

## THE ENVIRONMENTAL DIMENSION OF SPACE ARMS CONTROL\*

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Current debates on the prevention of an arms race in outer space are dominated by the perspective of international strategic balancing. This article addresses the issue through the often-neglected lens of environmental protection. It is argued that environmental protection becomes a prime motive of arms control more for its instrumental value to other interests, rather than the intrinsic value of the environment. Although the existing regime of outer space law has pacified part of the environmental concerns, in particular that arising from nuclear contamination, it fails to address the issue of proliferation of space debris which currently is the major impediment to the sustainable use of outer space. Customary principles of environmental law, in particular the no-harm principle and the principle of sustainable development, only constrain the way how military activities are conducted in outer space, rather than the right to conduct them *per se*. It is further advocated that arms control in outer space should be strengthened for the common interests of mankind derived from a sustainable space environment. Such a treaty should at least prohibit testing, deployment and use of space-based weapons and Anti-Satellites Weapons.

### I. INTRODUCTION

The conduction of military activities, either in time of warfare or in periods of not-war, is inherently detrimental to the physical environment, hindering other utilizations thereof. Environmental protection has thus become one of the prime motives for negotiating arms control treaties, such as the Antarctic Treaty and the Partial Test Ban Treaty. With regard to arms control in outer space, the mainstream debates thus far have taken place from the perspective of international strategic balancing.<sup>1</sup> In contrast, its environmental dimension has gained rather limited attention.

This article, adopting the latter approach, explores the environmental dimension of space arms control, to the extent of both *lex lata* and *lex ferenda*. Part II is an overview of the role of environmental protection in arms control in common spaces, such as Antarctica, the oceans and outer space, in a broad-brush manner. Part III provides a survey of the element of environmental protection in the existing regime of outer space law. Part IV examines the application of general international environmental law to military uses of outer space.

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<sup>1</sup> E.g. Mowthorpe M, *The Militarization and Weaponization of Space* (Lexington Books, 2004); Quinn A, *The new age of space law: the outer space treaty and the weaponization of space*, 17 *Minnesota Journal of International Law* 475 (2008).

### II. ENVIRONMENTAL PROTECTION AND ARMS CONTROL IN COMMON SPACES: COMPETING VALUES

Everything has its own values, which could be philosophically divided into intrinsic and instrumental ones. The intrinsic value is characterized in terms of the value that something has “in itself”, or “for its own sake”, or “as such”, or “in its own right”; whereas the instrumental value is the value that something has by virtue of being a means to an end.<sup>2</sup> No general hierarchy exists between the two categories, as people may sacrifice the intrinsic value of things for their instrumental value(s), or the other way around.

Common spaces, i.e. spatial areas beyond the limits of national jurisdiction (Antarctica, the oceans and outer space), are unexceptionally of multiple values. They are instrumentally valuable for benefits derived from commercial, scientific and military utilizations therein; and they are intrinsically so for their uniqueness *per se*. Taking Antarctica as an example, it is noted that the continent is of not only unique wilderness value (intrinsic), but also ecological and scientific values (instrumental).<sup>3</sup> To a same area, its various values are usually competing and environmental protection serves

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<sup>2</sup> See Stanford Encyclopaedia of Philosophy, at <<http://plato.stanford.edu/entries/value-intrinsic-extrinsic/>>.

<sup>3</sup> Convention on the Regulation of Antarctic Mineral Resource Activities, opened for signature 25 November 1988, 27 I.L.M. 859, Preamble.

as the link *inter se*. For instance, the conduction of military activities in Antarctica could easily derogate its fragile environment, which would in turn hinder research in this “international laboratory”; and nuclear tests in the oceans could contaminate commercial fish stocks.

Human activities in common spaces have been anthropocentric. What States seek from them is the optimal fulfilment of their needs, by striking a balance between competing values. Though along with utilizations there is never a lack of environmental cautions, the spaces are seldom protected for their own sake, but for the realization of pragmatic interests. This is particularly true when military activities are concerned. States would not let the pure ideal of environmental protection constrain their military freedom in the quest of security. Hence it is commonly seen that States, as rule makers of international law, are reluctant to subject their military to the level of environmental accountability that are required of civil actors. It is not until the man-made deterioration of the physical environment threatens human security, and the contemplated military advantage is outplayed by the benefits derived from other activities, that environmental protection becomes a prime initiative for arms control negotiations. For instance, the successful non-militarization of Antarctica is, to a great degree, due to the apprehension that military activities could easily cause irreparable damages to the fragile ecosystem and bring to an end the prospect of scientific research. Similarly, one of the concerns behind the prohibition of nuclear tests in outer space is the harmful effects of electro-magnetic pulse radiation to spacecraft.<sup>4</sup>

### III. OUTER SPACE LAW

The law governing outer space (*corpus iuris spatialis*) primarily consists of four in-force UN-based outer space treaties, which are complemented by a number of bilateral or multilateral arms control treaties bearing on outer space. Besides, the UN General Assembly has adopted many important resolutions regarding peaceful use of outer space.

#### III.I UN Outer Space Treaties

Military use has been one of the main impetuses of space exploration. Today, a large proportion of space utilities are dedicated to the military sector. However, States' right to conduct military activities in outer space is not absolute. The Outer Space Treaty, which is the backbone of current *corpus iuris spatialis*, prohibits

<sup>4</sup> Moltz J, Restraint regimes for space: a united states perspective, in: UNIDIR, Safeguarding Space for All: Security and Peaceful Uses – Conference Report (Geneva, 2005), 97-104.

Weapons of Mass Destruction (WMDs) in orbit around the Earth, on celestial bodies, or in outer space in any other manner. The Article also bans the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies. But the provision fails to prohibit conventional weapons in outer void space, namely the immense void space between celestial bodies, and Anti-Satellites Weapons (ASATs). It is widely agreed that one State's development of space-based weapons and ASATs would force others to follow suit, infusing a conventional space weapons race. None of these military uses of outer space is prohibited by Article IV.

Military activities, either in time of peace or warfare, are inherently detrimental to the physical environment. Outer space is no exception. The testing, deployment and use of space-based weapons and ASATs could generate large quantities of space debris. As recognized by the 1987 Brundtland Report of the World Commission on Environment and Development, “the creation of debris is an integral and unavoidable consequence of the testing and use of space weapons”, and “[t]he contribution of military activities to the Earth's debris belt could grow greatly if plans to place large numbers of satellite based weapons and weapons-related sensors are realized”.<sup>5</sup> In the event of a real “space war”, the adverse effect of space weapons is even larger. A conservative estimate shows that a modest space war involving destruction of 30 satellites would increase the level of space debris by almost a factor of four, while a larger one involving destruction of 100 satellite by 1250%, excluding the Kessler Syndrome effects.<sup>6</sup> This could make the Earth orbits no-go areas veiled by debris clouds.

The proliferation of space debris poses a challenging threat to human activities therein. Space debris moves at an extremely high speed. Even tiny pieces can cause destruction to a satellite. Although most space objects can resist debris fragments smaller than one cm in diameter, repeated impacts could accumulate to significant destruction. Besides, there is also a high risk of chain reactions, the so-called “Kessler Syndrome”, in which, if a collision does occur, the resulting fragments

<sup>5</sup> Report of the World Commission on Environment and Development: Our Common Future, Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment (hereinafter the Brundtland Report), at <<http://www.un-documents.net/wced-ocf.htm>>, Chapter 12, Para.71.

<sup>6</sup> MacDonald B, Steps to strategic security and stability in space, 4 Disarmament Forum 17 (2009), 21.

become an additional collision risk.<sup>7</sup> Nowadays, as the human society has become highly dependent on the space sector, its collapse is costly. Article IV is obviously not sufficient to halt such a conventional space weapons race.

Article IX of Outer Space Treaty is the provision which most directly addresses the issue of space pollution. It sets out various norms regarding environmental protection in outer space. As the Article does not make any distinction between military and civil activities, these norms apply to both categories equivalently.

The principle of co-operation and mutual assistance in this operative provision, in conjunction with the use of “shall”, entails contractual obligations with legally binding force on States Parties, rather than merely reflecting a statement of goals and good will. However, its implication to military activities could be given different interpretations, ranging from the grand policy goal of non-militarization to virtually meaninglessness. In this regard, the UN General Assembly has pinpointedly declared that “States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis”.<sup>8</sup> States conduct military activities in the quest for security, the supreme vocation of a sovereign State. One should find little difficulty in arguing that one of the most fundamental preconditions for States to participate in international cooperation is that it does not jeopardize their national security. Once States choose to develop their military strength at the cost of abandoning cooperation, the legal constraints upon their development are rather limited. As stated by the International Court of Justice (ICJ), in international law there are no rules, other than such rules as may be accepted by the State concerned, by treaty or otherwise, whereby the level of armaments of a sovereign State can be limited.<sup>9</sup> In time of peace, such rules mainly derive from the regime of collective security and the law of arms control. However, it is realized that it is by cooperation, rather than the traditional reliance on military power, that is the more sustainable way to maintain international and national security. This is captured by the idea of cooperative security which is gaining popularity in recent decades. As a space arms

race could only aggravate mistrust between States, States should be encouraged to regulate their military capability by mutual consent for mutual benefit, and to cooperate in coping with new global challenges such as climate change. In fact, each year since 1983, the General Assembly has been adopting a resolution calling upon or urging all States to contribute actively to the goal of preventing an arms race in outer space as an essential condition for the promotion of international cooperation in the exploration and use of outer space for peaceful purposes.

The term of “due regard” aims to balance competing interests of space-faring countries in outer space. The lack of a clear definition of the term has caused much confusion to any attempt to accommodate competing interests of different States. But it is for sure that it does not categorically deprive States of the right to conduct military activities in space, neither are they required to acquire prior consent from other States in the conduction, because outer space is free for exploration and use by all States and the right of civil utilization does not automatically pre-empt that of the military. The mutual and relative nature of “due regard” not only requires the acting state to take reasonable care of the safe conduct of other States’ space activities, but also expects tolerance of a certain degree of interference on the part of others. In order to fulfil the reasonable care requirement, the acting state should conduct a prior risk assessment, take necessary precautions to minimize its interference, and provide as much information and assistance as feasible for potential affected States to reduce the adverse effect. However, the obligation of due regard is not owed to the protection of space environment, but activities of other States.

The obligation to avoid harmful contamination and adverse changes is aimed to protect the space and Earth environments *per se*. However, its sufficiency to address current challenges to the space environment is in serious doubt. Firstly, it only applies in the context of studies and exploration of outer space, rather than use of it. Hence, it could be argued that the rule is inapplicable at all with respect to most military uses nowadays. Secondly, with “adverse changes” limited to those caused to the Earth environment resulting specifically from the introduction of extraterrestrial matter, in outer space States are only obliged to avoid harmful contamination, which unfortunately is not clearly defined. It is evident that almost every space activity would inevitably bring harmful contamination to outer space, be it large or small. Thirdly, in fact States are only obligated to avoid such harmful contamination and adverse changes, rather than to prohibit them.

Article IX also contains a dual consultation mechanism. The active consultation process is within the complete master of the State Party charged with the affirmative obligation. The obligation arises only when

<sup>7</sup> Klinkrad H, *Space Debris: Models and Risk Analysis* (Chichester: Praxis Publishing Ltd, 2006), 2.

<sup>8</sup> UNGA Res.51/122.

<sup>9</sup> *Military and Paramilitary Activities in and against Nicaragua* (Nicaragua v. United States of America), Merits, Judgment, I.C.J. Reports 1986, p.14, at 135; *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, I.C.J. Reports 1996, p.226 (hereinafter Nuclear Weapons case), para.21.

it has reason to believe that its activity or experiment would cause potentially harmful interference with activities of other States. The responsibility and authority to determine this condition is placed with the charged State itself. Besides, the highly subjectivity of wording allows it a wide degree of latitude to determine whether this triggering condition is met.<sup>10</sup> In the case when an affirmative determination is made, the obligated “appropriate international consultation” is not clearly defined as to its procedural and substantive natures. Even if a result is reached, States are not legally bound to comply with it. The passive consultation process, on the other hand, gives other States the right to request consultation on similar basis, but it fails to create any obligation on the part of the requested States. Due to the confidential nature of military activities, there are immense difficulties to acquire prior knowledge of the planned activity, so as to exercise the right.

The environment was not a primary concern for drafters of the Outer Space Treaty. No wonder it only provides general, sometimes ambiguous, guidelines for the protection of space environment. Nevertheless, its Article IX stands as a good basis for further elaboration into an international treaty dedicated thereto. The advocacy for a new international regime dealing specifically with space environment is gaining currency recently.<sup>11</sup>

### III.II Law of Arms Control Bearing on Outer Space

The regime of UN-based outer space treaties is complemented by arms control treaties bearing on outer space. As aforementioned, environmental protection is one of the prime motives of arms control in some circumstances. In respect of space arms control, it played a significant role in the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (the Partial Test Ban Treaty) and the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (the ENMOD Convention). In turn, these treaties contribute to the protection of space environment.

In order to address the rising concerns of a nuclear arms race in outer space, negotiations started in May 1955 in the United Nations Disarmament Commission.

<sup>10</sup> Mineiro M, FY-1C and USA-193 ASAT intercepts: an assessment of legal obligations under Article IX of the Outer Space Treaty, 34 *Journal of Space Law* 321 (2008), 337-8.

<sup>11</sup> For such proposals see, e.g. McDermott B, *Outer space: the latest polluted frontier*, 36 *Air Force Law Review* 143 (1992); Tan D, *Towards a new regime for the protection of outer space as the “province of all mankind”*, 25 *Yale Journal of International Law* 145 (2000).

After eight years of negotiations, the Governments of the former USSR, US and UK signed the Partial Test Ban Treaty in 1963 and made it open to other States for signature. Each State Party to the Partial Test Ban Treaty undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion or any other nuclear explosion, at any place under its jurisdiction or control in the atmosphere, beyond its limits including outer space, or under water including territorial waters or high seas; or in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted.<sup>12</sup> The use of “any other” makes the prohibited activities comprise all nuclear explosions regardless of the purpose. Although there have been criticisms against the treaty pertaining to the increase of underground tests immediately ensuing the prohibition of those in the atmosphere, in outer space and under water, it has lived up to the expectation of prevention of nuclear tests and radiation fallouts in the common areas.

The ENMOD Convention, inspired by the global opposition to the use of environmental modification technologies during the Vietnam War, prohibits State Parties from engaging in military or any other hostile use of environmental modification techniques having widespread, long lasting or severe effects as the means of destruction, damage or injury to any other State Party.<sup>13</sup> “Environmental modification techniques” are defined as “any technique for changing - through the deliberate manipulation of natural processes - the dynamics, composition or structure of the Earth... or of outer space”.<sup>14</sup> Although it is arguable that the creation of space debris may change the composition of outer space, they are usually collateral to space activities, rather than being made as a dedicated technique for the purpose. Besides, environmental modification techniques are prohibited only when they are conducted “as the means of destruction, damage or injury to any other State Party”. It is extremely difficult to prove the existence of such intent in current activities contributing to proliferation of space debris, which are largely military building-up for the purpose of deterrence.

The above two treaties are complementary to, and partly overlap with, the Outer Space Treaty in constraining military activities in outer space. However,

<sup>12</sup> Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, Moscow, 5 August 1963, in force 10 October 1963, 480 UNTS 43, Art.I, Para.1.

<sup>13</sup> Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 18 May 1977, in force 5 October 1978, 16 ILM 88, (hereinafter ENMOD Convention), Art.I.

<sup>14</sup> ENMOD Convention, Art.II.

they do not fill the largest lacuna of Article IV, hence failing to address the current challenge posed by space debris.

### III.III UN General Assembly Resolutions

The UN General Assembly and other organizations have produced many important resolutions, declarations, recommendations, guidelines or codes of conduct regarding outer space. Although they are not law in strict sense, the so-called soft law has successfully bridged the gaps of existing hard laws in protection of space environment. This has become the feature distinguishing the new stage of development of space law from the traditional treaty-making process, which has been in stagnancy. But one should bear in mind that resolutions are only of recommendatory effect in themselves, although they may be binding if they reflect customary international law or they are significant as instances of state practice that may lead to the formation of a new customary rule.<sup>15</sup>

The General Assembly has adopted, with overwhelming majority, a resolution on Prevention of an Arms Race in Outer Space (PAROS) each year since 1981. It is recognized that the legal regime applicable to outer space is insufficient to guarantee the prevention of an arms race in outer space and there is a need and urgency to consolidate and reinforce the regime, and that prevention of an arms race in outer space would avert a grave danger for international peace and security. While the PAROS resolutions focus on the lens of security interests, the resolutions entitled "International cooperation in the peaceful uses of outer space" adopted annually since 1989 touch upon the adverse effect of an arms race to space environment, recognizing that space debris is an issue of concern to all nations. These resolutions evidence the international concern over space environment, but fail to set out concrete obligations. An exception to this is the Declaration of Principles Relevant to the Use of Nuclear Power Sources in Outer Space (the NPS Principles), adopted by the General Assembly on 14 December 1992, embodies specific guidelines. The Principles apply to nuclear power sources in outer space devoted to the generation of electric power on board space objects for non-propulsive purposes. It lays down general rules concerning guidelines and criteria of safe use, safety assessment, notification of re-entry, consultations, assistance to States, responsibility, liability and compensation. They have greatly pacified international concerns stemmed from the Cosmos-945 incident, in which a Soviet nuclear-powered satellite crashed onto the Canadian territory.

<sup>15</sup> Shaw M, *International Law* (5<sup>th</sup> ed.) (Cambridge University Press, 2006), 1090.

In order to address the issue of debris proliferation, commendable efforts are being made in various inter-governmental or scholarly organizations. The Space Debris Mitigation Guidelines, formulated by the Committee on the Peaceful Uses of Outer Space, was endorsed by the General Assembly in Resolution 62/217 in 2007. The Committee is now seeking to transform the Guidelines into a set of principles on space debris to be adopted by the General Assembly. The voluntary Guidelines outline space debris mitigation measures for the mission planning, design, manufacture and operational phases of spacecraft and launch vehicle orbital stages. The Guidelines call for space-faring countries to: (1) limit debris released during normal operations; (2) minimize the potential for break-ups during operational phases; (3) limit the probability of accidental collision in orbit; (4) avoid intentional destruction and other harmful activities; (5) minimize potential for post-mission break-ups resulting from stored energy; (6) limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region after the end of their mission; (7) limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission.

### IV. GENERAL INTERNATIONAL ENVIRONMENTAL LAW

Outer space is free for exploration and use by all States. But the freedom is not without qualification. Space activities shall be conducted in accordance with the principle of equality and international law, including international environmental law. Currently, there is no international treaty which specifically addresses outer space environment. Reference could only be made to general international environmental law, for which customary international law is the most important source. But they should be distinguished from customary rules of arms control, which practically do not exist. It follows that customary principles of international environmental law do not constrain States' right to conduct military activities in outer space *per se*, but the way in which they are conducted.

#### IV.I The No-Harm Principle

One of the foundations of international law is the principle of sovereign equality of all States. But States never had absolute sovereignty. The doctrine is indeterminate and self-contradictory, because it would legitimize the conduct whatsoever of State A in its territory even if such conduct causes harm in the territory of State B in the form of absolute territorial sovereignty, and in the meantime the absolute territorial integrity which is the absolute right of State B not to tolerate any harm originating in the territory of State A. But in reality, a State cannot use its territory without

taking into account the consequences of such use on other States, while it is also expected to tolerate a certain degree of interference by other States.<sup>16</sup>

The doctrine of absolute sovereignty was refuted by the 1941 Trail Smelter arbitration, in which a Canadian iron and zinc smelter emitted air pollution that harmed the crops downwind in the neighboring United States. The Mixed Arbitration Tribunal concluded that “no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence”.<sup>17</sup> This so-called Trail Smelter Doctrine traces back to the notion of *sic utero tuo ut alienum non laedas*, i.e. “to use your own property as not to injure another’s”. In fact, somewhat reflecting this rationale, the ICJ had recognized “every State’s obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States” early in the Corfu Channel case of 1949.<sup>18</sup>

The Trail Smelter doctrine has been written into international instruments. Principle 21 of the 1972 Stockholm Declaration refers to “the responsibility [of States] to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction”. This is repeated in Principle 2 of the 1992 Rio Declaration. These two Declarations have expanded the traditional doctrine by including the common spaces to the scope of protection, apart from territories of States. However, the declarations only impose moral obligations and are not legally binding unless they are codified in treaties or rise to the level of customary international law.

The doctrine does appear in legally binding treaties as well, e.g. the preamble of the 1979 Geneva Convention on Long Range Transboundary Air Pollution and that of the 1992 United Nations Framework Convention on Climate Change. The preamble of a treaty only expresses the objectives and purposes, and normally does not reflect substantive obligations. Unlike the above two treaties, the 1982 United Nations Convention on the Law of the Sea (UNCLOS) provides, in its operative provisions, that “States shall take all measure necessary to ensure that activities under their jurisdiction or control are so

conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention”.<sup>19</sup> Similarly, the 1992 Convention on Biological Diversity also include the doctrine in its Article 3. However, States are very cautious when military activities are concerned. The UNCLOS was concluded in a way that its provisions regarding the protection and preservation of the marine environment do not apply to any warship, naval auxiliary, other vessels or aircraft owned or operated by a State and used only on government non-commercial service.<sup>20</sup> The Biological Diversity Convention, on the other hand, has marginal connection to the military.

The exemption of military activities from environmental accountability in treaties does not hinder the applicability of such a customary principle, the existence of which has been declared by the ICJ. In the *Nuclear Weapons* advisory opinion of 8 July 1996, the Court recognized that the “existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment”.<sup>21</sup> This is recalled in the *Gabčíkovo-Nagymaros Project* case.<sup>22</sup> But the Court seems very cautious in declaring the customary character of the rule by using “respect” rather than “not cause damage to” as used in the above-mentioned international instruments. The former obviously allows certain level of harm to the environment of other States or areas beyond the limits of State jurisdiction, which is inevitable in particular with respect to military activities, whereas the latter is all inclusive regardless of the magnitude of damage. In fact, the Trail Smelter tribunal also held that one of the preconditions for the obligation is that the polluting acts must be of serious consequence. Therefore, there is a threshold of seriousness of damage that triggers the obligation of prevention. The determination of such a threshold is more a technical matter than a legal one. But most testing, deployment and use of space-based weapons and ASATs by the present technical capability would cross the threshold without much difficulty, due to the large quantities of space debris those activities could generate. In time of armed conflicts, use of space weapons requires extremely high bar of military

<sup>16</sup> Kuokkanen T, *International Law and the Environment: Variations on a Theme* (The Hague: Kluwer Law International, 2002), 22-24.

<sup>17</sup> Trail Smelter (USA v Canada), Award of 1941, III RIAA 1938, 1965.

<sup>18</sup> The Corfu Channel Case (United Kingdom of Great Britain and Northern Ireland v. Albania), Merits, I.C.J. Reports 1947, p.4, at 22.

<sup>19</sup> United Nations Convention on the Law of the Sea, 10 December 1982, in force 16 November 1994, 21 ILM 1261(1982) (hereinafter UNCLOS), Art.194, Para.2.

<sup>20</sup> UNCLOS, Art.236.

<sup>21</sup> Nuclear Weapons case, at 241, Para.29.

<sup>22</sup> Gabčíkovo-Nagymaros Project (Hungry vs Slovakia), I.C.J. Reports 1997, p.7, at 41, Para.53.

necessity and proportionality in order for it to be justifiable, because it could easily annihilate the Earth orbits. It makes good sense, as argued by Bao, that there is a considerable and growing taboo against using space weapons in a situation of conflict, which resembles MAD in utilization of nuclear weapons.<sup>23</sup>

Apart from the consequential criterion of magnitude, the use of “respect” also seems to add a subjective dimension to the measurement, namely that the acting State should pay due diligence in order to avoid substantial damage to the environment of other States and areas beyond the limits of State jurisdiction. The idea of due diligence is a relative one. Therefore, the test of it is one of the process, rather than the result. With respect to military activities in outer space, it should be primarily asked whether the acting State has conducted prior risk assessment and whether it has taken necessary measures to minimize its harm to the environment. In this regard, the no-harm principle is complementary to the due regard principle in Article IX of the Outer Space Treaty, which as aforementioned is aimed to protect other States’ activities rather than the space environment.

#### IV.II The Principle of Sustainable Development

The term of sustainable development first appeared in the World Conservation Strategy which was formulated mainly by International Union for the Conservation of Nature and Natural Resources and published in 1980. It was subsequently refined by the Brundtland Report of 1987, and officially adopted by the majority of national governments at the Rio Conference on Environment and Development held in 1992 as the underlying theme of the five instruments passed.<sup>24</sup> The primacy of the paradigm was reaffirmed in several subsequent fora.<sup>25</sup> Today, it is regarded by many as the best paradigm to reconcile environmental protection and development.

<sup>23</sup> Bao S, Deterrence revisited: outer space, 2 *China Security* 2 (2007), 6-7.

<sup>24</sup> The Rio Declaration on Environment and Development; Agenda 21; the United Nations Framework Convention on Climate Change; the Convention on Biological Diversity; the Statement of Principles on Forests.

<sup>25</sup> Such as the 1994 Marrakech Agreement Establishing the World Trade Organization, the Programme of Action of the International Conference on Population and Development, the 1996 Copenhagen Declaration on Social Development, the United Nations Millennium Declaration, the Johannesburg Declaration on Sustainable Development, the World Summit on Sustainable Development Plan of Implementation, the Millennium Development Goals Report, the World Summit Outcome.

The outer space treaties do not refer to sustainable development, because they were drafted well before its birth. However, it has been claimed that the concept has entered the corpus of international customary law.<sup>26</sup> The paradigm has been gaining importance in recent decades, as the awareness of the interaction between mankind and the environment keeps growing. The term is now not only used in numerous international instruments with wide acceptance, but also gradually incorporated in municipal laws. Therefore, there should be little difficulty to apply it to outer space, which is the common province of mankind.

Sustainable development is defined as “development that meets the needs of present without compromising the ability of future generations to meet their own needs”.<sup>27</sup> Although the precise meaning and implications are unclear, its core elements have been reflected in international agreements, i.e. intergenerational equity, sustainable use, of intragenerational equity and integration of environment and development.<sup>28</sup> The idea is largely based on the presumption that there is a conflict of interests between different generations and the interests of a same generation are uniform. This does not seem to be true as far as the military is concerned, because States in a same generation have conflicting military interests. Therefore, there is no sustainable military use of outer space as such. Rather, it should be argued that military use hinders the sustainable development of outer space.

The conduction of military activities, due to their significant impact on the environment, goes against sustainable development. As identifies by the Brundtland Report, armed competition and conflict in general is an obstacle to sustainable development in two respects at least. Firstly, damage to the environment occurs from nuclear war and use of conventional, biological and chemical weapons. Secondly, vast resources are diverted into arms production and related research which could be used to promote sustainable development. With respect to outer space specifically, the Brundtland Report identifies debris in orbit as a growing threat to human activities in space. It also asserts that the creation of debris is an integral and unavoidable consequence of the testing and use of space weapons, and the contribution of military activities to the Earth’s debris belt could grow greatly if plans to place large numbers of satellite based weapons and weapons-related sensors are realized.<sup>29</sup>

The space environment is much more fragile than that of the Earth, because of its poor capability of

<sup>26</sup> Sands P, *Principles of International Environmental Law* (2<sup>nd</sup> ed.) (Cambridge University Press, 2007), 254.

<sup>27</sup> The Brundtland Report, Chapter 2, Para.1.

<sup>28</sup> Sands P, above note 26, at 253.

<sup>29</sup> The Brundtland Report, Chapter 12, Paras.70-71.

regeneration. The creation of debris is hardly evitable in space activities, and degradation is extremely slow. Research shows that debris in orbits higher than about 800 km above the Earth's surface will be up there for decades, above 1,000 km for centuries, and above 1,500 km effectively forever.<sup>30</sup> As the speed of creation far exceeds that of degradation, the trend of proliferation is due unless technology development enables us to dispose them economically. The last few decades have witnessed dramatic proliferation of space debris. Now over 21,000 orbiting debris larger than 10 cm in diameter are tracked; and as estimated there are over 100,000 pieces larger than a marble.<sup>31</sup> The over-proliferation of space debris would render the Earth orbits unusable, thus jeopardizing the interests of future generations. Any State doing so is apparently not taking account of the need of other States of a same generation, or that of future generations.

Keeping outer space free from a weapons race seems to be a precondition to safeguard its sustainable use. However, customary international environmental law merely constrains the way how military activities are conducted in outer space, rather than the right to conduct them *per se*. Usually, it is not until the detection of serious hazards resulting from military activities that the principles could be invoked. Even in this case, the lack of a claiming mechanism for derogation to the common space environment has rendered them meaningless. Therefore, international treaties should be amended as the most important measure to curb further proliferation of space debris. Debates have stimulated proposals of amending existing space law. Noteworthy is China and Russia's proposal to the Conference on Disarmament (CD) of a draft treaty on the prevention of the placement of weapons in outer space and of the threat or use of force against outer space object

<sup>30</sup> Primack J, Debris and future of space activities, in: Moltz J (ed.), *Future security in space: commercial, military, arms control trade-offs* (Monterey Institute Center for Nonproliferation Studies and Mountbatten Centre for International Studies, Occasional Paper No.10, July 2002), 18-22, 18.

<sup>31</sup> Su J, *Towards an effective and adequately verifiable PPWT*, 26 *Space Policy* 152 (2010), 154.

(PPWT).<sup>32</sup> Although criticisms have been made pertaining to the lack of explicit prohibition of ASATs and its weakness in verification, it nevertheless provides a constructive basis for a more solid space security regime. The proposal has been taken note of by the UN General Assembly in several of its resolutions.<sup>33</sup> From an environmental perspective, the treaty should at least explicitly ban testing, deployment and use of space-based weapons and ASATs. The same conclusion has been drawn from the perspective of international strategic balancing.<sup>34</sup>

## V. CONCLUSIONS

The law of arms control stems from such considerations as international strategic balancing, humanitarian protection and environmental protection. While the ideal of environmental protection is seldom attractive to States, it has nevertheless become one of the prime motives of arms control due to its instrumental value to other activities, such as commercial exploitation and scientific research.

The existing regime of outer space law is not sufficient to effectively protect the space environment, largely because it had not become a primary concern when it was framed. But significant changes have happened ever since. The last few decades have witnessed serious derogation of space environment and now a looming-large space weapons race which is very likely to devastate the Earth orbits. The no-harm principle and the sustainable development principle only impose certain constraints on the way how military activities are conducted in outer space. Therefore, in order to cope with these new challenges, the existing regime of space law should be strengthened by concluding a treaty in order to prevent space weapons control. Such a treaty should at least explicitly prohibit testing, deployment and use of space-based weapons and ground-based/airborne ASATs.

<sup>32</sup> CD/1839. For an introduction of the PPWT, see Su J, *The "peaceful purposes" principle in outer space and the Russia-China PPWT proposal*, 26 *Space Policy* 81 (2010).

<sup>33</sup> E.g. UNGA Res.65/68; UNGA Res.65/44; UNGA Res.64/49; UNGA Res.64/28.

<sup>34</sup> Su J, above 31.