The Legality of the Use of Space Weapons: Perspectives from Environmental Law

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For my dear, brave mother…

May she, and all beings, be happy and free.

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Abstract

The undesirability and prevention of the weaponisation of outer space have been discussed for decades by the international community. Of particular concern, there is a lacuna in existing space law governing conventional space weapons which use kinetic energy to destroy or damage space objects. Despite proposals to prohibit the use and deployment of such space weapons, as well as the repeated adoption of General Assembly resolutions to stem such developments, States are at an impasse on the matter. Recent pronouncements and activities by major space faring States point to the worrying likelihood of such weapons being used in outer space, and thereby greatly threatening international peace and security.

The creation of vast amounts of space debris following recent anti-satellite tests demonstrates just how damaging the use of kinetic space weapons can be to the natural environment of outer space. With States unable to agree on the legality of the use of space weapons, solutions can be sought beyond existing space law. This thesis argues that general public international law, and specifically international environmental law, can provide a viable and effective alternative to prohibiting the use of convention space weapons. Further, not only are States prohibited under general environmental law from engaging in activities that cause damage to the natural environment, under the laws of armed conflict there are conventional and customary laws which expressly prohibit the use of weapons that cause damage to the natural environment.

Résumé

L'inopportunité et la prévention de la militarisation de l'espace extra-atmosphérique ont été débattues depuis des décennies par la communauté internationale. Il existe notamment une lacune dans le droit de l'espace actuel, s'agissant des armements spatiaux qui utilisent l'énergie cinétique, dans le but de détruire ou d'endommager des objets spatiaux. En dépit de propositions pour interdire l'usage et le déploiement de telles armes, ainsi que de l'adoption répétée, par l'Assemblée Générale des Nations Unies, de résolutions visant à endiguer de tels développements, les États se trouvent dans une impasse sur ce sujet. Les récentes déclarations et activités des principaux États contributeurs dans le domaine spatial mettent en exergue la redoutable probabilité que de tels armements soient utilisés dans l'espace, constituant par conséquent un danger pour la paix et la sécurité internationales.

La création d'un nombre considérable de débris spatiaux, qui a suivi les récents tests antisatellites, démontre à quel point l'utilisation d'armements spatiaux cinétiques peut être préjudiciable à l'environnement de l'espace extra-atmosphérique. Face à des États incapables de s'accorder sur la légalité de l'utilisation des armements spatiaux, des solutions peuvent être trouvées au delà des règles de droit spatial existantes. Ce mémoire soutient que le droit international public général, et plus particulièrement le droit international de l'environnement, peut fournir une alternative fiable et effective pour interdire l'usage d'armes spatiales conventionnelles. Par ailleurs, le droit général de l'environnement n'est pas le seul à interdire aux États de s'engager dans des activités qui causent des dommages à l'environnement; le droit des conflits armés regroupe des lois conventionnelles et coutumières, qui interdisent formellement l'utilisation d'armes qui causent des dommages à l'environnement.

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Acronyms

ASAT	Anti-Satellite weapon
CD	Conference on Disarmament
ENMOD	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
ESA	European Space Agency
EU	European Union
FAA	(US) Federal Aviation Authority
IADC	Inter-Agency Space Debris Coordination Committee
ICJ	International Court of Justice
ICRC	International Committee of the Red Cross
ICTY	International Criminal Tribunal for the former Yugoslavia
ILC	International Law Commission
LEO	Low Earth Orbit
LTBT	Limited Test Ban Treaty
NASA	(US) National Aeronautics and Space Administration
NEO	Near Earth Object
NPS	Nuclear Power Sources
OECD	Organisation for Economic Co-operation and Development
OST	Outer Space Treaty
PAROS	Prevention of an Arms Race in Outer Space (UNGA resolution)
PCIJ	Permanent Court of International Justice
PPWT	Treaty on the Prevention of Placement of Weapons in Outer Space
UNCOPUOS	United Nations Committee on the Peaceful Uses of Outer Space
UNEP	United Nations Environmental Programme
UNGA	United Nations General Assembly
UNIDIR	United Nations Institute for Disarmament Research
UNOOSA	United Nations Office of Outer Space Affairs
UNSC	United Nations Security Council
US	United States
VCLT	Vienna Convention on the Law of Treaties

I. Introduction

The fictional 2009 *Case concerning the Deployment and Use of Force in Low Earth Orbit*[1] centres on the outbreak of conflict between the "rich and powerful continental State" of Telesto and the world's largest economy, Fornjot. The trigger is Telesto's continuing political and military support to Daphnis, a former province of Fornjot which, despite having broken away and gained formal independence, Fornjot refuses to recognise as independent. On-going tensions and military skirmishes simmered between the two powerful States, with space technology crucially supporting and enhancing the success of military campaigns on Earth. A tipping point was the unilateral deployment of an anti-satellite weapon system and a space based missile warning and defence system.[2] A series of mishaps and misunderstandings eventually cumulated to targeted attacks against and the destruction of dozens of satellites in outer space…

Though the case described above is fictional, it is not necessarily a fantasy too far off from reality. As one of the last vestiges of the Cold War, the issue surrounding the status of Taiwan remains the major source of tension between the United States, the world's main superpower, and the world's rising economic and political giant, China. While China maintains that Taiwan is an "inalienable" part of the motherland which must be reunified, if necessary by force,[3] the US has since the end of the Second World War committed itself to the protection and defence of the break-away State.[4] The 1995-1996 missile crisis in the Taiwan Strait resulted in the deployment of two US naval fleets to the region, and demonstrated exactly how delicate and potentially explosive the situation can be.[5] Any future escalation or confrontation between the US and China will have devastating consequences on international peace and security, and it is

[1] *Case concerning the Deployment and Use of Force in Low Earth Orbit*, 2009 Manfred Lachs Space Law Moot Court Competition, online: International Institute of Space Law <http://www.iislweb.org/lachsmoot/problems/prob2009.pdf>.
[2] *Ibid.*, para. 17.
[3] Ministry of Foreign Affairs of the People's Republic of China, 'The Taiwan Question and Reunification of China', Taiwan Affairs Office & Information Office, State Council (August 1993), online: Ministry of Foreign Affairs of the People's Republic of China <http://www.fmprc.gov.cn/eng/ljzg/3568/t17792.htm>.
[4] See e.g. "Taiwan Relations Act", Pub. L. 96-8, 10 April 1979, especially Sects. 2(5) and 2(6), which respectively governs it is US policy to "to provide Taiwan with arms of a defensive character" and that the US must maintain the capacity "to resist any resort to force or other forms of coercion that would jeopardize the security, or the social or economic system, of the people on Taiwan".
[5] See e.g. Robert Ross, "The 1995-1996 Taiwan Strait Confrontation: Coercion, Credibility, and Use of Force" (2000) 25 *International Security* 87; and Ian Easton, "The Great Game in Space: China's evolving ASAT Weapons Programs and their Implications for future US Strategy" (2009), online: Project 2049 <http://project2049.net/documents/china_asat_weapons_the_great_game_in_space.pdf>.

clear that increasing reliance on space technology for military campaigns means space assets have the potential to be a target in any future conflict. The testing of China's first anti-satellite weapon (ASAT) in 2007, [6] followed by the US shooting down its own defunct satellite in 2008,[7] only served to underline this potential, and forewarn that it may just be a matter of time before the fictional situation in the *Case concerning the Deployment and Use of Force in Low Earth Orbit* becomes reality...[8]

1. Severe (environmental) consequences of space weaponisation

Though the consequences of outer space becoming a theatre for war cannot be imagined, there is no doubt it is highly undesirable.[9] The deployment and possible use of space weapons can seriously undermine the legal framework governing peaceful activities in outer space that has existed for decades.[10] It will also have a chilling effect on international peace and security tantamount to how the proliferation of nuclear weapons has cast a shadow over international

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[6] See "Concern over China's missile test", *BBC News* (19 February 2007), online: BBC News <http://news.bbc.co.uk/2/hi/asia-pacific/6276543.stm>; and US, Department of Defense, *Annual Report to Congress: Military and Security Development involving the People's Republic of China 2011*, Office of the Secretary of Defense, online: Department of Defense <http://www.defense.gov/pubs/pdfs/2011_cmpr_final.pdf>, at 37. See also Phillip C. Saunders and Charles D. Lutes, 'China's ASAT Test: Motivations and Implications' (2007) 46 *Joint Force Quarterly* 39, at 40.

[7] The US maintains the destruction of USA-193 has "no parallel" with the Chinese ASAT test, for it was intended to destroy the uncontrollable space object to prevent it from crash landing and releasing hazardous fuel which could endanger human life: see "US spy satellite plan 'a cover'", *BBC News* (17 February 2008), online: BBC News <http://news.bbc.co.uk/2/hi/americas/7248995.stm>. Of interest to note, consistent with its obligations under the Liability Convention, the US vowed to pay compensation to any State should debris from the destruction of the satellite land on their territory: see Stephanie Nebehay, "U.S. vows to pay for damage caused by satellite", *Reuters* (15 February 2008), online: Reuters <www.reuters.com/article/2008/02/15/us-usa-satellite-damage-idUSL1587228120080215>.

[8] See UNOOSA, "Meeting International Responsibilities and addressing Domestic Needs", *Proceedings of the United Nations/Nigeria Workshop on Space Law*, UN Doc. ST/SPACE/32 (2006), online: UNOOSA <http://www.oosa.unvienna.org/pdf/sap/2005/nigeria/splawproc05.pdf>, at 37. See also Manfred Lachs, *The Law of Outer Space*: *An Experience in Contemporary Law-Making* (Leiden: Slijthoff, 1972), 105; and generally Nandasiri Jasentuliyana (ed.), *Maintaining Outer Space for Peaceful Uses: Proceedings of a symposium held in The Hague, March 1984* (Tokyo: United Nations University, 1984).

[9] The General Assembly, during its First Special Session on Disarmament, concluded that an arms race in general:

> runs counter to efforts to achieve further relaxation of international tension, to establish international relations based on peaceful coexistence and trust, […] and to develop broad international cooperation and understanding, [Further, the arms race] impedes the realization of the purposes, and is incompatible with the principles of the United Nations Charter.

See generally, UNGA, *Final Document of the Tenth Special Session of the General Assembly*, UN Doc. A/RES/S-10/2 (30 June 1978), para. 12.

[10] Michel Bourbonnière and Ricky Lee, "Legality of the Deployment of Conventional Weapons in Earth Orbit: Balancing Space Law and the Law of Armed Conflict" (2008) 18 *European Journal of International Law* 873, at 876.

relations. Furthermore, and central to the arguments propounded in this thesis, the use of certain space weapons will have dire consequences for the outer space environment.

a) What is a space weapon?

It is useful at the outset to define what is meant by the terms "space weapon" and "space weaponisation", and thereby also limit the scope the discussion of the present thesis. The definition of what is a weapon is already fraught with difficulty,[11] but it generally refers to an object that can be used in an armed conflict to inflict damage or destroy another person or object.[12] The definition of what is a "space weapon" is further complicated by the technological means that are continually under development.[13]

The United Nations Institute for Disarmament Research (UNIDIR) defines a "space weapon" as:

> a device stationed in outer space (including the moon and other celestial bodies) or in the Earth['s] environment designed to destroy, damage or otherwise interfere with the normal functioning of an object or being in the Earth['s] environment.[14]

A space weapon may thus be space-based or terrestrially-based.[15] Particularly in the outer space context, a problem of trying to define what is a weapon is that an object may be designed for one purpose, but then used to achieve another purpose that is capable of inflicting damage or destroying other objects.[16] This thesis will deal exclusively with a space "weapon by nature", which are devices designed specifically with the purpose of destroying or disabling space objects.

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[11] See W. J. Fenrick, 'Space without Weapons', 137-151 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989).
[12] See 'Weapon', *Oxford Dictionaries*, online: <http://oxforddictionaries.com/definition/weapon>.
[13] See Tare C. Brisibe, "Customary International Law, Arms Control and the Environment in Outer Space" (2009) 8 *Chinese Journal of International Law* 375, at 379.
[14] Cited in Andrew T. Park, "Incremental Steps For Achieving Space Security: The Need For A New Way Of Thinking To Enhance The Legal Regime For Space" (2006) 28 *Houston Journal of International Law* 871, at 882.
[15] Peter Stibrany, 'Some Challenges for Verification in Space Arms Control Agreements', 57-65 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989), at 62-63. See also See also "Definition Issues Regarding Legal Instruments On the Prevention of Weaponization of Outer Space", Permanent Mission of the People's Republic of China to the United Nations Office at Geneva and other International Organizations in Switzerland (9 June 2005), online: China-un.ch, <http://www.china-un.ch/eng/cjjk/cjjzzdh/t199362.htm>.
[16] Stephen Gorove, "Space without Weapons: International Legal Aspects of Weapons and Harm", 23-39 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989), at 26-27. See also Brisibe (2009), *supra* note 13, at 378.

The Outer Space Treaty already stipulates prohibitions on the placing or stationing of nuclear weapons and any other kinds of weapons of mass destruction in outer space.[17] Thus, for the purpose of this thesis, devices that rely on thermal-nuclear explosions will not be discussed. Further, weapons of mass destruction will also not be a focus of this thesis.[18] Though the damage caused by a kinetic explosion in outer space is devastating and, as will be elaborated below, will result in the widespread creation and dispersion of space debris,[19] it can hardly qualify as being able to induce a "destructive effect" comparable to that of an atomic, radioactive, or chemical and biological weapon.[20]

A space weapon may inflict damage or destroy another object in outer space by "conventional" means, which involves the ramming, shooting, mining or torpedoing of the target object.[21] Besides such "conventional" weapons which use kinetic energy to destroy or disrupt a space object, there are other weapons which use encryption, jamming or "spoofing" to disable space objects.[22] As this thesis focuses on the environmental impact of the use of a conventional space weapon, namely the creation of debris in outer space following its use, the focus will solely be on a weapon, whether space- or Earth-based, that uses kinetic energy to physically disable or destroy a space object. By default, "space weaponisation" refers to the deployment of

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[17] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 U.N.T.S. 205, 18 U.S.T. 2410, T.I.A.S. No. 6347, 6 I.L.M. 386 (entered into force on 10 October 1967. As of 1 December 2011, there are 100 States Parties and 26 signatories to the Outer Space Treaty.) [hereinafter: *Outer Space Treaty* or *OST*], art. IV [" States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner."]. At the very outset, it was clear that ballistic missiles, including intercontinental missiles which go through space, do not fall under the ambit of the OST, even if they were to carry a nuclear device: see Nicolas Mateesco Matte, *Aerospace Law* (London: Sweet & Maxwell, 1969), at 240-41 and 298-99.

[18] UNGA, *Conclusion of an international convention prohibiting the development, production, stockpiling and use of radiological weapons*, UN Doc. A/RES/34/87A (11 December 1979), Preamble, para. 1.
See also Gorove (1989), at 30.

[19] In the wake of a collision, a debris cloud comprised of up to millions fragmented particles of various sizes ranging from 0.1 to 120 cm in diameter usually forms. On average, a piece of debris travels at a velocity of 10km/s, or 36,000km/hr, and has the potential energy that is over 15 times that of dynamite: Howard A. Baker, *Space Debris: Legal and Policy Implications* (Dordrecht: Martinus Nijhoff Publishers, 1989), at 20-21. See Sect. II-3 below.

[20] D. Goedhuis, "What additional arms control measures related to outer space could be proposed?" in Bhupendra Jasani, ed., *Outer Space—A new Dimension of the Arms Race* (London: Taylor & Francis, 1982), at 306.

[21] Other forms of harm a space weapon can involve the use of directed energy, nuclear energy, electronic/optical interference or sabotage: see Peter C. Hughes, Kieran A. Caroll and Wayne G. Sincarsin, 'Classification and Verification of Weapons in Space, 5-14 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989), specifically at 9.

[22] Elizabeth S. Waldrop, "Weaponization of Outer Space: US National Policy" (2005) 29 *Annals of Air and Space Law* 329, 336-338. In fact, Rebecca Johnson notes, compared to low tech and low cost alternatives of jamming or electronic hacking of space assets, it is unlikely a State would opt for a physical attack: see Rebecca Johnson, "Security without Weapons in Space: Challenges and Options" (2003(1)) *Disarmament Forum* 53, at 56.

conventional space weapons in outer space. What this thesis will argue is that if the use of a particular weapon is prohibited under law, then its deployment must also be illegal.[23] The deployment of a space weapon, even if it is not used is enough to destabilise international relations and confidence between States. Indeed, the latest report by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) also highlighted a current major concern in outer space is the placement of *conventional* space weapons and the lack of "efficient measures to prevent any possibility of an arms race in outer space".[24]

b) Use of conventional space weapon and the creation of space debris

As to why the focus of the thesis is on conventional space weapons, the recent ASAT tests by China and US are instructive. In both tests, space objects stationed in outer space were destroyed by devices located on and launched from Earth, therefore both devices utilised satisfy the definition cited above of what the UNIDIR would term a space weapon. Of particular interest, and especially with regards to the Chinese ASAT test,[25] the use of these types of conventional space weapons demonstrated once again that a significant amount of space debris will be created, and that this debris will linger in the outer space environment for decades, if not centuries to come (see Section II-3 below). Indeed, the amount of debris created after the destruction of the Chinese weather satellite was equal to almost half of all satellite breakup debris in orbit since the space age began.[26]

To sum up, the use of any conventional space weapon will add to the already dire problem of space debris, and consequently enhance the danger of the Earth becoming encased by

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[23] Indeed, the Court in *Legality of Nuclear Weapons* observed "no State—whether or not it defended the policy of deterrence –suggested to the Court that it would be lawful to threaten to use force if the use of force contemplated would be illegal": *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion) [1996] *ICJ Rep* 226 [hereinafter: *Legality of Nuclear Weapons*], 246, para. 47.

[24] See e.g. UNCOPUOS, *Report of the Legal Subcommittee on its fiftieth session, held in Vienna from 28 March to 8 April 2011*, UN Doc. A/AC.105/990 (20 April 2011), paras. 39-40. See also UNCOPUOS, *Draft Report of the Committee on the Peaceful Uses of Outer Space, Fifty-fourth session, held in Vienna, 1-10 June 2011*, UN Doc. A/AC.105/L.281/Add.1 (6 June 2011), paras. 20 and 23-24. See also Joel Primack, "Pelted by Paint, Downed by Debris" (2002) 58 *Bulletin of the Atomic Scientists* 24, at 24.

[25] See generally 'Chinese ASAT Test', *CelesTrak*, available online at: CelesTrak <http://celestrak.com/events/asat.asp>. At the end of December 2006, the number of traceable debris objects belonging to China was merely 334, whereas by July 2007, six months after the ASAT test, this number had increased to 2234: Data from the October 2006 and July 2007 issues of the *Orbital Debris Quarterly News*. Respectively available online: NASA <http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv11i1.pdf> and <http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv11i3.pdf>.

[26] See January 2008 issue of the *Orbital Debris Quarterly News*, at 2-3, especially figures 1 and 2, online: NASA <http://www.orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv12i1.pdf>.

debris that makes it "highly hazardous" to use space for whatever purpose.[27] As the outer space environment is unique and fragile,[28] the intentional destruction of space objects through the use of conventional space weapons will pose a great danger to space activities in the years to come,[29] and thereby undoubtedly threaten the right of States to safely and freely explore and use outer space.

2. Attempts to tackle space weaponisation

The United Nations, as the closest embodiment of the consensus of the international community, is equipped with the mandate to address the issue of the weaponisation of outer space.[30] However, attempts at addressing the matter have stalled and waned. Since the early 1980s, the United Nations General Assembly has annually passed a resolution reminding the international community that the "prevention of an arms race in outer space would avert a grave danger for international peace and security".[31] The Conference on Disarmament (CD) is burdened with the "primary role" of negotiating a multilateral agreement "on the prevention of an arms race in outer space in all its aspects",[32] but the body remains deadlocked on the issue. To date, China and Russia have together proposed a draft Treaty on the Prevention of Placement of Weapons in Outer Space (PPWT) to ban all space-based weapons.[33] The European Union (EU) has proposed a Code of Conduct for Outer Space Activities, which calls upon States to take "all measures to

[27] Primack (2002), *supra* note 24, at 24.
[28] See e.g. Marietta Benkö, "The Problem of Space Debris: A Valid Case Against the Use of Aggressive Military systems in Outer Space?" in M. Benkö & K. U. Schrogl (eds.), *Current Problems and Perspectives for Future Regulation* (Utrecht: Eleven International, 2005).
[29] See Statement by Karen E. House, *United States Public Delegate to the 63rd Session of the United Nations General Assembly, Delivered in the Debate on Outer Space (Disarmament Aspects) of the General Assembly's First Committee*, 20 October 2008, US Mission Geneva online at: <http://geneva.usmission.gov/CD/updates/1020OuterSpace.html>. On the issue of the Chinese ASAT test, the US representative said that the debris caused "will pose a hazard to human spaceflight and satellites well into the Twenty-Second Century", see also D. J. Kessler, "Collisional Cascading: The Limits of Population Growth in Low Earth Orbit" (1991) 11 *Advances in Space Research* 63.
[30] Jackson Nyamuya Maogoto and Steven Freeland, "From Star Wars to Space Wars— The Next Strategic Frontier: Paradigms to Anchor Space Security" (2008) 33 *Journal of Air and Space Law* 10, at 19.
[31] See e.g. UNGA, *Prevention of an arms race in outer space*, UN Doc. A/RES/63/40 (2 December 2008).
[32] UNGA, *Prevention of an arms race in outer space*, UN Doc. A/RES/63/40 (2 December 2008), para. 5.
[33] CD, *Letter dated 12 February 2008 from the Permanent Representative of the Russian Federation and the Permanent Representative of China to the Conference on Disarmament addressed to the Secretary General of the Conference transmitting the Russian and Chinese texts of the draft "Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT)" introduced by the Russian Federation and China*, UN Doc. CD/1839 (29 February 2008) [hereinafter: PPWT].

prevent space from becoming an area of conflict".[34] However, the United States has consistently maintained it opposes any "arms control concepts, proposals and legal regimes" which jeopardises the right of the US to "conduct research, development, testing and operations in space for military […] purposes".[35]

3. Thesis outline

In the light of such divergent, and perhaps irreconcilable, opinions on the subject matter of the weaponisation of outer space, attention is better turned to other fields of the law that may offer an alternative solution to preventing the weaponisation of outer space. Indeed, Article III of the Outer Space Treaty obliges States to carry out space activities in accordance with general international law. This thesis argues that a fundamental component of law to which States must have regard are obligations found under international environmental law.

That the deployment and use of certain weapons must have regard to its impact on the natural environment has its basis in the International Court of Justice's *Legality of Nuclear Weapons* Advisory Opinion. There, the Court recalled the use of weapons, whether in peace time or during armed conflict, must be balanced against "existing norms relating to the safeguarding and protection of the environment".[36] The International Law Commission (ILC) has also recognised that the failure of a State to protect "the most essential common property of mankind", including the outer space environment, for future generations constitutes an exceptionally serious

[34] EU, *Draft Code of Conduct for Outer Space Activities, as approved by the Council on 8-9 December 2008, Council of the European Union, Brussels*, 17 December 2008, No. 17175/08, PESC 1697, CODUN 61., Article. 2

[35] CD, *Letter dated 19 August 2008 from the Permanent Representative of the United States of America addressed to the Secretary General of the Conference Transmitting Comments on the Draft "Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT)" as contained in Documents CD/1839 of 29 February 2008*, UN Doc. CD/1847 (2008), at 8.

[36] *Legality of Nuclear Weapons, supra* note 23, paras. 27 and 33. Specific reference is made to the Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) (entered into force on 8 June 1977. As of 1 December 2011, there are 171 State Parties and 4 signatories to Additional Protocol I.) [hereinafter: *Additional Protocol I*], and the 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (10 December 1976), UN Doc. A/RES/31/72 (entered into force on 5 October 1978. As of 1 December 2011, there are 76 States Parties and 48 signatories to ENMOD.) [hereinafter: ENMOD]; as well as UN, "Declaration of the United Nations Conference on the Human Environment" in *Report of the United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972*, UN Doc. A/CONF.48/14/Rev.1 [hereinafter: *Stockholm Declaration*] (specifically Principle 21) and UN, *Report of the United Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, Annex I, "Rio Declaration on Environment and Development", UN Doc. A/CONF.151/26 (Vol. I) (1992) [hereinafter: *Rio Declaration*] (specifically Principle 2). See below Sects. IV and V.

internationally wrongful act.[37] Furthermore, the obligation to take care of the environment and avoid "harmful interference with [space] activities of" other States is underlined in Article IX of the Outer Space Treaty. Indeed, as Manfred Lachs opined, the freedom of activity in outer space "is determined by the right and interest of other States" and the international community at large.[38]

This thesis intends to delve into elements of what has just been outlined above. Section II provides an overview of actions and opinions of major space-faring States in recent years, which serves to underline why, more than ever before, there is a heightened potential of outer space becoming weaponised. This is followed by an elaboration of the space debris problem and how it relates to the environmental impact of the prospective use of conventional space weapons.[39] Section III outlines existing restrictions and gaps in the arms control of outer space, highlighting the situation of an impasse in the debate surrounding the weaponisation of outer space.

The focus will then shift to international environmental law in Section IV, and it will be argued that conventional and customary laws governing the protection of the environment must be respected by all States in all their activities, even in outer space. As the use of a space weapon will most likely occur in the context of an armed conflict, relevant conventional and customary laws of international humanitarian law governing the protection of the environment in armed conflict will be analysed under Section V.

A conclusion will sum up the arguments made, and assess whether environmental law is adequate, in itself or as an alternative, to prevent space weaponisation and an arms race in outer space. Throughout the thesis, use will be made of primary sources, such as international conventions and original UN documents, as well as secondary sources, including academic writings by publicists in the field of international space law and international environmental law, and international humanitarian law.

[37] ILC, "Report of the International Law Commission on the work of its twenty-eighth session, 3 May-23 July 1976", 1976 *Yearbook of the ILC*, Vol. II(2), UN Doc. A/31/10, 108-109.
[38] Lachs (1972), *supra* note 8, at 117.
[39] Nuclear weapons and weapons of mass destruction will not be the focus of this thesis, for these weapons are expressly banned under Art. IV of the Outer Space Treaty.

II. Setting the Stage

1. Seriousness of the space weaponisation today

Already in the 1986 at the Conference on Disarmament, delegates underlined that no State "should develop, test or deploy space weapons *in any form*", and that an agreement on the "complete prohibition of space weapons should be concluded […] as soon as possible".[40] In 2011, the UNCOPUOS again underlined that there is currently no adequate legal mechanism to prevent the weaponisation of outer space.[41] In the latest Resolution, the General Assembly again recalled that the "importance and urgency" of preventing an arms race in outer space poses,[42] which if not realised will present "a grave danger for international peace and security".[43]

Till this day, as far as the international community knows, space remains unweaponised. The situation can be credited in part to the restraint of space faring powers,[44] but also due to the fear of triggering an arms race if any one State were to be discovered unilaterally deploying weapons in outer space. Space weaponisation allows a State the ability to engage in "instantaneous and simultaneous" attacks anywhere, whether on Earth against terrestrial targets, or in space against space assets.[45] Once a State possesses space weapons, it also possesses an unprecedented and almost uninhibited strategic advantage that other States will inevitably want

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[40] CD, *Final Record of the 350th Plenary Meeting*, UN Doc. CD/PV.350 (1986) [emphasis added].
[41] UN Doc. A/AC.105/L.281/Add., *supra* note 24, at 9, para. 47. This sentiment is also echoed in the Legal Subcommittee: see UN Doc. A/AC.105/990, *supra* note 24, at 9, para. 39. See also Nina Tannenwald, "Law versus Power on the High Frontier: The Case for a Rule-Based Regime for Outer Space" (2004) 29 *Yale Journal of International Law* 363, 372.
[42] UNGA, *Prevention of an arms race in outer space*, UN Doc. A/66/410 (10 November 2011), para. 1.
[43] *Ibid.*, Preamble, para. 7. As early as UNISPACE-82, it was noted that the "extension of an arms race into outer space is a matter of grave concern to the international community": see UNISPACE 1982 Report, para. 13, cited in US, *UNISPACE '82: A Context for International Cooperation and Competition* (US Government Printing Office: Washington, D.C., 1983), at 65 [emphasis added].
[44] Tannenwald (2004), *supra* note 41, at 402 and 414.
[45] Peter Hays, "The Evolving Military Use of Space", Day without Space presentation, 19 July 2011, online: Marshall Institute <http://www.marshall.org/pdf/materials/969.pdf>. As Tannenwald (2004), *supra* note 41, at 399, writes:

> In terms of their geostrategic impact, space-based weapons do not simply enhance existing threats but introduce a new and greater danger because of the threat they pose to strategic stability. The vulnerability of space-based weapons will likely create incentives for preemptive attack to protect the weapons during a crisis, greatly increasing the likelihood of war. Further, although supporters of space weapons claim that […] such weapons would be for defensive purposes, the reality is that, given their characteristics, many of them are inherently offensive weapons.

to match.[46] As Theresa Hitchens underlines it is "inconceivable" that either China or Russia would allow the US to become the sole possessor of space weapons, and other countries will also join the foray so as not to fall behind.[47]

Due to recent activities and the shifting opinions of leading space faring States, this long-standing restraint may be subject to "imminent collapse".[48] The current climate with regard to space activities is one in which States are under a legal regime "shaped largely by unilateral interpretation of general principles combined with informal rules of the road".[49] It is this "muddling through" scenario which Tannenwald warns will be unable to balance the varied interests in outer space, and which will eventually lead to a destabilising situation detrimental to overall stability and build-up of trust in the international community.[50] Maogoto and Freeland note that with renewed interest in exploring outer space, there is increasing competition, perhaps even tension, between spacefaring powers.[51] Given the "serious legal deficit"[52] in concrete and effective laws to restrict, let alone prohibit, the weaponisation of outer space, the passage of time and technological advances may likely result in a situation where space itself becomes the very theatre of war.[53]

An inclination toward space weaponisation is today even more acute, and the fears have been accentuated by pronouncements of US policy.[54] A 2011 US Department of Defense report noted that space has become "increasingly congested, contested, and competitive".[55] With the growing dependence on space systems for civilian and military purposes, vital national and

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[46] Bruce M. DeBlois, "Space Sanctuary: A viable National Strategy" (1998) 12(4) *Airpower Journal* 41, at 50. cf. Steven Lambakis, 'Putting Military Uses of Space in Context' in James Clay Moltz, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Monterey, CA: Mountbatten Centre for International Studies, 2002), at 26-27.

[47] Theresa Hitchens, 'Space Weapons: more security or less?' in James Clay Moltz, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Monterey, CA: Mountbatten Centre for International Studies, 2002), 28.

[48] Tannenwald (2004), *supra* note 41, 422.

[49] *Ibid.*, 378.

[50] *Ibid.*, 381.

[51] Maogoto and Freeland (2008), *supra* note 30, at 10-11. See also US, Department of Defense, *National Security Space Strategy: Unclassified Summary*, (January 2011), online: Department of Defense <http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf> [hereinafter: *National Security Space Strategy*], at 1.

[52] Maogoto and Freeland (2008), *supra* note 30, 36.

[53] *Ibid*.

[54] See e.g. Tannenwald (2004), *supra* note 41, 364. US, US Space Command, *Long Range Plan: Implementing USSPACECOM Vision for 2020* (April 1998), online: Federation of American Scientists <http://www.fas.org/spp/military/docops/usspac/lrp/toc.htm>, especially chs. 5-6.

[55] *National Security Space Strategy*, *supra* note 51, at 1.

strategic interests will become vulnerable if a State's space infrastructure is threatened or destroyed.[56] In order to ensure "space superiority",[57] the US Air Force Space Command noted the importance of developing the ability to both negate an adversary's ability to exploit space and the ability to "execute missions with weapons systems operating from or through space".[58] In the words of the former US Undersecretary of the Air Force, if the US does not weaponise outer space, "an enemy will".[59]

This aspiration to weaponise space before other States echoes sentiments already expressed by the 2001 Rumsfeld Report, which warned of a "Space Pearl Harbor"—the prospect of an attack against US space systems by States or entities with hostile intentions.[60] While short of mentioning the word 'weapon' in outer space, the Rumsfeld Report urges the development of means to "deter and to defend against hostile acts in and from space" in order to maintain and ensure the US' "continuing superiority" over the final frontier.[61] While noting there is no "blanket prohibition in international law on placing or using weapons in space",[62] the Rumsfeld Report also objected to repeated resolutions adopted by the General Assembly calling for the prevention of an arms race in outer space.[63]

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[56] *Ibid.*, at 3.
[57] US Air Force Space Command, *Strategic Master Plan FY06 and Beyond* (1 October 2003) [hereinafter: *Strategic Master Plan*], at 34.
[58] *Ibid.*, at 2. See also: *Background Paper: "Peaceful" and Military Uses of Outer Space: Law and Policy*, Institute of Air and Space Law, McGill University (2005), online: IASL <http://www.e-parl.net/pages/space_hearing_images/BackgroundPaper%20McGill%20Outer%20Space%20Uses.pdf>, at 3-4.
[59] Jack Kelly, 'U.S. the leader in war plans for space', *Pittsburgh Post-Gazette* (28 July 2003), online: Global Security <http://www.globalsecurity.org/org/news/2003/030728-space01.htm>. Tannenwald (2004), *supra* note 41, warns of the consequences of believing in the "inevitability" of the weaponisation of outer space, which will result in a self-prophesising prophecy: at 401-403.
[60] US, Department of Defense, *Report of the Commission to Assess United States National Security Space Management and Organization* (11 January 2001), online: Department of Defense <http://www.dod.gov/pubs/space20010111.pdf> [hereinafter: *Rumsfeld Report*], at xiii-xiv and 23-25. See generally Chapter 2 "Space: Today and the Future" of the Report. See also Tannenwald (2004), *supra* note 41, 366.
[61] *Rumsfeld Report*, *supra* note 60, at 100.
[62] *Ibid.*, at 37. See also *Strategic Master Plan*, *supra* note 57, at 35; and Tannenwald (2004), *supra* note 41, 377. According to the US, the only restrictions pertain to the 1963 Limited Test Ban Treaty, which prohibits "any nuclear weapon test explosion, or any other nuclear explosion" in outer space; the 1967 Outer Space Treaty, which prohibits the placing weapons of mass destruction in space or on the moon or other celestial bodies, and prohibits using the moon or other celestial bodies for any military purposes; the 1972 Anti-Ballistic Missile (ABM) Treaty, which prohibits the development, testing, or deployment of space-based components of an anti-ballistic missile system; a number of arms control treaties which prohibit the US and Russia from interfering with the other's use of satellites for monitoring treaty compliance; and the 1972 Environmental Modification Convention prohibits all hostile actions that might cause actions that might cause "long-lasting, severe or widespread" environmental damage in space (see Sect. V-1-a below).
[63] *Rumsfeld Report*, *supra* note 60, at 37-38.

A number of events over the last decade hint at possible steps towards weaponisation. The US withdrawal from the Anti-Ballistic Missile Treaty in 2002[64] effectively signaled the end of a regime which for almost three decades prohibited the testing or deployment of weapons in outer space.[65] The withdrawal renewed impetus for the US to complete a ballistic missile defence system to protect the homeland as well as allies around the world. As one commentator noted, instead of contributing to security, ballistic missile defence may arguably place all space assets, including the ones a State intends to secure from adverse attacks or interference, at even greater risk.[66] The ASAT tests in 2007 and 2008 served only to heighten, and not defuse, the possible tendency toward space weaponisation.

[64] US, Department of State, Colin Powell, *Statement on the Achievement of the Final Reductions under the START Treaty* (2001), online: US State Department <http://www.state.gov/secretary/former/powell/remarks/2001/dec/6674.html>.

[65] Johannes M. Wolff, "'Peaceful Uses' of Outer Space has permitted its Militarization—Does it also mean its Weaponization?" (2003) 1 *Disarmament Forum: Making Security in Space* 5, at 11; see also Jonathan Dean, "Defences in Space: Treaty Issues" in James Clay Moltz, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Monterey, CA: Mountbatten Centre for International Studies, 2002), at 4; and Tannenwald (2004), *supra* note 41, at 367.

[66] Primack (2002), *supra* note 24. See also David Grahame, *A Question of Intent*: *Missile Defense and the Weaponization of Space*, British American Security Information Council (1 May 2002), online: BASIC <http://www.basicint.org/sites/default/files/PUB010502.pdf>.

2. The Weaponisation of Outer Space and Space Debris Problem

Attention will now turn to the major concern surrounding space weaponisation, namely the issue of space debris, which as the recent ASAT tests have demonstrated, is an immediate by-product of any use of a kinetic weapon against a space object. Before discussing why the weaponisation of outer space greatly increases the risk of adding to the amount of space debris that already exists, and thereby hinder the peaceful exploration and use of outer space, the definition of what is "space debris" will first be explored.

a. Definition of "space debris"

As the use of *conventional* space weapons will invariably result in the creation of space debris, it is useful to turn to what is meant by, and what constitutes as, "space debris".[67] The UNCOPUOS' Scientific and Technical Subcommittee came up with the following definition at its thirty-second session:

> Space debris are all manmade objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized. [68]

[67] Note that the United States differentiates between "orbital debris" and "space debris". Whereas the former can be used to denote any manmade object in orbit, space debris has a broader definitional scope that can also denote naturally occurring objects such as meteorites: see US, *Interagency Report on Orbital Debris*, Office of Science and technology Policy, The White House (November 1995) [hereinafter: *Interagency Report on Orbital Debris*], at 3; see also UNCOPUOS, *Committee on the Peaceful Uses of Outer Space, Legal Subcommittee, 665th Meeting*, UN Doc. COPUOS/LEGAL/T.665 (8 April 2002), at 9. For consistency and to avoid confusion in the terminology, the term "space debris" will be used throughout this thesis. Of interest to note, Howard Baker makes a finer definition, and refers to the concept of "space refuse" to refer to :

> those man-made objects in outer space deemed to be valueless, as evidenced by an absence of operational control, and includes inactive payloads, operational debris, fragmentation debris and microparticulate matter.

See Howard A. Baker, "The ESA and US Reports on Space Debris: Platform for Future Policy Initiatives" (1990) 6 *Space Policy* 332, at 336.

[68] Despite this long-winded and detailed definition, for a long time there was no consensus on this matter in the UNCOPUOS: see *Technical Report on Space Debris: Text of the Report adopted by the text of the report adopted by the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space* UN Doc. A/AC.105/720 (1999) [hereinafter: *Technical Report on Space Debris*], at para. 6. Carl Christol would argue that "debris" is a "popular rather than legal term": see Carl Q. Christol, *The Modern International Law of Outer Space* (New York: Pergamon Press, 1982), at 130.

Since 2002, the Inter-Agency *Space* Debris Coordination Committee[69] came up with a simplified definition, and denotes "all man made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional".[70] This definition has also been accepted through consensus in the UNCOPUOS as of 2007.[71]

b. Regulating Space Debris

The problem of space debris was first identified in the UNCOPUOS in 1977, but only as a side issue related to the foreseeable crowding of the geostationary orbit.[72] In 1992, the General Assembly urged States to pay more attention to "the protection and the preservation of the outer space environment",[73] and specifically, attention should be paid to the problem of collisions of space objects with space debris.[74] A year later, the matter of space debris was added to the agenda of the Scientific and Technical Subcommittee.[75]

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[69] The Inter-Agency Space Debris Coordination Committee (IADC) includes Japan Aerospace Exploration Agency (JAXA), the National Aeronautics and Space Administration (NASA) of the United States, European Space Agency (ESA), the Russian Federal Space Agency (ROSCOSMOS), the China National Space Administration (CNSA), the British National Space Centre (BNSC), the Centre national d'études spatiales (CNES) of France, the Indian Space Research Organisation (ISRO), the Italian Space Agency (ASI), the German Aerospace Centre (DLR), as well as the National Space Agency of Ukraine (NSAU): See online, IADC <http://www.iadc-online.org/index.cgi> .

[70] IADC, *Space Debris Mitigation Guidelines*, 15 October 2002, at Sect. 3.1. The *European Code of Conduct for Space Debris Mitigation*, 28 June 2004, also adopts this definition: see CNSA <http://www.cnsa.gov.cn/n615708/n676979/n676983/n893604/appendix/2008529151013.pdf>, at 13. Dr. Gabriel Lafferranderie, the representative of the European Space Agency to the UNCOPUOS, noted that a definition, especially a legal one, is extremely important, and must "[take] into account the changes in space activities": see UN Doc. COPUOS/LEGAL/T.665, *supra* note 67, at 8.

[71] These guidelines became part of Annex IV of the UNCOPUOS, *Report of the Scientific and Technical Subcommittee on its forty-fourth session, held in Vienna from 12 to 23 February 2007*, UN Doc. A/AC.105/890 (6 March 2007), at 42.

[72] Luboš Perek, "Space Debris at the United Nations" (2002) 2 *Space Debris* 123, 124. At 132, Perek describes how many commercial satellites are not being re-orbited into disposal orbits due to the lack of (financial) incentive, and a lack of concern for the "fragility of the GEO environment". G. C. M. Reijnen discuses in depth the problem of crowding and pollution in the GEO environment: see "Environmental Pollution of Outer Space, in particular of the Geostationary Orbit" (1987) 30 *Colloquium on the Law of Outer Space* 155; see also Ram S. Jakhu, "Space Debris in the Geostationary Orbit: A Major Challenge for Space Law" (1992) 17 *Annals of Air and Space Law* 313. Detlef Alwes, Marietta Benkö and Kai-Uwe Schrogl trace the first identification of the space debris problem back to the Apollo programme of the late 1960s: see 'Space Debris: an Item for the Future', 233-270 in Marietta Benkö and Kai-Uwe Schrogl (eds.), *International Space Law in the making: Current Issues in the UN Committee on the Peaceful Uses of Outer Space* (Gif-sur-Yvette: Editions Frontiéres, 1993), at 243-244.

[73] UNGA, *International Cooperation in the Peaceful Uses of Outer Space*, Res. 47/67, UN Doc. A/RES/47/67 (14 December 1992), para. 23. It is interesting to note that the timing of this resolution was a few months after the Rio Declaration in June of 1992.

[74] *Ibid.*, para. 24. In the Preamble to the resolution, space debris is cited as a "concern to all nations": Preamble, para. 8.

[75] UNGA, *International Cooperation in the Peaceful Uses of Outer Space*, Res. 48/39, UN Doc. A/RES/48/39 (10 December 1993), paras. 8-9. See also Aldo Armando Cocca, "The Chicago Convention and Technological Developments in Air and Space" (1994) 19 *Annals of Air and Space Law* 135, at 144; see Jitendra S. Thaker, "Latest

At the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), delegates recognised the "collective duty of the international community to adopt measures to limit [the] generation of space debris", and underlined the "pressing question of space debris" was not specifically dealt with in existing space law treaties.[76] Especially developing countries[77] were concerned with the need to protect the near-Earth space and outer space environments, and they called for mitigation measures for space debris.[78] Similar concerns about the problem of space debris and its relation to the protection and preservation of the outer space environment has further been repeatedly emphasised at the Legal Subcommittee of the UNCOPUOS.[79] In 2009, the UNCOPUOS recognised that space debris "threatened access to and the use of outer space in both the short term and the long term".[80] The issue is so pervasive that special attention is paid to it in the 2010 US National Space Policy.[81]

The existing space law treaties are silent on the matter of space debris,[82] and the closest reference to debris is "space object". Article I(d) of the Liability Convention defines a "space

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Developments in the work of the Committee on the Peaceful Uses of Outer Space" (1995) 20(II) *Annals of Air and Space Law* 357, at 360.

[76] UN, *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999*, UN Doc. A/CONF.184/6, (18 October 1999), at para. 474. See also Perek (2002), *supra* note 72, at 131.

[77] Nandasiri Jasentuliyana, "The Role of Developing Countries in the Formulation of Space Law" (1995) 20(II) *Annals of Air and Space Law* 95, 125-126.

[78] See Resolution 1: The Space Millennium: Vienna Declaration on Space and Human Development, para. 1(c)(ii) in UN Doc. A/CONF.184/6, *supra* note 76.

[79] UNCOPUOS, *Report of the Legal Subcommittee on its forty-eighth session*, UN Doc. A/AC.105/935 (20 April 2009), at para. 155. Bringing the matter of space debris to the Legal Subcommittee had already been suggested by Böckstiegel in 1985: see comments by Karl-Heinz H. Böckstiegel in "Summary of Discussion" (1985) 28 *Colloquium on the Law of Outer Space* 288, at 289. Already in 2000, the Scientific and Technical Subcommittee of UNCOPUOS noted "that international cooperation is needed to expand appropriate and affordable strategies to minimize the potential impact of space debris on future space missions": UN, *Report of the Scientific and Technical Subcommittee on its 37th session, held in Vienna from 7 to 18 February* 2000, UN Doc. A/AC.105/736 (25 February 2000), at para. 95.

[80] UNCOPUOS, *Report of the Committee on the Peaceful Uses of Outer Space*, UN Doc. A/64/20 (2009), para. 109. Not only does the space debris problem affect outer space by their physical presence, it has also been suggested that debris can affect radiation levels in orbits around the Earth, and can even damage the Earth's upper atmosphere: see Jennifer M. Seymour, "Containing the Cosmic Crisis: A Proposal for Curbing the Perils of Space Debris" (1997-1998) 10 *Georgetown International Environmental Law Review* 891, at 897-898.

[81] US, *National Space Policy 2010*, White House, 28 June 2010, available online: White House <http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf>, at 7-8.

[82] In fact, Detlef Alwes, Marietta Benkö and Kai-Uwe Schrogl recommend the adoption of a number of principles relating to space debris based on the precedence set by the Principles on the Use of Nuclear Power Sources in Outer Space: see Alwes, Benkö and Schrogl (1993), *supra* note 72, at 258-259. Principle 8 of the NPS Principles (UNGA, Res. 47/68, UN Doc. A/RES/47/68 (14 December 1992) can be copied wholesale, and NPS substituted with space debris. Principle 8 stipulates:

object" as "component parts of a space object as well as its launch vehicle and parts thereof".[83] This definition can be interpreted as covering all human-made debris, which is the non-functional components part or remnant of any space object.[84]

The Outer Space Treaty stipulates that a State which launches or procures the launch of an object into outer space is internationally liable for damage to another State.[85] A launching State is liable to pay compensation for damage caused by its space object.[86] Further, ownership of a space object, including their component parts, regardless of whether it is functioning or not, and irrespective their presence in outer space or return to Earth, is retained by the State which registers the object.[87] Thus, liability for damage by a space object, and by extrapolation debris if the object is no longer functioning, can hereby be traced back to the launching State or the State of Registry.[88] Though in principle any component part must originate from a particular space object, and therefore must belong to a particular State (or States), the problem is often identifying where the component part comes from, and thus to which State that debris belongs to, especially if it is small in size.

> In accordance with article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, States shall bear international responsibility for national activities involving the use of nuclear power sources in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that such national activities are carried out in conformity with that Treaty and the recommendations contained in these Principles. When activities in outer space involving the use of nuclear power sources are carried on by an international organization, responsibility for compliance with the aforesaid Treaty and the recommendations contained in these Principles shall be borne both by the international organization and by the States participating in it.

[83] Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187, T.I.A.S. No. 6347, 6 I.L.M. 386 (entered into force on 1 September 1972. As of 1 December 2011, there are 90 States Parties and 23 signatories to the Liability Convention) [hereinafter: Liability Convention], art. I(d). See also Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15, T.I.A.S. No. 8480, 14 I.L.M. 43 (entered into force on 15 September 1976. As of 1 December 2011, there are 55 States Parties and 4 signatories to the Registration Convention.) [hereinafter: Registration Convention], art. I(b).

[84] Alwes, Benkö and Schrogl (1993), *supra* note 72, at 256-257. Indeed, the 1990 US Congress report on space debris noted that a precise legal definition of space debris may not be necessary if the term can be subsumed under existing the space law treaty definition of "space object": US Congress, Office of Technology Assessment, *Orbiting Debris: A Space Environmental Problem-Background Paper*, OTA-BP-ISC-72 (Washington, DC: US Government Printing Office, 1990) [hereinafter: *Orbiting Debris: A Space Environmental Problem Background Paper*], 27.

[85] OST, *supra* note 17, art. VII.

[86] The degree of liability is determined by where the damage takes place: see Liability Convention, *supra* note 83, arts. II and III.

[87] OST, *supra* note 17, art. VIII.

[88] Registration Convention, *supra* note 83, art. I(c).

The Rescue and Return Agreement indirectly could be interpreted to regulate the creation or identification of space debris. In principle, Article 5(4) of the Rescue and Return Agreement provides that if a State recovers a space object or its component that is of a "hazardous or deleterious nature" in part in its territory or elsewhere, that State *may* notify the launching authority.[89] It is not problematic if the space object or "its component" (read: space debris) is recovered on Earth or if the size of the space object is relatively large and has been readily identified. But it becomes problematic when the space object is recovered "elsewhere", which can safely be presumed to include outer space. Christol notes that in outer space, States may not necessarily want to undergo the costly operation of recovering such a hazardous object.[90] Sometimes, especially if the size of the object is too small, the identification of which State the object belongs to is difficult, if not impossible, let alone is it feasible to notify the launching authority once recovery has taken place.[91] Indeed, a State may even be prohibited to interfere with a space object without consent from the State of registry, which retains jurisdiction and control over a space object while it is in space regardless of where the object is located.[92] Though the Registration Convention obliges States to notify the UN Secretary-General about a space object which has been but is no longer in orbit,[93] this provision and other space treaties do not oblige States to recover or dispose of any component part of a previously functioning object.[94]

At the national level, States have been more proactive since the 1990s to tackle to matter of space debris. Japan, as early as 1996, adopted a debris mitigation standard,[95] while the United States similarly adopted the Orbital Debris Mitigation Standard Practices.[96] The Mitigation

[89] Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, 22 April 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 (entered into force on 3 December 1968. As of 1 December 2011, there are 92 States Parties and 24 signatories to the Rescue Agreement.) [hereinafter: Rescue and Return Agreement]; see also C. Q. Christol, "Suggestions for Legal Measures and Instruments dealing with Debris", 257-286 in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), at 266.

[90] Indeed, the cost of recovery or salvaging an object is "overwhelming": see Christol (1990), *supra* note 89, 271.

[91] *Ibid.*, 264-265

[92] OST, *supra* note 17, art. VIII.

[93] Registration Convention, *supra* note 83, art. IV(3).

[94] Christol (1990), *supra* note 89, at 278-279.

[95] See UNCOPUOS, *Space Debris Mitigation Mechanism in Japan* (2009), online: UNCOPUOS <http://www.oosa.unvienna.org/pdf/pres/lsc2009/pres-05.pdf>.

[96] See US, *United States Government Orbital Debris Mitigation Standard Practices*, online: NASA <http://orbitaldebris.jsc.nasa.gov/library/USG_OD_Standard_Practices.pdf> [hereinafter: *US Orbital Debris Mitigation Standard Practices*]. The United States Government Standard Practices were drafted in 1997 and adopted

Standard Practices deal with the release of debris during the 'normal' operation of a space object, and also deal with risks of debris creation through collisions or accidental explosions.[97] Further, the Mitigation Standard Practices also provide guidelines for disposing of a space object at the "end of mission life to minimize impact on future space operations".[98] The European Space Agency (ESA) similarly promulgated a European Code of Conduct for Space Debris Mitigation, adherence to which is however "voluntary".[99] The European Code of Conduct for Space Debris Mitigation does stipulate that intentional destruction of "a space system or its parts" is prohibited.[100]

At the UNCOPUOS, some States are of the view that a non-binding set of guidelines governing the mitigation of space debris is not sufficient to promoting and ensuring the safe and peaceful use of outer space.[101] Indeed, there is as yet no prohibition against generation vast amounts of space debris. Even so, the guidelines provide valuable insight into what States perceive to be acceptable conducts of behaviour which ensures stability in outer space, and reduces the "likelihood of friction and conflict".[102] Attention will now turn to just how serious the space debris problem is currently.

3. Space debris: a clear and present danger

When a simple fleck of paint can make a dent on the window of the space shuttle, it is easy to understand why US astronaut Sally Ride warned it would be "disastrous" to place weapons and ASATs in space.[103] Space debris, due to their very presence, and the speed at which they orbit the Earth, pollute the outer space environment[104] and "prejudice valid human uses" of outer

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by the US Government in 2000: see UNCOPUOS, *National research on space debris, safety of space objects with nuclear power sources on board and problems relating to their collision with space debris*, UN Doc. A/AC.105/789/Add.1 (17 March 2003), para. 5.

[97] *US Orbital Debris Mitigation Standard Practices*, *supra* note 96, Objectives 1-3.

[98] See US, *United States Government Orbital Debris Mitigation Standard Practices*, Objective 4.

[99], *European Code of Conduct for Space Debris Mitigation*, *supra* note 70, Art. 2.2.

[100] *Ibid.*, 4.1.2.

[101] See e.g. UN Doc. A/AC.105/890, *supra* note 71, at para. 93.

[102] *Ibid.*, para. 91.

[103] Dawn Levy, "Anti-satellite weapons testing would have 'disastrous' effects, Ride says", *Stanford report* (17 April 2002), online: Stanford University <http://news.stanford.edu/news/2002/april17/ride-417.html>:

> So, as soon as you start increasing the amount of junk in a low-Earth orbit, you have an unintended byproduct that starts putting some of your own quite valuable satellites at possible risk.

[104] See Alwes, Benkö and Schrogl (1993), *supra* note 72, at 235.

space.[105] With approximately 90% of all trackable objects in outer space classified as debris,[106] the scientific and legal community cannot ignore this increasingly prevalent risk to the use and exploration of outer space.[107] Collision with 'floating junk'[108] may result in damage and/or loss of life and/or property, and therefore significantly raise the risks as well as well costs of space missions and their planning.[109] The presence of space debris can also interfere with the scientific, commercial or military use of outer space, especially as debris occupies valuable orbital space available and exasperates the problem of 'space congestion'.[110] The problem of 'space congestion' is particularly acute in the lower Earth orbit,[111] but also has serious implications for the access to and use of the geostationary orbit.[112] Further, the problem of space debris is exasperated by the danger of collision with space objects carrying nuclear power sources.[113]

As of the end of October 2011, the number of tracked space debris over 10 cm totalled close to 12,700.[114] The danger and effect of space debris depends on a number of factors, namely

[105] Christol (1982), *supra* note 68, 143. In the words of Luboš Perek, there are "too many useless objects in space" which pose a threat to space activities: "Suggestions for the Future", 211-216 in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), at 211.

[106] Perek (2002), *supra* note 72, at 124. A measure in 1989 put the proportion of space debris compared to all trackable objects in outer space at 95%: see Alwes, Benkö and Schrogl (1993), *supra* note 72, at 237. See also *National Security Space Strategy*, *supra* note 51, at 1.

[107] In his synopsis, Perek noted that for close to two decades the space faring community chose to defer dealing with the problem of space debris: Perek (2002), *supra* note 72, 134.

[108] Baker prefers the term of "space refuse" over debris, and notes that such words as space "junk", "rubbish", "garbage", "waste" or "litter" carry "emotional overtones and could imply a moral condemnation": see Baker (1989), *supra* note 19, at 123, fn. 11. However, already in 1967, US Secretary of State Dean Rusk was quoted as saying "[there] is an awful lot of junk up there": see Christol (1982), *supra* note 68, at 130.

[109] See Baker (1989), *supra* note 19, at 10-16.

[110] Congestion of outer space is the result of too many in a limited amount of outer space in orbits surrounding the Earth: see e.g. Tannenwald (2004), *supra* note 41, at 397. According to the US Department of Defense, of the 22,000 or so tracked human-made objects in outer space, only 1,100, or approximately 5%, are active satellites. The remaining tracked objects can be classified as space refuse which no longer serve any strategic or economic purpose, and does not yet include the thousands, if not millions of untracked human-made objects that have been launched since the beginning of the space age: *National Security Space Strategy*, *supra* note 51, at 1.

[111] Baker (1989), *supra* note 19, at 16-19.

[112] Jakhu (1992), *supra* note 72, at 317-319.

[113] See e.g. UN Doc. A/AC.105/890, *supra* note 71, para.83.

[114] Data from the US Space Surveillance Network: See NASA, *Orbital Debris Quarterly News* (October 2011), at 10, online: NASA < http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv15i4.pdf >. According to NASA (as of July 2009), there are approximately 500,000 objects between 1 and 10 cm, and many millions of objects smaller than 1 cm: NASA, *Orbital Debris Program Office*, *Orbital Debris Frequently Asked Questions*, online: NASA <http://orbitaldebris.jsc.nasa.gov/faqs.html#1>. It has been noted that the existing catalogue was "far from complete" and not all States, especially those who lack the means of space debris observation, have access to such data: see UN Doc. A/AC.105/736 (25 February 2000), *supra* note 79, paras. 105-106.

the velocity it is travelling at, the mass of the debris, and the angle of impact.[115] The higher the debris is situated above the Earth, the longer it will remain in orbit until eventually orbital decay causes the debris to fall and disintegrate in the atmosphere.[116] Larger debris measuring more than 10cm[117] are constantly being monitored and tracked through a variety of Earth- and space-based systems,[118] and pose the largest threat to satellites in operation as well as human space flight missions.[119] Indeed, NASA warns that at present hundreds of close approaches (i.e. passes within less than one kilometre) between catalogued objects occur on a daily basis,[120] and that the number of debris larger than 10cm in low Earth orbit (LEO) will triple in the next 200 years, thereby increasing the probability of collisions tenfold.[121] LEO contains many commercial as well as military satellites, and is also where all existing manned spaceflight takes place.[122] In fact, to date, the US Space Shuttle has performed no less than eight collision-avoidance manoeuvres to prevent damage or destruction.[123]

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[115] *Interagency Report on Orbital Debris* (1995), *supra* note 67, 8.

[116] This is due to the fact that an orbiting object loses energy over time through friction with the upper atmosphere and other orbital forces. See 'Orbital Debris Frequently Asked Questions', NASA Orbital Debris Office, online: NASA <http://www.orbitaldebris.jsc.nasa.gov/faqs.html>. Depending on the altitude of the debris, it will deorbit within a span of a few months to even millions of years at the geo-synchronous orbit: see US, *Interagency Report on Orbital Debris*, *supra* note 67, at 6-7. See also Michael W. Taylor , "Trashing the Solar System One Planet at a Time: Earth's Orbital Debris Problem" (2007-2008) 20 *Georgetown International Environmental Law Review* 1, at 7.

[117] *Interagency Report on Orbital Debris* (1995), *supra* note 67, 8.

[118] These include using radar, optical instruments and use of satellites with visible and infra-red sensors. See UN Doc. A/AC.105/720 (1999), *supra* note 68, at 4-11.

[119] Between 1997 and 1998, there were at least three incidences whereby the European Remote Sensing Satellite (ERS-1) (in June 1997 and March 1998) and Satellite pour l'observation de la Terre (SPOT-2) (in July 1997) had to be manoeuvred to avoid collision with larger debris: see *Technical Report on Space Debris*, *supra* note 68, at 15.

[120] NASA, *Orbital Debris Quarterly News* (April 2005), online: NASA <http://www.orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv9i2.pdf>, at 1-2.

[121] Jer-Chyi Liou and Nicholas L. Johnson, "Risks in Space from Orbiting Debris" (2006) 311 *Science* 340, at 340. This prediction is based on the assumption that no new launches will take place. However, according to the US Federal Aviation Authority's Office of Commercial Space Transportation, in 2008 alone there were 69 launches, and this figure is likely to increase with greater commercialisation of the space sector: see US, *Commercial Space Transportation: 2008 Year in Review*, online: FAA <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2008%20Year%20in%20Review.pdf> , at 8. Baker writes that the total number of space debris may be up to eleven times the number of tracked objects, thereby making the risk of collision substantially higher: see Baker (1989), *supra* note 19, at 35.

[122] Baker describes the LEO as "a spherical shell, bounded below at about 200 km by the Earth's atmosphere and above at about 4,000 km by the Van Allen belts […] Since LEO is the easiest region of outer space to reach from Earth, it offers endless scientific, commercial and public use opportunities": Baker (1989), *supra* note 19, at 23. See also Tare C. Brisibe and Isabel Pessoa-Lopes, "The Impact of Orbital Debris on Commercial Space Systems" (2001) 44 *Colloquium on the Law of Outer Space* 310.

[123] Gabrielle Maxey, 'Clearing some Space', *University of Memphis Magazine*, Summer 2009, online: University of Memphis <http://memphis.edu/magazine/issues/summer09/space.php>. In fact, the windows of the US space shuttle

In 1978, Professor Donald Kessler of the NASA Johnson Space Centre hypothesised that "an exponential increase in the number of objects with time" will create a belt of debris around the Earth that may render the future exploration and use of outer space infeasible.[124] The "Kessler Syndrome" holds that an initial collision in outer space will trigger a series of chain collisions,[125] and as a result of more "mutual collisions" a situation will arise where space objects located in certain regions of space face higher risks of destruction or being rendered inoperable due to collisions.[126] More recently, in 2007, NASA's chief scientist for orbital debris described the situation of "cascading collisions"[127] as "inevitable". As Kessler recently underlined, the Chinese ASAT only served to highlight how the use of kinetic space weapons will have a devastating impact on the space environment and increase the likelihood of cascading collisions.[128]

Debris could be created intentionally, or unintentionally. There have to date been a number of space debris creating events as a result of an unintended collisions between space objects. In 1991, Cosmos 1934, a defunct Russian navigation satellite collided with a part of Cosmos 926.[129] In 1996, the French CERISE spacecraft collided with and partially disabled by a fragment belonging to an exploded Ariane upper stage.[130] On 17 January 2005, a 31 year old US rocket collided with the third stage of a Chinese CZ-4 launcher.[131] In February 2009, an Iridium satellite collided with a spent Russian satellite, resulting in the creation of close to 2,000 debris

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had to be replaced over 80 times as of 2001 due to impacts with sub-millimeter objects: ESA, *Space Debris: Assessing the Risk*, 16 March 2005, online at: ESA <http://www.esa.int/esaMI/ESOC/SEMZL0P256E_0.html>.

[124] See Donald Kessler and Burton G. Cour-Palais, "Collision Frequency of Artificial Satellites: The Creation of a Debris Belt" (1978) 83 *Journal of Geophysical Research* 2637, at 2637. Joel Primack warns of the creation of a "lethal halo around the Earth" if a "chain reaction of destruction" ensued in outer space: see Primack (2002), *supra* note 24, at 24.

[125] See Alwes, Benkö and Schrogl (1993), *supra* note 72, at 237-239.

[126] Kessler and Cour-Palais (1978), *supra* note 124, 2637. See also Nandasiri Jasentuliyana and Ralph Chipman, eds. *International Space Programmes and Policy: proceedings of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE), Vienna, Austria, August 1982* (Amsterdam: North Holland, 1984), at 101, para. 289; Taylor (2007-2008), *supra* note 116, 18-19.

[127] Howard Baker describes the cascading effect as "a process by which space debris will become self-generating and therefore uncontrollable": Baker (1989), *supra* note 19, at 13.

[128] For the latest alarm over the threat of a "cascade of collisions", see William J. Broad, 'Orbiting Junk, Once a Nuisance, Is Now a Threat ' *New York Times* (6 February 2007), online: New York Times <http://www.nytimes.com/2007/02/06/science/space/06orbi.html?_r=1>. Jer-Chyi Liou and Nicholas L. Johnson warn that in some low Earth orbits, the number of orbital debris is "above a critical spatial density", meaning that the rate new debris are being produced through mutual collisions exceeds the disappearance of debris from orbital decay: see Liou and Johnson (2006), *supra* note 121, at 340.

[129] *Orbital Debris Quarterly News* (April 2005), *supra* note 120, at 1.

[130] *Technical Report on Space Debris*, *supra* note 68, 32.

[131] *Orbital Debris Quarterly News* (April 2005), *supra* note 120, at 1.

pieces over 10 cm long.[132] The latest collision seemed to be a wake-up call for the international community, as States in the UNCOPUOS immediately underlined the necessity of "collective efforts to implement space debris mitigation measures".[133]

Anti-satellite weapon tests are by far the most significant contributing factor to the intentional creation of space debris in outer space.[134] Though not a unique event,[135] the serious environmental implications of an intentional destruction of a space object has been recently demonstrated by China's ASAT-test in January 2007. The debris created with the destruction of the Fengyun 1-C satellite is well documented,[136] and by the end of the first quarter of 2010 over 2,800 debris objects larger than 10 cm had been catalogued[137]— a quantity equal to almost half of all satellite breakup debris in orbit.[138] It is clear that if a single intentional and controlled destruction of a space object can create so much debris, then multiple destructions of space objects in orbit, should an armed conflict flare up in outer space, will be devastating for the space environment.

Without effective debris mitigation policies and guidelines, as well as environmental remediation initiatives, "the risks to space system operations in near-Earth orbits will continue to

[132] The collision was reportedly more devastating than the Chinese ASAT-test: see Paul Marks, 'Satellite collision 'more powerful than China's ASAT test' ', *New Scientist* (13 February 2009), online: New Scientist <http://www.newscientist.com/article/dn16604-satellite-collision-more-powerful-than-chinas-asat-test.html>. See also UN Doc. A/64/20, *supra* note 80, para. 110; NASA, *Orbital Debris Quarterly News* (April 2010), online: NASA <http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv14i2.pdf>, at 4.

[133] UNCOPUOS, *Report of the Scientific and Technical Subcommittee on its 46th session, held in Vienna from 9 to 20 February 2009*, UN Doc. A/AC.105/933 (6 March 2009), at paras. 72-73. This came after the UNCOPUOS in 2007 had warned that "[in] the future, fragments generated by collisions are expected to be a significant source of space debris": see UN Doc. A/AC.105/890, *supra* note 71, at 42.

[134] An early example of deliberate creations of space debris includes the former Soviet Union's intentional destruction of a series of reconnaissance satellites to prevent their discovery by unfriendly nations before re-entry: Baker (1989), *supra* note 19, at 5.

[135] At the height of the Cold War, between the 1960s and 1980s, the former Soviet Union and United States under the Strategic Defence Initiative (SDI) both developed and tested ground-based missiles able to destroy objects in outer space: Baker (1989), *supra* note 19, at 5-6. See also *Orbiting Debris: A Space Environmental Problem—Background Paper*, *supra* note 84, at 18-19, specifically Table 3, which catalogues the number of debris created as a result of Soviet and US ASAT tests up to 1989. The total number of debris created amounted to under 500, and is notably less the number of debris created by the Chinese ASAT test.

[136] See generally 'Chinese ASAT Test', *CelesTrak*, available online at: <http://celestrak.com/events/asat.asp>. At the end of December 2006, the number of traceable debris objects belonging to China was merely 334, whereas by July 2007, six months after the ASAT test, this number had increased to 2234: Data from the October 2006 and July 2007 issues of the *Orbital Debris Quarterly News*. Respectively available online: see *supra* note 25.

[137] See *Orbital Debris Quarterly News* (April 2010), online: NASA <http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv14i2.pdf >, at 4.

[138] See January 2008 issue of the *Orbital Debris Quarterly News*, at 2-3, especially figures 1 and 2, *supra* note 26.

climb".[139] However, the most effective means of preventing a situation which is disastrous for the outer space environment is to once and for cease all unnecessary intentional creation of space debris.[140] A key place to begin is to place a ban on the use of conventional kinetic space weapons which, as ASAT tests have demonstrated, are the single most significant contributor of debris in outer space. The following will outline efforts by the international community to prohibit the use of weapons in outer space.

[139] Liou and Johnson (2006), *supra* note 121, 341.

[140] At times, for the sake of human health and protecting the safety of those on Earth, it may be necessary to intentionally destroy a space object. This was indeed the rationale behind the destruction of USA-193: see "U.S. vows to pay for damage caused by satellite", *supra* note 7.

III. Restraints on Space Weapons

As already discussed, recent events seem to point to the inevitability of space weaponisation. The following section will outline what attempts have been undertaken to curb this trend, and illustrate why these attempts have been ineffective.

1. Space law dealing with weaponisation

The first two General Assembly resolutions dealing with outer space expressed the desire of States to use space "exclusively" for peaceful purposes.[141] Lachs has no doubts that "peaceful purposes" should be interpreted as a total prohibition of military activities.[142] At least, that "remains the goal" of preventing the spread of the arms race into outer space, and preserving the "special status" of outer space.[143]

However, with time, the language of "peaceful purposes" has been gradually watered down by subsequent references and with State practice. In the Declaration of Legal Principles, States emphasised the "common interest of all mankind" in exploring and using outer space for "peaceful purposes"—the word "exclusively" was thus omitted.[144] Even so, it is agreed that outer space activities must be conducted "for the betterment of mankind and for the benefit of States",[145] and cooperation to further such ends will develop mutual understanding and strengthen "friendly relations between nations and peoples".[146] All the abovementioned resolutions were adopted unanimously by the UN General Assembly,[147] and laid the foundations for the Outer Space Treaty.

ICJ Judge Bruno Simma reminds us at the core of international law, applied in whatever context or setting, is the desire to prevent and regulate armed conflict, and the maintenance of

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[141] See UNGA, *Regulation, limitation and balanced reduction of all armed forces and all armaments; conclusion of an international convention (treaty) on the reduction of armaments and the prohibition of atomic, hydrogen and other weapons of mass destruction*, Res. 1148(XII), UN Doc. A-RES-1148(XII) (1957), para. 1(f); and UNGA, *Question of the peaceful use of outer space*, Res. 1348 (XIII), U.N. Doc. A/4090 (1958), Preamble, paras. 1 and 10.
[142] Lachs suggests if "peaceful purposes" were to mean the same as non-aggressive, then it would have sufficed to make reference to international law and the United Nations Charter, for the phrase "peaceful purposes" would be redundant: see Manfred Lachs, "The International Law of Outer Space" (1964) 113 *Recueil des Cours* 1, at 90-91.
[143] *Ibid.*, 91 and 94.
[144] UNGA, *Declaration of Legal Principles Concerning the Activities of States in the Exploration and Use of Outer Space*, Res. 1962 (XVIII) (13 December 1963) [hereinafter: *Declaration of Legal Principles*], Preamble, para. 2
[145] *Ibid.*, Preamble, para. 3.
[146] *Ibid.*, Preamble, para. 4.
[147] See Ernst Fasan, 'Law and Peace for Outer Space' (1985) 28 *Colloquium on the Law of Outer Space* 16, at 16.

international peace and security and arms control "must enjoy the highest priority".[148] The Outer Space Treaty was drafted almost simultaneously with the Vienna Convention on the Law of Treaties,[149] which was in turn influenced by a general desire to preserve peace and prevent conflict.[150] Applied to the context of outer space, Lachs advocates that "peaceful purposes" is "a part of the issue of disarmament and international security *sensu largo*".[151] Indeed, a General Assembly resolution from 1963 pledged States to "take steps to prevent the spread of the arms race to outer space".[152] However, much to the disappointment of developing countries, the prevention of an arms race or ban on weapons in general does not figure in the final adoption of Outer Space Treaty.[153]

In very general terms, it may be argued that Articles I and III of the Outer Space Treaty can be construed to prohibit the weaponisation of outer space. Article I provides that activities in outer space "shall be carried out for the benefit and in the interests of *all countries*".[154] Placing or even using weapons in outer space can only be for the benefit and in the interest of one State, or at most, can only be for the benefit and in the interest of a handful of States which stand to benefit from whatever strategic or defensive value the space weapons may provide. In fact, as more often than not a weapon is targeting an adversary, the use of that weapon will actually be to the detriment and in violation of the interest of the target State.

Article III of the Outer Space Treaty mandates all States to carry out space activities "in the interest of maintaining international peace and security and promoting international cooperation and understanding".[155] It is argued that weaponising outer space is completely contrary to this interest, for in the existing political and legal world order, the prevention and

[148] Bruno Simma, "From Bilateralism to Community Interest in International" (1994) 250 *Recueil des cours* 217, 236-237.
[149] Vienna Convention on the Law of Treaties, 23 May 1969, UN Doc. A/Conf.39/27; 1155 UNTS 331; 8 ILM 679 (1969); 63 AJIL 875 (1969) (entered into force on 27 January 1980. As of 1 December 2011, there are 111 States Parties and 45 signatories to the Vienna Convention.) [hereinafter: VCLT].
[150] See e.g. Edward R. Finch and Amanda Lee Moore, "Outer Space can help the Peace" (1974) 16 *Colloquium on the Law of Outer Space* 27, at 28-29.
[151] Lachs (1964), *supra* note 142, 94. See also Vitaliy D. Bordunov, "Interests of Mankind and Problem of Preventing Outer Space Militarization" (1985) 28 *Colloquium on the Law of Outer Space* 1, at 2. Jonathan F. Galloway also notes that "outer space should be progressively demilitarized and the incipient new arms race should be stopped": "Nuclear Winter, Ballistic Missile Defense and the Legal Regime for Outer Space" (1985) 28 *Colloquium on the Law of Outer Space* 20, at 23.
[152] UNGA, *Question of general and complete disarmament*, GA Res. 18/1884, UN Doc. A/RES/18/1884 (17 October 1963), Preamble, para. 2.
[153] See Jasentuliyana (1995), *supra* note 77, 99-100.
[154] OST, *supra* note 17, art. I [emphasis added].
[155] Lachs (1972), *supra* note 8, 117-118.

regulation of armed conflict takes precedence, and the maintenance of international peace and security and arms control "must enjoy the highest priority".[156]At the General Assembly's First Special Session on Disarmament, States declared that an arms race is not only contrary to conducting relations on the basis of peaceful coexistence and promoting international cooperation and understanding, but it is also "incompatible with the Charter of the United Nations, especially respect for sovereignty, refraining from the threat or use of force" against any State.[157] This includes an arms race in outer space.[158] Moreover, under the 1970 Friendly Relations Declaration, States have an obligation to "adopt measures to reduce international tensions and strengthen confidence among States."[159] It goes without saying weaponising outer space does not reduce tensions or strengthen confidence among States, but will heighten suspicion and fears in international relations.

More substantively on the matter of weapons, Article IV of the Outer Space Treaty only prohibits any objects carrying nuclear weapons or any kinds of weapons of mass destruction from being placed in Earth orbit, installed on celestial bodies or stationed in outer space.[160] No mention is made with regard to the use or deployment of other types of weapons in outer space, or the use or deployment of any type of weapon capable of destroying objects in outer space.[161] This should be contrasted with the law governing the Moon and other celestial bodies, for Article IV of the Outer Space Treaty provides "the testing of *any* type of weapons and the conduct of military manoeuvres" on such bodies is strictly prohibited.[162] Thus, while only the Moon and celestial bodies are truly subject to use for exclusively peaceful purposes,[163] the situation regarding outer space is much less clear.

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[156] Simma (1994), *supra* note 148, 236-237.
[157] UN Doc. A/RES/S-10/2, *supra* note 9, para. 12.
[158] *Ibid.* para. 80.
[159] UNGA, *Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations*, Res. 2625 (XXV), UN GAOR, 25th Sess., Supp. No. 22, UN Doc. A/2212 (1970) [hereinafter: *Friendly Relations Declaration*], para. 3.
[160] See also UN Doc. A/RES/18/1884, *supra* note 152, in which the General Assembly welcomed the express intentions of the Union of Soviet Socialist Republics and the United States of America "not to station in outer space any objects carrying nuclear weapons or other kinds of weapons of mass destruction" (para. 1). The text of para. 2(a) later forms the basis of art. IV of the Outer Space Treaty.
[161] Matte (1969), *supra* note 17, 269.
[162] OST, *supra* note 17, art. IV [emphasis added]. See Bourbonnière and Lee (2008), *supra* note 10, at 875.
[163] OST, *supra* note 17, art. IV.

2. *Military activities and "peaceful purposes" under space law*

Looking at other treaties in the period of the signing of the OST may hint at what "peaceful purposes" means,[164] and whether the phrase is sufficient to prohibit space weapons, either space- or Earth-based, from being deployed or used.

The Antarctica Treaty,[165] drafted a couple of years before the Outer Space Treaty, has been often touted as an precedent-setting arms limitation agreement which demilitarises a region by excluding arms completely for the prevention of conflict before it begins.[166] The Preamble of the Antarctica Treaty instructively outlines that "peaceful purposes" is "in the interest of all mankind", and that Antarctica "shall not become the scene or object of international discord".[167] Article I of the Treaty declares that Antarctica "shall be used for *peaceful purposes only*"[168]. "Peaceful purposes" implies that "any measure of a military nature" is prohibited, and the prohibition applies to, among other things, the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapon.[169]

The 1972 Biological Weapons Convention, establishing a multilateral regime on the prohibition and elimination of all types of biological weapons,[170] may further elaborate what is

[164] Eilene Galloway notes that a subtle distinction should be made between the terms "peaceful purposes" and "peaceful uses", terms that are sometimes used interchangeably. Thus the OST deals with the "use" of outer space, but in Article IV the word "purposes" is also mentioned alongside "use". Galloway would profess that " 'purposes' implies intent prior to use", rather than the actual usage of space hardware and technologies in space application: see Eilene Galloway, "International Institutions to ensure Peaceful Uses of Outer Space" (1984) 9 *Annals of Air and Space Law* 303, 310-311, and 323-324.

[165] Antarctic Treaty, 1 December 1959, 402 U.N.T.S. 71 (entered into force on 23 June 1961. As of 1 December 2011, there are 49 States Parties, and 21 other Non-Consultative Parties'.).

[166] *Ibid.*, art. I(1). However, the Treaty does not prohibit the "use of military personnel or equipment for scientific research or for any other peaceful purposes" (art. I(2)). See also US, Department of State, Antarctic Treaty, online: United States Department of State <http://www.state.gov/t/isn/4700.htm>. However there are authors who do not believe Antarctica is a relevant realm for extrapolating meaning of legal terminology applicable to the context of outer space: see e.g. Harry Almond, Jr., "Space without Weapons", 109-136 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989); and Oliver Lissitzyn, "The American Position on Outer Space and Antarctica" (1959) 53 *American Journal of International Law* 126.

[167] Antarctica Treaty, *supra* note 165, Preamble, para. 1. For a critique of Antarctica being a relevant realm for deciphering the legal terminology applicable to the context of outer space, see: Almond, Jr. (1989), *supra* note 166, at 118. J. Bruhacs notes one should be wary of "straying into the dubious field of the application of analogy in international legal relations": "General International Law and Demilitarization of Outer Space" (1984) 27 *Colloquium on the Law of Outer Space* 277, at 277. See also Lissitzyn (1959), *supra* note 166, at 131.

[168] Antarctica Treaty, *supra* note 165, art. I [emphasis added].

[169] *Ibid.*

[170] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, 10 April 1972 (entered into force on 26 March 1975. As of 1

meant by "peaceful purposes". The Convention was adopted as a part of "general and complete disarmament".[171] From the wording of Article I, "peaceful purposes" is contrasted with any uses for "hostile purposes or in armed conflict".[172]

Though States must use outer space for "peaceful purposes",[173] Manfred Lachs recognises there is no outright ban on using space for military purposes.[174] The activities of the dominant spacefaring States, namely Russia (the former Soviet Union) and the United States, have always been heavily influenced and supported by their respective militaries.[175] For the US, "peaceful" is interpreted as meaning any non-aggressive use, while the Soviet Union maintained that "peaceful" would entail the prohibition of all military activity from outer space[176] – a position Matte notes was in reality "vague and changeable".[177] Indeed, the practice of the spacefaring powers proves there is a common belief that peaceful denotes "non-aggressive", thus military activities, if conducted in a way that does not threaten the political or territorial integrity of another State, is deemed permissible.[178]. Of interest to note, however, though the Registration Convention obliges States to provide the Secretary-General of the United Nations with

December 2011, the Convention has 164 States Parties and 13 signatories.), UNTS [hereinafter: Biological Weapons Convention].

[171] *Ibid.*, Preamble, paras. 1.

[172] *Ibid.*, arts. I (1) and (2).

[173] UNGA, *International Co-Operation in the Peaceful Uses of Outer Space*, UNGA Res. 1721 (XVI) (20 December 1961), Sect. A, Preamble, para. 1.

[174] Lachs (1964), *supra* note 142, at 89.

[175] Carl Q. Christol, "The Common Interest in the Exploration, Use and Exploitation of Outer Space for Peaceful Purposes: The Soviet-American Dilemma" (1984) 27 *Colloquium on the Law of Outer Space* 281, 282.

[176] See G. P. Zhukov, "On the Question of Interpretation of the Term "Peaceful Use of Outer Space" Contained in the Space Treaty" (1969) 11 *Colloquium on the Law of Outer Space* 36, at 36; V. S. Vereschetin, "Perspectives of the Uses of Outer Space for Applied Purposes and State Sovereignty" (1977) 19 *Colloquium on the Law of Outer Space* 103, 106. Emilion Jaksetic, "The Peaceful Uses of Outer Space: Soviet Views" (1979) 28 *American University Law Review* 483, at 493.

[177] Matte (1969), *supra* note 17, 271-272; Jaksetic (1979), *supra* note 176, at 496. Indeed, with respects to a matter like reconnaissance, the Soviet Union had initially been critical of the US, but have with time become more muted on the matter: see Jaksetic (1979), 499.

[178] Christol (1984), *supra* note 175, 282-283. See also: US, United States Air Force, *Space Operations, Air Force Doctrine Document 2-2* (27 November 2006), at 27:

> activities in space be non-aggressive, or in other words, in compliance with the requirements under the United Nations Charter and international law to refrain from the threat or use of force except in accordance with the law, such as in self-defense or pursuant to United Nations Security Council authorization.

information on, among others, the "general function of the space object",[179] no space object has in fact been registered as performing a military function.[180]

That space has been militarised is not beyond dispute. As early as 1967, during the Vietnam War, the US used meteorological satellites to aid their bombing campaigns.[181] Space technology is used for reconnaissance,[182] navigation and precision targeting, as well as command and control purposes to support military operations. None of these military activities have been deemed to violate the spirit of the OST. In fact, space has long been recognised as the ultimate frontier for gaining military advantage—so much so that satellite technology has been referred to as "the eyes, ears and nerves of today's military forces".[183] Space technology has been used to verify[184] and monitor the existence of weapons under international arms control regimes,[185] and military devices can actually serve "vital stabilizing purposes".[186] In fact, space technology is crucial to ensure that the degree of weaponisation—should it occur if it has not yet occurred— in outer space is kept at a minimum.[187]

However, there is a fine line between using space for military purposes (militarisation), and the actual placement, and eventual use, of weapons in outer space (weaponisation).[188] If

[179] Besides the "general function of the space object", art. IV(1) of the Registration Convention, *supra* note 83, stipulates that States must provide information on:

(a) name of launching State or States;
(b) an appropriate designator of the space object or its registration number;
(c) date and territory or location of launch;
(d) basic orbital parameters, including:
(i) nodal period;
(ii) inclination;
(iii) apogee;
(iv) perigee.

[180] See Goedhuis (1982), *supra* note 20, at 298. For detailed information on the register, see UNOOSA, *United Nations Register of Space Objects launched into Outer Space*, online: UNOOSA <http://www.oosa.unvienna.org/oosa/en/SORegister/index.html>.

[181] Matte (1969), *supra* note 17, at 304.

[182] *Ibid.*, at 270.

[183] Wolff (2003), *supra* note 65, at 6.

[184] "Verification" can be defined as the gathering of information to support certain postulates expressed in a treaty: see Stibrany (1989), *supra* note 15, 57-58.

[185] See Finch and Moore (1974), *supra* note 150.

[186] R. H. Milton, cited by Christol (1984), *supra* note 175, at 283.

[187] Gorove (1989), *supra* note 16, at 40.

[188] Park (2006), *supra* note 14, 873. Park calls this "muddying the waters of the space security debate", at 874. Steven Lambakis however argues, it is not useful to different between weaponising and militarising outer space, for any military deployment essential involves a corresponding weapons component. Thus even if the weapons have never been used, "the so-called weaponization of space is happening under our very noses": see Lambakis (2002) *supra* note 46, at 23.

"peaceful purposes" in practice means that space can be used for military purposes, does it also permit a State to weaponise outer space?[189]

3. Proposals to prevent the weaponisation of outer space

It has been long recognised that any attempt at weaponising outer space will have a detrimental impact on international relations.[190] Indeed, the GA noted specifically there is an urgent need to prevent an arms race in outer space, and also recognised the "threat posed by anti-satellite systems and their destabilising effects on international peace and security".[191] In 1981, the General Assembly warned if outer space were to become an "arena for the arms race", it would be "a source of strained relations between States" and even threaten the existence of humankind.[192] Lachs echoes these sentiments, and warns that weapons in outer space will feed a vicious cycle and be the source of more conflicts and suspicions, fuelling insecurity and mistrust.[193] Thus, it is commonly agreed that adopting an international treaty to avert an arms race in outer space is essential.[194]

Already since the 1980s, the Conference on Disarmament (CD) and the UNCOPUOS have shared the responsibility on working towards the prevention of an arms race in outer space.[195] Since the issue of the weaponisation of outer space was first brought on the agenda,

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[189] Maogoto and Freeland (2008), *supra* note 30, 24

[190] Emil Kostantinov would go as far as to warn that the creation, development and use of space (offensive) weapons would have a "ruinous" effect on mankind: "Space Law and Space Offensive Weapons" (1985) 28 *Colloquium on the Law of Outer Space* 47, at 48. The General Assembly, during its First Special Session on Disarmament, concluded that an arms race in general:

> runs counter to efforts to achieve further relaxation of international tension, to establish international relations based on peaceful coexistence and trust, […] and to develop broad international cooperation and understanding, [Further, the arms race] impedes the realization of the purposes, and is incompatible with the principles of the United Nations Charter.

See generally, UN Doc. S-10/2, *supra* note 9, para. 12.

[191] See UNGA, *Prevention of an Arms Race in Outer Space and Prohibition of Anti-Satellite Systems*, UN Doc. A/RES/37/99D (23 December 1982), Preamble, para. 6.

[192] UNGA, *Conclusion of a Treaty on the Prohibition of the Stationing of Weapons of any kind in Outer Space*, Res. 36/99, UN Doc. A/RES/36/99 (9 December 1981), Preamble, paras. 3 and 4.

[193] Lachs (1964), *supra* note 142, at 88. The creation, development and use of space weapons would have a "ruinous" effect on mankind, and will result in a "new and irreversible arms race" that will "foster a manifold increase of the risk of outbreak of military conflicts: Kostantinov (1985), *supra* note 190, 47-49.

[194] UN Doc. A/RES/36/99, *supra* note 192, para. 1.

[195] Though the Conference on Disarmament has a "primary role" in reaching an agreement on the prevention of an arms race in outer space, this does not exclude the UNCOPUOS from coming up with recommendations or adopting resolutions to that end: A. Piradov and B. Maiorsky, "The United Nations Committee on the Peaceful uses of Outer

various attempts have been made to conclude treaties that would constrain the deployment and use of weapons in outer space, but to no avail.[196] The 1979 Italian proposal of an "Additional Protocol to the 1967 Outer Space Treaty",[197] which would effectively instate a blanket prohibition on the development and use of all armaments,[198] was rejected.[199] In the early 1980s, the (then) Soviet Union advocated "a complete ban on the testing and deployment in space of any space-based weapon for the destruction of objects on the Earth, in the atmosphere and in outer space".[200] Though the proposed treaty does not outlaw Earth-based devices that could destroy an asset in outer space,[201] the proposed treaty did go as far as prohibiting the "use or threat of force against space objects" in orbit, on celestial bodies or "stationed in outer space in any other manner".[202] Despite its lofty objectives, Christol notes that the 1981 Soviet proposal was designed to outlaw future stationing of weapons in outer space, and also partly designed with the activities of the United States in mind.[203] It did not fully outlaw activities of the Soviet

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Space and the Question of Ways and Means for Maintaining Outer Space for Peaceful Purposes" (1985) 28 *Colloquium on the Law of Outer Space* 105.

[196] Tannenwald (2004), *supra* note 41,378-379; Maogoto and Freeland (2008), *supra* note 30, at 25 and 30.

[197] CD, *Additional Protocol to the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" with a view to Preventing an Arms Race in Outer Space*, UN Doc. CD/9 (26 March 1979). Full text available as an appendix: see Fernando Lay, "Space Law: A new Proposal" (1980) 8 J. Space L. 41. See also Ilias I. Kusksvelis, "Verification and the Space Related Agreements" (1985) 28 *Colloquium on the Law of Outer Space* 61, at 64.

[198] Article 1 of the proposed "Additional Protocol to the OST" provides:

> Outer space, including the moon and other celestial bodies, shall be used for peaceful purposes only. States Parties to this Protocol undertake to refrain from engaging in, encouraging or authorizing, directly or indirectly, or in any way participating in any measures of a military or other hostile nature, such as the establishment of military bases, installations and fortifications, the stationing of devices having the same effect, the launching into earth orbit or beyond of objects carrying weapons of mass destruction or any other types of devices designed for offensive purposes, the conduct of military manoeuvres, as well as the testing of any type of weapons.

See CD/9, *supra* note 197, art. I(1).

[199] Lay (1980), *supra* note 197, at 52.

[200] See *Letter dated 19 August 1983 from the First Vice-Chairman of the Council of Ministers of the Union of Soviet Socialist Republics, Minister for Foreign Affairs of the USSR, to the Secretary-General*, online: JAXA <http://www.jaxa.jp/library/space_law/chapter_3/3-2-1-2_e.html>. The text of the 'Draft Treaty on the *Prohibition of the Stationing of Weapons of Any Kind* in Outer Space' is available as an annex to the letter. The draft treaty was considered by the UN General Assembly as crucial "to prevent the spread of the arms race to outer space": see UN Doc. A/RES/36/99, *supra* note 192.

[201] Rip Bulkeley and Graham Spinardi, *Space weapons: Deterrence or Delusion* (Cambridge: Polity Press, 1986), 226-227. See also Christol (1984), *supra* note 175, 285

[202] CD, *Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space 1981*, UN Doc. A/36/192 (20 August 1981), art. 1(1).

[203] Christol (1984), *supra* note 175, at 284.

Union, which had embarked on the development of an ASAT programme as early as 1967.[204]

Over the past decade, China and Russia have proactively proposed legal restrictions on space weapons, regardless of whether they are in orbit or situated on Earth. In June 2001, China submitted before the Conference on Disarmament a proposal to prohibit the testing, deployment or use of any weapons in outer space,[205] regardless "whether they are in orbit or based on the ground".[206] Though the introduction of a draft proposal on the prevention of the weaponisation of outer space is grounded in the interest of preserving international security,[207] it was seen as a veiled response to the US' plans to ensure space superiority and a response to the US' intentions to continue its missile defense programme.[208]

In 2002, China and Russia together spearheaded proposals for drafting a treaty which would effectively prohibit all space weapons, as well as outlaw the use or threat of force against space objects.[209] These efforts cumulated in the 2008 draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT).[210] The proposed Treaty, which notes that the placement of weapons in outer

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[204] Carl Q. Christol, "Arms control and disarmament in space: the rough road to Vienna 1984" (1985) 1 *Space Policy* 27, at 33-34. UN General Assembly took note of the Soviet proposal, and considered it "necessary to take effective steps" to prevent the spread of the arms race into outer space: see UN Doc. A/RES/36/99, *supra* note 192, para. 1.

[205] CD, *Working Paper-Possible Elements of the Future International Legal Instrument on the Prevention of the Weaponization of Outer Space*, U.N. Doc. CD/1645 (2001), online: Ministry of Foreign Affairs of the People's Republic of China, <http://www.fmprc.gov.cn/eng/wjb/zzjg/jks/cjjk/2622/t15443.htm>

[206] Hu Xiaodi, Ambassador of China to the Conference on Disarmament, Statement before the NGO Committee on Peace and Disarmament (11 October 2001), online: NGO Committee on Disarmament, Peace and Security <http://disarm.igc.org/T1011010s3.html>.

[207] China, *Statement by Ambassador Hu Xiaodi for Disarmament Affairs of China at the Plenary of the Conference on Disarmament*, 7 June 2001, online: Permanent Mission of the People's Republic of China to the United Nations Office at Geneva and other International Organizations in Switzerland <http://www.china-un.ch/eng/cjjk/cjda/cj2001/t85198.htm>.

[208] The Chinese proposal, tabled in June 2001, makes references to the *Rumsfeld Report*, which was released some five months earlier. Indeed, in the Statement of the Chinese Ambassador for Disarmament Affairs before the Conference on Disarmament, references are made to such concepts as "Space Pearl Harbor": *ibid.;* see also Tannenwald (2004), *supra* note 41, 377.

[209] CD, *Working Paper Presented by the Delegations of China, the Russian Federation, Vietnam, Indonesia, Belarus, Zimbabwe and Syria: Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects', paper submitted at the Conference on Disarmament*, UN Doc. CD/1679 (27 June 2002), online: Permanent Representative of the Russian Federation to the UN Office and other International Organizations in Geneva <http://www.geneva.mid.ru/disarm/doc/CD1679-ENGLISH.pdf>. See also CD, *Statement by Ambassador Leonid A. Skotnikov, Permanent Representative of the Russian Federation to the Conference on Disarmament, at the Plenary Meeting of the Conference on Disarmament, Geneva, 27 June 2002*, online: Acronym <http://www.acronym.org.uk/docs/0206/doc10.htm>. See further Tannenwald (2004), *supra* note 41, 371-372.

[210] PPWT, *supra* note 33.

space would pose a "grave danger for international peace and security",[211] draws inspiration from the repeated adoption of General Assembly resolutions which call for the prevention of an arms race in outer space.[212]

The proposed PPWT prohibits the placement of any kind of weapon in outer space.[213] The PPWT also prohibits the "threat or use of force against outer space objects".[214] Effectively, the proposed treaty prohibits the deployment (and therefore also the use) of a weapon in outer space, and it also indirectly prohibits the use of any space weapon that is situated anywhere other than in outer space. It is perhaps the most comprehensive ban on space weapons to date, and as recent as 2011 delegates at the UNCOPUOS perceived the draft treaty as capable of preventing an arms race in outer space.[215]

However, the PPWT received criticism from the US for failing to address a number of matters.[216] In its undertaking international obligations, ensuring "freedom of action" in outer space for the US (and its allies) has consistently been the primary concern and interest.[217] Indeed, a primary objection is the US' consistent opposition to any arms control regime that would restrict the rights of the US to "conduct research, development, testing, and operations in space for military, intelligence, civil, or commercial purposes".[218] Under the proposed PPWT, the concepts of "use of force",[219] and "threat of force" are ill-defined.[220] The leads to the conclusion that Article V of the PPWT, which permits a State to exercise the right of self-defence in accordance with Article 51 of the UN Charter,[221] seems to have the effect of temporarily suspending the prohibitions contained in the proposed treaty when a State seeks to claim that it is

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[211] *Ibid.*, Preamble, para. 4.
[212] *Ibid.*,, Preamble, para.7. For the General Assembly resolution, see e.g. UNGA, *Prevention of an arms race in outer space*, UN Doc. A/RES/65/44 (8 December 2010); and see also Sect. III-4 below.
[213] PPWT, *supra* note 33, art. 1(c). A "weapon in outer space" refers to:

> any device placed in outer space […] which has been specially produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth or in the Earth's atmosphere, or to eliminate a population or components of the biosphere which are important to human existence or inflict damage on them.

[214] PPWT, *supra* note 33, art. 2.
[215] See UN Doc. A/AC.105/L.281/Add., *supra* note 24, at 9, para. 47.
[216] See CD/1847, *supra* note 35.
[217] See comments of the Legal Adviser of the State Department, Mr. Loftus Becker, in Lissitzyn, *supra* note 166, at 126-127; and Matte (1969), *supra* note 17, at 23. See CD/1847, *supra* note 35, paras. 21 and 26.
[218] CD/1847, *supra* note 35, para. 21.
[219] *Ibid.*, para. 5.
[220] *Ibid.*, para. 6(iii).
[221] PPWT, *supra* note 33, art. 5.

acting in self-defence.[222] Further, the US notes the proposed prohibition on space weapons does not include any mechanism for weapons verification or for transparency and confidence-building,[223] which the US considers are essential components of any regime to preserve outer space for peaceful purposes.

To date, over three years after the initial joint Chinese-Russian proposal for the PPWT, other than reaffirmations by the UNCOPUOS that the treaty is a useful step to the prevention of the weaponisation of outer space, there have been no concrete steps towards transforming the PPWT into a workable international treaty for States to ratify. As Professor Jakhu notes, though the objections advanced by the US are valid, no counter proposals or amendments to the PPWT have been tabled, either by the US or by China and Russia, who were the original initiators of the draft PPWT. This deadlock and apparent waning interest in the PPWT may be evidence that the major space faring States are in fact calling each other's bluff, and that, as genuine and constructive as the content of the PPWT may appear to be, the political will to implement a prohibition on the deployment and use of space weapons is unfortunately lacking.[224]

4. PAROS resolutions

From the above overview, it is clear between the major space-faring powers, there is great unwillingness to agree to any concrete treaty regime to regulate the potential weaponisation of outer space.[225] However, where conventional law does not (yet) exist, customary law may be able to bridge the gap that currently exist between what is permissible and what is prohibited.[226] As Jonathan Galloway succinctly writes, new developments in technology "should not control or determine the law", for customary law can, and should, be interpreted to contain and limit weapons that come into being.[227]

[222] CD/1847, *supra* note 35, para. 6(i) and 6(ii).
[223] *Ibid.*, paras. 18-20.
[224] Ram Jakhu, personal interview, Montreal, Canada, 2 December 2011.
[225] UN Doc. A/RES/65/44, *supra* note 212, para. 7.
[226] See Robert Jennings, "Customary International Law and General Principles of Law", in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), at 150
[227] Galloway (1985), *supra* note 151, at 20.

a) PAROS as evidence of customary law

Since 1981,[228] the General Assembly has annually adopted a resolution calling for the prevention of an arms race in outer space (PAROS). Though the PAROS resolutions do not contain concrete provisions about the legality of the deployment or use of weapons in outer space,[229] they do note that preventing an arms race in outer space is "an essential condition" for international cooperation in outer space and for using outer space for peaceful purposes.[230] For almost three decades, the General Assembly has annually urged States to work toward "effective and verifiable bilateral and multilateral agreements" to prevent an arms race in and the weaponisation of outer space. Further, the PAROS resolutions call upon States to "actively contribute" to the peaceful use of outer space, and to "refrain from actions contrary to that objective". [231] Arguably, the placement and use of space weapons would be contrary to that objective.[232] These resolutions have been adopted almost unanimously, in some years with very few (if any) negative votes and abstentions. Only the US has consistently abstained from voting or voted against the PAROS resolutions.[233]

To what extent can it be argued that the obligation to refrain from actions that would contribute to an arms race in outer space, and indirectly to refrain from the deployment and use of space weapons, contained in PAROS resolutions has become customary international law binding on all States? To recall, the formation of a new customary norm requires action of States which "amount to settled practice".[234] State practice (or abstention from such practice) must also be "accompanied by the *opinio juris sive necessitates"*,[235] which denotes "evidence of a belief that this practice is rendered obligatory by the existence of a rule of law requiring it".[236]

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[228] UNGA, *Prevention of arms race in outer space*, UN Doc. A/RES/36/97C (9 December 1981).
[229] UN Doc. A/RES/65/44, *supra* note 212, preamble, para. 13.
[230] See e.g. UNGA Res. 47/67, *supra* note 73, Preamble, para. 5. Para. 4 of the Preamble expresses that States are "[g]ravely concerned about the extension of an arms race into outer space".
[231] UN Doc. A/RES/65/44, *supra* note 212, para. 4.
[232] Cf. *Legality of Nuclear Weapons*, *supra* note 23, para. 72, where the ICJ held if a prohibition on deployment or use of a weapon existed, "the General Assembly could simply have referred to it and would not have needed to undertake such an exercise of legal qualification".
[233] See Sect. II-4-b below.
[234] *North Sea Continental Shelf* (Federal Republic of Germany v. Netherlands; Federal Republic of Germany v. Denmark) [1969] ICJ Report 3 [hereinafter: *Continental Shelf*], at para. 77.
[235] *Military and Paramilitary Activities in and against Nicaragua* (Nicaragua v. US) [1986] ICJ Report 14 [hereinafter: *Nicaragua*], at para. 207.
[236] *North Sea Continental Shelf*, *supra* note 234, para. 77. See also Rosalyn Higgins, *Problems & Process: International Law and How We Use It* (Oxford: Oxford University Press, 1994), at 22.

The ICJ in *Nicaragua* held that *opinio juris* may indeed be deduced from the attitude of States towards General Assembly Resolution. Consent to the text of such resolutions should be construed as "acceptance of the validity of the rule or set of rules declared by the resolution".[237] The adoption year after year by the General Assembly of a resolution with the same content is clear and convincing evidence of the "desire [...] of the international community" on a particular subject matter[238] — in this case, to refrain from any action that would contribute to an arms race in outer space and, indirectly, to refrain from deploying or using space weapons. With regards to practice, *Legality of Nuclear Weapons* authoritatively held:

> the illegality of the use of certain weapons as such does not result from an absence of authorization but, on the contrary, is formulated in terms of prohibition.[239]

Placed in the context of space weapons, that States have not deployed or used any space weapon must be construed as "settled practice", even if the "practice" is refraining from a certain activity. To support this argument, the 2007 Chinese ASAT test drew condemnation and objection from various States, including the US, the United Kingdom, Japan and Australia, which is evidence that States consider the use of a space weapon as inconsistent with international norms.[240] Further, this "practice" is accompanied by the acceptance of the objective to refrain from actions that contribute to an arms race in outer space, which has been the content of PAROS resolutions since the 1980s.

With regards to the amount of time needed for the practice to contribute to the formation of a customary law, Matte notes due to the speed at which space technology and activities take place, customary space law relies less on the elements of "repetition, in time, of certain uses", but rests only on the *opinio juris* of States.[241] Indeed, as former President of the ICJ Higgins

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[237] *Nicaragua*, *supra* note 235, para. 188. See also Higgins (1994), *supra* note 236, 22.
[238] *Legality of Nuclear Weapons*, *supra* note 23, para. 73.
[239] *Legality of Nuclear Weapons*, *supra* note 23, para. 52
[240] See Peter Spiegel and James Gerstenzang, "Chinese missile strikes satellite", *Los Angeles Times* (19 January 2007), online: *Los Angeles Times* <http://www.latimes.com/news/nationworld/world/la-fg-satellite19jan19,0,3917551.story?coll=la-home-headlines>. See also *Space Deterrence Workshop Report*, Secure World Foundation, online: Secure World Foundation <http://swfound.org/media/7176/space_deterrence_workshop_report_final.pdf>, at 2.
[241] Matte (1969), *supra* note 17, 276-277. On the formation of "instant custom" in space law, see Bin Cheng, *Studies in International Space Law* (Oxford: Oxford University Press, 1997), 191-193. See also comment of the US representative, UN Doc. A/AC.105/C.2/SR.20 (27 June 1963), at 11:

argues, the formation of a customary norm is "greatly facilitated and accelerated" through the workings and processes of an international organization such as the United Nations.[242] And the continuous adoption of the PAROS resolution with the same or similar content is evidence of the "desire [...] of the international community" on the urgency of preventing an arms race in outer space.

b) The US as a "consistent objector"

The above demonstrates the PAROS resolutions have contributed to the formation a customary norm prohibiting the deployment and/or use of space weapons, or at the very least, the PAROS resolutions have created a prohibition on any actions which would be contrary to the objective of preventing to an arms race in outer space.[243] Custom, by its very definition, trumps State consent for it is "an obligation involuntarily undertaken" and thus not "based on the consent of any given State".[244] However, under international law the concept of the "persistent objector"[245] governs that a State which "actively, unambiguously and consistently" objects to the formation of a customary rule is not bound by that rule.[246] Of great interest is the position of the US on this matter. Though the US voted in favour of the first PAROS resolution in 1981,[247] from 1982[248] to

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> When a General Assembly resolution proclaimed principles of international law […] and was adopted unanimously, it represented the law as generally accepted in the international community.

Cited in Martin Menter, "Government Regulation of Space Activities" (1965) 7 *Jag Law Review* 5, at, 9.

[242] Higgins (1994), *supra* note 236, 22-23. Judge Tanaka echoes this sentiment in the *Continental Shelf Cases*, citing the "speedy tempo of present international life" has accelerated "the formation of customary international law. What required a hundred years in former days now may require less than ten years": in *North Sea Continental Shelf*, Dissenting Opinion of Judge Tanaka [1969] ICJ. *Reports* 171, at 177; see also *South West Africa*, Dissenting Opinion of Judge Tanaka, [1966] ICJ Reports 250, at 291.

[243] At the very least, according to Sri Lanka, the repeated and annual adoption of the Prevention of an Arms Race in Outer Space Resolution and the "almost universal endorsement of its principles" has the effect of transforming the principles contained in the resolution into customary law: see CD, *Statement by H.E. Mrs. Sarala Fernando, Permanent Representative of Sri Lanka to the United Nations, Geneva, at the First Committee, New York, 8 October 2004*, online: Reaching Critical Will <http://www.reachingcriticalwill.org/political/1com/1com04/statements/SriLanka.pdf>. See also Brisibe (2009), *supra* note 13, at 384.

[244] Higgins (1994), *supra* note 236, at 34.

[245] See e.g. *Fisheries* (United Kingdom *v.* Norway), [1951] ICJ Reports 116, at 131. See generally Olufemi Elias, 'Persistent Objector', in R. Wolfrum (ed.), *The Max Planck Encyclopaedia of Public International Law* (Oxford: Oxford University Press, 2008), online: Max Planck Institute <www.mpepil.com>.

[246] Patrick Dumberry, "Incoherent and Ineffective: The Concept of Persistent Objector Revisited" (2010) 59 *International and Comparative Law Quarterly* 779, at 781.

[247] UN Doc. A/RES/36/97, *supra* note 228. For the voting record of General Assembly resolutions, see United Nations Bibliographic Information System (UNBISNET), "Voting Records", online: UNBISNET <http://unbisnet.un.org/>.

1989,[249] the US voted against the PAROS resolution. Then from 1990 until 2006, the US abstained on the subject matter. 2007 and 2008 marked a turning point,[250] in which for two years the US again voted against the PAROS resolution. For the years 2009 to 2011, the US again returned to abstaining from voting on the PAROS resolution.[251] The voting record of the US, a State whose interests are undoubtedly "specially affected"[252] by the PAROS resolutions, suggests that the US has been a persistent objector from the beginning. The conclusion that a major space-faring power does not believe there is a legal rule prohibiting the deployment or use of space weapons, or that if there is, this customary rule has no applicability to the US, is alarming.

To summarise, for the past three decades, various proposals on a convention to completely prohibit the weaponisation of outer space have been tabled to fill the lacunae in the legal framework.[253] However, as has been outlined, it is never easy,[254] if at all possible, for States to reach a consensus on any matter, not to mention a matter as sensitive and which has resounding restraints on a State's freedom in outer space as the weaponisation debate. An attempt to prove the existence of a customary prohibition against weaponising outer space may be convincing, but objections voiced by the US to PAROS resolutions may mean that a major space-faring power is not bound by the prohibition. With the apparent impasse in the legal regulation on the matter, the prospect of space becoming entrenched as a theatre of warfare may no longer be some distant fiction, but may soon become a reality that will have adverse effects for international peace and security. The following section will illustrate what possible alternatives there are to break this impasse.

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[248] UNGA, *Prevention of arms race in outer space*, UN Doc. A/RES /37/83 (9 December 1982).
[249] UNGA, *Prevention of arms race in outer space*, UN Doc. A/RES /44/112 (15 December 1989).
[250] UNGA, *Prevention of arms race in outer space*, UN Doc. A/RES/62/20 (5 December 2007); UNGA, *Prevention of an arms race in outer space*, UN Doc. A/RES/63/40 (2 December 2008), respectively.
[251] See UNGA, *Prevention of arms race in outer space*, UN Doc. A/RES/64/28 (2 December 2009); UN Doc. A/RES/65/44, *supra* note 212; and UN Doc. A/66/410, *supra* note 42, respectively.
[252] *North Sea Continental Shelf Case*, *supra* note 234, para. 74, at 43.
[253] See Brisibe (2009), *supra* note 13, 381.
[254] It takes at least a decade for the UNCOPUOS to develop legal principles to regulate space activities: see Alwes, Benkö and Schrogl (1993), *supra* note 72, at 233.

IV. The "Green" Approach to the Space Weaponisation Debate

As has been outlined, the debate on the legality of the weaponisation of outer space has reached an impasse decades after it was first recognised as a matter of international concern. Even so, the absence of specific laws should not deter any international space lawyer who, in seeking "a higher degree of well-being" for humankind,[255] is keen to ensure that space activities subscribe to the noble objective of using space for peaceful purposes when the legal regime governing space was first being formulated. This "higher degree of well-being" of humankind implies looking beyond the interest, or interests, of any one State or group of States.[256] It also implies that humankind consists not only of the current generation of human beings alive today, but also encompasses the interests of future generations.[257] Other than concern for the natural environment, there is no other subject matter that impinges more urgently on the present and future wellbeing— and indeed survival— of humankind. Indeed, the special status of outer space means that the natural environment of outer space necessitates the protection and preservation of *all* States.[258] Therefore, as Maogoto and Freeland innovatively argue, the weaponisation of outer space debate should be viewed from a "green" perspective, especially as environmental law can offer a "less contentious platform for curtailing space weaponization."[259]

In the fundamental, and yet highly controversial, question of whether the use of nuclear weapons is legal, the International Court of Justice made it sufficiently clear: the legality of a State's action not only rests on the rights of other States that may be infringed upon, but must also consider the consequences a particular course of action may have on the natural environment. The Court thus recalled:

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[255] Carl Q. Christol, "The Use of Outer Space for Peaceful Purposes: Legal and Political Considerations" (1985) 28 *Colloquium on the Law of Outer Space* 4, at 6-7.

[256] As Lachs noted in 1964, just after the Declaration of Legal Principles, the law of outer space:

> [is] meant to regulate relations between States, to determine their rights and duties resulting from all activities directed towards outer space and within it—*and to do so in the interest of mankind as a whole* […]

Lachs (1964), *supra* note 142, at 33 [emphasis added].

[257] E. Brown-Weiss, "Intergenerational Equity: A Legal Framework for Global Environmental Change", in *Environmental Change and Environmental Law. New Challenge and Dimensions* (Tokyo: United Nations University Press, 1992), at 395.

[258] Patricia M. Sterns and Leslie I. Tennen, "Principles of Protection of the Outer Space Environment in the *corpus Juris Spatialis*" (1987) 30 *Colloquium on the Law of Outer Space* 172, at 174.

[259] Maogoto and Freeland (2008), *supra* note 30, at 32.

> the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn. 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.[260]

It will be argued below that in their activities in outer space, States must have regard for the consequences of their activities on the natural environment. The use of kinetic weapons and the subsequent creation of space debris will have a devastating impact on the natural environment. The use of such weapons in outer space, as well as the debris created, will adversely impinge on the lawful interests of other States in outer space, as well as endanger life and the safety of human beings and space objects.

1. The Environment includes outer space

Though there is no agreed definition of the term "environment", the Stockholm Declaration suggests the environment is that which provides humankind "physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth".[261] The environment can be classified as "natural" or "man-made", but both are deemed essential to the wellbeing of human beings "and to the enjoyment of […] right to life itself".[262] For the purpose of this thesis, attention will focus on the natural environment—that which exists and has existed independently of the presence and activities of human beings.[263] It is postulated that outer space is a part of this natural environment, which is vital to the continued sustenance of human beings, and that outer space is a region which affords humankind opportunity for growth and development. Therefore, the environment of outer space, just like all other environments and regions on and around Earth, is an area that States must protect.[264]

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[260] *Legality of Nuclear Weapons*, *supra* note 23, para. 29.
[261] *Stockholm Declaration*, *supra* note 36, Preamble, para. 1.
[262] *Ibid.*
[263] Under Principle 2 of the *Stockholm Declaration*, *supra* note 36, there is a reference to the "natural resources of the earth, including the air, water, land, flora and fauna". See also Philippe Sands, *Principles of International Environmental Law*, 2nd ed. (Cambridge: Cambridge University Press, 2003), 16.
[264] In the report *Our Global Neighborhood*, the Commission on Global Governance cited environmental concerns as capable of endangering global security, as well as the security of the planet: see Commission on Global Governance, *Our Global Neighborhood, Report of the Commission on Global Governance*, available online: Global Development Research Center <http://www.gdrc.org/u-gov/global-neighbourhood/index.htm>, especially Ch. 3, 'Promoting Security', and ch. 7. See also Tannenwald (2004), *supra* note 41, at 409-410.

In 1980, the International Law Commission concluded that "a threat to a vital ecological interest" can occur in the context of outer space.[265] Further support for this conclusion can be found in a number of international documents, some of which are discussed below.

The 1963 Limited Test Ban Treaty (LTBT), as outlined in its Preamble, has as one of its objectives the ending of the contamination the environment.[266] Specifically, it prohibits the testing of nuclear weapons in the atmosphere, under water and *in outer space*.[267]

Under the 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD Convention), States were concerned with "scientific and technical advances" likely to result in the "modification of the environment".[268] ENMOD prohibits States from using warfare techniques which deliberately manipulates natural processes and changes "the dynamics, composition or structure of the Earth […] or *of outer space*".[269]

Further, the 1982 World Charter for Nature enjoins States to respect the natural make-up of "*all* areas of the [Earth]" and also enjoins States to avoid impairing the "essential processes" of nature.[270] Paragraph 21 of the World Charter specifically obliges States to ensure activities within their jurisdiction or control do not result in damage to "natural systems located within other States or *in the areas beyond the limits of national jurisdiction*".[271] States must also

[265] See ILC, *Yearbook of the International Law Commission, vol. II(2)*, UN Doc. A/CN.4/SER.A/1980/Add.l (Part 2) (1980), at 40, para. 16.

[266] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, 5 August 1963 (entered into force 10 October 1963. As of 1 December 2011, there are 117 State Parties and 10 signatories), art. I(1)(a) [hereinafter: Limited Test Ban Treaty, or LTBT], Preamble, para. 3. The Comprehensive Nuclear Test Ban Treaty also cites the protection of the environment as an objective of the treaty: see UNGA, *Comprehensive Nuclear-Test-Ban Treaty*, Res. 50/245, UN. Doc A/RES/50/245 (10 September 1996) (not yet in force. As of 1 December 2011, the treaty has 157 States Parties and 26 signatories), Preamble, para. 9. Glenn H. Reynolds & Robert P. Merges note that despite nuclear disarmament as being the treaty's direct subject matter, the Test Ban Treaty, especially with its aim to prevent "global nuclear contamination", is guided by environmental concerns: *Outer Space: Problems of Law and Policy* (Boulder, CO. : Westview Press, 1997), at 54.

[267] LTBT, *supra* note 266, art. I(1)(a) [emphasis added]. It is a "limited" test ban treaty, because nuclear explosions are still permitted underground, except 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" (art. I(1)(b)). The Comprehensive Nuclear Test Ban Treaty prohibits all nuclear test explosions or any other nuclear explosion: see *supra* note 266.

[268] ENMOD, *supra* note 36, Preamble, para. 3.

[269] *Ibid.*, arts. I and II [emphasis added].

[270] UNGA, *World Charter for Nature*, UN Doc. A/RES/37/7 (28 October 1982), paras. 1 and 3 [emphasis added].

[271] *Ibid.*, para. 21(d) [emphasis added].

"[safeguard] and conserve nature *in areas beyond national jurisdiction*".[272] By extrapolation, the aforementioned obligations would therefore necessarily oblige States to respect and protect the environment of outer space.[273]

Even before the promulgation of the Outer Space Treaty, the first Chairman of the Legal Subcommittee of UNCOPUOS Manfred Lachs warned that polluting space or causing "permanent changes in the balance of the atmosphere surrounding the earth" will very likely affect "human health or even life".[274] The very nature of space activities—the many risks and impacts of which remain unknown— means that the space activity of one State exposes other States to more dangers and risks than activities in any other environment.[275] In fact, and core to the discussion of the present thesis, Lachs notes polluting outer space can endanger the security of other States and affect the rights of other States to carry out space activities.[276]

2. Existing space law related to the protection of the environment

Despite the recognition by the International Law Commission and Manfred Lachs that the outer space environment can be polluted and that States are responsible for such activities, existing space law says little about such matters. Except for a number of non-binding international guidelines,[277] existing laws and principles governing outer space are practically silent on the matter of responsibility for the creation of space debris. The Principles Relevant to the Use of Nuclear Power Sources in Outer Space pertains to contamination but only in a very specific context when a space object utilises nuclear power sources.[278] Article IX of the OST, which sets

[272] *Ibid.*, para. 21(e) [emphasis added]. A similar phrasing can be found under the Convention on Biodiversity (5 June 1992), which obliges States to ensure that activities under their jurisdiction or control "do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (art. 3). In terms of jurisdiction, the Convention stipulates that its provisions apply regardless of where the effects of the activities are felt (art. 4).
[273] See G. M. Danilenko, "Space Activities and Customary Law of Environmental Protection", 169-180 in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), 172-173.
[274] Lachs (1964), *supra* note 142, at 72. Concern for damage to the environment was so great that the Committee on Space Research established a Consultative Group on the Potentially Harmful Effects of Space Experiments in 1962. This has since been replaced by the Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS).
[275] Lachs (1964), *supra* note 142, at 73.
[276] *Ibid.*, at 77.
[277] See e.g. The IADC *Space Debris Mitigation Guidelines* and *European Code of Conduct for Space Debris Mitigation*, both *supra* note 70.
[278] UN Doc. Res. 47/68, *supra* note 82.

out "parameters of permitted and prohibited space activities",[279] is the most relevant provision on the matter of protecting the outer space environment, and the obligation contained therein is two-fold.

a) Avoiding "harmful contamination"

Firstly, Article IX provides that when conducting studies and the exploration of outer space, States shall "avoid […] harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter".[280] The express reference to "harmful" contamination leaves the impression that other forms of contamination are permissible.[281] What degree of contamination is to be deemed "harmful", and who is to judge the degree of 'harmful-ness'?[282] Kolossov suggests "contamination" in the outer space context denotes the creation of any hindrance to the legitimate activities of other States.[283] This would cover circumstances involving the "deliberate introduction of alien items into outer space".[284] If this definition is accepted, then the intentional destruction of a space object and the resultant widespread creation of space debris would indeed be considered "harmful contamination".

Correctly, Professor Ram Jakhu considers Article IX to be "a general, and weak, legal instrument for the regulation and control" of space debris, and of environmental damage in general.[285] The obligation to avoid harmful interference is weak, for the obligation is couched in terms of avoidance, and not in absolute prohibitive terms. Article IX singles out the obligation to

[279] Galloway (1984), *supra* note 164, 311.
[280] A similar provision is reflected in the Agreement on the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 34/68, U.N. GAOR, 34th Sess., Supp. No. 46, U.N. Doc. N34/664 (1979) [hereinafter: Moon Agreement] (entered into force on 11 July 1984. As of 1 December 2011, there are 14 States Parties and 4 signatories to the Moon Agreement), art. 7.
[281] Stephen Gorove, "Contamination and the Outer Space Treaty" (1972) 14 *Colloquium on the Law of Outer Space* 63, at 64. Baker notes the avoidance of harmful contamination under art. XI of the OST does not extend to the environments of the Moon and other celestial bodies: See Howard A. Baker, "Protection of the Outer Space Environment: History and Analysis of Article IX of the Outer Space Treaty" (1987) 12 *Annals of Air and Space Law* 143, at 163. Only Article VII of the Moon Agreement, *supra* note 280, provides that States must undertake measures to prevent disrupting the existing balance of the environments of celestial bodies other than the Earth.
[282] Gorove (1972), *supra* note 281, at 64. See also Sterns and Tennen (1987), *supra* note 258, at 179.
[283] This would encompass the "introduction of such items, substances and energy into outer space which results in endangering the health of cosmonauts, causing hindrance for legitimate outer space activities, and causing damage to outer space objects": Y. M. Kolossov, "Legal Aspects of Outer Space Environmental Protection" (1980) 23 *Colloquium on the Law of Outer Space* 103, at 103.
[284] *Ibid.*, at 105.
[285] Jakhu (1992), *supra* note 72, at 321. Danilenko would note that the duty to inform and consult are "emerging as general stands of behaviour" concerning environmental protection, but are not necessarily customary rules yet: see Danilenko (1990), *supra* note 273, at 173-174.

avoid harmful contamination only when conducting studies and the exploration of outer space. Taking an ordinary meaning approach to treaty interpretation,[286] nothing suggests the obligation to avoid harmful contamination applies to general uses of outer space other than that related to study and exploration of outer space.[287] Thus, when using space for telecommunications or reconnaissance, is there then no obligation to avoid harmful contamination?[288] If so, then the intentional destruction of a space object, which will certainly result in "harmful contamination", may in fact fall short of the obligation contained in Article IX.

b) Obligation and right to consult

Secondly, Article IX provides that a State should undertake international consultations if it believes its planned activity in outer space, including the Moon and other celestial bodies, would cause "potential harmful interference with activities of other States Parties in the peaceful exploration and use of outer space". Similarly, a State may request consultation if it believes the space activity of another State would potentially cause harmful interference with activities in the peaceful exploration and use of outer space.[289] Harmful interference may be defined as the introduction of substances in outer space which is a "hazard to human health and hindrance to exploration of outer space".[290]

In the simple language of the text,[291] the treaty obligation upon States is to ensure their space activities do not interfere with the interests of other States in outer space. However, with the volatile forces of launching, and the natural gravitational forces of orbital operations, it is almost impossible to conduct space activities without creating some kind of contamination in the

[286] VCLT, *supra* note 149, art. 31.
[287] Comparing Article I and Article IX of the OST, the former provision speaks of general "use" of outer space, whereas the latter article refers to specific uses of outer space, namely for the purpose of conducting studies and exploration. Also Article 7(1) of the Moon Agreement, *supra* note 280, provides that in the *use* and exploration of the Moon, States must prevent "disruption of the existing balance of its environment", whether by harmful contamination or otherwise, whereas Article IX of the OST speaks only of *studies and exploration* of outer space. See also Danilenko(1990), *supra* note 273,171.
[288] Van Traa-Engelman notes that the existence of a "lacuna in this obligation relating to space activities in the field of more practical uses of outer space" is a "reason for major concern": See Hanneke van Traa-Engelman, "Environmental Hazards from Space Activities: Status and Prospects of International Control" (1982) 25 *Colloquium on the Law of Outer Space* 55, at 57.
[289] OST, *supra* note 17, art. IX. For a more detailed discussion, see Gorove (1972), *supra* note 281.
[290] Gerhard Reintanz, "Some Legal Remarks on Space Activities which may have Harmful Effects on the Environment" (1972) 15 *Colloquium on the Law of Outer Space* 277, at 277. See also OECD, *Recommendation on Principles concerning Transfrontier Pollution*, OECD Recommendation C (74) 224 of 14 November 1974, Annex, Title A [hereinafter: *OECD Recommendation C (74) 224*].
[291] VCLT, *supra* note 149, art. 31(1).

form of space debris or otherwise.[292] Thus, the right to consult and seek consultation enshrined in Article IX hinges upon the *degree* of debris contamination that might qualify as being a "harmful interference" to the space activities of other States.[293] The re-entry of the defunct Mir Space Station into the Earth's atmosphere in 2001 is an excellent example of how a State fulfilled the Article IX obligation to consult the international community.[294]

What is meant by "consultation"? During the drafting of the OST, terminology such as "contacts and exchange of views" and "negotiation" were used in lieu of "consultation".[295] Sztucki concludes it is "a notion of diplomatic practice rather than international law",[296] and should be interpreted as "joint deliberation" between States "with the purpose to facilitate the settlement of disputes or to smooth down the differences of views […] or for the purpose of establishing common policy".[297] The consultation clauses of the OST must be construed in light of the general undertaking to cooperate in outer space activities, and to foster exchanges of information so as to ensure more transparency and avoid conflict of interests.[298] Though the consultation provision offers the "most valuable and practical means to counter the negative effects of space activities", there is currently no framework through which States can effectively undertake the process of consultation or seek consultation with a potentially interfering State.[299]

Based on a literal reading of Article XI, the obligation to consult relates only to a situation when a State believes its activities will cause harmful interference to the *peaceful* activities of other States in outer space. The obligation is thus subjective, and as Gorove observes the provision requiring consultation provides "an opportunity for any party to be lax in censuring

[292] Taylor (2007-2008), *supra* note 116, at 26.
[293] Nandasiri Jasentuliyana, "Celebrating Fifty Years of the Chicago Convention Twenty-Five Years After the Moon Landing: Lessons for Space Law" (1994) 19 *Annals of Air and Space Law* 429, at 442.
[294] See UN Doc. COPUOS/LEGAL/T.665, *supra* note 67, at 10.
[295] Jerzy Sztucki, "International Consultations and Space Treaties" (1974) 17 *Colloquium on the Law of Outer Space* 147, at 151.
[296] *Ibid*. For a historical analysis of diplomatic consultation, see *ibid.* 151-156.
[297] *Ibid.*, 151.
[298] *Ibid.*, at 167-168. See also "Affaire du Lac Lanoux" (1963) 12 *Reports of International Arbitral Awards* 281; reprinted in English in 53 *Journal of International Law* 156 (1959), specifically paras. 22-23. See also Rüdiger Wolfrum, "Purposes and Principles of International Environmental Law" (1990), 33 *German Yearbook of International Law* 308, at 314.
[299] Though this was an opinion stated in 1982, the situation has not much changed: see van Traa-Engelman (1982), *supra* note 288, 57. As van Traa-Engelman notes, clarification of Art. IX of the OST should take priority in the international community's attempt to regulate hazardous effects of space activities, especially in providing "an adequate protection against the ultimate harmful effects of warfare in outer space": 59.

itself".[300] Further, by implication, is there an obligation to consult, or any corollary right to consult, when a State is conducting *non-peaceful* activities?[301] Much of the right to seek consultation, as well as the obligation of the potentially interfering State to consult, rests on the availability of information, which in a strategic domain as outer space may be hard to come by.[302] Thus, it can concluded that Article IX of the OST does not provide any effective protection against the environmentally hazardous effects of warfare in outer space—certainly not in circumstances when a State intentionally wishes to use a kinetic weapon to destroy a space object.[303]

And what happens after consultation takes place? Is the planned activity which is believed will cause harmful interference with activities of other States then prohibited or must be modified to ensure less interference? The OST is silent on the matter, and it is presumed that consultation between States will result in a compromise that is acceptable for all States—a situation which may be hard, if not impossible, to achieve in reality. Article IX is further flawed in that nothing deals with a situation when the request for consultation is rejected.[304] In the light of the above analysis of the provision's flaws, if Article IX is to be construed as a provision to stem the environmental contamination of outer space, then it has very little impact. For a more forceful and extensive protection of the outer space environment from contamination by space debris, and specifically debris caused by the use of a kinetic space weapon, the law must be sought from beyond existing space law.

[300] Gorove (1972), *supra* note 281, at 63. As Sterns and Tennen put it, Article IX of the Outer Space Treaty is not "self-executing": *supra* note 258, at 175, especially fn. 20; see also Lachs (1964), *supra* note 142, who comments that Article IX of the OST appears to "raise a whole spectrum of questions" (at 73).
[301] Sztucki (1974), *supra* note 295, at 157-158.
[302] *Ibid.*, at 164.
[303] van Traa-Engelman (1982), *supra* note 288, at 59.
[304] Gorove (1972), *supra* note 281, 64. Sztucki notes that "the obligation to hold consultation is not tantamount to the obligation to reach an agreement on its subject matter": see (1974), *supra* note 295, at 165.

3. Protecting the outer space environment: solutions from international environmental law

The Declaration of Legal Principles, adopted by the UN General Assembly in 1963,[305] recognised the exploration and use of outer space "for peaceful purposes" is the "common interest of all mankind".[306] It further unequivocally proclaimed that:

> activities of States in the exploration and use of outer space *shall be carried on in accordance with international law,* including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.[307]

That international law should govern activities in outer space was recognised as early as 1961 by the General Assembly.[308] This stipulation is further repeated under Article III of the Outer Space Treaty,[309] making this principle undisputed. However, what is meant by the phrase "in accordance with international law", and what is the scope and extent of international law that applies?

It is postulated that carrying out activities in outer space in accordance with international law includes compliance with principles of environmental law,[310] the universal applicability of

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[305] *Declaration of Legal Principle, supra* note 144. Vladimir Kopal believes that the Declaration of Legal Principles contain fundamental principles that have become "peremptory norms of general international law/*jus cogens* accepted and recognized by the international community of States as a whole": see UN, *Disseminating and Developing International and National Space Law the Latin American and Caribbean Perspective: Proceedings United Nations/Brazil Workshop on Space Law*, UN Doc. ST/SPACE/28 (New York: United Nations, 2005), at 26.

[306] *Declaration of Legal Principle, supra* note 144, Preamble, para. 2.

[307] *Ibid.*, para. 4 [emphasis added]. J. A. Frowein notes that it is "rather rare" that other sources of international law is referred to in a treaty as the basis for the activities of States: see 'Customary International Law and general Principles concerning Environmental Protection in Outer Space', 163-167 in Karl-Heinz *Böckstiegel*, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), at 164.

[308] UN Doc. Res. 1721 (XVI), *supra* note 173, sect. A, para. 1(a). In fact, two years earlier, the Legal Subcommittee of the (then ad hoc) COPUOS underlined that "as a matter of the principle", the UN Charter, the Statute of the International Court of Justice are "not limited in their operation to the confines of the Earth", and that the use and exploration of outer space must be done in accordance with "existing or future international law or agreements": see UN, *Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space,* UN Doc. A/4141 (14 July 1959), at 22-25; see also Philip C. Jessup and Howard J. Taubenfeld, "The United Nations Ad Hoc Committee on the Peaceful uses of Outer Space" (1959) 53 *American Journal of International Law* 877, at 879-880.

[309] OST, *supra* note 17, art. III.

[310] However, Stephen Gorove would note even if a treaty, like the Outer Space Treaty, reiterates the applicability of the UN Charter to the context of outer space, it does not mean that general obligations and prohibitions related to certain activities apply "without the need of any further assertion": Stephen Gorove, "Maintaining Outer Space for Peaceful Uses: Some Specific Proposal for a Modest Headway in Arms Control" (1985) 28 *Colloquium on the Law of Outer Space* 27, at 27.

which is mainly established in customary international law.[311] International law signifies "the principles which are in force between all independent nations",[312] and Lachs opines international law extends to whichever realm and at whichever moment in time States interact with one another. Thus, as soon as activities of States entered the realm of outer space, the overarching regime of international law which governs the rights and responsibilities of States became automatically applicable there.[313] Though obviously not all of international law would apply to the context of outer space,[314] many domains of international law would acquire a "new dimension" in regulating the conduct of States in outer space, and would therefore warrant "a more extensive interpretation".[315] In the interpretation of any international document, not only are the rules of international law existing at the time of the treaty's conclusion relevant, but present circumstances and future trends are relevant as well.[316] Indeed, the *Namibia* Advisory Opinion echoed such sentiments by underlining that law "has to be interpreted and applied within the framework of the entire legal system prevailing at the time of the interpretation".[317]

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[311] Danilenko (1990), *supra* note 273, at 170.

[312] *The S.S. Lotus*, P.C.I.J. Judgment (1927), A/10, at 17.

[313] Lachs (1964), *supra* note 142, at 43-44. At 89, Lachs notes that international law, and the UN Charter, bind States in outer space "as in all other dimensions". Even before the space era, Oscar Schachter argued that legal principles and precedents which form customary international law are applicable to space activities: See Oscar Schachter, 'Who owns the Universe', 8-17 in *Space Law: a Symposium prepared at the request of Lyndon B. Johnson, Chairman, Special Committee on Space and Astronautics, United States Senate, Eighty-fifth Congress, Second Session* (Washington, U.S. Govt. Printing Office, 1959), at 14.

[314] Exceptions of those rules that do not apply would be *lex specialis* rules which governs "one or some of the other environments only", such as for example the law of the sea: see Lachs (1964), *supra* note 142, 44-46. Interesting to note, space law itself is *lex specialis,* and obviously its particular rules and legal regime would not apply to other environmental settings. This does not preclude the use of legal analogies governing other environments of humankind when attempting to interpret rules for the outer space context. See also Petras (2003), *supra* note 314, 182-183.

[315] Lachs (1964), *supra* note 142, 41-42. As the US Representative to the First Committee of the General Assembly succinctly argued in 1962:

> Outer space is not a new subject, it is just a new place in which all the old subjects come up. The things that go on in space are intimately related to the things that go on here on earth. It would be naive to suppose that we can insulate outer space from other aspects of human existence.

See "Contemporary Practice of the United States Relating to International Law" (1963) 57 *American Journal of International Law* 403, at 429.

[316] See VCLT, *supra* note 149, art. 31(c).

[317] *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) notwithstanding Security Council Resolution 276 (1970)* (Advisory Opinion) [1971] *ICJ Reports* 16 [hereinafter: *Namibia*], para. 53, at 31. In the *Lotus* case, the PCIJ (the ICJ's predecessor) held when addressing any question of international, one must have regard to "the very nature and *existing conditions* of international law" [emphasis added]: *Lotus, supra* note 312, at 18. The ILC cites the UN Charter as a good example of this, for its provisions "were wide enough to be adapted by practice and judicial decision to needs that could not be foreseen in every detail

It is undeniable that environmental law has evolved and "expanded its scope of application to cover new spaces and new resources", which includes "common spaces and the environment as a whole".[318] As former ICJ President Rosalyn Higgins has expressed, environmental law is invariably a part of "mainstream international law".[319] In *Gabčíkovo-Nagymaros*, Vice-President Weeramantry opined that the environmental impact of human activities on the global commons necessitates infusing all areas of law with concerns and principles of environmental law.[320] Thus, no State should be permitted to act in a way that is environmentally detrimental, even though at the time of drafting and adopting the treaty environmental concerns were not foreseen or expressly dealt with in the said treaty.[321] Activities and laws of outer space must therefore also be interpreted and applied with the protection of the environment in mind.

a) General duty to protect the natural environment

At the 1972 UN Conference on the Human Environment (Stockholm Conference), States recognised protecting the environment as the "desire of the peoples of the whole world and the duty of all Governments".[322] The ability of human beings to transform the natural environment, at times in ways detrimental to human life and survival,[323] makes it imperative for all States—and humankind in general— to "defend and improve the human environment for present and future generations".[324] This obligation, couched in very similar language, is repeated and

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at the time of their drafting": see ILC, *Yearbook of the International Law Commission*, 1973, vol. II, UN Doc. A/9010/Rev.1, at 229, para. 164.

[318] Wolfrum (1990), *supra* note 298, at 317. See also Lothar Gündling, who argues that international environmental protection in the broadest sense comprises not just areas within States, but also responsibility to protect areas outside the jurisdiction of any State: 'Environment, International Protection' (1986), 96-104 in *Encyclopaedia of Public International Law* (Amsterdam: North Holland, 1995), 98.

[319] Speech by H. E. Judge Rosalyn Higgins, President of the International Court of Justice to the General Assembly of the United Nations, 26 October 2006, online: ICJ <http://www.icj-cij.org>.

[320] *Gabčíkovo-Nagymaros* (Hungary/Slovakia) [1997] ICJ Reports 7, Separate Opinion of Vice-President Weeramantry, at 118.

[321] *Ibid.*, at 114-115.

[322] *Stockholm Declaration*, *supra* note 36, Preamble, para. 2. See also Oscar Schachter, "The Emergence of International Environmental Law" (1991) 44 *Journal of International Affairs* 457, 458; and Gündling (1995), *supra* note 318, at 96.

[323] *Stockholm Declaration*, *supra* note 36, Preamble, para. 1 and 3.

[324] *Ibid.*, Preamble, para. 6; UNGA, *Charter of Economic Rights and Duties of States*, UN Doc. A/RES/29/3281 (12 December 1974), Preamble, para. 4(f) and art. 30. See also UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 101-102, para. 15:

affirmed by the ICJ in *Legality of Nuclear Weapons* referred to above.[325] Without a doubt, today protecting the natural environment from damage is "a deeply entrenched principle, grounded in common sense, case law, international conventions, and customary international law".[326]

That the protection of the environment is a duty of all States took time to be recognised. For a long time the international legal system was founded on sovereign equality, and international law merely played a role to "coordinate the activities of States".[327] Under such a system, only a party whose rights have been infringed upon or affected may resort to legal action to invoke the international responsibility of the wronging State.[328] However, this State-focused perspective of the international legal system no longer holds. For the protection of the natural environment in areas beyond national jurisdiction— including outer space—it is "inappropriate […] and would render international law […] ineffective" if the legal regime is continually perceived as being founded on the exchange of bilateral rights and obligations between States.[329]

In recent years, from the issue of human rights to the protection of the natural environment, international law has evolved to become "the articulation of a universal interest […] exemplified by the common threat to human survival".[330] International law is increasingly

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> More recently, the requirements of economic and social development on all sides and the marvelous achievements, but also the terrible dangers, of scientific and technological progress have led States to realize the imperative need to protect the most essential common property of mankind and, in particular, to *safeguard and preserve the human environment for the benefit of present and future generations* [emphasis added].

[325] *Legality of Nuclear Weapons*, *supra* note 23, 241 -242, para. 29.
[326] Dissenting Opinion of Judge Weeramantry in *Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court's Judgment of 20 December 1974 in the Nuclear Tests* (New Zealand v. France) [1995] ICJ Reports 288 [hereinafter: *Nuclear Tests*], at 347.
[327] Wolfrum (1990), *supra* note 298, at 325.
[328] *See e.g. South West Africa* (Ethiopia and Liberia v. South Africa, Second Phase) [1966] ICJ Reports 6 [hereinafter: *South West Africa*], at 32, para. 44.
[329] See Wolfrum (1990), *supra* note 298, at 325. Simma (1994), *supra* note 148, warns that at the international level "the value-poverty of bilateralist international law appears […] glaring" (at 233), while Philippe Sands echoes:

> It remains to be seen whether a diminishing conception of sovereignty in the face of a more assertive international judiciary, together with a more inclusive, accessible and diverse international legal order, leads to any greater protection of the environment.

See *supra* note 263, at 12. See also Alexandre Kiss, "The International Protection of the Environment", 1069-1093 in R. St. J. Macdonald, Douglas M. Johnston (ed.), *The Structure and Process of International Law: Essays in Legal Philosophy, Doctrine, and Theory* (Dordrecht: Martinus Nijhoff Publishers, 1983), at 1085. The current ICJ President Hisashi Owada would argue that the protection of the environment cements the concept of an "international public order": see "International Environmental Law and the International Court of Justice", Inaugural Lecture at the Fellowship Porgramme on International and Comparative Environmental Law, *Iustum Aequum Salutare* (2006) 5, at 9-12.
[330] Higgins (1994), *supra* note 236, 11. The ILC noted in 1976 that:

founded on the recognition and protection of community interests and communal obligations.[331] Thus, the seminal ruling in the *Lotus* case, in which it was held that what is not prohibited is permitted under international law,[332] is no longer as relevant in today's community of States.[333] Judge Simma of the International Court of Justice would argue that "more thoroughly" than ever before community interests are "permeating the body of international law". [334] The protection of the environment and the wellbeing of the global commons are both core interests that require communal efforts in safeguarding or preserving.[335] Indeed, Judge Simma emphasises concern for the environment is "a particular impressive illustration" of the existence of community interests in international law.[336]

States are not only under a general obligation to protect the environment from damage. It is argued that this duty is an obligation in the interest of all States, and that is owed to all States. In short, it is an obligation *erga omnes,* which by its very nature is a "concern of all States",[337] and which also means that any State possesses the right to bring a case before the ICJ to enforce

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> New rules of international law have thus appeared […]; these rules impose upon States obligations which are to be respected because of an increased collective interest on the part of the entire international community.

UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 101-102, para. 15.

[331] Judge Weeramantry argues that the international law has entered an era which must recognize and protect interests that are not only beyond the individual interests of States, but takes into consideration "greater interests of humanity and planetary welfare": see Separate Opinion of Vice-President Weeramantry in *Gabčíkovo-Nagymaros, supra* note 320, at 118. See also Kiss (1983), *supra* note 329, at 1085; and UN, *Report of the Secretary-General on the Protection of the Environment in Times of Armed Conflict,* UN Doc. A/48/269 (29 July 1993) [hereinafter: *Protection of the Environment in Times of Armed Conflict*], 14, para. 73.

[332] *Lotus, supra* note 312,, at 18:

> The rules of law binding upon States therefore emanate from their own free will as expressed in conventions or by usages generally accepted as expressing principles of law and established in order to regulate the relations between these co-existing independent communities or with a view to the achievement of common aims. Restrictions upon the independence of States cannot therefore be presumed.

[333] For support of this position, see C. A. Colliard, "Report on Colloquium" (1983) 25 *Colloquium on the Law of Outer Space* 331, at 332; V.S. Vereshchetin, *Prevention of the Arms Race in Outer Space: International Law Aspect*, United Nations Institute for Disarmament Research, UNIDIR/86/08, 10-11; Galloway, *supra* note 151, at 23; and Ram Jakhu, "Legal Issues relating to the Global Public Interest in Space Law" (2006) 32 *Journal of Space Law* 31, 41-43. In relation to the protection of the natural environment, see Pierre-Marie Dupuy, "Overview of the Existing Customary Legal Regime regarding International Pollution", 61-89 in Daniel Barstow Magraw (ed.), *International Law and Pollution* (Philadelphia: University of Pennsylvania Press, 1991), 70.

[334] Simma (1994), *supra* note 148, at 234.

[335] *Ibid*.

[336] *Ibid.*, at 238. See also Owada (2006), *supra* note 229, at 8.

[337] *Barcelona Traction* (Belgium v. Spain), [1970] ICJ Reports 3, at 32, para. 33.

these obligations owed to all States.[338] Though the international legal system lacks an executive body to identify and pronounce interests that "are the concern of all States", [339] the protection of the environment is undisputedly a matter deserving "of international concern and action".[340] Recalling Judge Simma's opinion that concern for the environment is a prime illustration of the existence of community interests in international law,[341] Judge Weeramantry in his capacity as the Vice-President of the ICJ declared:

> It would not be wrong to state that the love of nature, the desire for its preservation, and the need for human activity to respect the requisites for its maintenance and continuance are among those pristine and universal values which command international recognition. [342]

It is submitted that international law in general, and outer space law in particular, must be read and applied with principles of environmental law in mind.[343] Former President of the Court Rosalyn Higgins is an advocate of perceiving international law as a "process, rather than rules or

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[338] See UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 99, para. 10:

> It follows, according to the Court, that the responsibility engaged by the breach of these obligations is engaged not only in regard to the State which was the direct victim of the breach; it is also engaged in regard to all the other members of the international community, so that, in the event of a breach of these obligations, every State must be considered justified in invoking—probably through judicial channels—the responsibility of the State committing the internationally wrongful act.

[339] The Court does cite acts of aggression and genocide are examples of obligations *erga omnes*: see *Barcelona Traction*, *supra* note 337, at para. 34.

[340] Gündling (1995), *supra* note 318, at 98. Wolfrum (1990), *supra* note 298, notes in this respect:

> It is beyond the power of a single State or a group of States to define what environmental policy serves the interest of the world community and to impose this definition upon the rest of the State community. This does not presuppose that the identification of environmental problems of global concern and the elaboration of respective rules can only be undertaken through the consent of all States (328-329).

[341] Simma (1994), *supra* note 148, at 238. Writing in 1990, Rüdiger Wolfrum notes the necessity of removing the protection of the environment from the exclusive competence of States and situating the matter on par with the protection of human rights, which is universally recognised as an interest of the international community of States: see Wolfrum (1990), *supra* note 298. See also Kiss, *supra* note 329, at 1071 and 1088-1089; and *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 14, para. 73.

[342] *Gabčíkovo-Nagymaros*, *supra* note 320, Separate Opinion of Vice-President Weeramantry, at 108-109. Indeed, at 91-92, Judge Weeramantry noted that the protection of the environment is "a vital part of contemporary human rights doctrine" as the deterioration or destruction of the natural environment will no doubt "impair and undermine" all other the human rights.

[343] See M. Williams, 'Customary International Law and General Principles of Law', 153-162 in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), especially at 158-159.

commands",[344] and argues that the evolving nature of law allows it to be read and constructed in ways to fill in gaps in the law where there is no law.[345] In this vein, Pardo and Christol argue that faced with new realities and demands, law has the ability to evolve to engender the acceptance and protection of old and new interests.[346] Thus, even though there is no express or outright declaration to that effect, particularly in the outer space context, the protection of the natural environment must be construed as a fundamental obligation in international law.

In the case of *Gabčíkovo-Nagymaros*, the ICJ took the opportunity to unequivocally pronounce that "great significance" must be attached to the "respect for the environment, not only for States but also for the whole of mankind".[347] In addition, the Court effectively made the link that causing environmental damage attracts international State responsibility.[348]

Indeed, the ILC already in 1976 recognised the existence of certain norms which are "essential for the protection of fundamental interests of the international community", the breach of which would constitute an "international crime".[349] A prime example of such a breach of an essential norm is:

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[344] Higgins (1994), *supra* note 236, 10.
[345] *Ibid.*, at 1-2 and 5-6.
[346] Arvid Pardo and Carl Q. Christol, "Common Interest: Tension between the Whole and the Parts", 643-660 in R. St. J. Macdonald, Douglas M. Johnston (ed.), *The Structure and Process of International Law: Essays in Legal Philosophy, Doctrine, and Theory* (Dordrecht: Martinus Nijhoff Publishers, 1983), at 651.
[347] *Gabčíkovo-Nagymaros*, *supra* note 320, at 41, para. 53.
[348] *Ibid.*; and UN Doc. A/CN.4/SER.A/1980/Add.l (Part 2), *supra* note 265. See also Rüdiger Wolfrum, "International environmental Law: Purposes, Principles and Means of Ensuring Compliance", 3-70 in Fred L. Morrison and Rüdiger Wolfrum (ed.), *International, Regional and National Environmental Law* (The Hague: Kluwer Law International, 2000), at 30.
[349] 1976 ILC Draft Articles on State Responsibility, art. 19. The existence of "international crimes" rests on the idea that there are certain international obligations which the international community attaches particular importance to. Thus in 1976, the ILC's Special Rapporteur on State Responsibility, Roberto Ago, argued in favour of distinguishing between "a limited category" of "particularly serious wrongs", to be called "international crimes", and "a much broader category covering […] less serious wrongs": see *ibid.*, at 97, para. 6. Note that the concept of "international crimes" should be distinguished from "international criminal law": see also UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 103, para. 19. The latter concerns individual criminal responsibility as opposed to international State responsibility, States have an obligation to either prosecute or extradite to another State willing and/or able to prosecute what are essentially the "most serious crimes of concern to the international community as a whole": see generally UN, Rome Statute of the International Criminal Court, UN Doc. A/CONF.183/9 (17 July 1998). In related vein, it is of interest to note that Art. 8(2)(b)(iv) of the Rome Statute defines causing "widespread, long-term and severe damage to the natural environment" as a war crime. The concept of causing "widespread, long-term and severe damage" is of course an echo of art. I of ENMOD, *supra* note 36. The ICTY notes that this provision of the Rome Statute is "an authoritative Indicator of evolving customary international law on this point": ICTY, *Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign against the Federal Republic of Yugoslavia*, 13 June 2000 [hereinafter: *ICTY Final Report*], para. 22.

> a serious breach of an *international obligation of essential importance for the safeguarding and preservation of the human environment*, such as those prohibiting massive pollution of the atmosphere […].[350]

The obligation to safeguard the environment is so paramount that the ILC, after an extensive analysis of "international jurisprudence, State practice and the most authoritative doctrine", concludes that it has been "elevated to the rank of *jus cogens*" in the contemporary legal order.[351] Though the notion of "international crime" is no longer referred to in relation to the responsibility of States,[352] the 2001 Draft Articles on State Responsibility still references the breach of an obligation to preserve the environment under the provision governing the breach of peremptory norms,[353] confirming that till this day the protection of the environment is still of paramount concern for all States. [354]

Placed in context, the "human environment" must be interpreted to include outer space,[355] for as previously noted by the ILC "a threat to a vital ecological interest" can occur in the context

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[350] 1976 ILC Draft Articles on State Responsibility, art. 19(3)(d) [emphasis added]. See UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, see at 121, para. 71.

[351] UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 121, para. 67. In a persuasive argument worth citing at length, the ILC declared:

> Contemporary international law has reached the point of condemning outright the practice of certain States […] in imperiling human life and dignity in other ways, or in so acting as gravely to endanger the preservation and conservation of the human environment. The international community as a whole, and not merely one or other of its members, now considers that such acts violate principles formally embodied in the [UN] Charter and, even outside the scope of the Charter, principles which are now so deeply rooted in the conscience of mankind that they have become particularly essential rules of general international law.

See *ibid.* at 109, para. 33.

[352] Due to strong opposition from States to be labeled as "criminal" and to avoid "penal implications", the term "international crime" was substituted or eliminated altogether from the 2001 ILC Draft Articles on State Responsibility: see Giorgio Gaja, "Should all References to International Crimes disappear from the ILC Draft Articles on State Responsibility?" (1999), 10 *European Journal of International Law* 365, at 369. See also ILC, *Yearbook of the International Law Commission*, Vol. II(2) (1996), UN Doc. A/51/10, at 70, para. 1.

[353] In fact, the Commentaries to the 2001 Draft Articles on State Responsibility references the 1976 concept of "international crimes": see ILC, 'Commentaries to the Draft Articles on Responsibility of States for Internationally Wrongful Acts*',* U.N. GAOR, 53rd Sess., Supp. No. 10, 107, U.N. Doc. A/56/10 [hereinafter *Commentaries to the 2001 Draft Articles*], at 113, fn. 651.

[354] Citing the historical case of *Russian Fur Seals*, the ILC is of the opinion that breaches of international law can imperil "the survival of communities and peoples, the territorial integrity and political independence of States *and the environment of whole regions*": *ibid.*, at 87, para. 1 [emphasis added].

[355] Frowein (1990), *supra* note 307, at 167. Gyula Gál notes that despite the unsettle matter of where space begins, there can be division of the atmosphere into aerial and space environmental regimes, and laws on environmental protection is applicable to vertical space as a whole: see "Indivisibility of Environmental Protection in Vertical Space" (1984), 27 *Colloquium on the Law of Outer Space* 388.

outer space.[356] "Pollution, by one means or another, of vast areas of the atmosphere" is cited by the ILC as an example of the way humankind has inflicted damage on the environment.[357] Despite the unsettled question on the delimitation of outer space, the atmosphere must be interpreted as meaning all the area that is vertically above the Earth, thus includes outer space.[358] The ILC noted that there are kinds and scales of pollution which are "beyond imagination"[359]— therefore pollution through the creation of space debris in the outer space context cannot be excluded.

Whether the duty to protect the environment from damage is a peremptory norm, from which there can be no derogation,[360] is beyond the scope of this thesis. However, with regards to the duty to protect the outer space environment from damage, Schachter confirms that the protection of the global commons must at least be regarded as an obligation *erga omnes*.[361] Indeed, due to the impact of human activities in the global commons, there is a need to interpret every domain of international law in the light of fundamental principles of environmental law, and the individual wills and rights of States must be balanced against "global concerns of humanity as a whole".[362]

Erga omnes norms thus depart from the traditional State-centred system that only the injured State may claim the violation of an obligation owed to the international community.[363] Accordingly, the 2001 Draft Articles on State Responsibility provide that where a common interest is infringed upon, all States may be considered as having suffered an injury, and all States have the right to invoke the responsibility of the violating State.[364]

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[356] See UN Doc. A/CN.4/SER.A/1980/Add.l (Part 2), *supra* note 265, at 40, para. 16.
[357] UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, 109, at para. 32.
[358] See Gál (1984), *supra* note 355.
[359] UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 109, para. 32.
[360] VCLT, *supra* note 149, art. 53.
[361] Schachter (1991), *supra* note 322, at 490.
[362] *Gabčíkovo-Nagymaros*, *supra* note 320, Separate Opinion of Vice-President Weeramantry, at 118.
[363] While *Barcelona Traction*, *supra* note 337, was undoubtedly the seminal judgment which gave *erga omnes* its scope and definition, passing references to the concept of obligations *erga omnes* were already made in *South West Africa*, *supra* note 328, para. 70, and also in *North Sea Continental Shelf*, *supra* note 234, paras. 14 and 35. This was followed by a series of cases, including *Namibia*, *supra* note 317, para. 125; and *East Timor* (Portugal v. Australia) [1995] *ICJ Reports* 90, para. 29. Simma would argue that the Court in *East Timor* missed the opportunity to effectively clarify the rule regarding enforcement by other States other than the injured one by placing the "concept of obligations *erga omnes* into the procedural straitjacket of the doctrine of the "indispensable third party" developed in the *Monetary Gold* case": Simma (1994), *supra* note 148, 297-298.
[364] ILC, Draft Articles on Responsibility of States for Internationally Wrongful Acts, November 2001, Supplement No. 10 (A/56/10), chp.IV.E.1 [hereinafter: 2001 *Draft Articles on State Responsibility*], art. 48(1)(b).

However, this is so far merely a theoretical right of States to bring a legal action on behalf of the international community, for under the procedural rules of the Court there are hurdles to the State(s) bringing the action. As the Court in *East Timor* held, the Court is unable to "rule on the lawfulness of the conduct of a State" if its judgment would entail "an evaluation of the lawfulness of the conduct of another State which is not a party to the case".[365] Furthermore, for bringing an action before the Court, the Claimant State must prove that there is some sort of substantive legal interest which necessitates protection. In *South West Africa*, the ICJ held that a State bringing a claim must base its claim on *actio popularis*— in other words the "rights [of protection] must be vested in those who claim them, by some text or instrument or rule of law".[366] As Judge Weeramantry notes in cases which deal with environmental damage "of a far-reaching and irreversible nature", denying States standing before the Court "scarcely does justice to rights and obligations of an *erga omnes* character".[367]

In the Advisory Opinion on *Reservations to the Convention on Genocide*, the ICJ distinguished between conventions that provide for reciprocal rights and duties between States and conventions that instead espouse to embody and protect "high ideals" of all States.[368] In the context of the whether it is possible for a State to object to certain provisions of the Genocide Convention by way of a reservation, the Court held that the very *raison d'être* of the convention is to "safeguard the very existence of certain human groups".[369] The protection of the environment must similarly also be perceived as crucial to the existence of not only certain human groups, but the entire human race. It is undoubtedly a "high ideal" of all States to protect the natural environment from contamination and irreparable damage. In extrapolating this reasoning of the ICJ in the Advisory Opinion on *Reservations to the Convention on Genocide*,

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[365] *East Timor*, *supra* note 363, at 102, para. 29.
[366] *South West Africa*, *supra* note 328, at 32, para. 44. See also Malgosia A. Fitzmaurice, "International Protection of the Environment" (2001) 293 *Recueil des Cours* 9, at 169; Wolfrum (1990), *supra* note 298, at 325; Simma (1994), at 230-231; and UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 99, para. 10.
[367] See *Gabčíkovo-Nagymaros, supra* note 320, Separate Opinion of Vice-President Weeramantry, at 114-115. At 118, Judge Weeramantry opines:

> We have entered an era of international law in which international law serves not only the interests of individual States, but looks beyond them and their parochial concerns to the greater interests of humanity and planetary welfare.

[368] *Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide* (Advisory Opinion) [1951] ICJ Reports 15, at 23.
[369] *Ibid.*, at 23.

provisions in a convention on the protection of the environment should not be construed to protect the interests of any one State. Instead, States "have, one and all, a common interest, namely, the accomplishment of those high purposes which are the *raison d'être* of the convention".[370]

In light of the above, it is argued that the general obligation under international law to protect the natural environment also extends to the environment of outer space. States are not able to act freely despite the absence of laws that prohibit State action. Invariably, in today's interconnected community of States, the action of one State which has an impact on the environment of a global common will have an impact on the rights and interests of other States.[371]

b) Refraining from pollution in outer space

Above, it has been argued that States have a duty to protect the environment from damage, or even to ensure that their activities do not damage the natural environment. What is meant by the term 'damage', and how can the outer space environment be damaged?

An alternative word for causing damage to the environment is "pollution", which can occur in a number of contexts and result from various activities.[372] From the contamination of a shared water source[373] to air pollution originating from a smelter,[374] from radioactive clouds that circle the world after a nuclear fallout[375] to an oil spoil in international waters[376] or release of ozone-depleting substances into the atmosphere, there are countless examples of where there is

[370] *Ibid*.
[371] As Pardo and Christol note common interests depend on the "time, place and nature of the respective claims [of States] which require mutual protection and sharing": Pardo and Christol (1983), *supra* note 346, at 646.
[372] Daniel Barstow Magraw lists various examples of transboundary pollution which affect the global commons, including outer space, and specifically cites the creation of space debris as a specific pollution threat: "International Law and Pollution" (1991), 3-29 in Daniel Barstow Magraw (ed.), *International Law and Pollution* (Philadelphia: University of Pennsylvania Press, 1991), at 5. See also Daniel Bodansky, "Is There an International Environmental Constitution?" (2009) 16 *Indiana Journal* of *Global Legal Studies* 565, at 579.
[373] See e.g. *Gut Dam Arbitration* (U.S. v. Can.) 22 Sept. 1968, "Report of the Agent of the United States before the Lake Ontario Claims Tribunal" (1969) 8 *ILM* 118.
[374] *Trail Smelter Arbitral Tribunal: Decision* (1941) 35 AJIL 684 [hereinafter: *Trail Smelter*].
[375] The Chernobyl Disaster is a prime example: see e.g. UNGA, *International co-operation to address and mitigate the consequences of the accident at the Chernobyl nuclear power plant*, UN Doc. A/RES/45/190 (21 December 1990).
[376] See e.g. UNGA, *Protection of the environment in times of armed conflict*, UN Doc. A/RES/47/37 (25 November 1992).

human activity damage to the natural environment will inevitably result. In the light of increasing activities being conducted beyond the Earth's atmosphere, no doubt there are various ways in which human activities are impacting negatively on the outer space environment, but also impacting on the inherent right of other States to use outer space.[377]

In 1974, the Organization for Economic Cooperation and Development defined "pollution" as:

> the introduction by man, directly or indirectly, of substances […] into the environment, resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and impair or interface with amenities and other legitimate uses of the environment. [378]

States have accepted this definition,[379] and a number of international instruments define pollution in specific contexts based on a rewording of the definition cited above.[380]

In the context of outer space, the creation of space debris can without a doubt be regarded as pollution. Using the OECD definition above, one can easily replace space debris as a "substance", which through the use of weapons in outer space, is introduced into the environment. Space debris has a "deleterious" effect on the outer space environment, because it changes the composition of outer space[381] and would also directly "impair or interface with amenities and other legitimate uses of outer space". "Amenities" in this context would refer to other space objects, while "legitimate uses" of outer space could be inferred to denote uses of outer space that are consistent with the principles and purposes of the Outer Space Treaty.[382]

To support this interpretation of pollution in outer space, already in 1964 Lachs wrote that a State will attract international responsibility for:

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[377] For a good overview of the definition of pollution in outer space, see G. Gal, 'Treaty Law Problems of Space Environmental Protection: de *lege ferenda* Tasks for International Legislation', 287-299 in Karl-Heinz Böckstiegel, ed., *Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection*, (Köln: Carl Heymanns Verlag, 1990), at 294-295.

[378] OECD Recommendation C (74) 224, *supra* note 290, Annex, Title A. Daniel Barstow Magraw makes a distinction between transboundary pollution and what he terms "commons pollution", which is similar to the transboundary pollution, and is different because the effects are felt in an area of the global commons, including outer space, that is not subject to the exclusive jurisdiction of any one State: see Magraw (1991), *supra* note 372, 4. See also Kiss (1983), *supra* note 329, 1072.

[379] Dupuy (1991), *supra* note 333, at 62.

[380] See e.g. the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution of 16 February 1976 (1976) 15 ILM 285 (art. 2)), and the OECD, Recommendation on Principles concerning Transfrontier Pollution, *supra* note 290.

[381] ENMOD, *supra* note 36, arts. I and II.

[382] See OST, *supra* note 17, art. III.

> endangering the security of other States or affecting their lawful interests preventing other States from carrying out lawful experiments or activities *by pollution (of outer space or celestial bodies) or otherwise* […]. [383]

As argued above, though much of the substance of international law is still based on State consent, the freedom of States to act is increasingly being subjected to legal constraints.[384] Lachs' opinion underlines the fundamental principle related to "the legality of State behaviour"[385] and which dictates that States must refrain from acts that adversely affect the activities of other States.[386] With particular regard to the context of outer space, the OST is recognised as one of the first multilateral instrument which obliges States to have "due regard to the corresponding interests" of other States.[387] Thus, the freedom to use outer space "is neither absolute nor unqualified", but is limited by the right and interest of other States,[388] and implies that States must not act in a way that is injurious to the rights of other States.[389] The creation of space debris, even if it is by unintended consequences through the use of a kinetic space weapon, will no doubt impair the rights of States to freely use vast portions of outer space, and therefore be counter to a fundamental principle of space law.

As the effects of pollution are often felt beyond the national boundaries of any State, a "fundamental principle of modern environmental law" is the prohibition of transboundary pollution.[390] It is postulated that this prohibition is perfectly applicable to the context of outer space, and can be used to constrain the wanton creation of space debris in the aftermath of the use of a kinetic space weapon.

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[383] Lachs (1964), *supra* note 142, 77 [emphasis added]. Former ICJ Judge V. S. Vereschetin also considers the pollution of the outer space environment as one of the core issues that confronts the international community it the near future: see 'Next Steps in International Space Law', in Nandasiri Jasentuliyana, *Perspectives on International Law* (Boston: Kluwer Law International, 1995).

[384] Lachs echoes these sentiments: (1964), *supra* note 142, at 69. See also Vladimir Kopal, "Two Problems of Outer Space Control: The Delimitation of Outer Space, and the Legal Ground for Outer Space Flights" (1960) 3 *Colloquium on the Law of Outer Space'* 108, at 110 .

[385] Lachs (1964), *supra* note 142, at 69. This principle goes against the principle held in Lotus that "restrictions upon the independence of States cannot be presumed": see *Lotus*, *supra* note 332.

[386] See Owada (2006), *supra* note 229, at 15-16. See also Ian Brownlie, *Principles of Public International Law* (Oxford: Oxford University Press, 2008), 444.

[387] See *Declaration of Legal Principles*, para. 6; and OST, *supra* note 17, art. IX.

[388] Lachs (1964), *supra* note 142, 70; and Lachs (1972), *supra* note 8, at 117.

[389] See also Jakhu, *supra* note 333, at 43.

[390] Dissenting Opinion of Judge Weeramantry in *Nuclear Tests*, *supra* note 326, at 346.

The prohibition of transboundary pollution was established by the *Trail Smelter* arbitral award,[391] and is reaffirmed under Principle 21 of the 1972 Stockholm Declaration, which stipulates:

> States have […] the responsibility 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*. [392]

Principle 21 should not be perceived merely as a declaration of policy, for it is a principle declaratory of customary international law.[393] Merely four years after the adoption of the Stockholm Declaration, the ILC in 1976 noted the provisions regarding the preservation and protection of the environment in the Stockholm Declaration are in fact "peremptory" in nature[394] —meaning that there can be no derogation from this principle, whether in peacetime or in wartime.[395] Finally, the ICJ in *Legality of Nuclear Weapons* clearly pronounced that the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or areas beyond national control is "part of the corpus of international law relating to the environment".[396]

Pierre-Marie Dupuy would elaborate that States must have regard to the impact on the environment situated beyond their national frontiers resulting from "actual or anticipated activities" under their control.[397] This rule is derived from *Corfu Channel*, which held a State can

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[391] *Trail Smelter*, *supra* note 374, at 716:

> 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 establish by clear and convincing evidence.

The United Nations Environmental Programme (UNEP) notes the Principle is "a reformulation and expansion of the *Trail Smelter* Principle": see UNEP, *Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law* (November 2009) [hereinafter: *UNEP Report on Armed Conflict*], at 41.

[392] *Stockholm Declaration*, *supra* note 36, Principle 21 [emphasis added]. See also *Trail Smelter*, *supra* note 374, 716-717.

[393] Wolfrum (2000), *supra* note 349, at 28. Kiss (1983) also notes that Principle 21 is an expression of the "common conviction" of States to ensure that their activities do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (*supra* note 329, at 1075). See also "Legal Aspects of the Conservation of the Environment" (1982), 60 *International Law Association Report Conference* 157, at 158-159 and 178 (per Professor Dr. D. Rausehning); Schachter (1991), *supra* note 322, at 461; and Sands (2003), *supra* note 263, 38. Specifically in the outer space context, see Danilenko (1990), *supra* note 273, 173-174.

[394] See UN Doc. A/CN.4/SER.A/1976/Add.l (Part 2), *supra* note 324, at 109, para. 32.

[395] The US would however object to this proposition: see ICRC, *Customary International Humanitarian Law, Volume II: Practice* (Cambridge, ICRC, 2005) [hereinafter: *Customary International Humanitarian Law: Practice*], 866-967, para. 108.

[396] *Legality of Nuclear Weapons*, *supra* note 23, at 241, para. 29.

[397] Dupuy (1991), *supra* note 333, at 63.

be responsible for harm to another State regardless of whether there was knowledge that such harm would ensue.[398] The environmental impact of a State's activities, or the activities of objects under their control,[399] trumps the sovereign right to engage in activities without restraint.[400] Placed in the context of outer space, when a State engages in activities in outer space—an environment situated "beyond the limits of national jurisdiction"[401]— it is bound by a general duty under international law to assume responsibility for the impact of their "actual or anticipated activities" on the outer space environment.

[398] In *Corfu Channel*, the International Court of Justice held that Albania had an obligation to notify other States (in the case it was the United Kingdom) of the existence of an "imminent danger" (in the case, posed by a minefield). This obligation was based on "certain general and well-recognized principles" that (among others) a State must not "allow knowingly its territory to be used for acts contrary to the rights of other States": see *Corfu Channel* (United Kingdom v. Albania) [1949] ICJ Reports 4, at 22. Any such omission to notify other States of an "imminent danger" would be "grave omissions [that] involve the international responsibility" of the concerned State: *ibid.*, at 23. Cf. Taylor, who regards it as "questionable" whether principles of the *Corfu Channel* are applicable to outer space, especially when space is "an area completely outside the territorial jurisdiction of states": Taylor (2007-2008), *supra* note 116, 30.

[399] As the Permanent Court of Arbitration held in *Island of Palmas*, sovereignty of a State can be manifested in "different forms, according to conditions of time and place": see *Island of Palmas* (Netherlands v. USA) [1928] 2 *United Nations Reports of International Arbitral Awards* 829, at 840.

[400] See Wolfrum (2000), *supra* note 349, at 29. See also Sands (2003), *supra* note 263, at 14, where he notes that today the "challenge" is reconciling the "fundamental independence of each State with the inherent and fundamental interdependence of the environment".

[401] Stockholm Declaration, *supra* note 36, Principle 21 [emphasis added]. See also *Trail Smelter*, *supra* note 374, 716-717.

V. Laws of War governing the Protection of the Environment

The above section outlined how general international environmental law is applicable to outer space activities, and that specifically, there is a customary obligation on States not to engage in activities that will damage the natural environment and negatively impact on the rights of other States to use space. Even though one can question whether environmental law continues to apply in armed conflict,[402] the ICJ in *Legality of Nuclear Weapons* held under existing international law there are "important environmental factors that need to be properly taken into account in the context of the implementation of the principles and rules of the law applicable in armed conflict".[403] In the latest 2011 Draft Articles on the Effects of Armed Conflicts on Treaties,[404] the ILC is unequivocal in noting that treaties relating to the international protection of the environment continue to operate during an armed conflict.[405] Reiterating the ICJ's opinion in *Legality of Nuclear Weapons*,[406] the ILC notes that international law presumes that "environmental treaties apply in case of armed conflict".[407] The section that follows demonstrates that even if it is argued general environmental law does not apply in armed conflict, there are in fact specific principles and rules under the laws of war which provide the conduct of warfare must have special regard to the natural environment.

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[402] ICRC, *Customary International Humanitarian Law, Volume I: Rules* (Cambridge, ICRC, 2009) [hereinafter: *Customary International Humanitarian Law: Rules*], at 151. See also "Guidelines for military manuals and instructions on the protection of the environment in times of armed conflict" [1996] 311 *International Review of the Red Cross* 230, online: ICRC <http://www.icrc.org/eng/resources/documents/misc/57jn38.htm> [hereinafter: *Guidelines for military manuals*]:

> International environmental agreements and relevant rules of customary law may continue to be applicable in times of armed conflict to the extent that they are not inconsistent with the applicable law of armed conflict.

[403] *Legality of Nuclear Weapons*, *supra* note 23, para. 33.
[404] ILC, Draft Articles on the Effects of Armed Conflicts on Treaties, online: ILC <http://untreaty.un.org/ilc/texts/instruments/english/draft%20articles/1_10_2011.pdf>.
[405] *Ibid.*, art. 7 and Annex (g).
[406] *Legality of Nuclear Weapons*, *supra* note 23, at paras. 29–31.
[407] See ILC, Draft Articles on the Effects of Armed Conflicts on Treaties, with commentaries, in *Yearbook of the International Law Commission, 2011*, vol. II, Part Two (forthcoming), paras. 52-55.

1. Armed conflict and protection of the environment

There is no doubt that military activities can often be detrimental to the natural environment.[408] The 1992 Rio Declaration,[409] a reaffirmation and consolidation of the Stockholm Declaration, [410] recognised this threat. At Rio, States agreed that peace and environmental protection "are interdependent and indivisible", [411] and that "[warfare] is inherently destructive". [412] States further obliged themselves to "respect international law providing protection for the environment in times of armed conflict",[413] many of which are found in customary international humanitarian law,[414] and codified under the Hague[415] and Geneva Conventions.[416]

The 1992 Iraqi occupation of Kuwait saw gross environmental damage due to the destruction of oil-wells and release of crude oil into the sea. In response, the UN General

[408] In 1982, the General Assembly adopted the *World Charter for Nature*, which declared that nature "shall be secured against degradation cause by warfare or other hostile activities" (*supra* note 270, para. 5). Further, under paragraph 20, the Charter obliges States to avoid military activities that are damaging to nature. See also *UNEP Report on Armed Conflict*, *supra* note 391, at 42.

[409] *Rio Declaration*, *supra* note 36.

[410] Though Principle 26 deals specifically with the elimination of nuclear and other weapons of mass destruction, no other provision in the Stockholm Declaration deals with the protection of the environment in the context of armed conflict: *supra* note 36. See also *UNEP Report on Armed Conflict*, *supra* note 391, at 41-42.

[411] *Rio Declaration*, *supra* note 36, Principle 25. In the *Report of the Secretary-General on the Protection of the Environment in Times of Armed Conflict*, the UN Secretary-General underlined that "in addition to the rules of law pertaining to warfare, general (peacetime) provisions on the protection of the environment may continue to be applicable": *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 5, para. 25.

[412] *Rio Declaration*, *supra* note 36, Principle 24. See also *Protection of the Environment in Times of Armed Conflict*, which referred Rio Declaration to the explicit reference of armed conflict in the Rio Declaration a "fundamental shift" in the protection of the environment in warfare: *supra* note 331, para. 62.

[413] *Rio Declaration*, *supra* note 36, Principle 24. It has been questioned whether the Rio Declaration is actually binding: see *UNEP Report on Armed Conflict*, *supra* note 391, at 42. Another important declaration issued at the Rio Conference was Agenda 21, under Article 39.6 of which States agreed that in armed conflict "large-scale destruction of the environment that cannot be justified. Though Agenda 21 does not definitely outline the state of the law with regards to the protection of the environment in armed conflict, it does point to the instrumental role and competence of the International Committee of the Red Cross have in this regard: Agenda 21, Art. 39.6: see UN, *Report of the United Nations Conference on Environment and Development, 3-14 June 1992, Rio de Janeiro*, UN Doc. A/CONF.151/26/REV.1(VOL.I), at 471.

[414] This relates to *jus in bellum*, the law governing the conduct of armed conflict, once use of force has begun, and which "regulates how states may use force": *ICTY Final Report*, *supra* note 349, para. 31. Hugo Grotius wrote in Chapter 12 ("On Moderation in Despoiling an Enemy's Country") of *On the Law of War and Peace* ("De Jure Belli ac Pacis") noted that "driving off some of our cattle, or burning a few of our houses, can never be pleaded as a sufficient and justifiable motive for laying waste the whole of an enemy's kingdom" (para. I) and that "every thing necessary for the support of man" ought to be spared (para. II): see On the Law of War and Peace (*De Jure Belli ac Pacis)*, translated by A. C. Campbell (London, 1814), online: <http://www.constitution.org/gro/djbp_312.txt>. See also *Customary International Humanitarian Law: Rules*, *supra* note 402, xxxv; generally rules Ch. 14 "The Natural Environment".

[415] Final Act of the International Peace Conference, The Hague, 29 July 1899 and 18 October 1907.

[416] Geneva, 12 august 1949; and 1977 Additional Protocol I to 1949 Convention. See also Alexandre Kiss and Dinah Shelton, *Guide to International Environmental Law* (Leiden: Martinus Nijhoff Publishers, 2007), 253.

Assembly underlined the "universal applicability" of the Hague and Geneva Conventions[417] and also emphasized that wanton destruction of the environment "not justified by military necessity" is "clearly contrary to existing international law".[418] The UN Secretary General also emphasized that under international law there is an interest of the international community to protect the environment—an interest that goes beyond the interests of States, and one that must be safeguarded even in times of armed conflict when "selecting methods and means of warfare".[419]

a) Protection of the natural environment in armed conflict: ENMOD

The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD), drafted in the context of widespread environmental damage inflicted during the Vietnam War,[420] poignantly deals with the "methods and means of warfare" permissible. Article 1 of ENMOD obliges States:

> not to engage 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. [421]

The UN Committee on Disarmament elaborates "widespread" as "encompassing an area on the scale of several hundred square kilometers". "Long-lasting" denotes "lasting for a period of months, or approximately a season". "Severe" is defined as "involving serious or significant

[417] UN Doc. A/RES/47/37, *supra* note 376, Preamble, para. 2.
[418] *Ibid.*, Preamble, para. 5. In 1993, the UN Secretary General noted though the original Hague Regulations or 1949 Geneva Conventions do not specifically make reference to the protection of the environment or address specific environmental concerns in warfare, Art. 23(1)(g) of the Hague Regulations prohibits the destruction or seizure of enemy property, unless the destruction or seizure is "imperatively demanded by the necessity of war". Similarly, Article 55 of the Hague Regulations and Article 53 of the Fourth Geneva Convention prohibit the destruction of property unless "such destruction is rendered absolutely necessary by military operations". In the view of the Secretary-General, the abovementioned "wanton or unjustified destruction of property" invariably results in damage to the environment. Thus despite the lack of specific prohibition on causing damage to the environment, existing provisions regarding the protection of property should be interpreted to cover the protection of the environment: see *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 5-6, paras. 26-30. Later in the same report, the UN Secretary-General concludes that provisions such as Articles 35 and 55 of 1977 Additional Protocol I "supplement [existing] principles and rules of international humanitarian law": see *supra* note 36, at 7, para. 36. See also *UNEP Report on Armed Conflict*, *supra* note 391, 13; see opinion of Australia on the "deliberate creation of oil slicks by Iraqi forces" (*Customary International Humanitarian Law: Practice*, *supra* note 395, at 849, para. 31.); and the opinion of Austria (*ibid.* at 849, para. 33-34).
[419] *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 14, para. 73. The annex of the report contains guidelines for military manuals drafted by the ICRC which urge States to adopt measures to protect the natural environment in their military operations.
[420] See *UNEP Report on Armed Conflict*, *supra* note 391, at 12. See also Petras (2003), *supra* note 314, 194.
[421] ENMOD, *supra* note 36, art. I.

disruption or harm to human life, natural or economic resources or other assets".[422] What is prohibited is any technique which would have "widespread" *or* "long-lasting" *or* "severe" effects on the environment, thus only one of the conditions needs to be satisfied to trigger the application of the provision.[423] "Environmental modification techniques", are defined as any technique which "through the deliberate manipulation of natural processes" changes:

> the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, *or of outer space*. [424]

While ENMOD complements Additional Protocol I to the Geneva Convention (below),[425] in comparison the applicability of ENMOD is broader, for the provisions of the Convention apply regardless of whether there has been a declaration of armed conflict.[426]

Looking at the drafting history and circumstances surrounding the drafting and adoption of the ENMOD Convention leads to the conclusion that a broader interpretation was intended. The ENMOD Convention was adopted at the height of the Cold War as a "result of extensive study, debate, and negotiation at the Conference of the Committee on Disarmament at Geneva and at the United Nations".[427] Indeed, at the Convention's adoption, the General

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[422] *Understanding regarding the [ENMOD] Convention*, 'Understanding Relating to Article I'. Available online: <http://dosfan.lib.uic.edu/acda/treaties/environ1.htm> [hereinafter: *Understanding Relating to Article I*]; and Yves Sandoz, Christophe Swinarski and Bruno Zimmermann (ed.*), Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949*, International Committee of the Red Cross (Geneva: Martinus Nijhoff Publishers, 1987) [hereinafter: *Commentary on the Additional Protocols*], at 417, fn. 117. See also *Legality of Nuclear Weapons*, *supra* note 23, at 241, para. 27.

[423] See also Harry H. Almond, Jr., "A Draft Convention for Protecting the Environment of Outer Space" (1980) 23 *Colloquium on the Law of Outer Space* 97. Contrast this with the arts. 35(3) and 55 of 1977 Additional protocol I, *supra* note 36, where the threshold for prohibiting a method or means of warfare that is detrimental to the environment must be what the UNEP calls "triple cumulative", i.e., the method or means of warfare must be cause "widespread, long-term *and* severe damage" to the environment [emphasis added]: *UNEP Report on Armed Conflict*, *supra* note 391, at 12. See also *ICTY Final Report*, *supra* note 349, para. 15 (see Sect. V-1-b below).

[424] ENMOD, *supra* note 36, art. II [emphasis added]. It has been suggested that the Convention does not prohibit environmental damage that incidentally results from conflict *per se*: Susana Pimiento Chamorro and Edward Hammond, *Addressing Environmental Modification in Post-Cold War Conflict: The Convention on the Prohibition of Military or Any other Hostile Use of Environmental Modification Techniques (ENMOD) and Related Agreements* (2001), online: Edmonds Institute <http://www.edmonds-institute.org/pimiento.html>. See also Sands (2003), *supra* note 263, 314.

[425] Petras (2003), *supra* note 314, at 195

[426] The ICRC referred to the uncontested comments of the US representative to the 1975 Conference of the Committee on Disarmament, who noted that while the Additional Protocol I applied to armed conflict, ENMOD contains prohibitions which apply "to the use of techniques [detrimental to the environment] for hostile purposes, even in a case where there had been no declaration of war whatsoever, and where no other weapons were used": see *Commentary on the Additional Protocols*, *supra* note 422, at 414-415, para. 1450.

[427] See Jimmy Carter, 'Convention on the Hostile Use of Environmental Modification Techniques Message to the Senate Transmitting the Convention (22 September 1978), online: The American Presidency Project: <http://www.presidency.ucsb.edu/ws/index.php?pid=29829>.

Assembly took special note of the international community's desire in "halting the arms race" and affecting a "general and complete disarmament".[428] This means whatever the method of weaponry utilised or proliferated, and whether the weapon will be used, it is contrary to the prevailing atmosphere of disarmament. Further, States noted the dangers of "new means of warfare", [429] suggesting that the provisions and applicability of the ENMOD should not be entrenched in a particular time.[430] For the Convention to govern, it is not necessary for there to be express intention to adversely affect the natural processes of the environment. Indeed, in the Preambular text, States agreed that "scientific and technical advances" have the potential to modify the environment not yet foreseen.[431] This adds further support to the fact that the Convention's provisions should be interpreted in a manner mindful of the likely advancements in technology and warfare that may have a detrimental and incidental impact on the environment, whether on Earth or in outer space. It is therefore safe to conclude that weapons that create incidental damage to the environment, whether they currently exist or are yet to be developed, fall under the scope of techniques and means covered by the Convention.

Placed in the context of using space weapons, in particular kinetic space weapons which create space debris, there is no doubt that the use of such weapons violate the very object and purpose of the Convention. It is clear that the deliberate or incidental creation of space debris through the use of a space weapon will, intentionally or not, change the "dynamics, composition or structure" of outer space.[432] Debris created in outer space will be dispersed unpredictably in all directions and most likely remain in orbit for decades, if not for centuries. This raises the prospect of causing "serious or significant harm to human life, natural or economic resources or other assets". In the words of the ENMOD Convention, the debris created would result in "widespread" *and* "long-lasting" *and* "severe" effects on the outer space environment—clearly satisfying not just one but all criteria which trigger the Convention's application.

[428] ENMOD, *supra* note 36, Preamble, para. 1.
[429] *Ibid.*
[430] Indeed, under para. 1 of the Preamble, the text underlines the desire of States to *save* "mankind from the danger of using new means of warfare", suggesting that future acts of warfare and unforeseen consequences are intended to be under the scope of the Convention.
[431] ENMOD, *supra* note 36, Preamble, para. 3.
[432] Cf. Petras, who argues that ENMOD does not "bar or restrict the deployment or use of weapons in space", as the Convention deals specifically with environmental modification techniques "through the deliberative manipulation of natural processes". The creation of debris is merely adding to the presence of matter in outer space, and does not at all alter the space itself: Petras (2003), *supra* note 314, at 195.

b) Protection of the natural environment in armed conflict: 1977 Additional Protocol I

When assessing the consequences that warfare may have on the natural environment, attention must also be drawn to the 1977 Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (hereinafter: *1977 Additional Protocol I*).[433] Adopted in the same year as the ENMOD Convention, the 1977 Additional Protocol I essentially functions as a 'capture' treaty prohibiting acts of warfare that are detrimental to the natural environment should the ENMOD Convention be deemed inapplicable.

Article 35, on the basic rules governing warfare, stipulates that in armed conflict States do not have unlimited right to choose whatever methods or means of warfare they desire.[434] Methods or means of warfare which "cause widespread, long-term and severe damage to the natural environment" are prohibited.[435] Furthermore, for the provision to apply, it is not necessary that the method or means of warfare be coupled with the intent to inflict damage to the natural environment; an expectation of causing damage to the natural environment is enough.[436] Article 55(1) of the Additional Protocol I again prohibits means of warfare which can, or is expected to, cause intentional or unintentional damage to the natural environment.[437]

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[433] *Additional Protocol I, supra* note 36. In the following, the discussion will focus solely on the 1977 Additional Protocol I, which governs International Armed Conflict, whereas the 1977 Additional Protocol II governs Non-International Armed Conflicts. There are practical and logical reasons behind this, especially in the discussion on the use of space weapons. It is safe to assume that such weapons, because of the sophistication and costs surrounding their usage, will only be utilised in a potential conflict between States, thus a conflict of an international nature, triggering the application of Additional Protocol I. It is unlikely that parties within any particular State, especially "dissident armed forces or other organized armed groups" (Additional Protocol II, Art. 1(1)), will have access to or the ability to use space weapons, especially in an "armed conflict not of an international character". Of interest to note, Additional Protocol II does not mention any obligation to safeguard the environment. This may be because in conflicts of a non-international nature, parties within a particular State are assumed to be governed by laws and regulations of environmental law of the State in question.

[434] 1977 Additional Protocol I, *supra* note 36, art. 35(1). See also 1907 Hague Regulations Respecting the Laws and Customs of War on Land, art. 22; and *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 4, para. 20.

[435] 1977 Additional Protocol I, *supra* note 36, art. 35(3).

[436] *Ibid.*, art. 35(3). See also *UNEP Report on Armed Conflict*, *supra* note 391, at 11.

[437] 1977 Additional Protocol I, Art. 55(1). The complete provision of Art. 51(1) declares:

> Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.

Both Articles 35(3) and 55(1) have a "very high threshold of application",[438] as the resultant damage to the natural environment must be "widespread, long-term *and* severe".[439] Note that the language employed is similar to Article 1 of ENMOD, the substantial difference is that under ENMOD, the wording is "long-lasting", as opposed to "long-term" under the 1977 Additional Protocol I.[440] This difference in terminology does have significant implications for the time period that the environmental damage lasts. Though "long-lasting" under ENMOD denotes "lasting for a period of months, or approximately a season",[441] under the 1977 Additional Protocol I, "long-term" should be understood as meaning "a period of decades".[442] The prohibition is "absolute"[443] in nature due to the "transnational aspect" of the damage felt, and it applies even if there is no direct threat to any particular population or to the flora and fauna of the enemy State.

Despite the similarities in terminology used in both the 1977 Additional Protocol I and ENMOD, one must interpret and understand the treaties and provisions "in the light of its own character, its context, object and purpose".[444] ENMOD does not prohibit environmental modification techniques outright, for its primary objective is the prohibition of such techniques if it has a detrimental impact on another State party.[445] By contrast, the 1977 Additional Protocol I prohibits, under Articles 35 and 55(1), any "methods or means of warfare" that will or can be

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[438] *ICTY Final Report*, *supra* note 349, para. 15.

[439] Additional Protocol I, *supra* note 36, arts. 35 and 55(1) [emphasis added]. See also *UNEP Report on Armed Conflict*, *supra* note 391, at 12; *ICTY Final Report*, *supra* note 349, para. 15. See also *infra* fn. 423.

[440] *Commentary on the Additional Protocols*, *supra* note 422, at 415, para. 1450; and also 663, para. 2136. Indeed, the ICRC notes:

> […] there is no doubt that the two texts are complementary in time of war, i.e., that the Protocol supplements the United Nations Convention. It is probably for this reason that an effort was made to employ a uniform terminology as far as possible.

See *Commentary on the Additional Protocols*, *supra* note 422, 415-416, para. 1452.

[441] See *Understanding Relating to Article I*, *supra* note 422. See also *Legality of Nuclear Weapons*, *supra* note 23, para. 27.

[442] *Commentary on the Additional Protocols*, *supra* note 422, at 416, para. 1452. See also *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 7, para. 34.

[443] Article 8.2(b)(iv) of the Rome Statute of the International Criminal Court defines causing "widespread, long-term and severe damage to the natural environment" as a war crime, and thus "establishes an additional condition with respect to the criminalisation of the prohibition contained in this rule": see *Customary International Humanitarian Law: Rules*, *supra* note 402, at 153. As the ICTY recognised, the ICC Statute is "an authoritative indicator" of the customary nature on the matter of prohibiting damage to the environment: *ICTY Final Report*, *supra* note 349, para. 21.

[444] *Commentary on the Additional Protocols*, *supra* note 422, at 418, para. 1456. Cf. VCLT, *supra* note 149, art. 31.

[445] ENMOD, *supra* note 36, art. 1. See also *Commentary on the 1977 Additional Protocols*, *supra* note 422, at 415-416, para. 1452.

expected to result in "widespread, long-term and severe damage to the natural environment" *per se,*[446] for the environment is deemed by the ICRC as a "common property" that "should be retained for everyone's use and be preserved".[447]

Placed in the context of kinetic space weapons, there can be no doubt that the intentional or unintentional effects of their use will violate the very object and purpose of Articles 35 and 55 of Additional Protocol I. The creation of space debris through the use of kinetic space weapons will or can be expected to result in "widespread, long-term and severe damage to the natural environment" in outer space. Most debris would remain in orbit for decades, if not much longer, thus satisfying the "long-term" condition. Further there does not need to be intent to damage the natural environment of outer space, for the expectation that space debris will be created is enough for Additional Protocol I to apply. As has been illustrated earlier, any use of kinetic space weapons will invariably result in the creation of space debris, therefore it is not possible to avoid the application of the provisions of Additional Protocol I. As mentioned, this prohibition is absolute, regardless whether any immediate threat or damage is felt by any particular State.

To further support that 1977 Additional Protocol I can be applied to regulate the use of space weapons,[448] Article 36 obliges States to determine whether "a weapon, means or method of warfare" would contrive provisions of the Protocol,[449] or any other rule of international law, which would include customary international law.[450] Indeed, the ICRC in this respect even made a reference to the possibility of weapons deployed in space war, and concludes, quite pessimistically, but also quite realistically that:

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[446] See also *UNEP Report on Armed Conflict*, *supra* note 391, 12.
[447] *Commentary on the Additional Protocols*, *supra* note 422, at 420, para. 1462.
[448] As the ICRC notes, and which is also the underlining premise of this thesis, art. 36, like "*jus in bello*", deals specifically with "with the use of weapons, not their possession, for prohibition of the latter falls under the heading of disarmament": *Commentary on the Additional Protocols*, *supra* note 422, at 424, para. 1471.
[449] *1977 Additional Protocol I*, *supra* note 36, art. 36.
[450] As the *Commentary on the Additional Protocols*, *supra* note 422, outlines (at 423, para. 1466):

> The principle is as follows: on the basis of this article the High Contracting Parties undertake to determine the possibly unlawful nature of a new weapon, both with regard to the provisions of the Protocol, and with regard to any other applicable rule of international law. The determination is to be made on the basis of normal use of the weapon as anticipated at the time of evaluation. If these measures are not taken, the State will be responsible in any case for any wrongful damage ensuing.

> all predictions agree that if man does not master technology, but allows it to master him, he will be destroyed by technology.[451]

Writing about the lingering effects of weapons, the ICRC noted that the "devastating character" of modern weapons are "not simply limited to the period of hostilities".[452] Admittedly, the ICRC was referring specifically to the threat that devices such as landmines and booby-traps pose to the human population. However, this is but one example, and it would not too unusual to extrapolate the ICRC's warning to the context of outer space, and perceive how the use of space weapons can produce "war remnants" that have potentially "ominous consequences" on the space environment.[453] Indeed, already in 1975, the ICRC had warned of "new kinds of disasters which may emerge from the growing impact of technology upon the environment", specifically homing in on the concerns how human activities may have hazardous impacts on the " '*outer limits*' of the ecological systems of the earth".[454]

2. The ICRC Rules and protection of the natural environment in armed conflict

States and experts do not believe in the need for drafting new rules to protect the natural environment generally, or specifically in the context of an armed conflict in new theatres of warfare. Existing legal norms, whether conventional or customary,[455] are enough to ensure that States observe their obligations to not injure the environment, whether in peacetime or in the conduct of war.[456] As the International Committee of the Red Cross (ICRC) notes, existing treaty law may be obscure and may not exist for application in particular contexts that have not been regulated or foreseen by the treaty drafters or States. However, there is evidence that in their practice States have gone beyond existing treaty law, thereby lending support to the existence

[451] *Ibid.*, at 427-428, para. 1476.
[452] *Ibid.*, at 410-411, para. 1443.
[453] *Ibid.*, at 410-411, para. 1443.
[454] *Commentary on the Additional Protocols, supra* note 422, 412, para. 1446 [emphasis added].
[455] *Customary International Humanitarian Law: Rules, supra* note 402, at 143 ["State practice establishes this rule as a norm of customary international law applicable in both international and non-international armed conflicts".]
[456] *Protection of the Environment in Times of Armed Conflict, supra* note 331, at 11, para. 58. Cf. UNEP's call that the ILC should investigate the international regime for protecting the environment during armed conflict, and examine how the laws "can be clarified, codified and expanded" and in particular how existing international environmental law can help to "clarify gaps and ambiguities" in international humanitarian law: *UNEP Report on Armed Conflict, supra* note 391, at 6 and 28.

and adherence to rules of customary international law.[457] As the ICJ held in *Nicaragua*, "[customary] international law continues to exist alongside treaty law",[458] and customary law may even have greater application than conventional law.

In the *Legality of Nuclear Weapons* Advisory Opinion, the ICJ was unequivocal in declaring that both Articles 35(3) and 55 of Additional Protocol I are in fact embodiments of:

> a general obligation to protect the natural environment against widespread, long-term and severe environmental damage; the prohibition of methods and means of warfare which are intended, or may be expected, to cause such damage; and the prohibition of attacks against the natural environment by way of reprisals.[459]

Thus the customary nature of the prohibition against actions that will or potentially may be expected to injure the environment is affirmed.[460] And the affirmation of the customary nature of the prohibition means that even if certain States are not party to Additional Protocol I, they would still be bound to observe the prohibition.[461]

The ICRC has identified a number of rules reflective of the existing customary international law regarding the conduct of warfare. Specifically, Rules 43-46 are said to be an "articulation of the principles of distinction, proportionality and military necessity" in relation to the natural environment.[462]

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[457] *Customary International Humanitarian Law: Rules*, *supra* note 402, xxxv. See also *Customary International Humanitarian Law: Practice*, *supra* note 395, Rule 45, at 151-158. See also *Guidelines for military manuals*, *supra* note 402, para. 4; *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 5, para. 21.

[458] *Nicaragua*, *supra* note 235, para. 176.

[459] *Legality of Nuclear Weapons*, *supra* note 23, at 242, para. 31. See also Paolo Benvenuti, "The ICTY Prosecutor and the Review of the NATO Bombing Campaign against the Federal Republic of Yugoslavia" (2000), 12 *European Journal of International Law* 503, at 509.

[460] However, in the report published by the Committee established to Review the NATO Campaign against the Federal Republic of Yugoslavia in the 1999 Kosovo War, the International Criminal Tribunal for the Former Yugoslavia (ICTY) weakly concluded that Article 55 of Additional Protocol I "*may* […] reflect current customary law": *ICTY Final Report*, *supra* note 349, para. 15 [emphasis added]. See also *UNEP Report on Armed Conflict*, *supra* note 391, at 26-27.

[461] See *ICTY Final Report*, *supra* note 349, para. 15. Specifically, the ICTY mentioned the US and France, neither States of which ratified the 1977 Additional Protocol I. France acceded to Additional Protocol I on 11 April 2001, whereas the US signed Additional Protocol I on 12 December 1977. By virtue of the Vienna Convention on the Law of Treaties, the US must "refrain from acts which would defeat the object and purpose of a treaty" (VCLT, *supra* note 149, art. 18(a)).

[462] *UNEP Report on Armed Conflict*, *supra* note 391, at 20-21. See also *Space Operations, Air Force Doctrine Document 2-2*, *supra* note 178, at 26 ["The right of self-defense, as recognized in the United Nations Charter and more fundamentally in customary international law, applies in outer space. Also, law of war precepts such as necessity, distinction and proportionality will apply to any military activity in outer space."]

Rule 43 governs that the environment cannot be attacked unless it is a "military objective"[463] and unless it is "required by imperative military necessity".[464] This rule is reflective of the rule that military operations must be governed by the principle of distinction,[465] and only military objects may be attacked. Thus civilian objects and the natural environment cannot be the object of attack[466]—a position strongly supported by ample State practice, military manuals and official pronouncements.[467] Further, Rule 43 governs it is prohibited to attack a military objective that is expected to cause "incidental damage to the environment which would be excessive in relation to the concrete and direct military advantage anticipated".[468] The customary nature of this obligation is clearly supported by the 1992 General Assembly resolution which underlined the "destruction of the environment, not justified by military necessity and carried out wantonly, is clearly contrary to existing international law".[469] With respect to the potential use of kinetic space weapons, it is postulated that even if a space object were to be military objective, the damage to the environment of outer space in the creation of space would by far exceed any "concrete and direct military advantage anticipated". Obviously, an action that does not "serve a clear and important military purpose", yet inflicts grave and wanton damage to the environment is prohibited.[470] More specifically, central to the argument of this thesis, no State can possibly argue or defend that the wanton contamination of outer space with space debris, even if it is incidental to the intended military objective is a necessity, especially as any such contamination will adversely affect the right of other States to use space.[471]

[463] ICRC Rule 43(a): "No part of the natural environment may be attacked, unless it is a military objective".
[464] ICRC Rule 43(b): "Destruction of any part of the natural environment is prohibited, unless required by imperative military necessity".
[465] See ICRC Rule 7: "The parties to the conflict must at all times distinguish between civilian objects and military objectives. Attacks may only be directed against military objectives. Attacks must not be directed against civilian objects". See also *Legality of Nuclear Weapons*, *supra* note 23, para. 78.
[466] See *Customary International Humanitarian Law: Rules*, *supra* note 402, at 25-26.
[467] For military manuals of Australia, Belgium and the US, see *Customary International Humanitarian Law, Volume II: Practice*, *supra* note 395, 846, paras. 8-11; for an official statement of the US, see 852-854, paras. 50 and 53.
[468] Rule 43(c): "Launching an attack against a military objective which may be expected to cause incidental damage to the environment which would be excessive in relation to the concrete and direct military advantage anticipated is prohibited".
[469] UN Doc. A/RES/47/37, *supra* note 376, Preamble, para. 5. See also *Customary International Humanitarian Law: Rules*, *supra* note 402, at 145.
[470] *ICTY Final Report*, *supra* note 349, para. 22
[471] See as A. Frowein put it: "It is not conceivable for public international law to recognise the rule that [contamination] of outer space with repercussions for its use and for the atmosphere could be legal": Frowein (1990), *supra* note 307, at 165. See also *Nicaragua*, *supra* note 235, para. 218, at 114.

Rule 44 holds that "methods and means of warfare" must have due regard to the "protection and preservation of the natural environment". Thus after the Iraqi invasion of Kuwait in 1990, a Security Council resolution made specific reference to Iraq's international liability for any damage resulting from the unlawful invasion, which includes any environmental damage.[472] Further, in *Legality of Nuclear Weapons* the Court[473] and many States[474] underlined the importance of protecting the environment in armed conflict. Applied to outer space, any weapon used against space objects must therefore have regard to the "protection and preservation of the natural environment".

Customary Rule 45 repeats much of the obligation on States contained under ENMOD and Articles 35 and 55 of the 1977 Additional Protocol I. The Rule partly provides:

> The use of methods or means of warfare that are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment is prohibited.

The State practice and opinion in support of this rule is clear,[475] and "as far as methods of warfare and use of conventional weapons are concerned" there is a "widespread, representative and virtually uniform" acceptance of the customary nature of Rule 45.[476] The only objection to the prohibition of a means of warfare intended or expected to cause "widespread, long-term and severe damage to the natural environment" concerns only the use of nuclear weapons.[477] Thus it is safe to conclude the use of a conventional kinetic space weapon, which as outlined earlier will result in "widespread, long-term and severe damage to the natural environment" in the form of the massive debris cloud that ensues, would be prohibited by ICRC Rule 45.

Having outlined the conventional and customary law on the protection of the natural environment applicable to armed conflict, the question to ask is whether there is evidence they

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[472] UNSC, *Iraq-Kuwait*, Res. 687, UN Doc. S/RES/687 (3 April 1991), para. 16. See also *Customary International Humanitarian Law: Rules*, *supra* note 402, at 147.
[473] *Customary International Humanitarian Law: Rules*, *supra* note 402, 148; *Legality of Nuclear Weapons*, *supra* note 23, para. 29.
[474] For the opinion of States contained in memoranda submitted before the Court in the same case, see *Customary International Humanitarian Law, Volume II: Practice*, *supra* note 395, at 862, paras. 87-89.
[475] The ICRC notes that States believe "any party to a conflict must observe this rule, or must avoid using methods or means of warfare that would destroy or could have disastrous effects on the environment": *Customary International Humanitarian Law: Rules*, *supra* note 402, at 152.
[476] *Ibid.*, 154. See also *North Sea Continental Shelf*, *supra* note 234, para. 74.
[477] See *Customary International Humanitarian Law: Rules*, *supra* note 402, at 154. The UK and the US have all objected to the prohibition being applied to the use of nuclear weapons: see *Customary International Humanitarian Law, Volume II: Practice*, *supra* note 395, 883-884, paras. 184-186.

would apply in the context of an eventual outbreak of conflict in outer space? The ICRC would answer in the affirmative. In *Protection of the Environment in Time of Armed Conflict,*[478] the ICRC argued even if there is no identifiable law governing a specific setting or context of warfare, "general principles of international law", such as the principles of distinction and proportionality, prohibit States from inflicting damaging effects on the environment in armed conflict.[479] Repeatedly, the ICRC underlines in situations not governed by international agreements, other rules binding on all States to protect the environment are to be "derived from established custom, the principles of humanity and the dictates of public conscience".[480]

The reference to "principles of humanity and the dictates of public conscience" echoes the "Martens Clause", which was first adopted at the 1899 Hague Conference,[481] variations of which has been reiterated later in The Hague and Geneva Conventions. In the conduct of warfare, and in the absence of provisions in customary law or treaty law, the Martens Clause is a capture-clause obliging States to observe principles of international humanitarian law (IHL) in general. Extrapolating the phrase "principles of humanity and the dictates of public conscience", the argument put forward by this thesis, and an opinion affirmed by the ICRC, is that the Martens Clause would oblige States to have regard to customary principles protecting the environment in armed conflict.[482]

The Martens Clause is undeniably a part of customary international law, and applies to *all* armed conflicts, regardless of whether the nature or indeed very theatre of the armed conflict

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[478] *Guidelines for military manuals, supra* note 402.
[479] *Ibid.*, para. 4. See also *Protection of the Environment in Times of Armed Conflict, supra* note 331, at 5, para. 21.
[480] *Guidelines for military manuals, supra* note 402, para. 7. An example of the Martens Clause can be seen under the Preamble of the Hague II, 29 July 1899:

> Until a more complete code of the laws of war is issued, the High Contracting Parties think it right to declare that in cases not included in the Regulations adopted by them, populations and belligerents remain under the protection and empire of the principles of international law, as they result from the usages established between civilized nations, from the laws of humanity and the requirements of the public conscience.

See also *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 5, para. 22.
[481] *Customary International Humanitarian Law: Rules*, *supra* note 402, at xxxi.
[482] Though Geneva Conventions I and II are not applicable to the context of outer space warfare, they do reiterate the Martens Clause are stipulate that repudiation of the Conventions will not "impair" the obligations which States are bound to "by virtue of the principles of the law of nations, as they result from the usages established among civilized peoples, from the laws of humanity and the dictates of the public conscience": see Geneva Convention I for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, Geneva, 12 August 1949, Art. 63; and Geneva Convention II for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea, Geneva, 12 August 1949, Art. 62. Both these Conventions affirm that the content of the Martens Clause is customary international law. See *UNEP Report on Armed Conflict, supra* note 391, at 12.

has been regulated by treaty.[483] Arguably, even if a State refutes the applicability of a treaty or customary law on the prohibition against causing damage to the environment in warfare, the capture-Martens Clause can be interpreted to apply in the eventual outbreak of an armed conflict in outer space.

a) Necessity

The foregoing demonstrated that even under the laws of armed conflict, there are clear and convincing conventional and customary laws prohibiting the use of weapons that cause grave damage to the environment. The nature of kinetic space weapons, due to the resultant debris that will be created after their use, are effectively outlawed by these conventional and customary prohibitions. However, does this mean that in protecting the natural environment from damage, must States always act with "total restraint"?[484] To investigate whether these prohibitions are always absolute, international law governing the prohibition of the threat or use of force and the right to self-defence must be investigated.

Under the United Nations Charter, all States must refrain from the threat or use of force.[485] This obligation has been recognized as customary law,[486] and the only legitimate use of force is when a State exercises its "inherent right of self-defence".[487] The right of self-defence

[483] *Commentary on the Additional Protocols, supra* note 422, at 39, para. 56. The UN Secretary General noted that the application of the Martens Clause in the context of protecting the environment is "indisputable": see *Protection of the Environment in Times of Armed Conflict*, *supra* note 331, at 15, para. 77. Cf. Kiss and Shelton (2007), *supra* note 417, who note that the 1977 Additional Protocols apply "only to land warfare and to sea or air warfare that affects the land": at 257. See also " *Guidelines for military manuals, supra* note 402, para. 7:

> In cases not covered by international agreements, the environment remains under the protection and authority of the principles of international law derived from established custom, the principles of humanity and the dictates of public conscience.

[484] *Legality of Nuclear Weapons, supra* note 23, para. 30.

[485] UN Charter, art. 2(4). This coincides with the *jus ad bellum*, the law governing the use of force: *ICTY Final Report, supra* note 349, para. 30 ["In brief, the jus ad bellum regulates when states may use force and is, for the most part, enshrined in the UN Charter"].

[486] See e.g. *Nicaragua*, *supra* note 235, para.187-191; *Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory* (Advisory Opinion) [2004] ICJ Reports 136 [hereinafter: *Legality of the Wall*], para. 81. See also Ian Brownlie, 'International Law and the Use of Force by States Revisited' (2002) 1 *Chicago Journal of International Law* 1.

[487] UN Charter, art. 51. The Security Council holds the only other right to use legitimate force under Chapter VII of the Charter.

can only be invoked *after* an armed attack[488] of the "most grave forms".[489] Further, the use of force justified under self-defence used must be a necessary and proportionate response to the armed attack.[490] Specifically on the matter of space weapons, if a State has been attacked and exercises its right to self-defence, can the use of a kinetic space weapon ever be justified as necessary and proportionate in view of the devastating damage the weapon will cause to the space environment?

Though it has been suggested that in the conduct of an armed conflict, the choice and use of a particular weapon depends more on "cost effectiveness and military usefulness" and to a much lesser extent on "legal acceptability",[491] the ICJ has held that necessity is "not a purely a question for the subjective judgment of the party".[492] The condition of necessity applies "whatever the means of force employed",[493] and therefore must also be satisfied if a space weapon is to be used in self-defence. Necessity may be invoked only when the very survival of the State is at stake.[494] Thus, the *Caroline* case first recognised the "necessity of self-defence and self-preservation"[495] in a situation where the threat of an armed attack is "instant, overwhelming, and [leaves] no choice of means, and no moment for deliberation".[496] *Gabčíkovo-Nagymaros* further clarified that under customary international law necessity denotes a situation whereby a State's "essential interests" is threatened by a "grave and imminent peril".[497] In this case, the Court held it is justifiable to suspend a State's other international obligations in order to safeguard a State's "essential interests" in the protection of the natural environment.[498]

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[488] *Ibid.*, affirmed in the *Friendly Relations Declaration*, *supra* note 159, and *Nicaragua*, *supra* note 235, paras. 193-194 and 211; *Oil Platforms* (Islamic Republic of Iran v. USA) [2003] ICJ Reports 161, para. 74. For the right of collective self-defence, the victim State must appeal for help: see *Nicaragua*, *supra* note 235, para.232.
[489] *Nicaragua*, *supra* note 235, para.195.
[490] *Ibid.*, paras. 176 and 194; *Oil Platforms*, *supra* note 488, para.76; *Legality of Nuclear Weapons*, *supra* note 23, para.41.
[491] F. J. F. Osborne, 'Space without Weapons: An Assessment of Technological Status', 87-99 in *Space without Weapons, Proceedings of the Symposium held on 25-27 October 1989* (Montreal: Centre for Research in Air and Space Law, 1989), 88.
[492] *Nicaragua*, *supra* note 235, para. 282; see also *Gabčíkovo-Nagymaros*, *supra* note 320, para. 51.
[493] *Legality of Nuclear Weapons*, *supra* note 23, para. 41.
[494] *Commentaries to the 2001 Draft Articles*, *supra* note 353, at 83.
[495] Lord McNair (ed.), *International Law Opinions: vol. II, Peace* (Cambridge: Cambridge University Press, 1956), at 228.
[496] R. Y. Jennings, *The Caroline and McLeod Cases* (1938) 32 American Journal of International Law 82, 89 (citing Letter from Daniel Webster to Lord Ashburton (July 27, 1848)).
[497] *Gabčíkovo-Nagymaros*, *supra* note 320, at paras. 51-52. See also *Commentaries to the 2001 Draft Articles*, *supra* note 353, at 82-83.
[498] See *Gabčíkovo-Nagymaros*, *supra* note 320, para. 48. See also *Customary International Humanitarian Law: Rules*, *supra* note 402, 147.

b) Proportionality

The principle of proportionality, which is the other ground to assess the lawfulness of the exercise of the use of force in self-defence,[499] is undisputedly a "general principle of law".[500] *Caroline* illustrated that proportionality denotes "nothing unreasonable or excessive" may be done in any defensive act.[501] Though in a military context proportionality implies the force used and damage caused cannot be disproportionate to the military objective to be achieved, the International Law Commission declared that the assessment of proportionality must not be based on a "purely 'quantitative'" measure of the injury suffered, but must take " 'qualitative' factors such as the importance of the interest protected" into account.[502] Satisfying the requirement of proportionality in order to trump the prohibition of causing grave environmental damage, the military action must "confer a *very substantial* military advantage" for the action to be legitimate.[503]

To conclude on the matter of self-defence, a number of issues can be offered for thought. Whether a State can legitimately use a space weapon in response to an armed attack depends much on the circumstances of the initial armed attack. However, the Court in *Legality of Nuclear Weapons* already held regardless of whether a weapon is used for a legitimate purpose under the UN Charter, the weapon "that is already unlawful *per se*, whether by treaty or custom, does not become lawful".[504] Placed in context, space weapon will invariably result in devastating consequences on the space environment, and thereby contravene environmental laws and laws of war outlined above. The use of that weapon does not become legal even if the weapon is used in the legitimate cause of self-defence.

The above criterion governing the principles of proportionality and necessity can only be assessed in light of known facts. What is clear is that the threshold for necessity is extremely high, and must reach a level where the State's very existence is at stake. How likely is it that,

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[499] *Nicaragua*, *supra* note 235, paras. 176 and 194; see also *Oil Platforms*, paras. 43 and 74*; Legality of Nuclear Weapons*, *supra* note 23, para. 41.
[500] ICJ Statute, art. 38(c).
[501] R.Y. Jennings, *The Caroline and McLeod Cases*, 32 *American Journal of International Law* 82, 89 (1938) (citing Letter from Daniel Webster to Lord Ashburton (July 27, 1848)).
[502] *Commentaries to the 2001 Draft Articles*, *supra* note 353, 134-135. See also Robert A. Ramey, *Armed Conflict on the Final Frontier: The Law of War in Space* (2000)48 *Air Force Law Review* 1; and Steven Freeland, "The Applicability of the *Jus in Bello* Rules of as International Humanitarian Law to the Use of Outer Space" (2006) 49 *Colloquium on the Law of Outer Space* 338.
[503] *ICTY Final Report, supra* note 349, para. 22 [emphasis added].
[504] *Legality of Nuclear Weapons, supra* note 23, para. 39.

given the devastating effect a space weapon can have on the space environment, the use of a space weapon is the only means with which to respond to the armed attack? Finally, the creation of vast amounts of debris which will not only damage the space environment *per se* but will inevitably also threaten the legitimate use of outer space for all States. On balance, can the use of a space weapon ever be considered a proportionate response to any form of armed attack that outweighs the interest of all States in the protection of the environment and the interest of all States to freely use outer space for peaceful purposes?

VI. "Legality of the Threat or Use of Space Weapons": Request for an Advisory Opinion

The preceding discussion on the legality of the use of kinetic space weapons focused on the devastating environmental impact that will occur should such weapons be used in outer space. The environmental consequences, in the creation of space debris that will remain in orbit for decades, if not much longer, is argued to be in breach of fundamental norms of international law that oblige States not to engage in activities that result in irreparable damage to the natural environment. The law can be traced to general environmental law as well as the laws of war, whether in the form of conventions or customary law. Further, it has been postulated that the use of such weapons cannot possibly satisfy the criterion of proportionality or necessity when weighed against the military objective that is to be achieved.

However, it is recognised the foregoing thesis is largely theoretical, and is underlined largely by what the law should be, and less by what the law is. In support of the foregoing arguments, opinions of notable international jurists and such bodies involved in the codification of international law, such as the ILC, have been extensively extrapolated. Jurisprudence of the ICJ has also been cited to shed some light on the shadow of uncertainty that exists surrounding the issue of the legality of use of kinetic space weapons. Even so, sceptics may not be easily convinced, and international realists may easily dismiss environmental concerns with the more pressing urgency of war and the survival of the State.

The law on the very matter of the legality of use of kinetic space weapons needs to be stated and clarified before States unilaterally interpret the law (or lack thereof) and unilaterally begin to weaponise outer space. Therefore, an appeal should be made to the ICJ, or rather to States within the UN to request an advisory opinion from the ICJ.[505] Such a request for an advisory opinion is not new. Indeed, throughout this thesis, much reference has been made of the Court's seminal advisory opinion in *Legality of Nuclear Weapons,* in which the General Assembly requested the Court to deliver its opinion:

[505] A proponent of referring the matter to the ICJ is Jonathan Dean (2002), *supra* note 65, at 5.

> […] relating to the threat or use of force in international relations, the disarmament process, and the progressive development of international law. The General Assembly has a long-standing interest in these matters and in their relation to nuclear weapons. This interest has been manifested in the annual First Committee debates, and the Assembly resolutions on nuclear weapons; in the holding of three special sessions on disarmament (1978, 1982 and 1988) by the General Assembly, and the annual meetings of the Disarmament Commission since 1978; and also in the commissioning of studies on the effects of the use of nuclear weapons. [506]

If one were to substitute references to "nuclear weapons" for "space weapons" (and also change the years mentioned), it is clear that the Court does have the wherewithal to consider and deliver its legal opinion on the very subject matter of the legality of use of space weapons. Indeed, besides having a long-standing interest in the matter of nuclear weapons, the General Assembly, together with the Conference on Disarmament and the UNCOPUOS, have since the 1980s been concerned with the prospect of an arms race in outer space.

As the Court has previously held, the UN Charter confers on the General Assembly the competence to deal with "any questions or any matters" within the scope of the Charter.[507] Specifically, Article 11 of the UN Charter grants the General Assembly the competence to deal with "general principles of co-operation in the maintenance of international peace and security, including the principles governing *disarmament and the regulation of armament*".[508] The matter of discussing and clarifying the law on space weapons at this critical juncture falls exactly under the General Assembly's mandate, and will have important bearing on "international relations, the disarmament process, and the progressive development of international law".[509]

Under Article 65(1) of the Statute of the ICJ, the Court possesses the competence to deliver an advisory opinion "on any legal question" should it be requested to do so by a body that is authorised to make such a request "in accordance with the Charter of the United Nations".[510] Note the exact wording of Article 65(1) is that the Court "*may* give an advisory opinion on any

[506] *Legality of Nuclear Weapons*, *supra* note 23, at 233, para. 12.
[507] UN Charter, art. 10. See also *Legality of Nuclear Weapons*, *supra* note 23, at 233, para. 12.
[508] UN Charter, art. 11 [emphasis added]. See also *Legality of Nuclear Weapons*, *supra* note 23, at 233, para. 12.
[509] *Legality of Nuclear Weapons*, *supra* note 23, at 233, para. 12.
[510] Statute of the ICJ, art. 65(1). See e.g. *Accordance with International Law of the Unilateral Declaration of Independence in respect of Kosovo* (Advisory Opinion) [2010], online: <http://www.icj-cij.org/docket/files/141/15987.pdf> [hereinafter: *Kosovo*], para. 18.

legal question",[511] meaning that the Court still has discretionary power to decline or accept the task of delivering an advisory opinion on a matter.[512] However, recognising its responsibility within the UN system as the "principal judicial organ",[513] the Court will "in principle not decline to give an advisory opinion", unless there are "compelling reasons" to do so.[514] In fact, never has the Court found "compelling" enough reasons to refuse an advisory opinion, and on the occasion that it did refuse to give an advisory opinion, it was on jurisdictional grounds.[515]

With regards to what is a "legal question", the Court opined in *Western Sahara* that the question must be:

> framed in terms of law and [which] raise problems of international law [and] are by their very nature susceptible of a reply based on law; indeed, they are scarcely susceptible of a reply otherwise than on the basis of law.[516]

That a subject matter may be politically contentious, or may involve "political aspects", does not make a matter lose "its character as a legal question" or take away the Court's inherent competence to deal with the subject matter.[517] Indeed, regardless of the political aspects of a subject matter, the Court cannot shirk its responsibility to "discharge an essential judicial task", which is to provide:

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[511] Statute of the ICJ, Art. 65(1) [emphasis added]. See *Application for Review of Judgment No. 273 of the United Nations Administrative Tribunal* (Advisory Opinion) [1982] ICJ Reports 325, at 333-334, para. 21; *Legality of the Wall*, *supra* note 486, at 144, para. 14; and *Kosovo*, *supra* note 510, para. 19.

[512] See e.g. *Legality of Nuclear Weapons*, *supra* note 23, at 234-235, para. 14; *Legality of the Wall*, *supra* note 486, at 156, para. 44; and *Kosovo*, *supra* note 510, para. 29.

[513] UN Charter, art. 92. See also *Legality of Nuclear Weapons*, *supra* note 23, at 235, para. 14; *Legality of the Wall*, *supra* note 486, at 156, para. 44.

[514] *Legality of Nuclear Weapons*, *supra* note 23, at 253, para. 14; *Legality of the Wall*, *supra* note 486, at 156, para. 44; *Kosovo*, *supra* note 510, para. 30.

[515] See *Legality of Nuclear Weapons*, *supra* note 23, at 235, para. 14. In the PCIJ's *Status of Eastern Carelia* case, the ICJ's predecessor declined to give an advisory opinion because to do so "would be substantially equivalent to deciding the [existing] dispute between the parties", one of which did not consent to the dispute being referred to the Court: [1923] Ser. B, No. 5, 7, at 28-29.

[516] *Western Sahara* (Advisory Opinion) [1975] ICJ Reports 12, at 18, para. 15; and *Legality of Nuclear Weapons*, *supra* note 23, at 233-234, para. 13. See also *Namibia*, *supra* note 317, at 27:

> In the view of the Court, the contingency that there may be factual issues underlying the question posed does not alter its character as a 'legal question' as envisaged in Article 96 of the Charter. The reference in this provision to legal questions cannot be interpreted as opposing legal to factual issues. Normally, to enable a court to pronounce on legal questions, it must also be acquainted with, take into account and, if necessary, make findings as to the relevant factual issues.

[517] *Legality of Nuclear Weapons*, *supra* note 23, at 234, para. 13; and *Kosovo*, *supra* note 510, para. 27.

> an assessment of the legality of the possible conduct of States with regard to the obligations imposed upon them by international law[518]

An advisory opinion, though not binding, does have the effect of stating the law.[519] Though the Court's Statute stipulates that decisions of the Court are only binding between parties and "in respect of that particular case",[520] the Court's legal pronunciations in its advisory opinions does have an effect on the development, and at times statement, of current international law.[521] The Court's assessment on the legality of the use of space weapons will go a long way to breaking the stalemate that has existed in the debate surrounding kinetic space weapons. Further, a clear pronouncement on the state of the law today will serve to remind States of their international obligations, and the source of those international obligations, whether convention-based or originating from custom. In light of the foregoing, there is clear enough leeway for the Court to state its opinion on the very matter of use of kinetic space weapons, just as it has done in the case of nuclear weapons.

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[518] *Legality of Nuclear Weapons*, *supra* note 23, 234, para. 13;
[519] Higgins (1994), *supra* note 236, 198.
[520] Statute of the ICJ, art. 59.
[521] Higgins (1994), *supra* note 236, opines at 202 [emphasis in original]:

> The Court's function is to settle disputes between States and to provide advice to authorized organs. It is not to develop international law in the abstract. But, of course, the very determination of specific disputes, and the provision of specific advice, *does* develop international law. This is because the judicial function is not simply the application of existing rules to facts. The circumstances to which it will be said to apply, the elaboration of the content of a norm, the expansion upon uncertain matters, all contribute enormously to the development of international law.

Higgins does note that in some cases, the Court's legal opinion or pronouncement of the law merely sows "legal seeds", and it takes time for the legal obligation identified to be translated into reality, if ever: at 203-204. The *Legality of the Wall* Advisory Opinion is an obvious example of this, as close to eight years to the declaration that the Wall in the Occupied Palestinian Territory is contrary to international and humanitarian law, the Wall still stands.

VII. Conclusion

> In shaping the law of outer space, as indeed of international law in general, the jurist has an important task to perform. It is not only the framing of technical treaty clauses, not only the analysis of documents. It is much more: he is called upon to make law progress and move, *to mould it in the interest of men and nations, to guarantee the protection of law to the great achievements of the past and present, to remove threats to our survival, to strive for a progressive law of tomorrow*. **Manfred Lachs**[522]

The above quote sums up the proposed thesis and arguments that have been made in the foregoing pages well. Space law has developed quickly as a response to rapid developments in the use of outer space. Though there exist space treaties and a number of principles contained in General Assembly resolutions, much technological developments and uses of outer space could not possibly be foreseen by the drafters of such laws. Thus, while the Outer Space Treaty stipulates States are prohibited from placing objects carrying nuclear weapons or weapons of mass destruction around the Earth's orbit, there is a "lacuna" with regards to the introduction of other kinds of weapons.[523] Recent political pronouncements as well as actions and posturing by leading space faring powers have only served to heighten, not diminish, the likelihood that space weapons will be introduced into the final frontier.

For three decades, the Conference on Disarmament and in the General Assembly has paid much attention to the "importance and urgency" of preventing the weaponisation of outer space and the beginnings of an arms race in outer space.[524] The focus and fear is that if such a tendency were to develop, it will be a great source of strain on relations between States and even threaten the existence of humankind.[525]

Attempts to develop concrete laws to regulate or outlaw the use of space weapons have not been successful. The proposed *Treaty on Prevention of the Placement of Weapons in Outer*

[522] Lachs (1964), *supra* note 142102-103 [emphasis added].
[523] He Qizhi, "On Strengthening the Role of COPUOS in Maintaining Outer Space for Peaceful Uses" (1985) 28 *Colloquium on the Law of Outer Space* 37, 39. See more recently UN Doc. A/AC.105/935, *supra* note 79, at para. 27.
[524] UN Doc. A/RES/65/44, *supra* note 212, para. 1.
[525] *Ibid.*, Preamble, para. 7; see also UN Doc. A/RES/36/99, *supra* note 192, Preamble, paras. 3 and 4. As early as UNISPACE-82, it was noted that the "extension of an arms race into outer space is a matter of grave concern to the international community": see *UNISPACE 1982 Report*, para. 13, see *supra* note 43, at 65 [emphasis added]. See also Christol (1984), *supra* note 175, 282. Similarly, Kusksvelis (1985) remarked that the "only real consequences of the development of the ASATs" serves to "increase [the threat] of a war due to an error", and is a wasteful enterprise: *supra* note 197, at 65.

Space and of the Threat or Use of Force against Outer Space Objects is the latest of such an endeavour, however it does not seem likely to see the light of day given the US' staunch opposition to any measure that will restrict or constrain the US' "freedom of action" in outer space. The General Assembly has over the past three decades annually adopted a resolution calling for the prevention of an arms race in outer space, and calling on States to "refrain from actions contrary to that objective".[526] Though there is evidence the PAROS resolutions, by virtue of minimal opposition to its repeated adoption, have contributed to the development of a customary law in this regard, the US can arguably be a "persistent objector", and thereby be exempt from obligations contained in the PAROS resolutions.

Due to the different types of space weapons out there, this thesis chose to focus on the matter of "conventional" space weapons, which has been highlighted as a major concern in outer space by the UNCOPUOS.[527] The focus on "conventional" space weapons that rely on kinetic energy to physically destroy or disable a space object is also due to the vast amounts of space debris that will be created in the aftermath of their use, which the UNCOPUOS has warned will threaten "access to and the use of outer space in both the short term and the long term".[528]

Recent ASAT tests made evident there is an unintentional effect of the creation of space debris that will remain in orbit for decades, if not centuries, to come. This devastating and indirect pollution of the outer space environment cannot possibly be argued as satisfying the obligation to use outer space "for the benefit and in the interests of all countries".[529] Indeed, the creation of space debris can actually be argued as restricting the free access to space for use by all States,[530] thereby violating the rights of all States.[531] In fact, the speed at which debris travels, and the potential for cascading collisions to occur should a particular region of space be saturated with debris, will threaten all space assets, thus even the space assets of the State which initially utilises a space weapon. However, whether these arguments are tenable is up to debate. Despite

[526] UN Doc. A/66/410, *supra* note 42, para. 4.
[527] UN Doc. A/AC.105/990, *supra* note 24, paras. 39-40. See also UN Doc. A/AC.105/L.281/Add.1, *supra* note 24, paras. 20 and 23-24.
[528] UN Doc. A/64/20, *supra* note 80, para. 109.
[529] OST, *supra* note 17, art. I.
[530] *Ibid.*, art. I.
[531] See UN, *Survey of International Law in Relation to the Work of Codification of the International Law Commission*, UN Doc. A/CN.4/1/Rev.1 (1949), at 34, para. 57 ["a State must not permit the use of its territory for purposes injurious to the interests of other States in a manner contrary to international law"]. See also *Corfu Channel*, *supra* note 398, at 22.

the apparent and direct connection between the intentional destruction of space objects through the use of kinetic collision and the creation of debris in outer space, the security and strategic interests of States may overshadow the urgency of refraining from actions that not only pollutes the space environment, but also seriously jeopardises international relations.

If space law, as outlined, does not provide a strong enough legal framework to halt the potential use of kinetic weapons, then, as Lachs suggests in the quote cited above, it is the jurist's task to "make law progress and move" by searching for solutions elsewhere. Indeed, the OST allows for this possibility under Article III, which effectively infuses space law with general international law to regulate activities in and the use of outer space. As space debris is no doubt pollution in the outer space environment, it is only logical and less contentious that environmental law is a suitable and viable solution to prohibit the use of kinetic space weapons, the use of which will undoubtedly result in the creation of space debris.[532]

Though space law contains references to contamination of outer space under Article IX of the OST, a more effective protection of the outer space environment from contamination by space debris as a result of the use of space weapon must look at environmental law in general. It has been persuasively argued that environmental law, of which much of the content is found in customary law and later reaffirmed in environmental law treaties, does contain prohibitions against causing damage to the environment and against States causing pollution.[533] That environmental law's application extends to outer space has been demonstrated with reference to the learned opinions of judges of the ICJ and also the conclusions drawn by the respected International Law Commission.[534] In fact, environmental law's prohibition against damage to the environment is an interest of all States, for the harm is done to the environment itself, and does not necessarily have to result in harm to any particular State. As the ILC in 2011 concluded, conventions governing environmental obligations would even continue to be in force in times of armed conflict.[535]

Even if it is unpersuasive that States must abide by general and customary environmental law which prohibits activities that pollute the natural environment in outer space, it has been

[532] Maogoto and Freeland (2008), *supra* note 30, 32.
[533] See e.g. Stockholm Declaration, *supra* note 36, and generally *Legality of Nuclear Weapons, supra* note 23, para. 29 and 33; and *Gabčíkovo-Nagymaros, supra* note 320, para. 53.
[534] See e.g. UN Doc. A/31/10, *supra* note 37, 108-109.
[535] See Draft Articles on the Effects of Armed Conflicts on Treaties, *supra* note 404, art. 7 and Annex (g).

postulated that under international humanitarian law there are specific conventional and customary laws which contain the same prohibitions.[536] The Martens Clause stipulates that "principles of humanity and the dictates of public conscience" would still govern in an armed conflict of whatever nature and in whatever setting, and this can be interpreted as a capture clause to underline that specific regard must be had for the effect a means of warfare may have on the natural environment.[537] In the event of self-defence following an armed attack, a State which plans to use kinetic space weapons must have regard to the considerations of necessity and proportionality.[538] Arguably, it is unlikely there will be circumstances so dire that a State is left with no other choice but to use a kinetic space weapon in response. Further, it can be questioned whether the damage to the natural environment, coupled with potential interests and rights of other States to use space that may be injured, as well as the potential damage to space objects that may be caused by space debris following the use of a kinetic space weapon, will ever be proportionate to the military objective to be achieved.

The case against the use of kinetic space weapons is strong, and can be traced to obligations and prohibitions contained in general international law, space law, environmental law as well as international humanitarian law. Throughout, the premise of this thesis to prohibit kinetic space weapons rests on the fact that any such use would result in violations of the prohibitions of causing damage to the environment. What is the situation with regard to the threat to use a space weapon or just a weapon's mere deployment as a deterrent? The *Legality of Nuclear Weapons* case is illustrative of what the law may be. The Court held if the use of a device is unlawful, then naturally "the stated readiness to use it would be a threat prohibited" under Article 2(4) of the UN Charter.[539] Thus the threat and use of force must always be considered together. Even if a weapon is supposed to be a deterrent, it would still be unlawful "to threaten to use force if the use of force contemplated would be illegal."[540] Even so, mere possession of a weapon that is illegal because of the devastating consequences its use may have on the natural environment does not necessary constitute a credible threat to use the weapon.

[536] ENMOD, *supra* note 36, art. 1; 1977 Additional Protocol I, *supra* note 36, arts. 35(3) and 55(1); ICRC Rules 43-45.
[537] *UNEP Report on Armed Conflict*, *supra* note 391, at 12.
[538] *Legality of Nuclear Weapons*, *supra* note 23, para. 30.
[539] Indeed, the Court observed "no State—whether or not it defended the policy of deterrence –suggested to the Court that it would be lawful to threaten to use force if the use of force contemplated would be illegal": *Legality of Nuclear Weapons*, *supra* note 23, para. 47.
[540] *Ibid.*

States do have a right to deploy weapons to self-guard against an armed attack. The "threat of force" must therefore be interpreted in the light of whether weapon would be "directed against the territorial integrity or political independence of a State, or against the Purposes of the United Nations or whether, in the event that it were intended as a means of defence".[541]

Navigating the overlapping and various sources of conventional and customary law which directly or indirectly relate to the debate surrounding the weaponisation of outer space, it is possible to, again borrowing Lachs' quote, "remove threats to our survival, to strive for a progressive law of tomorrow". As respected publicist and former judge of the ICJ Robert Jennings noted, there is no other field of law other than space *and* environmental law where the development of the law is so heavily influenced by a new kind of customary law, which defies the traditional general usage of laws that custom is traditionally associated with, and yet falls short of being agreed to by States in the form of treaty rules.[542]

The lacunae in concrete and easily identifiable laws to regulate the weaponisation of outer space is unfortunate, and may lead to interpretations of the law and unilateral actions that undermine the relative peace and stability that has governed activities in outer space.[543] As Schachter notes, in outer space States are often uncertain about or unwilling to express their positions on a particular matter "until actual cases and controversies have arisen".[544] Even having outlined a creative alternative to breaking the deadlock in the space weaponisation debate, there are no doubt other types of weapons existing or under development that have the capability to threaten international peace and security and undermine relations between States. Thus a more authoritative identification or pronouncement of the legality of space weapons, whether in general or of kinetic weapons in particular, is urgently needed. The *Legality of Nuclear Weapons* Advisory Opinion, which has been referred to repeatedly throughout this thesis, is an excellent example of how the International Court of Justice has the competence to deal with a pressing matter which goes to the fundamental issues of the "threat or use of force in international

[541] *Ibid.* para. 48.
[542] Robert Jennings alludes to the formation of laws that is a "hermaphroditic creature" having both characteristics of custom and treaty law, and recalls what Bin Cheng identified as a new kind of law called "instant custom": Jennings (1990), *supra* note 226, 151. Similarly, Gennady M. Danilenko notes that with regards to custom applying in the outer space environment, one may not speak of the "actual existence of relevant rules but rather of the prospects for their development": see Danilenko (1990), *supra* note 273, at 173.
[543] Johnson (2003, *supra* note 22, at 55.
[544] Schachter (1959), *supra* note 313,14.

relations, the disarmament process, and the progressive development of international law".[545] It is submitted that for greater clarity and coherence in the legal regime governing space weapons, the UN's "principal judicial organ"[546] has the competence and expertise to deal with what for decades has been a politically sensitive, yet nonetheless fundamental, matter impinging on international peace and security, and indeed, the very future and survival of humankind.

Any weapons control regime, even if it is indirectly through alternative sources of law which centre on the concern for the wellbeing of humanity and the environment, must be coupled with confidence-building and transparency measures.[547] Further, the establishment of regional space organisations can entrench peace into the international legal order and influence how a bloc of States conducts themselves in outer space.[548] Though it may be premature to establish a space organisation for all states, such as a World Space Agency, regional arrangements have been set in motion and have successfully managed to pool together resources across national boundaries to achieve a common objective. Space organisations, such as the European Space Agency[549] and the more recently established Asia-Pacific Space Cooperation Organization,[550] have constitutional documents that enshrine proclaimed purposes and objectives, among which the peaceful and transparent use of outer space are guiding principles.

Having argued the use of kinetic space weapons endangers international peace and security, and that a ban on the use of such weapons can be found in general international law and environmental law, one must bear in mind one possible exception to the proposed ban. There are numerous Near Earth Objects (NEOs), such as asteroids, that threaten to strike our planet, and such NEOs, due to their speed and size, can cause devastating damage to Earth, and may even threaten the survival of humankind. The NEOShield project, as proposed and funded by the

[545] *Legality of Nuclear Weapons*, *supra* note 23, para. 12.
[546] UN Charter, art. 92.
[547] This is the opinion of the US, and also the reason cited for the US' opposition to the proposed PPWT: CD/1847, *supra* note 35, paras. 18-20. For an earlier discussion on confidence-building measures, see UN, Centre for Disarmament Affairs, Report of the Secretary-General, *Study on the Application of Confidence-building Measures in Outer Space*, UN Doc. A/48/305.
[548] See generally, Valnora Leister, "Regional Space Agencies: A Mechanism to maintain Outer Space for Peaceful Uses" (1985) 28 *Colloquium on the Law of Outer Space* 81.
[549] A detailed analysis of the ESA has already been conducted by Michel Bourely, and the analysis of the APSCO that follows uses a similar framework of analysis which will look at the APSCO first "as an actor, then as a subject": see 'Space Law and the European Space Agency', pp. 87-96 in Nandasiri Jasentuliyana (ed.), Space law: Development and Scope (Westport, CT: Praeger, 1992), at 87.
[550] See H. Zhao, "Asia-Pacific Space Cooperation Organization Convention" (2007) 50 *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* 3.

European Union, was initiated in early 2012 and aims to investigate the possibility of using kinetic impacts to deflect an asteroid from its collision course with Earth. If the NEO is too large, a proposed idea is to create a nuclear explosion in outer space to divert the large object's trajectory.[551] Evidently, such uses of kinetic space weapons and nuclear weapons will be consistent to "peaceful purposes" and will be an exception to the general ban on kinetic explosions as has been advocated throughout this thesis, for the objective will be of benefit to all of humankind.

This thesis has thus tried to demonstrate that in the domains of both space and environmental law, where the interests of the community outweighs the interests of an individual or a select group of States, the making of and adherence to law must undergo a paradigm shift. There must be recognition of the existence of essential values that necessitate protection above and beyond the traditional conceptions of international law and which trump the requirements of State consent. It is recognised that the current thesis is limited in scope to the prohibition of the use of kinetic space weapons. Even so, one generic type of weapon if successfully banned from outer space is one step away from outer space descending into a shooting ground and one step closer to fulfilling the objectives of using space for peaceful purposes and for the benefit of all humankind.

[551] DLR, "Project NEOShield: Asteroid defence systems", online: DLR <www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10081/151_read-2640/>. See also Leonard David, "Asteroid Threat to Earth Sparks Global 'NEOShield' Project", *Space.com* (26 January 2012), online: Space.com < http://www.space.com/14370-asteroid-shield-earth-threat-protection-meeting.html>.

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Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, 10 April 1972 (entered into force on 26 March 1975), UNTS [hereinafter: Biological Weapons Convention].

Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems , 26 May 1972 (entered into force on 3 October 1972; ceased to operate on 13 June 2002) [hereinafter: ABM Treaty].

Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187, T.I.A.S. No. 6347, 6 I.L.M. 386 (entered into force on 1 September 1972) [hereinafter: *Liability Convention*].

Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15, T.I.A.S. No. 8480, 14 I.L.M. 43 (entered into force on 15 September 1976) [hereinafter: Registration Convention].

Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 10 December 1976, UN Doc. A/RES/31/72 (entered into force on 5 October 1978), [hereinafter: ENMOD].

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