays from the sun and pulverized by the force of waves.

Concerns about the impact of microplastics on marine ecosystems and human health are as follows. Fish and marine mammals feed on microplastics along with plankton, and the fish are then eaten by birds and humans. This food chain from organism to organism causes microplastics to cycle within the ecosystem. Microplastics also easily adsorb toxic chemical substances derived from the additives used in plastics, causing the bioaccumulation of toxic chemicals in the food chain. Such food chain as well as the resulting bioaccumulation have led to concerns about the effects on marine ecosystems and human health.

In order to prevent cascading and cyclically occurring undesirable effects on marine ecosystems and people, it is essential to introduce measures to reduce the use of plastics. The following are examples from Japan. A local government in the upper reaches of a river introduced legislation by enacting an ordinance banning the use of plastic shopping bags, thereby preventing their waste from flowing downstream, while at the same time protecting the good landscape of the river. As for the Japanese national government, it not only revised legislation to charge for plastic shopping bags, but has also been working towards the establishment of a law; the Act on Promotion of Resource Circulation for Plastics to reduce plastic waste and promote recycling.

For Japan, the beautiful oceans are an important natural resource and environment that should be preserved for the fishing industry. Having such a geographic backdrop, Japan must not only stop the flow of plastic into the oceans, but also play the role of flag-bearer in the world, in preventing plastic pollution from the standpoint of conserving the Earth's oceans.

SDGs as a basis for the prevention of marine plastic pollution

Marine pollution by plastics has surfaced as a global issue because of its cascading negative effects on ecosystems and human society. To this end, the Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015 as part of action to protect the global environment by a united world effort. The SDGs consist of goals concerning 17 fields, which all 193 UN member states must meet on a global scale by 2030. Regarding marine ecosystems, it is specified in Goal 14 under the title; Life Below Water, which recognizes that the sea is the origin of ecosystems and the base for their protection.

Goal 14 asks us not only to protect the habitats of marine ecosystems, but also to take action while considering the diverse and bountiful benefits that the oceans provide to humankind. In other words, it reaffirms that the rich oceans to be passed on to future generations are a habitat of paramount importance for the irreplaceable diversity of marine ecosystems, and signifies the necessity and importance of human efforts to conserve the oceans from a long-term perspective. Further steps are required for prevention of plastic pollution and the protection and conservation of marine ecosystems, together with proactive action in collaboration with not only oceanic countries but also land-locked countries. Specifically, the development of international legal systems is one way, but global-scale environmental education will be the basis for people living in a global society, to advance knowledge which serves as a driving force, while enhancing their activities.

Smart environmental education to foster wise users of plastics

Plastic is indispensable for human society and will remain so in the future. At the same time, it is necessary to protect our blue oceans and maintain sound ecosystems. In order to fulfil both, it is essential to consider where

plastic waste goes beyond its use and to prevent the spread of plastic into the global and marine environment.

Now is the time to act promptly in order to eliminate the ecological loss and price arising from plastic pollution. Without being excessively dependent on plastics as in the past, it is necessary to substitute them with recyclable resources such as wood and metals, as mentioned above, and to review the use of plastic itself. To achieve these, it is vital to device effective measures including the development of advanced technology for the reuse of plastic, and the creation of a closed-loop recycling system for its use and recycling.

More importantly, to fundamentally prevent plastic pollution, it is necessary to promptly urge those who use plastic to change their mindset. Smart environmental education will assume a great role in cultivating smart consumers and citizens.

Smart environmental education is the flag bearer for character formation as a wise consumer and serves as a lever to transform global society. The sustainable health of the planet, its ecosystems and human society can only be safeguarded when ideas and actions for the conservation of ecosystems, the source of life, are passed on from generation to generation through smart environmental education.

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