Significance of Extending the Scope of the Basel Convention on Space Debris

Issues to Space

Ⅰ. Introduction

Since the Industrial Revolution that began in UK in the late 18th century, mankind has brought various technological developments and benefits to people through economic activities and globalization（Ministry of Land, Infrastructure, Transport and Tourism, 2017）. However, the use of fossil fuels such as coal, oil and other industrial activities have brought about the negative aspects of environmental pollution and the degradation of our own habitat. Today, the geographical range of human activities extends not only over the Earth but also into space. At the same time, the waste and environmental problems caused by human activities are also spreading into space.

One of the environmental problem in space today is the problem of space debris. Space debris is a generic term for flying objects consisting of debris from satellites, rocket debris, and rocket wreckage that have reached the end of their useful lives, and are said to be orbiting the earth at a speed of at least 7-8 km per second. It is said that there are more than 20,000 pieces of space debris larger than 1 meter and 500,000 to 700,000 pieces larger than 1 cm, so satellites and workers orbiting at the same speed are exposed to the threat of metal fragments coming at them at speeds of 10 to 15 km per second (Kawamoto, 2012). As an example of how dangerous space debris can be, the Linear Chuo Shinkansen Line being developed in Japan as of 2022 has a maximum design speed of 500 km/h (Linear Chuo Shinkansen Regional Development Study Group, 2011), which is about 0.14 km per second. In other words, space debris orbits the earth 70 to 100 times faster than Japan's Linear Chuo Shinkansen. In Newtonian mechanics,

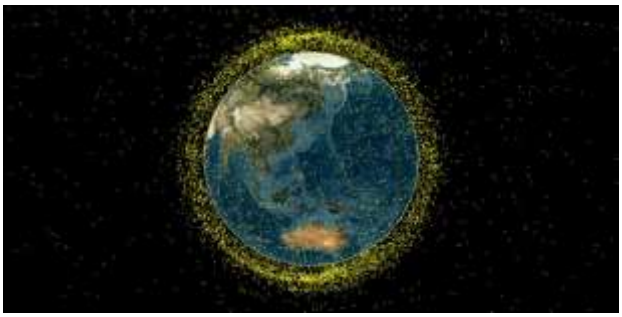

Figure 1. Low orbit debris geostationary image
(Provided by NASA/JAXA)

the kinetic energy (K) of an object is proportional to the square of its mass (m) and velocity (v).

$$\mathrm{K} = \frac{1}{2}mv^2$$

Thus, not only large objects such as discarded satellites, but even a single screw less than one centimeter in diameter can pose a sufficient threat due to its speed of flight.

Furthermore, the threat of space debris is not limited to its destructive power. When space debris collides with other space debris, the number of fragments increases, and as these fragments repeatedly collide with other man-made objects and space debris, they have the property of multiplying in an uncontrolled manner, like cancer cells. This catastrophic phenomenon is called the Kessler Syndrome because it progresses catastrophically like a disease(Ohtani, 2019). The frightening aspect of this phenomenon is that not only is it a serious obstacle to space exploration, but industrial satellites such as GPS and telecommunications, which are essential to human life today, are at risk of being destroyed by space debris (Yamaguchi, 2011).

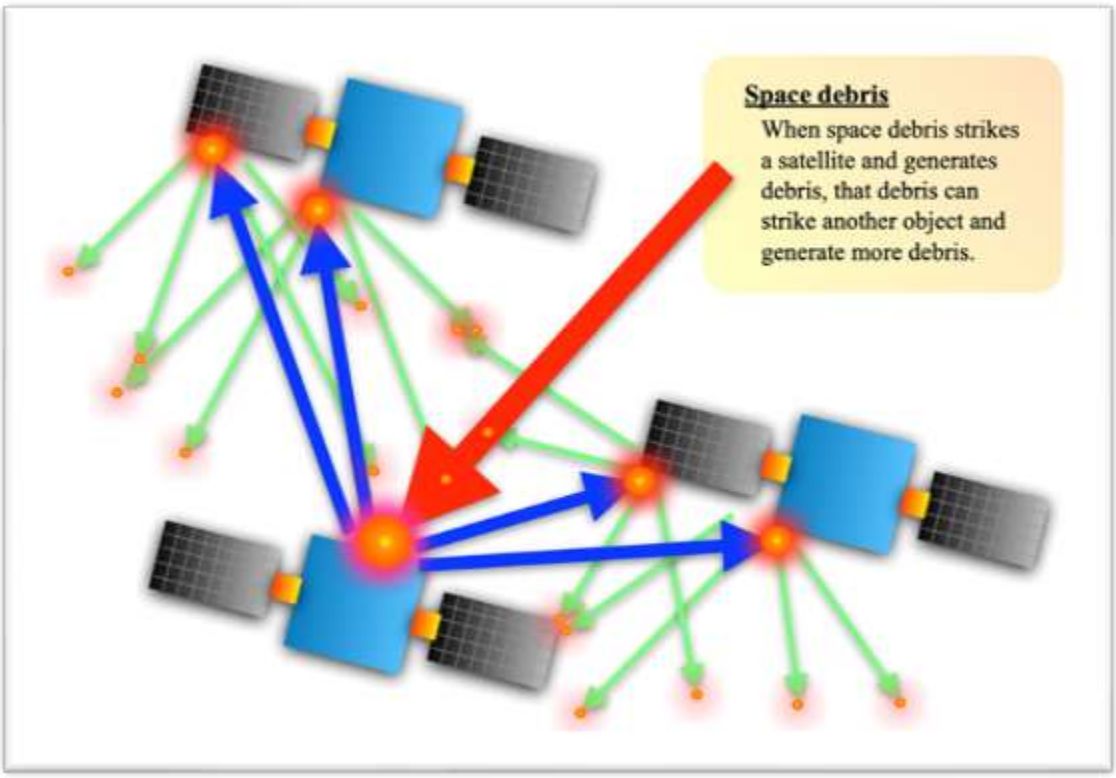

Figure 2. Image of Kessler Syndrome

Although space debris is a threat to mankind created by human industrial activities, this is not the first time in history that such a disaster has occurred due to human activities. In Japan, for example, Yokkaichi asthma (Sulfur oxide; SOx), Minamata disease (Methylmercury), and Itai-itai disease (Cadmium) were caused by industrial development, and society has overcome these problems by establishing policies to deal with them (Japan Environmental Management Association for Industry, 2003). In other words, the problem of space debris is a new pollution that we humans are facing, and it is a problem that can be addressed through the formulation and implementation of appropriate policies. However, in today's globalized world, it is difficult to coordinate the interests of many people across national borders, and it is becoming increasingly difficult to deal with this problem. Although international policies such as the IADC guidelines have been clearly stated, these standards are not legally binding, and strict implementation within each country is not easy (Aoki, 2022). This paper discusses the significance and necessity of addressing the space debris

problem by expanding the scope of existing treaties, rather than creating new treaties. And the Basel Convention is the basis for solving this problem. On this paper, while touching on the basic contents of the Basel Convention, it is discuss why it is useful to expand the application of the Basel Convention to space as a measure against space debris from three aspects: (1) the existing articles can be used, (2) it is no need to conclude a new treaty with other countries, and (3) the Basel Convention can serve as a model case for solving future space development issues.

Ⅱ. The existing articles can be used

First of all, in dealing with the space debris problem, there are advantages in using the existing Basel Convention rather than creating a new convention, since it will be more effective for a greater number of countries. It is also necessary to clarify what kind of international arrangement the Basel Convention is in the first place.

The Basel Convention is an international treaty issued in 1992 that regulates the movement of hazardous waste across national borders and its disposal (Tomii, 2010). In today's global society, not only people, goods, and other economic activities cross national borders, but also waste materials. There are various types of waste, including soil and water pollution, odors, and air pollution, which are byproducts of human technological development and are referred to as pollution. In the 1980s, incidents of water and soil pollution that caused health hazards to residents in developing countries, such as the Koko incident in Nigeria (1988), where hazardous wastes were exported to other countries, began to occur (Tsuruta, 2022). This is one of the reasons why the Basel Convention was concluded to deter the globalization of waste and environmental destruction (Takahashi, 2016).

The Basel Convention stipulates that, in principle, hazardous wastes must be disposed of in the country of emission. However, if the transboundary movement of hazardous wastes is

unavoidable, the Basel Convention provides for the consent of the other country, fulfillment of responsibilities until disposal is completed, take-back of wastes when disposal is not performed, and penalties for violations. The restrictions on the movement of hazardous waste set forth in the Convention are strict, and the conditions are limited to cases where the producing country does not have the technology to dispose of the waste or the waste is to be reused in the other country (Takahashi, 2016). As of December 2019, 186 countries, including Japan, have signed the treaty (Ministry of Foreign Affairs, 2019).

Comparing the hazardous waste regulated by the Basel Convention with today's space debris problem, the following similarities can be seen.

- The waste is a product of human industrial activity.
- The waste is moves across borders.
- The waste poses a risk to human health.
- The waste poses an environmental impact hazard.

Certainly, space debris is not biologically toxic to humans like cadmium or hexavalent chromium. However, it is clear that space debris is a hazardous waste for human beings because it flies around the earth in orbit at 7-8 km per second and can be lethal upon contact with human bodies or facilities. Therefore, rather than creating a new treaty on such hazardous waste, it would be easier to add space debris to the existing list of hazardous waste under the Basel Convention, which would have the effect of legally deterring such waste.

Ⅲ. It is no need to conclude a new treaty with other countries

When new international rules are established, it is necessary to clarify the process that must be followed in order to have them implemented by countries around the world. First of

all, even if a newly created treaty is completed within an international partnership, that fact alone does not mean that countries will begin to act in accordance. In the case of Japan, for example, the process of concluding a new treaty requires not only treaty negotiations in an international organization, but also submission to and approval by the Diet in accordance with Article 73, Item 3 of the Constitution of Japan, and then the conclusion of the treaty. The process of concluding a treaty differs from country to country, with the United States requiring the advice and consent of the Senate, Germany, Italy, and the Republic of Korea requiring the approval of the legislative body, and France requiring conformity with domestic laws, but each country and its voters must be given an incentive to go through this process when formulating a new treaty (Nakauchi, 2020). However, each country needs to be incentivized to undertake this process if a new treaty is to be developed. Environmental laws, while protecting human life and the environment, have the negative aspect of restricting a country's economic activities. While each country understands the importance of an international environmental framework, it is difficult to conclude a new environmental law unless it is sufficiently persuasive to domestic economic conditions and public opinion. This point can be seen in the background of the withdrawal of the United States under the Donald Trump administration from the Paris Agreement in 2017, where environmental issues are in conflict with economic issues (Uno, 2018).

However, the problem of space debris cannot be left unattended. As mentioned earlier, space debris is growing like a cancer cell, repeatedly colliding with various man-made objects in Earth's orbit. If the Earth's orbit becomes unusable, it will be difficult to maintain not only future space development, but also the already widespread infrastructure for daily life, including GPS, cellular phones, the Internet, and weather forecasting. As with clinical cancer treatment, early detection and early response to space debris and other new environmental problems are essential. Therefore, a quick and effective way for countries

around the world to act on this issue would be through the method of adaptation and expansion of the Basel Convention, which has already been signed by 186 countries around the world (Ministry of Foreign Affairs, 2019). It will also give countries that are not parties to the treaty room to negotiate the need to protect the environment in space by maintaining its influence and reinforcing the global trend to protect the environment.

Ⅳ. The Basel Convention can serve as a model case for solving future space development issues

As of 2022, the world is once again expanding the stage of human research and development to the Moon, as in the Artemis Project (Ministry of education, culture, sports, science and technology, 2021). However, the fact that humans will be engaged in labor, economic, and development activities in the extreme environments of space and the Moon means that new problems arise. In the future, there will be an increasing number of situations in space development where confusion will arise and interests will need to be reconciled due to institutional inadequacies. For example, space development will face a variety of social problems, such as the occurrence and risk of occupational accidents such as low gravity injury, leukemia, and pneumoconiosis in space (Koseki, 2020), standards regarding the attribution of profits from economic activities on the Moon, and standards for the legitimacy of state-led lunar resource exploitation, which will require a step If a mistake is made, it could lead to international conflicts. In light of these circumstances, it is necessary to realize sustainable growth of industry and civilization by establishing international rules to prevent the possibility of international conflicts arising among countries in the course of space development. The key to solving this problem is the rediscovery and utilization of past cases and laws and regulations, which are the assets that mankind has accumulated to date. Even if it is a new problem that has arisen in the development and industrialization of space, there are

similar cases in the past if we search for information accumulated by mankind since the dawn of history. For example, in the case of space debris, the problem is the transboundary air, ocean, and soil pollution caused by industrialized countries after the Industrial Revolution. This time, it is occurring in space, especially in the orbit of Earth's satellites.

In other areas as well, for example, ideas for international frameworks for the placement of satellites, which are increasing year by year, and for traffic management can be obtained from road traffic laws, maritime traffic safety laws, and aviation laws that are already in operation in many countries. When trying to persuade countries to adopt new provisions, it is better to extend existing frameworks that have already been approved than to ask them to start over from scratch, as in the "foot-in-the-door technique" in the field of psychology (Sannomiya & Hisasaka, 2006; Dolinski, 2011). In this way, it is possible to build up a strategy to cope with new events that are expected to occur based on the accumulated information assets of mankind in the past. It follows that, the extension of the Basel Convention to space, as described in this section, can serve as an example of a model case for solving problems that arise in the future.

Ⅴ. Conclusion

The significance and necessity of adopting the Basel Convention's approach of extending its application to space in response to today's problem of space debris in space have been described above. Existing international treaties such as the Convention on Liability for Space Damage and the Convention on the Registration of Space Objects existed, but there were no international arrangements to clarify the process and responsibility for disposal (Aoki & Kozuka, 2019). The Basel Convention will contribute to the realization of sustainable space development by clarifying waste disposal.

It also became clear that there are many problems in concluding a new international treaty, such as the need for a universal topic to persuade voters in each country and the speed with which the treaty can enter into force. Against this background, a method of expanding the scope of application of treaties that already exist to address these issues will be effective.

Today, the industrial utilization of space has become an essential part of human geography for building an economy and society. As the theory of "tragedy of the commons" proposed by biologist Garrett Hardin (1915-2003) shows, common lands in which the responsibilities of the members are not clearly defined can eventually fall into disrepair and become an environment in which each member's assets cannot be maintained, as each member tries to maximize their profits. This leads to an environment in which common lands fall into disrepair and individual assets cannot be maintained. In order to prevent this tragic future, also known as "social dilemma," appropriate measures are needed to prevent the human race from collapsing together (Yamagishi, 1989). One of the solutions to this problem is the establishment of common rules that clearly define the responsibilities of each space user and their location in the space environment, as well as their implementation. In order to realize the Goal 9 of the SDGs, "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" it is necessary to consider not only the Earth but also space for the sustainable development of the world (United Nations, 2022). In today's globalized global society, it is easy for resource-related interests to conflict not only among individuals but also among nations. Therefore, it will be essential to establish a system in which peaceful, stable growth and fair benefits to all countries of the world are distributed through relationships based on rules and agreements for future development, rather than through violence and disorderly development.

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