

Towards Space Sustainability: Lessons from Environmental Liability Regimes

by

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Abstract

This thesis is about space sustainability and the need to protect the outer space environment for the long term. It attempts to address this by assessing the outer space liability regime, particularly the fundamental flaw that it does not directly account for damage caused to the space environment. Jurisprudential lessons can be learnt from existing environmental liability regimes for hazardous activities on earth, to protect the outer space environment. While it is acknowledged that there are shortcomings in the environmental liability regimes as they stand, if the inherent weaknesses are remedied environmental liability could be a good tool for deterrence and accountability for damage caused to the space environment by polluters.

Resume

Cette thèse est sur la soutenabilité de l'espace et la nécessité de protéger l'environnement spatial à long terme. Elle traite du problème en regardant le régime de responsabilité civile spatiale, notamment en se penchant sur le fait qu'il ne tient pas compte des dommages causés à l'environnement spatial. Des leçons de jurisprudence peuvent être tirées des régimes actuels de responsabilité environnementale pour les activités dangereuses sur terre, pour protéger l'environnement spatial. Alors qu'il est reconnu qu'il y a des limitations dans les régimes de responsabilité tels qu'ils se présentent, si l'on remédie aux faiblesses inhérentes, la responsabilité environnementale pourrait être un bon outil de dissuasion et de responsabilité pour les dommages causés à l'environnement spatial par les pollueurs.

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Introduction

Activities in outer space have continued to grow since the Sputnik entered orbit in 1957, both in scope and the variety of parties involved. Launch capabilities are no longer restricted to Governments. Space activities are undertaken by so called mixed enterprises or public-private users and increased commercialization is encouraged. Despite the view that “outer space...has hardly been touched by human activities, and the capacities to influence it seem to be low”¹ it is increasingly accepted that as the number of actors and space activities increase, the negative impact and the irreversible damage which may be caused to the environment is bound to increase alongside all the benefits gained from the exploitation of the resource, affecting all users of the environment in the long term.

The usage of the term “the environment” has been criticized for its ambiguity.² It is a term everyone seems to understand but no one can legally define.³ It has been understood to be a description of “physical matter that encompasses the air, the sea, the land, natural resources, flora and fauna and cultural heritage”⁴ as well as a “description of a non physical sense of surroundings and perception.”⁵ The space environment does not seem to feature directly in these definitions of the environment outside of the human perception of it. It is proposed that a sound and all purpose definition of the environment would need to stress “the relative and potentially infinite character of the concept, the interrelatedness of all environmental components, the

¹ Volker von Prittwitz, „Space as Environment: On the Way to Sustainable Space Policy,” (August 2011) ESPI Perspectives No. 50 Online: [espi<http://www.espi.or.at/images/stories/dokumente/Perspectives/ESPI_Perspectives_50.pdf>](http://www.espi.or.at/images/stories/dokumente/Perspectives/ESPI_Perspectives_50.pdf)

² As stated in R. McCorquodale & M. Dixon, *Cases and Materials on International Law*, 4th edition (Oxford:OUP, 2003) at 454

³ L.K Caldwell, *International Environmental Policy and Law*, 1st edition. (Durham, NC: Duke University Press, 1980) at 170

⁴ R. McCorquodale & M. Dixon, *supra* note 2 at 454

⁵ *Ibid*

primodal role played by mankind in the environment, and possibly also balance anthropocentric and eco-centrist notions.”⁶

Such an all encompassing definition is outside the scope of this thesis but an interesting definition of environment that can serve as a basis for describing the space environment is that it is the “whole set of biotic and non-biotic elements having an effect on an individual or species, ultimately determining its form and survival”.⁷

Using the abovementioned definition, protection of the environment in the context of the space domain would refer to:

1. protecting those set of elements in space that can determine form or survival, and/or
2. Safeguarding the subjects (individuals or species) from the effects of those elements in space as part of the ecosystem.

In the context of this thesis the subjects are not limited to individuals or species but also the physical environment and space assets.

The idea of responsibility for keeping space free of environmental hazards has led to the coinage of the term “astroenvironmentalism”- an umbrella term to describe a variety of related concerns held by many players in the environmental arena that argues that we must avoid making the same

⁶ Sonja Ann Jozef Boelaert – Suominen, “International Environmental Law and Naval War: The Effect of Marine Safety and Pollution Conventions During International Armed Conflict”, (December 2000) Newport Paper Number Fifteen, Centre for Naval Studies, at 9

⁷ Jean-François Mayence, “Planetary Protection: Towards a Space Environment Law?” Presentation at the Fifth Eilene Galloway Symposium on Critical Issues in Space Law, Online : Olemiss<<http://www.spacelaw.olemiss.edu/activitiesandevents/2010/fifth%20galloway/mayence%20presentation.pdf>>

mistakes in space as we have on earth. It is a concept which applies values of environmentalism and preservationism to developments in space exploration, commercialization and militization.⁸

Historically, space activity could be put into three broad based categories: the launch vehicle sector, which includes the development of space technology; satellites for space applications, which includes remote sensing, navigation, and communications, and the space science sector, which includes undertaking experiments, scientific exploration of the space environment and astronomical observation. Proposed activities include exploration for tourism, commercial exploitation and colonization.

The invariable factor with all these activities, from an “astroenvironmental” perspective is that waste must be produced, either at the initial, intermediate or final stages of the activity, causing pollution in different forms. The highlighted areas are damage caused by debris circulating in space, harmful contamination and harmful interference, nuclear and radioactive space activities, damage to the ozone layer, damage caused by space stations and damage caused by solar satellites.⁹

Some of the concerns of astroenvironmentalism can include¹⁰:

- Keeping the space surrounding the Earth clear of pollution, debris, and garbage.
- Considering space and the celestial bodies pristine wildernesses that need to be protected rather than frontiers to conquer.

⁸ Ryder W. Miller, *Astroenvironmentalism: The Case for Space Exploration as an Environmental Issue*, 15 *Electronic Green Journal*, 2001

⁹ I. H. Ph.Diederiks- Verschoor, *An Introduction to Space Law*, 2nd edition (Netherlands: Kluwer Law International, 1999) at 130-137

¹⁰ Ryder W. Miller, *supra* note 8 at 2

- Tracking and monitoring the environmental damage caused by the fuels used for space expeditions.
- Arguing against the idea to "terraform" celestial bodies.
- Creating a set of ethical guidelines to protect the life that we encounter elsewhere.
- Creating safeguards to insure there is no contamination of celestial bodies.
- Creating the legal power to enforce these concerns.

The international community has adopted a new program of work to assess one of these concerns: the issue of preservation of the outer space environment. Termed “Space Sustainability”, it refers to a comprehensive and coordinated effort which includes developing tools of governance that lead to the reduction and removal of orbital debris, promoting international civil space situational awareness to improve knowledge and transparency, and preventing intentional destruction of spacecraft by debris-causing anti-satellite (ASAT) weapons.¹¹ To that aim, in 2011, the latest agenda item at the Science and Technical Subcommittee (STSC) of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) is on the "Long Term Sustainability of Outer Space Activities" (LTSOSA). Under this agenda item, the proposed ultimate objective of a dialogue on the long-term sustainability of outer space activities is to produce a set of voluntary non binding guidelines focused on practical measures that could be applied by space actors to *enhance* the long-term sustainability of space activities. The working group’s stated practical objective is to¹²:

¹¹ Dumitru-Dorin Prunariu, “Space Sustainability: Setting a Technical Baseline for New Regimes” Presentation at UNIDIR Space Security Conference 2011: Building on the Past, Stepping Towards the Future

¹² Committee on Peaceful Uses of Outer Space, Terms of Reference and Methods of Work of the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee (24 January 2011) UN Doc A/AC.105/C.1/L.307 at 3

- reduce the risks to space activities for all space actors and
- ensure that all countries are able to have equitable access to limited natural resources of outer space.

Though it is not yet determined what to enhance the long term sustainability of space activities entails, the wording is sufficiently broad to encapsulate different value judgments as to what constitutes risk or ability to have access. The proposed terms of reference for the working group broadly categorizes the following areas for discussion:

- (a) Sustainable space utilization supporting sustainable development on Earth
- (b) Space debris
- (c) Space weather
- (d) Space operations
- (e) Tools to support collaborative space situational awareness
- (f) Regulatory regimes
- (g) Guidance for actors in the space arena

It is proposed that the objective of the STSC working group could be achievable using a bottom up approach mirroring the “successful” development of the 2007 Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation guidelines adopted by UNCOPUOS as a non-political, pragmatic way forward to reach consensus on how to keep outer space safe and secure for the long term.¹³

¹³ Gerard Brachet, Long Term Sustainability of Outer Space Activities *in* United Nations Institute for Disarmament Research (UNIDIR), Security in Space: The Next Generation Conference Report 31 March -1 April 2008 at 127

This is an international issue because space is a global commons and no single country can dominate this issue by its own behavior or its own power alone. The identified challenges include that there are many views on what constitutes sustainability and established space actors are concerned that any resolutions should not limit their freedom to act in space whilst emerging space nations are concerned that any resolutions should not impose unacceptable barriers to new entrants in the space arena.¹⁴ To address some of these concerns, it is proposed¹⁵ that any recommended guidelines for safe space activities should:

- (a) Maintain or improve the safety of spaceflight operations and protect the space environment without imposing unacceptable or unreasonable costs, and taking into account the needs and interests of developing countries;
- (b) Be consistent with existing international legal frameworks for outer space activities and should be voluntary and not be legally binding;
- (c) Be consistent with the relevant activities and recommendations of other working groups of the Committee and its Subcommittees, the Inter-Agency Space Debris Coordination Committee and other relevant international organizations.

While such efforts are commendable, following an ethical assessment, if we agree that the space environment is worthwhile and important as an asset or resource or in its own right, and therefore has a value, we not only raise the moral question of its protection through voluntary preventative measures but the requirement of legal mechanisms to ensure same and liability for environmental damage.

¹⁴ Peter Martinez, Current International Space Security (Sustainability) Activities/Initiatives, Presentation to ISU SSP 2010 - Space Security Theme Day Online: SWF <<http://swfound.org/media/31123/Martinez-Space%20Security%20initiatives.pdf>>

¹⁵ Committee on the Peaceful Uses of Outer Space, *supra* note 12

With respect to environmental protection, reference is typically made to three benefits that liability regimes might engender. First, they can help internalize costs of pollution into the polluter's sphere, thereby implementing the 'polluter pays principle'. Secondly, they can act as an economic instrument, providing incentives for compliance with environmental protection standards, thereby helping to prevent environmental harm from occurring in the first place. Thirdly, they provide an important back-up system should environmental harm occur notwithstanding the regulatory efforts of the underlying protective regime.¹⁶

The development of general liability regime pertaining to environment has proved very difficult to develop despite the apparent benefits that could be derived from such a concept. As a result, specific sectoral liability regimes, pertaining to environmental liability have been established to regulate hazardous activities, not only to compensate innocent victims but also to encourage and to some extent guarantee that the environment is maintained for the continuous use and benefit of future generations, as the principle of inter-generational equity dictates.¹⁷

The established oil pollution and nuclear damage liability regime serve as a good comparison for the assessment of the rather less tested outer space liability regime, namely the Convention on International Liability for Damage Caused by Space Objects, (*Liability Convention*).¹⁸ To date the former regimes have been assessed and amended and though the nuclear conventions have not as of yet served as a basis for any significant compensation claim,¹⁹ many claims have been

¹⁶ Jutta Brunee, Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection(April 04) 53:2 International Comparative Law Journal 351-367at 365

¹⁷ Edith Brown Weiss, Our Rights and Obligations to Future Generations for the Environment, 84 American Journal of International Law 198 (1990) 198-205

¹⁸ Convention on International Liability for Damage Caused by Space. Objects, 29 March 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187. (hereinafter *Liability Convention*)

¹⁹ Patricia Birnie & Alan Boyle, *International Law and the Environment*, 2nd edition (Oxford: Oxford University Press, 2002) at 484

pursued and successfully met under the oil pollution regime. The outer space liability regime has not been put through that same scrutiny. The only contested case²⁰ involving space objects was between the Soviet Union and the Canadian Governments. In 1978 the Soviet satellite, Cosmos 954, which had a nuclear reactor, disintegrated on to Canadian territory. The Canadian's claimed that the deposit of hazardous radioactive debris from the satellite throughout a large area of Canadian territory and the presence of the debris in the environment constituted 'damage to property' and also constituted a violation of Canada's sovereignty to determine the acts that will be performed on its territory. Forkosch²¹ asks the question whether impairment of health or property would extend to cover environmental pollution. On the face of it, based on the Cosmos claim, pollution may be viewed as damage to property²² but it remains inconclusive because although a settlement was reached by a payment of three million dollars, the Soviets never acknowledged liability under the *Liability Convention*.²³

In this study, chapter one assesses the emerging concept of space sustainability to determine its suitability as a platform for the cause of protection of the space environment. As the emerging concept does not adequately speak to the roots of sustainability, which are ecology and environmentalism, chapter two assesses the philosophical and moral perspectives to protection of

²⁰ Cosmos 954 Claim 18 ILM 899 (1979)

²¹ Morris Forkosch, *Outer Space and Legal Liability*, (The Hague: Martinus Nijhoff, 1982) 79

²² Canada, Statement of Claim, January 23, 1979 at para 15 in Ram Jakhu, ASPL 637 Space Law: General Principles Vol. III, McGill Coursepack, at 113

²³ Protocol Between the Government of Canada and the Government of the Union of Soviet Socialist Republics, Article 1, Department of External Affairs Communique, No. 27, April 2, 1981. It is claimed that the settlement was based on a number of considerations including past lump sum settlements, the desirability of prolonging negotiations, and the various political considerations surrounding the negotiations, See Edward G. Lee, Liability for Damage Caused by Space Debris: The Cosmos 954 Claim, in C.B. Bourne (ed) 26 *The Canadian Yearbook of International Law* (UBC Press, 1988) at 274

the outer space environment to determine the rationale for environmental protection in space as well as the applicable law. Concluding that outer space is of value and therefore should be protected and preserved through binding legal measures chapter three addresses the issue of space debris from the viewpoint of liability and chapter four assesses the outer space liability regime in light of liability regimes of international environmental law. Chapter five offers some brief conclusions.

Chapter 1: Space Sustainability

1.1 Definitions of Space Sustainability

The Secure World Foundation²⁴ defines Space Sustainability as “*ensuring* that all humanity can *continue* to use outer space for peaceful purposes and socioeconomic benefit.” It is also described as “the *ability* of all humanity to *continue* to use outer space for peaceful purposes and socio-economic benefit over the long term” [emphasis added].

It is proposed that read together these broad definitions seem to take as their premise that:

1. All humanity has thus far been using space for peaceful purposes and for socio-economic benefit
2. This use is being or has the potential to be threatened
3. That measures must be taken, therefore it’s a call for action
4. That *all humanity* currently has the stated ability (in the sense of having a skill or the capacity) of space sustainability for peaceful purposes.

Under this conceptualization, the negative effect of not using space sustainably is primarily economic.²⁵ Bearing in mind the governmental origins of Space, where economics did not play a primary role in decision making, the growing focus on the economic perspective in space affairs

²⁴ Secure World Foundation is private operating foundation that promotes cooperative solutions for space sustainability and the peaceful uses of outer space. The foundation is extremely active in international discourse regarding space. See Secure World Foundation, “Space Sustainability: A Practical Guide” Online: SWF <http://swfound.org/media/1808/space_sustainability_booklet.pdf>

²⁵ It is stated on the website that “If we do not use space sustainably, the cost of using space will increase, which could make it too expensive to continue to use space” – Online: Secure World Foundation <<http://swfound.org/our-focus/space-sustainability>>.

seems to acknowledge Carolyn Deere's opinion that problems can emerge in the international domain from an absence of powerful economic interests.²⁶

Space sustainability has also been conceptualized as the *defining* of good behavior, boundaries, and disincentives for negative behavior in space;²⁷ a much more limited political concept calling for specific measures to strengthen norms, including²⁸:

- An International Code of Conduct – The European Union have proposed a non-binding voluntary code whose purpose is "security, safety, sustainability" for all space activities providing for general measures on space operations and space debris²⁹
- The Scientific and Technical Subcommittee working group objective of establishing guidelines for the long term sustainability of outer space activities
- Proposed "ICAO for Space"³⁰ – The establishment of an international organization focused on space safety and the establishment of binding safety standards similar to the International Civil Aviation Organization
- Industry efforts for a global Space Situational Awareness database

²⁶ Carolyn Deere, "Sustainable International Natural Resources Law" in Marie-Claire Cordonier Segger & Ashfaq Khalfan (eds.) *Sustainable Development Law Principles, Practices, & Prospects*, (New York: Oxford University Press, 2004) at 301

²⁷ Theresa Hutchins, "Space Sustainability: International Efforts to Bound Space Activity." Presentation to CSIS –Space Enterprise Council: *Can We Keep Space from Becoming a Shooting Gallery?* 21 July 2008 ,Online: CDI <<http://www.cdi.org/pdfs/csisjuly08.ppt>>

²⁸ *Ibid.* See also Dumitru-Dorin Prunariu, "Space Sustainability: Setting a Technical Baseline for New Regimes" Presentation at UNIDIR Space Security Conference 2011: Building on the Past, Stepping Towards the Future; UN Committee on Peaceful Uses of Outer Space, "Long Term Sustainability of Outer Space Activities: Preliminary Reflections" (8 February 2011) UN Doc. AC105/C1_2010/CRP.3

²⁹ Revised Draft Code of Conduct for Outer Space Activities 2010, Online: Council of European Union < <http://www.consilium.europa.eu/uedocs/cmsUpload/st14455.en10.pdf>>

³⁰ T. Sgobba, An ICAO for Space? October 2007 Presentation of the IAASS, Online: CDI<<http://www.cdi.org/pdfs/Sgobba.pdf> >

1.2 Scene of Address

UN COPUOS: The Governance Framework for the Use of Outer Space and its appropriateness as a forum to address the problem

Established in 1959 under the auspices of the United Nations General Assembly and following the launching of the first artificial satellite, the Committee on the Peaceful Uses of Outer Space (UNCOPUOS) and its secretariat, the Office of Outer Space Affairs (OOASA) were established to consider the activities relating to the *peaceful* uses of outer space, international cooperation and legal problems which might arise in programmes to explore outer space and organizational arrangements to facilitate these activities.³¹

The first satellite, the Sputnik 1, launched by the USSR disproportionately caught the attention of the world. The US sought to downplay the effect of the USSR's initial leadership in Space by promoting international cooperation and the peaceful use of space for the benefit of mankind as the *modus operandi* in the new environment.³² In the interpretation of what constituted peaceful use of Outer Space two broadly opposing views emerged, spearheaded by cold war tensions between the US and USSR and the fact that neither State was fully aware of the capabilities of the other. The US position, which prevailed, was that peaceful meant non aggressive, resulting in the permissibility of military activities that could not in reality be determined as “peaceful” according to the view propounded by the USSR. None the less, the COPUOS focus on the discourse of peaceful uses and benefit for mankind kept the appearance of openness and access

³¹ See Online: OOSA<http://www.oosa.unvienna.org/oosa/en/COPUOS/cop_overview.html>

³² Walter Macdougall, Sputnik, The Space Race and the Cold War (May 1985) 41:5 Bulletin of Atomic Scientists 20-55

to the new domain, whilst ensuring that space exploration remained an exclusive endeavour that allowed states to foster national prestige and to pursue military objectives.

The Committee is advised by its two subcommittees, a Scientific and Technical Subcommittee and a Legal Subcommittee. Classically, all issues related to governance and regulation of outer space at the international level was debated by the Legal Subcommittee, culminating in the adoption of the guiding principles that make up the core international normative/legal framework that exists today (Table 1).

TREATIES	RESOLUTIONS
1967 Treaty on Principles Governing the Activities in Space in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies	1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space
1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space	1982 Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting
1972 Convention on International Liability for Damage Caused by Space Objects	1986 Principles Relating to Remote Sensing of the Earth from Outer Space
1976 Convention on Registration of Objects Launched into Outer Space	1992 Principles Relevant to the Use of Nuclear Power Sources in Outer Space
1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.	1996 Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries

Table 1: Core International Legal/Normative Framework

Literature abounds with respect to the history and formulation of the international space law regime and the status of the principles and their application primarily because the regime provides little guidance on how to achieve what it lays down. Broadly speaking, some of the core general principles that emerged from this formalistic regime include:

- Recognition of outer space including the Moon and other celestial bodies as *res communis*
- Establishing the freedom of exploration and of non-appropriation of outer space
- Requirement to comply with international law, including the Charter of the United Nations
- The use of space for peaceful purposes
- The obligation to assist and rescue astronauts

- The international responsibility and international liability of States for all national space activities, including those of private actors
- The obligation to register space objects as well as maintaining jurisdiction and control over space objects
- Demilitarization of space
- Planetary protection
- Moon declared to be the Common Heritage of Mankind.
- Codified emerging perspectives for special categories of space activities, including,
 - The use by States of artificial satellites for International direct broadcasting
 - Remote sensing of the earth from outer space
 - Use of nuclear power sources in outer space
 - International cooperation in the exploration and use of outer space.

Following the adoption of Agreement Governing the Activities of States on the Moon and Other Celestial Bodies in 1979 (which was highly focused on perspectives from and for the benefit of developing countries) the Legal Subcommittee seemed to reach a plateau in hard law rule making. There was a trend towards the establishment of non binding voluntary guidelines spearheaded by non classic actors and perspectives from a multiplicity of environments. With its strong focus on technical issues and less on political issues the Science and Technical Subcommittee became increasingly seen as a scene of address that could focus on the “pertinent issues” relevant to the future of space activities.

The Science and Technical Subcommittee as the new space norm maker

Initially, the STSC bothered itself only on exchanging information on scientific and technical issues related to the use of space technology and the outer space environment. In recent times, it has taken a more practical role in the formulation of norms governing the use of outer space. An

example of this is with the adoption of the Space Debris Mitigation Guidelines by the UNCOPUOS in 2007, initially developed by the Inter-Agency Space Debris Coordination Committee (IADC), and then adopted by the Committee. Whilst it remains a technical guideline, the adoption of the Guidelines renewed the sensibility in the norm making capacity of Committee in an age where its effectiveness is constantly questioned. While calls continue that the guidelines should be made legally binding and further discussed at the Legal Subcommittee, its progression has been seen as an impetus for the creation of an international standard within the framework of the International Organisation for Standardisation (ISO), which possibly contributes to depoliticizing the guidelines, bearing in mind the highly politicized nature of the use of space.

Discourse on the practicalities, governance and regulation of space applications (national and international security, earth observation, telecommunications, satellite navigation, scientific exploration) have largely been outside of the UNCOPUOS, bearing in mind that most applications were either performed by the military and therefore classified or commercial and therefore outside the scope of the membership, the majority of which were not involved in the exploitation of space. Outside of the issue of the actual launching and operation of space objects and the international risks to Earth and third parties posed by the existence of space objects, and other topics of little commercial significance, issues related to most space applications are operational not exclusive to the discourse of space, and therefore did not need to be addressed by UN COPUOS inter alia for the following reasons:

- The space industry product manufacturers produce ,manufacture and distribute space products amongst other products and are subject to general rules as applicable to other products they manufacture or distribute
- The data derived from space are interpreted and utilized on Earth and are simply another form of data subject to data policies imposed by owners, users, distributors of the data
- Telecommunications from space is just another way to communicate so is subject to the general framework applicable to telecommunications.
- Space exploration and human space flight is either national or international and where international is subject to general rules of cooperation determined by state policy or foreign policy objectives

Interchangeability

Depending on the forum for discussion and in line with the above mentioned initiatives the concept of Space Sustainability is therefore also often used interchangeably with the following notions:

- Space Security³³ - entails access to space and freedom from threats

³³ The Space Security Index Report defines space security as “the secure and sustainable access to, and use of, space and freedom from space-based threats” Space Security Index, *Space Security 2011: Executive Summary* (Ontario: Pandora Press, 2011)1. Online: Space Security < <http://www.spacesecurity.org/executive.summary.2011.PDF>> .This definition is in line with European and Atlantic perspectives to space security, see Xavier Pascoe, *A European Approach to Space Security*, (Cambridge: American Academy of Arts and Sciences, 2009) Online: CISSM < http://www.cissm.umd.edu/papers/files/a_european_approach_to_space_security.pdf> and Nancy Gallagher, *A Reassurance Based Approach to Space Security*, Prepared for the International Security Research and Outreach Programme International Security Bureau, October 2009 Online: CISSM < http://www.cissm.umd.edu/papers/files/a_reassurance_based_approach_to_space_security.pdf>. The United Nations Institute for Disarmament Research also hold an annual conference on space security but has a narrower conception of space security as it is more focused on arms control and confidence building measures necessary for space security. For selected publications and activities relating to space security, see Online: UNIDIR < <http://www.unidir.org/bdd/focus->

- Space Stability³⁴ - entails having space situational awareness
- Space Safety³⁵ - entails protection from all unreasonable level of risk (primarily protection of humans or human activities)
- Responsible Use of Space.³⁶

These all reflect the 2 components of Space Sustainability as described by the founder of Secure World Foundation³⁷: “the first is the physical environment, which includes management of space debris, electromagnetic and physical crowding and congestion, and space weather... The second component is the political environment, and includes promoting stability and preventing conflict between nations.” Bearing the above in mind and notwithstanding the potential confusion caused by the interchangeability of terms used, at the core of all proposals conceptualizing space sustainability or related concepts is the notion that:

1. Space assets should be kept safe/secure and harm should not be caused to them or by them

search.php?onglet=3>. Also said to be about preserving the safety of the space environment for space actors, so that they may continue to use outer space for their purposes. See Peter Martinez, Current International Space Security (Sustainability) Activities/Initiatives, Presentation to ISU SSP 2010 - Space Security Theme Day Online: SWF <<http://swfound.org/media/31123/Martinez-Space%20Security%20initiatives.pdf>>

³⁴ Frank A. Rose, Strengthening Stability in Space, Remarks given at United Nations Institute for Disarmament Research (UNIDIR) Space Security Conference 2011: Building on the Past, Stepping Towards the Future, Geneva, Switzerland(4April 2011) Online: US Department of State < <http://www.state.gov/t/avc/rls/159671.htm>>

³⁵ Tommas.Sgobba, Space Safety in a Globalised World, Presentation to ESRIN (20 October 2008) Online: IAASS < www.iaass.org/files/pdf/ESRIN%20-Safety-Lecture.pdf>

³⁶ Wolfgang Rathgeber, Kai-Uwe Schrogl, Ray A. Williamson (eds.), *The Fair and Responsible Use of Space: An International Perspective* (Germany: Springer, 2010)

³⁷ Quote attributable to Cynthia Arsenault in Megan Ansdell et al, “Analyzing the Development Paths of Emerging Space Nations: Opportunities or Threats for Space Sustainability” (2011) Online: SWF< http://swfound.org/media/46125/emergingspaceactors_report-august2011.pdf>

2. Peaceful space activities should continue as they are free from purposeful/intentional or unintentional harmful interference
3. The space environment must be preserved
4. International cooperative efforts are required

It is proposed therefore that these four points are the current core basic conditions for (or of) Space Sustainability, if sustainability is seen as an objective or a goal to achieve.

1.3 Rationale for Space Sustainability

The proposed baseline conditions for the current conception for Space Sustainability as proposed by this thesis coincides with Gallagher's analysis of the logic for space cooperation as "Space Governance for Global Security" where all space actors seek "to secure the space domain for peaceful use; to protect space assets from all hazards; and to derive maximum value from space for security, economic, civil, and environmental ends"³⁸

Based on this understanding therefore, the current conception of and rationale for Space Sustainability can also be for Global Security. This logic emphasizes that "the more different countries, companies, and individuals depend on space for a growing array of purposes, the more they need equitable rules, shared decision-making procedures, and effective compliance mechanisms to maximize the benefits that they all can gain from space, while minimizing risks from irresponsible space behaviours or deliberate interference with legitimate space activities."³⁹

While it is acknowledged that such a need exists, the difficulty in reaching agreement on how to effect same may be a reason that some States are more focused on the output of the dialogue on

³⁸ Nancy Gallagher, "Space Governance and International Cooperation" (May 2010) 8:2 *Astropolitics* 13. Online: CISSM <http://www.cissm.umd.edu/papers/files/space_governance_and_international_cooperation.pdf>

³⁹ *ibid*

long term sustainability as the creation of a report outlining best practices and options that could enhance sustainability through increased information sharing and a focus on technical issues and not on the creation of any new legal regimes.

Acknowledging but putting aside the focus purely on technical risks, a review shows that the following issues have been identified as constituting the greatest risk to space activities, including:

1. Space debris and collisions
2. Lack of international space situational awareness
3. Purposeful interference (such as jamming) and unintentional harmful interference
4. Effects of space weather and radiation
4. Aggressive action/behavior and their geopolitical causes
5. Human error and lack of capacity as a substantial cause of risk
6. Failure to meet societal needs and reduced space budgets

To minimize some of these risks, it is proposed⁴⁰ that the 3 pillar approach/thrusts for space sustainability is debris mitigation, debris removal and space traffic management, with an immediate need for data in support of conjunction assessment and collision avoidance. This increased data sharing/collection would also deal with the secondary issues of enabling additional research and potential solutions to the problem of space debris and enhance the transparency and cooperation among States. The same author suggests that this could serve to both educate space actors about the severity of the space debris problem and provide stability and reduce the likelihood of conflict resulting from fear, paranoia, or mistakes of the problem. It

⁴⁰ Brian Weeden, "Space Sustainability: To Preserve and to Protect", *Satmagazine* (March 2009) 17. Online: Satmagazine, < http://www.satmagazine.com/2009/SatMag_Mar09.pdf>

is also proposed that such data could also serve as verification for a potential Code of Conduct in space, setting the stage for future space governance models.

These proposals are all in line with the logic of sustainability for Global Security and according to this author, while this logic could stand as the dominant conceptualization, it is not clear if it adequately speak to the issue of sustainability. It is proposed that to do so would require a broader discussion and solutions aimed towards harmonization of policy as called for under the sustainable development paradigm.

Sustainable Development Paradigm

While some States have indicated that a broader discussion on sustainable development is called for,⁴¹ the U.S. has signified that any discussion on sustainable development would be outside the scope of the dialogue on the long term sustainability of outer space activities in the context of the agenda item within the STSC forum.⁴² It is likely that this view will be determinative considering Japans' proposal of a risk analysis approach to the dialogue focused purely on

⁴¹See United Nations Committee on Peaceful Uses of Outer Space, Long Term Sustainability of Outer Space Activities, A/AC.105/C.1/2011.CRP.9 (4 February 2011) Online: OOSA<www.oosa.unvienna.org/pdf/limited/AC105_C1_2011_CRP09E.pdf>

⁴² The U.S. propose that such a discussion could more appropriately be considered at the COPOUS level instead of the STSC or Working Group level bearing in mind Section 1.e.ii 1996 UN Declaration on International Cooperation in the Exploration and Use of Outer Space and Section 3 of the 1999 Vienna Declaration on Space and Human Development. While the aim of this is to ensure a meaningful discussion, it is proposed that this suggestion is unhelpful as COPUOS is more a reporting body and there is little scope for such deliberations at this level. See United Nations Committee on Peaceful Uses of Outer Space, Long Term Sustainability of Outer Space Activities A/AC.105/C.1/2011/CRP.17 (7 February 2011)Online: OOSA<http://www.oosa.unvienna.org/pdf/limited/AC105_C1_2011_CRP17E.pdf>

technical issues.⁴³ While the proposal includes comprehensive survey of threats, identification of risk factors, risk assessment, contingency planning, and developing best practices, it admits its failure to consider the secondary issue that the dialogue seeks to address: namely “ensuring that all countries are able to have equitable access to limited natural resources of outer space”.

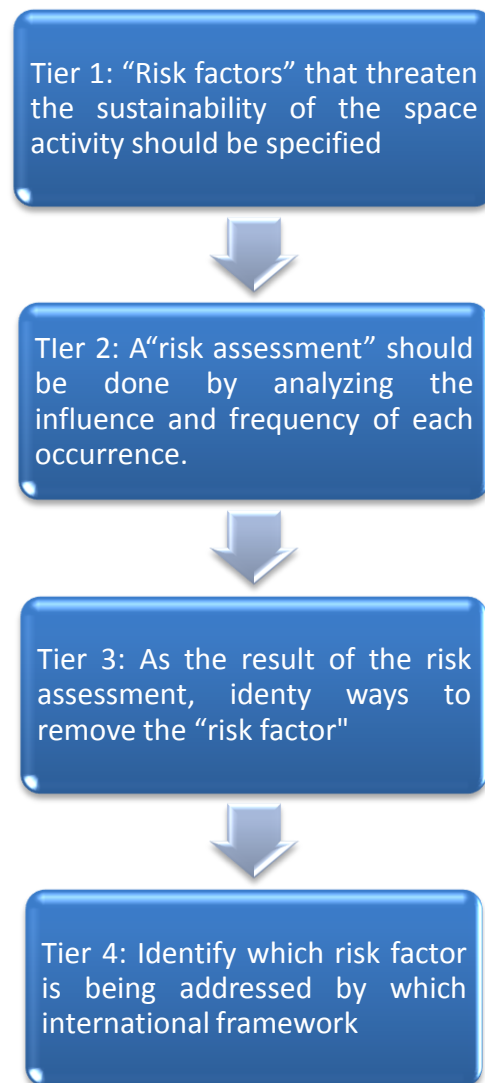


Figure 1: Japan's Proposed Technical Risk Assessment Approach

⁴³ United Nations Committee on Peaceful Uses of Outer Space, Long Term Sustainability of Outer Space Activities, A/AC.105/C.1/2011/CRP.20 (16 February 2011) Online: OOSA< http://www.oosa.unvienna.org/pdf/limited/c1/AC105_C1_2011_CRP20E.pdf>

Further still, Russia have proposed⁴⁴ that the access issue should be limited to *access to outer space*, already guaranteed under the Outer Space Treaty,⁴⁵ and not access to the “limited natural resources of outer space;” an issue which arguably falls under the sustainable development paradigm and has been described⁴⁶ as a back door way to implement the controversial and often erroneously interpreted Moon Agreement.⁴⁷

According to Deere,⁴⁸ the natural resources arena provides some of the clearest examples of the interplay between social, environmental and economic stakes, needs and priorities that sustainable development addresses and there is no reason why this should not apply to the resources of outer space. Deere states that in fact the most relevant and crucial international law in relation to the use and management of natural resources emerges in the economic domain.

It is proposed that using a systemic, sustainable development law approach an integration of policy with regards to the technical risks as well as the issue of access to space and its resources calls for “a conscious engagement with the web of overlapping social environmental, cultural

⁴⁴ United Nations Committee on Peaceful Uses of Outer Space, Long Term Sustainability of Outer Space Activities, A/AC.105/2011/CRP.10 (30 May 2011) Online: OOSA<http://www.oosa.unvienna.org/pdf/limited/l/AC105_2011_CRP10E.pdf

⁴⁵ See Article 1, Treaty on the 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, TIAS No. 6347, 6 I.L.M. 386 [hereinafter *Outer Space Treaty*]

⁴⁶ Taylor Dinerman, “Sustainability: Just Another Excuse for UN Power Grab” (27 April 2009) Online: Space Review<<http://www.thespacereview.com/article/1358/1>>,

⁴⁷ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 5 December 1979, 1363 U.N.T.S. 3, 18 ILM 1434 [hereinafter *Moon Agreement*]. The Agreement calls for the establishment of an international regime that provides for equitable sharing of resources of the moon and celestial bodies. For a plausible interpretation of the Moon Agreement, see Ram Jakhu & Maria Buzdugan, “The Role of Private Actors: Commercial Development of the Outer Space Resources, Including Those of the Moon and other Celestial Bodies: Economic and Legal Implications,” (2008) 6 *Astropolitics* 201-250

⁴⁸ Carolyn Deere, “Sustainable International Natural Resources Law” in Marie-Claire Cordonier Segger & Ashfaq Khalfan (eds.) *Sustainable Development Law Principles, Practices, & Prospects*, (New York: Oxford University Press, 2004) 310

and legal frameworks as well as cultural considerations, economic policies, expectations, players and interests.”⁴⁹ Bearing in mind current U.S. Space Policy,⁵⁰ such a broad overarching objective may not be achievable as part of the dialogue on the Long Term Sustainability of Outer Space Activities but U.S. policy regarding preservation of the space environment is insightful because international initiatives in line with it are likely to garner the most support.

U.S. Space Policy is partly focused on minimizing space debris and preserving the space environment for use. The U.S. intends to do this through the following measures:⁵¹

- Lead the continued development and adoption of international and industry standards and policies to minimize debris, such as the United Nations Space Debris Mitigation Guidelines;
- Develop, maintain, and use Space Situational Awareness (SSA) information from commercial, civil, and national security sources to detect, identify, and attribute actions in space that are contrary to responsible use and the long-term sustainability of the space environment;
- Collaborate with industry and foreign nations to: maintain and improve space object databases; pursue common international data standards and data integrity measures; and provide services and disseminate orbital tracking information to commercial and international entities, including predictions of space object conjunction.

This is clearly in line with Hutchins’s conceptualization of Space Sustainability as “*defining* of good behavior, boundaries, and disincentives for negative behavior in space”,⁵² and Gallagher’s

⁴⁹ *Ibid*

⁵⁰ National Space Policy of the United States (28 June 2010) Online: White House <http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf>

⁵¹ *Ibid*

reference to the importance to States of deriving maximum value from space for security, economic, civil, and environmental ends.⁵³ In light of the latter viewpoint, it is proposed⁵⁴ that sustainability is made operational and can be achieved through the *application* of satellites because it can be used to cope with threats and risks. Locating space applications in sustainability issue areas can contribute to sustainability, when seen as the intersection of the issue areas. Identified issue areas⁵⁵ include environment, security, mobility, knowledge, resources and energy. These applications would therefore be more akin to sustainability of and on Earth which is not the current focus. It is proposed that the shift from sustainability on Earth to sustainability in space takes away the focus of providing for needs of all but the most advanced space nations.⁵⁶ This sentiment is aptly summarized in this definition of sustainability:

“Sustainable space activities can be seen as activities (in space, from space, through space and towards space) that meet the needs of the present space actors without comprising the ability of future generations to meet their own needs of performing space related operations safely.”⁵⁷

It is proposed⁵⁸ that it is the emergence of new institutional space actors, particularly from the “South”, that is putting a greater pressure on the space environment and the claim stands that the participation of the South in Space Sustainability efforts is unsatisfactory. Yet the role of less advanced nations in sustainability initiatives seems mostly recipient in that advanced nations

⁵² Theresa Hutchins, *Space Sustainability: International Efforts to Bound Space Activity*. Presentation to CSIS –Space Enterprise Council: *Can We Keep Space from Becoming a Shooting Gallery?* 21 July 2008 ,Online: CDI <<http://www.cdi.org/pdfs/csisjuly08.ppt>>

⁵³ Nancy Gallagher, *supra* note 38

⁵⁴ Kai-Uwe Schrogl et al (eds), *Threats, Risks & Sustainability – Answers by Space* (Austria: Springer, 2009)

⁵⁵ *Ibid*

⁵⁶ Nicholas Peter & Wolfgang Rathgeber 2007 “How to Raise the Space Sustainability” Presentation at the International Astronautical Congress, (24-28 September 2007) Hyderabad, Online: ESPI< <http://www.espi.or.at/images/stories/dokumente/presentations/2007/peter-rathgeber-iac07.pdf>>

⁵⁷ *Ibid*

⁵⁸ *Ibid*

seek to engage newcomers in space in the early phase of the development of future directives and code of conduct rules for sustainable space activities to ensure that *they* comply with these standards.⁵⁹ Their space activities are judged as either threats or opportunities for Space Sustainability than as part of the sustainability initiative.⁶⁰ This is likely because for national space programs focused on addressing national development such internationally focused initiatives such as Space Sustainability will likely take a back seat. While it is suggested⁶¹ on the one hand that forging an understanding of the rationale and development paths of all space actors, in particular emerging ones is paramount to engaging these actors in the promotion of Space Sustainability, another proposed potential solution to bridge this participatory gap includes⁶²:

- development of space traffic management system regulation to raise sustainability consciousness
- cooperation and other forms of exchange with the “North” and “established space actors” including data sharing, knowledge transfer and discussion fora/core groups

Space Traffic Management⁶³ while discussed severally has not yet gained substantial support in its own right but may be developed through cooperative space situational awareness initiatives.

Space Situational Awareness (SSA)

SSA is therefore at the heart of current Space Sustainability, and is defined as “knowledge, understanding and maintained awareness of population of space objects; space environment; and

⁵⁹ *Ibid*

⁶⁰ Megan Ansdell et al, “Analyzing the Development Paths of Emerging Space Nations: Opportunities or Threats for Space Sustainability” (2011) Online: SWF<http://swfound.org/media/46125/emergingspaceactors_report-august2011.pdf>

⁶¹ *Ibid*

⁶² Nicholas Peter & Wolfgang Rathgeber, *supra* note 56

⁶³ Most reports use the report of the International Academy of Astronautics as a starting point. See IAA, *Cosmic Study on Space Traffic Management*, (France: International Academy of Astronautics, 2006)

existing threats”.⁶⁴ Its goal is to provide a base level of information about the position of all relevant objects in space to all actors to enable intelligent and efficient use of space.

As a lynchpin for safe and secure operations in space, according to U.S. Space Policy it enables:

- the tracking of objects
- timely warnings of potential collisions
- avoidance of radiofrequency interference
- real-time information about “situations” in space.
- detecting irresponsible space behaviour
- monitoring the actions of potential adversaries

This requires international civil cooperation in the collection and distribution of space situational awareness data but exchange of satellite data is complicated because no single information exchange protocol exists and till now the will has not been there to collectively develop same. The challenge is to find the balance between the need for operators to protect sensitive information and capabilities and their need to share information to ensure the safety of space operations.⁶⁵ The Space Data Center was established by founding members of the Space Data Association (Inmarsat, Intelsat and SES) to provide an automated space situational awareness system through which operators share operator owned orbital data. It is proposed that an international system could be developed and managed by an international non-profit, possibly modeled after the Internet Corporation for Assigned Names and Numbers (ICANN).⁶⁶

⁶⁴ Jana Robinson , “Space Sustainability: The Basis for Responsible Use of Space” Online: ESPI <http://www.espi.or.at/images/stories/dokumente/presentations2011/Presentation_Robinson.pdf>

⁶⁵ UN Committee on Peaceful Uses of Outer Space, “Long Term Sustainability of Outer Space Activities: Preliminary Reflections” (8 February 2011) UN Doc. AC105/C1_2010/CRP.3

⁶⁶ See Brian Weeden, “Space Sustainability: To Preserve and to Protect”, Satmagazine (March 2009) 17; Richard Dalbello, “Commercial Efforts to Manage the Space Environment,” (2009) UNIDIR Online: UNIDIR< <http://www.unidir.org/pdf/articles/pdf-art2908.pdf>>

If space situational awareness is at the heart of space sustainability, it is necessary to assess if the goals of astroenvironmentalism can be met through sustainability by assessing the roots of sustainability to aid in reconceptualization from space sustainability for security to space sustainability for the benefit of the environment.

1.4 Roots of Sustainability

"Sustainability" is now a widely invoked concept but there is as yet no consensus on the precise meaning of the term. The ordinary meaning of the word sustain is to maintain or endure and bearing in mind that all conceptions of sustainability consider the future; sustainability can be simply defined as "the ability to maintain or support an activity over the long term."⁶⁷ But, in assessing the concept of sustainability, it must be realized that many bad programmes, practises and behaviours are sustainable and the idea that present circumstances and their present societal arrangements might be sustained is in reality the unsustainable thought for the majority of the world's people.⁶⁸ Therefore, the cynic or possibly realist opinion could stand that politically speaking and internationally, the concept of sustainability could simply be a new label that could reflect;

1. the imposition of the will of a particular state or small group of states on others;⁶⁹
2. a lowest common denominator dynamic⁷⁰
3. an attempt to erode and limit or elevate the powers of some states vis-a-vis others⁷¹

⁶⁷ Jana Robinson, *supra* note 64

⁶⁸ Peter Marcuse, "Sustainability is not Enough" (October 1998) 10:2 Environment and Urbanization 103-112 Online: SAGE <<http://eau.sagepub.com/content/10/2/103.full.pdf+html>>

⁶⁹ Daniel Bodansky, "Whats so Bad about Unilateral Protection to Protect the Environment" (2000) EJIL No 2 339-347 at 342

⁷⁰ Walter Carlsnaes et al (eds.), *Handbook of International Relations* (London: Sage, 2002) at 539

⁷¹ Taylor Dinerman, "Sustainability: Just Another Excuse for UN Power Grab" (27 April 2009) Online: Space Review <<http://www.thespacereview.com/article/1358/1>>

4. hint at legitimization and sustainment of the unequal structures and processes that manifest themselves in the growing north and south divide.⁷²

Marceuse⁷³ calls the pursuit of sustainability a delusion stating that getting to the long run entails conflicts, controversies, issues of power and redistribution of wealth: conflicts that the sustainability slogan hides instead of revealing. Bell and Morse⁷⁴ note that flexibility to the meaning of the term can be a strength in a diverse world, and it is no surprise that there is still diversity in viewpoints regarding the meaning even after the often quoted World Commission on Environment and Development definition of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”⁷⁵ They conclude, in agreement with Kidd⁷⁶, that there is no wrong definition and a misguided search for the "proper" definition of sustainability is futile. Kidd states that the key to avoiding controversy is for each analyst to describe clearly what they mean by sustainability in the context of the specific problem being dealt with.

That said there are some broad underlying themes that cut along sustainability literature such that some of the roots of sustainability can be identified to lead to a baseline for definition. Kidd suggests that the contemporary view of sustainability in a broad sense has originated from the following 6 strains of thought:

1. Ecological/Carrying Capacity Root

⁷² B.S. Chimni, “Third World Approaches to International Law: A Manifesto” (2006) 8 International Community Law Review 3-27

⁷³ Peter Marceuse, Sustainability is not Enough, Progressive Planning Magazine 2010 Online: Planners Network<www.plannersnetwork.org

⁷⁴ Simon Bell & Stephen Morse, *Sustainability Indicators: Measuring the Immeasurable?* 2nd edition (London: EarthScan, 2008) at 6

⁷⁵ World Commission of Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987) at 8

⁷⁶ Charles V. Kidd, “The Evolution of Sustainability” 5:1 Journal of Agriculture and Environmental Ethics 1-26

2. Resource/Environment Root
3. Eco-development Root
4. Biosphere Root
5. Critique of Technology Root
6. No Growth-Slow Growth Root

It is suggested that the ecological core of the concept of sustainability is crucial and is at the heart of the other strains.⁷⁷ The basis of the ecological root is the notion that an ecosystem can only contain a certain density of individuals because each individual utilizes resources in the system. Too many individuals (overshooting the carrying capacity) results in overuse of the resources and eventual collapse in the population.⁷⁸ As sustainable development involves a delicate balancing of competing environmental, social and economic interests, accordingly the view holds that without ecology and carrying capacity at the core, environmental, social and economic interests have nowhere to go.

The greatest contrasting philosophy is between those who define sustainability in essentially ecological terms and maintain that research and debate should be devoid of the question of values, whereas other views maintain that a system of values must be incorporated in the definition of sustainability. Bell and Morse⁷⁹ conclude that if the heavy influence on value judgments and ethics is acknowledged then sustainability may have more in common with truth and justice. This latter view informs an alternative conceptualization of the root of sustainability

⁷⁷ Simon Bell & Stephen Morse, *supra* note 74 at 7

⁷⁸ *Ibid*

⁷⁹ *Ibid*

fundamental to this thesis and that is the justice root. To truly make sense, it is proposed that Sustainability is an overarching principle that has the achievement of social justice as its aim.

Sustainability as systemic social justice

At the conceptual level sustainability is said⁸⁰ to be represented by a change in a property referred to as “system quality.” It equates a situation where quality either remains the same or increases and if quality declines, the system can be said to be unsustainable. This is in line with its definition from one legal perspective whereby it is proposed⁸¹ that a deeper meaning of sustainability is systemicity.⁸² According to the systemic view, sustainability is the self-evident term for the dynamic equilibrium between man and nature and for the co-evolution of both within the Gaia⁸³ mega-system. On a practical level this can be understood as a requirement of “harmonisation of all public policies and social practices and their convergence towards ensuring the co-evolution of manmade systems and ecosystems.”⁸⁴ It is this harmonization and convergence that makes it a modern conception of justice, “focused on social justice, justice towards nature and future generations and justice between private individuals.”⁸⁵

⁸⁰ Simon Bell & Stephen Morse, *supra* note 74 at 12

⁸¹ Micheal Decleris, *The Law of Sustainable Development: General Principles*, (Luxembourg: Office for Official Publications of the European Communities, 2000) at 63

⁸² See *ibid* at 64.

⁸³ The Gaia system is understood as a compound of the geosphere and Biosphere. The Gaia theory proposes that all organisms and their inorganic surroundings on Earth are closely integrated to form a single and self-regulating complex system, maintaining the conditions for life on the planet. See James Lovelock, *The Vanishing Face of Gaia: A Final Warning* (London: Basic Books, 2009) at 255

⁸⁴ Micheal Decleris, *supra* note 81 at 76-77

⁸⁵ *Ibid* at 77

Space Sustainability for unity

Under Decleris's conception of sustainability as systemicity, a fundamental and important principle is that of the supremacy of ethical and cultural systems over man made systems, especially the man made productive system and the market. This attempt to assign supremacy to the market is at the heart of the Secure World Foundations conceptualization, because the negative effect of not using space sustainably is said to be primarily economic.⁸⁶ Bearing in mind the prestige rational of Space activity⁸⁷, where economics did not play a primary role in decision making, the growing focus on the economic perspective in space affairs seems to acknowledge Carolyn Deere's opinion that problems can emerge in the international domain from an absence of powerful economic interests,⁸⁸ and speaks to the interests of current established space nations, who are apparently no longer concerned with prestige. The market sees itself as society's leading system but Decleris states that the market is simply a system of activity which is within and subject to the control of the greater ethical and cultural systems⁸⁹ so a focus on economic aspect alone may not speak to the greatest number of actors.

Under the principle of systemicity, Sustainability exists when 3 kinds of capital, namely natural capital,⁹⁰ social capital⁹¹ and cultural capital⁹², are not diminished by the decisions and acts of

⁸⁶ It is stated on the website that "If we do not use space sustainably, the cost of using space will increase, which could make it too expensive to continue to use space" – Online: Secure World Foundation <<http://swfound.org/our-focus/space-sustainability>>.

⁸⁷ Walter Macdougall, *supra* note 32

⁸⁸ Carolyn Deere, "Sustainable International Natural Resources Law" in Marie-Claire Cordonier Segger & Ashfaq Khalfan (eds.) *Sustainable Development Law Principles, Practices, & Prospects*, (New York: Oxford University Press, 2004) at 301

⁸⁹ See Micheal Decleris *supra* note 81 at 64

⁹⁰ Understood as the sum of all the kinds of ecosystems into which living and physical systems organise themselves

States and citizens, but increase with the passage of time. The aim is that the increase in the capital is by virtue of public policy adopted through a regulation of the process of co-evolution to prevent further degradation of the ecosystems and society. This prevention of degradation of the space environment is a shared goal that should seek to unite and restore cohesion. The re-conceptualization of space sustainability from this perspective therefore includes a greater value being given to natural capital that includes outer space as well as the cultural capital of actors utilizing the domain alongside increasing social capital such as safety, stability and security.

Before such a goal can be articulated, a philosophical assessment must be made as to whether the outer space environment should be preserved and protected in its own right and what provisions currently exist to that aim. Chapter two addresses this question.

⁹¹Understood as the legal values of humanitarianism and solidarity, and the institutions based upon those values (for example, social care, security, etc.), and upon which is understood as monetary value cannot be place

⁹² Understood as cultural heritage and the links that exist between architecture, the arts, popular traditions and ways of life at European, national and regional levels alike

Chapter 2: Philosophical Foundation to Outer Space Environmental Protection and Applicable Law

2.1 Environmental Ethics

It is proposed⁹³ that to think that humanity can have no serious impact in the space environment is misguided and ignores some fundamental facts that differentiate the space domain from the domains of land, sea and air on Earth; namely orbital mechanics and that the permanence of actions taken in orbit can have consequences for a very long time.

Such an increase in pollution further aggravated by the permanence factor is against the principle of sustainability because it decreases system quality over time.

Environmental considerations, in the form of regulation, have philosophical and moral foundations. The determination of these foundations should be clearly understood despite the notion that “legal regulation of the environment is largely a set of facts to be learned about the way the law deals with environmental issues...(as) resolved within the ordinary standards and criteria which influence legal argument.”⁹⁴ Coyle and Morrow argue that despite profound societal change, “only a fundamental shift in thinking re-establishing the central importance of intrinsic value can fully articulate and justify modern approaches to regulating the environment;”⁹⁵ that said, the moral significance of “intrinsic value” itself must also be considered because it is the account of a moral right that determines the acceptability of a given set of legal rights.⁹⁶

⁹³ Brian Weeden, *supra* note 40

⁹⁴ Sean Coyle & Karen Morrow, *The Philosophical Foundations of Environmental Law*, (Oxford and Portland Oregon: Hart Publishing, 2004) at 1

⁹⁵ *ibid* at 7

⁹⁶ J. G. S Wilson, “Rights” in R. E. Ashcroft et al (eds), *Principles of Health Care Ethics*, 2nd Edition (Oxford: Wiley, 2007)

In Environmental ethics, the philosophical and moral perspectives for environmental protection are broadly speaking, anthropocentric (human centered) or non-anthropocentric (protective of animals, bio-centric or eco-centric) in nature. It has been argued that when the most morally defensible versions of an anthropocentric environmental ethics and a non-anthropocentric ethics are laid out, they would lead us to accept the same principles of environmental justice,⁹⁷ but the natural assumption is that there is an important distinction to be made on a practical level because those with an anthropocentric disposition to environmental protection and conservation will be less likely to act to protect the environment if other human-centered values interfere whereas bio/eco-centric perspectives will encourage support for the environment even if these actions reduce material quality of life.⁹⁸

While it is proposed⁹⁹ that only a synergistic environmental ethics that totally adopts, embraces and balances both categories of environmentally ethical ideas is promising; it is suggested that an eco-centric perspective that would equate the other planets and planetary medium with equal status to man, through an approach that classifies the entire universe or universes as an ecosystem makes little sense unless one further analyses and breaks down the non-anthropocentric ethics into geo-centric (earth centered) and cosmo-centric perspectives, thereby ascribing value to the cosmos as a whole and distinct from earth.

⁹⁷James P. Sterba, "Reconciling Anthropocentric and Non-anthropocentric Environmental Ethics" (1994) 3:3 Environmental Values, 229-244. For opposing argument that Sterba's argument fails as a result of an underestimation of the divergence that occurs at the level of general principles and practical policy as a result of the initial value commitments which characterize each position see Brian K Steverson, "On Reconciling Anthropocentric and Non-anthropocentric Environmental Ethics", (November 1996) 5:4 Environmental Values 349-361

⁹⁸ Suzanne C. Gagnon Thompson & Michelle A. Barton "Eco-centric and Anthropocentric Attitudes toward the Environment," (1994)14: 2 Journal of Environmental Psychology 149-157

⁹⁹ Tonjin Yang, "Towards an Egalitarian Global Environmental Ethics in Environmental Ethics and International Policy", Henk A.M (ed) (Paris:UNESCO, 2006)

Baker¹⁰⁰ argues for a biocentric (life centered) moral perspective. This perspective is based on two premises: the biological nature of humankind and the equality of all members of the class of biological entities. Acceptance of the biological equality of all human and non-human living entities also entails a total rejection of the idea that human beings are superior to other living things but physical entities on the other hand are seen as having instrumental, intrinsic or inherent value, to the extent that they are useful to the survival and well-being of biological entities. The implications of the biocentric moral perspective for the human treatment of non-human biological entities are substantial with constraints on human actions derived from three moral duties:

1. A duty not to do harm to any biological entity.
2. To avoid interference with the normal activity and healthy development of biological entities-in-ecosystems.
3. To make restitution in order to preserve or promote the natural existence of biological entities-in-ecosystems.

The three moral duties form the basis of biocentric management, which provides the framework for the constraints on human activities. The goal of biocentric management as proposed by Baker is to ensure that human projects neither harm, nor interfere with, the fulfilment of the natural existence of all non-threatening non-human biological entities-in-ecosystems. It is proposed by the author that while such a focus is unduly restrictive before confirmation that there are ecosystems worth protecting it is somewhat in line with perspectives in the discourse of international planetary protection policy. The current focus for environmental protection efforts in space is to avoid harmful cross contamination of celestial bodies and thereby protect any (hypothetical) extraterrestrial life against contamination, for the benefit of science. To this end,

¹⁰⁰Howard Baker, "The Application of Emerging Principles of International Environmental Law to Human Activities in Outer Space" (DCL Thesis, McGill University Institute of Air and Space Law, 1996) [unpublished]

the Committee on Space Research¹⁰¹ accepts that for certain space mission/target body combinations, controls on contamination shall be imposed in accordance with a specified range of requirements, based on the following policy statement:

The conduct of scientific investigations of possible extraterrestrial life forms, precursors, and remnants must not be jeopardized. In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from another planet. Therefore, for certain space mission/target planet combinations, controls on contamination shall be imposed, in accordance with issuances implementing this policy. (DeVincenzi et al. 1983)

Missions are categorized with different planetary protection requirements. These categories are: Category I include any mission to a target body which is not of direct interest for understanding the process of chemical evolution or the origin of life. Category II missions comprise all types of missions to those target bodies where there is significant interest relative to the process of chemical evolution and the origin of life, but where there is only a remote chance that contamination carried by a spacecraft could jeopardize future exploration Category III and Category IV missions comprise certain types of missions (mostly flyby and orbiter for Category III and mostly probe and lander for Category IV) to a target body of chemical evolution and/or origin of life interest or for which scientific opinion provides a significant chance of contamination which could jeopardize a future biological experiment. Category V missions comprise all Earth-return missions.

¹⁰¹ COSPAR, the Committee on Space Research, was established in October 1958 by the International Council of Scientific Unions, ICSU. It is an interdisciplinary scientific committee concerned with scientific research and defines itself as a non-political organisation. Its activities with regard to scientific programmes have a consultative and coordinating character. See Ulrike M. Bohlmann, Connecting the Principles of International Environmental Law to Space Activities, IAC-11.E7.4.2

Through categorisation in this manner stringent requirements are only placed where there is scientific interest. This does not consider the biological life form but the integrity of scientific experiments and as such is in fact an anthropocentric consideration.

There is no explicit mention of preservation of the existing lifeless surfaces of extraterrestrial bodies, despite industrial and terraforming plans. To evaluate in a realistic way the proper relationship of mankind to these basic categories of our cosmic environment, the necessity of putting together a fundamental or intrinsic value-system for the cosmos has been suggested, referred to as cosmocentrism.

A cosmocentric ethic may be characterized as one which places the universe at the centre or establishes the universe as a priority in a value system, appeals to something characteristic of the universe which might then provide a justification of value and allow for reasonably objective measurement of value.¹⁰² While Lupisella, in his cosmocentric ethic system assigns a significant degree of intrinsic value to non-living entities, he admits that it would be very difficult to establish such a system by consensus.¹⁰³

Rolston¹⁰⁴ warns against the bias that only habitable places are good as the class of habitable places is only a subset of the class of valuable places. He gives the example that even on Earth, we have learned to value landscapes and seascapes that have nothing to do with human comfort

¹⁰² M. Lupisella & John Logsdon, Do We Need A Cosmocentric Ethic? IAA-97-IAA.9.2.09 IAF preprint Torino 1997

¹⁰³ M. Lupisella, From Biophysical Cosmology to Cosmocentrism, paper presented at conference "SETI in the 21st Century" 21-23 January 1998, Sydney Australia

¹⁰⁴ Holmes Rolston III, "The Preservation of Natural Value in the Solar System" in *Beyond Spaceship Earth: Environmental Ethics and the Solar System*, Eugene C. Hargrove (ed) (San Francisco, CA: Sierra Club Books, 1986) at 171

(Antarctic, Sahara, Marine depths) and just as there is appropriate behavior before earthen places regardless of their hospitality for human life, there is appropriate behavior beyond Earth.

Almar¹⁰⁵ suggests as a first step that the task ahead would be to survey and evaluate all existing planetary environments with regard to their scientific value (or even uniqueness), sensitivity to artificial interference, difficulty or ease of access by planetary missions, etc. to estimate the probability of some kind of indigenous life in the territory in question. This survey should also make distinctions among the different forms of permitted activities: complete protection, which might imply remote sensing only; robotic exploration only, which might imply in-situ robotic exploration (perhaps with only a limited number of missions, and maybe subcategories distinguishing between biological and non-biological experiments); controlled human exploration (implying high levels of control over disturbance activities and contamination); or uncontrolled human exploration (suggesting little or no control of activities).

The first objective of such a classification project would certainly be to start a limited, well defined and organized initiative to select the highest scientific priority areas and objects and the kind of protection that is necessary in the case of each of the regions and celestial objects in question. Based on such a survey, a list of the most important planetary environments should be compiled by a panel or a task force composed of space science experts. A classification scheme of territories with gradually decreasing interest for science should be established, making exploration and exploitation of resources on a number of planetary surfaces permissible.

¹⁰⁵ Ivan Almar, “New Concepts for Advanced Planetary Protection Policy” in *Protecting the Environment of Celestial Bodies (PECB Cosmic Study)* M.Hofmann et al. (eds)(Paris: International Academy of Astronautics, 2010) at 29

When the properties making up the space environment are analyzed it is difficult to justify how such a radioactive vacuum can have any value outside of the extrinsic value of the properties that make it anthropocentrically “useful” as a medium by modern day technological standards, particularly as for now man “seems” to be the only user of those zones. It is argued though that the natural state is intrinsically good however hostile that natural state and that as such it should be kept pristine.

The precautionary approach would suggest that scientific uncertainty or lack of knowledge as to if other users of the space environment exist should not prevent cautionary behavior aimed at safeguarding it but the author argues that cosmo-centric claims are only valid to the extent that if the case is made for intrinsic value of the cosmos, it does not automatically follow that it will have the same moral significance as other members of the moral community.¹⁰⁶ Secondly, so long as specific categories of humans will be impacted differently in the process of answering the question as to how/why the cosmos should be “protected” (possibly through moral satisfaction gained from being declared morally right), the measure of value is clearly never independent of the valuer, even if determined intrinsically.¹⁰⁷

The overarching claim therefore is that the most morally acceptable perspective is that while humans are at the centre of all concern they are not the only concern and bearing this in mind, there is no need to have any other perspective, in light of the subject of this thesis, than one of enlightened anthropocentrism. Enlightened anthropocentrism places some restrictions on the

¹⁰⁶ Paul York 2002, “The Ethics of Terraforming”, Online: Philosophy Now <http://www.philosophynow.org/issue38/The_Ethics_of_Terraforming?

¹⁰⁷ John Passmore, *Man's Responsibility for Nature: Ecological Problems and Western Traditions* (London:Gerald Duckworth & Co Ltd, 1974); Keekok Lee, The Source and Locus of Intrinsic Value: A Reexamination (1996) 18:3 *Environmental Ethics* 297-309.

human use of non human entities and accepts limited responsibility from adverse consequences arising from such use.¹⁰⁸

This enlightened approach rejects Huebert and Blocks¹⁰⁹ claim that environmental programs for outer space are philosophically ill founded economically and pragmatically unjustified, particularly because the basis for its holding that “intrinsic value” is absurd is based only on economic rationales. To reject this claim is to say that programs should be established for environmental purposes where they do not cause moral conflict. But acknowledging the cost benefit analysis if there is some value to be preserved, the case must still be made that there is an environmental concern that justifies the imposition of restrictions and measures. It may be for this reason that current planetary protection guidelines adopted by the Committee on Space Research (COSPAR) promote preservation of the space environment and celestial bodies for the benefit of science and exploration.¹¹⁰

Environmental Concern?

It seems there is no available measure of what amounts to an environmental concern. This may depend on human sociological and psychological factors as well as the way the message of a movement is portrayed as being environmental by proponents of the view. Environmental Concern Research (ECR) has emerged as a field of study that considers individual and social concern for the quality of the natural environment as a necessary basis for the development of successful environmental protection. This research has produced mixed results with a variety of

¹⁰⁸ Howard Baker, *supra* note 100 at 39

¹⁰⁹ J. Huebert & Walter Block, Space Environmentalism, Property Rights and the Law, 37 University of Memphis Law Review 281-310 at 282

¹¹⁰ COSPAR Planetary Protection Policy (20 October 2002) as amended. Online: COSPAR <<http://cosparhq.cnes.fr>>

claims made including the plausible claim that different types of environmental concern result from the degree to which an individual perceives an interconnection between self and nature.¹¹¹

Whilst this claim could contribute a justification to the claim of this thesis that the more hostile to human endeavor an environment is the less deserving it is of intrinsic environmental protection, ECR seems determinant on the testing mechanisms used. While this is an issue with any empirical research where subjects are assessed by questioning, the conclusion reached by Van Liere and Dunlap (1981) seems most acceptable to the author; that “social science research had found difficulty in establishing the personal meaning of environmental concern; that the results from different studies were largely non-comparable and consequently that the effects of being concerned for the environment upon subsequent pro- or anti-ecological behavior were not understood.”¹¹² This is not to condemn the utility of such research. It is concluded that the determining factor may be to acknowledge egoistic, altruistic and biospheric value orientations whilst creating environmental messages and for proponents to develop “an understanding of the way in which the public evaluates (these) messages”¹¹³

Essentially protecting the environment includes the “control, reduction and elimination of existing causes of damage to the environment” as well as encouraging the preservation and rational use of the environment.¹¹⁴ What is clear is that despite the definition of the term and what it includes, it is vital that the idea of protecting the environment recognizes that Earth, and all systems internal to it, forms part of a greater system. Earth has a place in a

¹¹¹ P. Wesley Schultz, *The Structure of Environmental Concern: Concern for Self, Other People, and the Biosphere*, (December 2001) 21:4 *Journal of Environmental Psychology* 327-339

¹¹² Paul M.W. Hackett, “Modelling Environmental Concern: Theory and Application”, 13:2 *The Environmentalist* 117-120 at 118

¹¹³ *Ibid* at 119

¹¹⁴ R. McCorquodale & M. Dixon, *supra* note 2 at 454

system that *includes* outer space and as such the concept of the “environment” and its protection, in this context, is the protection of the totality of spheres in which mankind exists or conducts activity. In other words despite the infinite nature of outer space, to the extent that mankind can conduct activity in its realm, it is part of the mankind’s overall environment and the potential hazardous effect of activities in outer space should be perceived in the light similar to those of other activities hazardous to the Earth’s environment. Such a proposition must take into consideration that if a decision is made to act, then basically only two alternatives exist – the complete protection of all celestial bodies and interplanetary space, which is not a realistic requirement, or the protection of selected bodies and regions – which seems to be feasible. Article 7.3 of the Moon Agreement is of interest in this context, as it foresees the possibility of zones of special protection being established on celestial bodies. But once again it is not recognition of an intrinsic value of the extraterrestrial environment that drives the provision but the preservation of scientific interest.

2.2 Space Environmental Law Provisions

Environmental provisions within existing space law is minimal. There are only two clear provisions dealing with extra terrestrial environment matters and both refer to contamination. Article IX of the Outer Space Treaty¹¹⁵ lays a duty on states to “pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination...” Article 7.1 of the Moon Agreement provides that “in exploring and using the Moon, State parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its

¹¹⁵ Citation at note 45

harmful contamination through the introduction of extra-environmental matter or otherwise.”

These provisions are vague and raise questions as to what is meant by “harmful” contamination.

It is proposed¹¹⁶ that the answer to the question can be found through a reading of the entire Article IX, which states:

“In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.”

The first sentence reiterates the principle of international cooperation in the exploration and use of outer space and celestial bodies found in the preamble and Articles 1 and III of the treaty. But, the important point here is the stress that is placed on “due regard” to the corresponding interests of other state parties. “Due regard” implies a consideration for the interests and activities of other states. The second sentence must therefore be interpreted in light of the first such that contamination is harmful when it is against the interests of other states. Therefore any contamination which would result in harm to a states experiment or program is to be avoided.

¹¹⁶ Darlene A. Cypser, *International Law & Policy of Extraterrestrial Planetary Protection*, 33 *Jurimetrics* 315 (1993) 324-326

One author¹¹⁷ suggests that this lack of definition of harmful contamination is cured by the subsequent paragraphs which call for prior consultation. These consultations would lay down the states practices by which the meaning of “harmful contamination would be measured.” This consultation is not foreseen for the “mere” harmful contamination of the outer space environment or the adverse changes in the environment of the Earth but only where harmful interference with activities of other States Parties or activities in the peaceful exploration and use of outer space would occur. The purpose of this limitation is clearly to preserve the character of outer space as an area that can be freely used by all, and States are enjoined only to consider possible detrimental consequences that their space activity could have on the activities of other states.¹¹⁸

Article 7.1 of the Moon Agreement elaborates in more detail when compared to Article IX of the Outer Space Treaty, by explicitly considering the risk of lunar contamination and imposing upon states the duty to take measures to prevent the disruption of the existing balance of the environment. It states:

“In exploring and using the moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of Earth through the introduction of extraterrestrial matter or otherwise”

The requirement to "prevent disruption" is more comprehensive than the Article IX requirement to avoid harmful contamination in outer space, on the Moon and on other celestial bodies, and

¹¹⁷ Gyula Gal, Space Law, 154 1969 as stated in Darlene A. Cypser, *ibid*

¹¹⁸ Gérardine Meishan Goh,& Bobby Kazeminejad, “Mars through the looking glass: an interdisciplinary analysis of forward and backward contamination” (2004) 20:3 Space Policy at 219

adverse changes to Earth, because both "harmful contamination" and "adverse changes" must be avoided on the Moon.

According to Baker,¹¹⁹ by stating that the “existing balance” of the Moon's environment is not to be disrupted, Article 7 invites a scientific definition of "disruption", based on the general principles of ecology.

Finally, the second sentence of its Article 4.1 stipulates that due regard shall be paid to the interests of present and future generations: The principle of intergenerational equity, which is part of the more general concept of sustainability, is evoked.¹²⁰

By these provisions, there is no intrinsic value assigned to the outer space environment such that the outer space environment becomes protected in its own right.

Permitting this thesis to engage the issue of preservation of the outer space environment from a more systemic perspective, by reconceptualising Space Sustainability from an environmental perspective, it is proposed that a contribution can be made to a discussion on the issue of liability for damage caused by space debris, particularly if debris mitigation guidelines become binding. As space situational awareness becomes advanced and the ability exists to determine the cause of space debris or collision incidents, liability will be a necessary deterrent and way of compensating those damaged by such an event, including damage to the character of the outer space environment.

¹¹⁹ Howard Baker, *supra* note 100

¹²⁰ Ulrike M. Bohlmann, Connecting the Principles of International Environmental Law to Space Activities, IAC-11.E7.4.2, at 2

Chapter 3: Space Debris and Liability

While there are other causes of environmental damage to the space environment, the most prominent environmental problem connected with space activities is space debris.

‘Space debris’ is a general term referring to all tangible man-made materials in space other than functional space objects. Debris thus includes spent satellites themselves, ejected instrument covers, upper stages (orbital transfer stages), and fragments thereof, etc., that is objects which originate from what were functional space objects but which no longer serve a useful purpose.¹²¹

As it stands, there is no specific reference to space debris in the space law regime even though it is said to be the inevitable consequence of the global uses of space,¹²² but some international definitions exist. The International Academy of Astronautics position paper on orbital debris defines orbital debris as “any man-made Earth-orbiting object which is non-functional with no reasonable expectation of assuming or resuming its intended function, or any other function for which it is or can be expected to be authorized, including fragments and parts thereof. Orbital debris includes nonoperational spacecraft, spent rocket bodies, material released during planned space operations, and fragments generated by satellite and upper stage breakup due to explosions and collisions”.¹²³ A Technical Report on Space Debris by the Scientific and Technical Subcommittee of the UNCOPUOS uses the following definition:

¹²¹Lotta Viikari, *The Environmental Element in Space Law: Assessing the Present and Chartering the Future* (: Martinus Nijhoff:Netherlands, 2008)

¹²² Theresa Hitchens, *Space Debris: Next Steps in Safeguarding Space for All: Security and Peaceful Uses—Conference Report*, 25–26 March 2004

Online: UNDIR< <http://www.unidir.org/pdf/articles/pdf-art2378.pdf>>

¹²³ International Academy of Astronautics, *Position Paper on Orbital Debris* (Paris: IAA, 1999) at 3

“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.”¹²⁴

The Inter-Agency Space Debris Coordination Committee (IADC) concisely defines space debris as “all man made objects including fragments and elements thereof, in earth orbit or re-entering the atmosphere, that are non functional”. These definitions all deal with objective functionality of man-made space objects, a quality that may be difficult to determine. While to one party an object may be seemingly non functional, it is the state that retains jurisdiction and control of the space object that can determine functionality and may have reasons for determining that a non functional object is not space debris. An attempt has been made by the International Law Association to define space debris in a legal instrument to take into consideration criteria other than ‘objective’ functionality when determining the usefulness of spacecraft as “ man-made objects in outer space, other than active or useful satellites, where no change can reasonably be expected in these conditions in the foreseeable future. ”¹²⁵

The scale of the debris problem is still being debated and analyzed. Studies performed on the detrimental effect of space debris on space activities are well documented and Space debris has been a matter of discussion for the UN COPUOS from different perspectives. Stubbe¹²⁶ has identified three phases of consideration. The first stage began in 1994 where the issue of space

¹²⁴ Technical Report on Space Debris, UN doc. A/AC.105/720 (New York: United Nations, 1999) at Para 6

¹²⁵ See ESA/IRC (96), 16, Annex 3, Buenos Aires International Instrument on the Protection of the Environment from Damage caused by Space Debris, Article 1(c)

¹²⁶ Peter Stubbe, Common but Differentiated Responsibilities: New Impetus for Legal Appraisal for Outer Space Pollution, (March 2010) ESPI Perspectives No 31 Online: ESPI<
http://www.espi.or.at/images/stories/dokumente/Perspectives/ESPI_Perspectives_31.pdf

debris was introduced in the agenda of the Science and Technical Subcommittee of the UN COPUOS with the aim of studying the nature and technical characteristics of the debris environment. It ended with the adoption of the Technical Report on Space Debris.¹²⁷

In the second phase, the work of the Science and Technical Subcommittee turned to space debris mitigation and the IADC presented its proposals for debris mitigation to the Science and Technical Subcommittee which reviewed these measures. Based on the work of the IADC, the Working Group on Space Debris of the Science and Technical Subcommittee subsequently drafted guiding principles for preventing the further proliferation of space debris, which was adopted by UN COPUOS in 2007.

The seven Guidelines adopted by the UN reflect the need to:

- Limit debris released during normal operations
- Minimize potential for break-ups during operational phases
- Limit the probability of accidental collision in orbit
- Avoid intentional destruction and other harmful activities
- Minimize potential for post-mission break-ups resulting from stored energy
- Limit the long-term presence of spacecraft and launch vehicle orbital stages in LEO after the end of their mission
- Limit the long-term interference of spacecraft and launch vehicle orbital stages with GEO region after the end of their mission

¹²⁷ Technical Report on Space Debris, UN doc. A/AC.105/720 (New York: United Nations, 1999)

It must be noted that there are some limitations to the guidelines¹²⁸:

- The COPUOS Guidelines are not legally binding under international law
- The COPUOS Guidelines are general recommendations to be implemented by States primarily through national legislation, regulations, and/or policy directives therefore incorporation of the Guidelines into domestic policy and/or regulatory procedures, mechanisms varies according to each State, its level and type of space activity
- The Guidelines do not outlaw a certain space debris creation activity, nor do they impose sanctions on the violators
- The Guidelines are not designed as a comprehensive approach for the space debris problem
- The Guidelines do not deal with the disposal of the debris currently orbiting in space
- The Guidelines cannot stabilize the space debris environment and do not give guidance to liability and insurance
- The Guidelines do not address the generation of space debris in a non-peaceful context

While it is recorded that “the results of recent decommissioning activities show a clear increase in the implementation of these guidelines (and) [t]his change of trend is a clear common success and represents an important improvement in communication and cooperation between the international organizations, national authorities and operators,”¹²⁹ others say that there are mixed

¹²⁸ Ram Jakhu, Towards Long Term Sustainability of Space Activities: Overcoming the Challenges of Space Debris (15 February 2011) Online: OOSA <<http://www.oosa.unvienna.org/pdf/pres/stsc2011/tech-35.pdf>>

¹²⁹ UN Committee on Peaceful Uses of Outer Space, *supra* note 8at10

signs about how well the UN COPUOS Guidelines are working in practice.¹³⁰ The key reason for non compliance is said to be cost.¹³¹

Starting in 2009, for the 3rd phase, the debris issue was formally introduced in the agenda of the Legal Subcommittee of UN COPUOS and member states of UN COPUOS now inform each other about their national efforts to implement space debris mitigation measures. Stubbe states that this formal introduction “cannot hide the fact that an examination of the implications of space debris pollution under international law did not yet find its way into COPUOS.”¹³²

Despite the absence of specific reference to debris, it is debatable whether the principles contained in the space agreements can be applied in addressing the debris problem, such that it should be debated at the Legal Subcommittee of the UN COPUOS. It is stated categorically that as the term space debris does not appear in any of the space law instruments, “the phenomenon is not covered by space law.”¹³³ But writers¹³⁴ with a less strict approach to interpretation have said that given the definition of space object in the Liability Convention as “including component parts,”¹³⁵ space debris should be classified as a space object for treaty purposes.

¹³⁰ UN Committee on Peaceful Uses of Outer Space, Towards Long Term Sustainability of Space Activities: Overcoming the Challenges of Space Debris (3 February 2011) UN Doc A/AC 105/C.I/2011/CRP. 14

¹³¹ Theresa Hitchens, *supra* note 52

¹³² Peter Stubbe, *supra* note 126 at 4

¹³³ International Academy of Astronautics, *Position Paper on Orbital Debris* (Paris: IAA, 1999) at 36

¹³⁴ Juan Manuel de Faraminan Gilbert, “Space Debris: Technical and Legal Aspects” in G. Lafferanderie & D. Crowther (eds), *Outlook on Space Law Over the Next 30 years* (Kluwer Law International, 1997) at 311

¹³⁵ *Liability Convention* Article 1d, *supra* note 18.

Somewhere mid ground is Lafferranderie's assertion that the basic tenets of space law are applicable to the consequences of damage created by space debris.¹³⁶

If the effects of space debris could be looked at as damage, as Lafferranderie's suggestion implies, a reassessment of the Liability Convention may be in order noting that the Liability Convention's initial fundamental flaw is its lack of an environmental perspective. This is particularly so with respect to the definition therein given to the term damage. An assessment of modern international environmental law sees a more holistic definition given to the term damage but under the Liability Convention, damage is given a standard physical meaning and defined as:

"Loss of life, personal injury or other impairment of health or loss of or damage to property of states or of persons natural or juridical or property of international intergovernmental organizations".¹³⁷

This limitation prevents any scope being given to environmental issues because it means the damage can at best be considered on the backdrop of a physical damage, meaning that protection of that environment can not be ensured or guaranteed.

From an environmental perspective, the damage could be the existence of space debris itself. It poses a danger to everything in its surroundings and left unchecked its multiplication could potentially alter the space environment to the point where it becomes inaccessible to man or machine. The principle of intergenerational equity, a policy underlying global sustainable development treaties such as the Convention on Biological Diversity and the Convention on

¹³⁶ G. Lafferranderie, *Maintaining the Space Environment*, Commentary Paper Proceedings of the Workshop of Space Law in the 21st century, UN Office for Outer Space Affairs 2000

¹³⁷ *Liability Convention*, Article 1 (a) *supra* note 18

Climate Change stresses the importance of maintaining the environment for future generations, a position also underlying the outer space legal regime. Though outer space is an infinite realm, some of the zones that mankind most utilize constitute limited resources. This notion highlights the anthropocentric nature of environmental protection. Man will go only as far as is necessary for his own benefit such that the idea of protecting the outer space environment for its own benefit is an overly ambitious exercise contrary to notions of social justice. If it were not so then the proposal that useless objects are kept in the “graveyard orbit”, designated for that purpose, where they will permanently remain, would not seem so attractive.

That the Legal Subcommittee of UN COPUOS have not fully addressed this issue does not prevent us from doing so here. According to Jakhu, the importance in this is that:

“the existing international legal framework governing space activities must be considered both with regard to legal obligations and rights to take preventive measures that address the risks posed by space debris, as well as to the legal consequences should such a risk materialize.”¹³⁸

While initiatives such as the debris mitigation guidelines and other non binding technical norms can address prevention and/or minimization of the risk the latter aspect primarily raises questions of responsibility and liability for damage caused by space debris and the allocation of risks, a matter that requires legal mechanisms to ensure deterrence and accountability and long term sustainability of space activities.

¹³⁸ Ram Jakhu, *supra* note 128

Chapter 4: Environmental Liability Regimes and the Space Liability Regime

This chapter aims to assess the outer space liability regime in light of liability regimes for ultra-hazardous activities. This proceeds through a peeling back of layers to the liability discussion as proposed by Brunee.¹³⁹ The first layer is the law of state responsibility and liability, the second layer is the idea that, rather than hold States responsible for breaches of international law, efforts have focused on the development of a system of liability for the harmful consequences of lawful but risk-intensive activities; namely for nuclear power generation and maritime transport of oil. These agreements brought about a shift from state liability to civil liability. The fourth layer addresses the Outer space liability regime.

4.1 State Responsibility and Liability

State Responsibility and liability are well discussed concepts of international law. Responsibility in international law has been defined to mean “the principle which establishes an obligation to make good any violation of international law producing injury, committed by the respondent state.”¹⁴⁰ Liability has also been defined in similar terms as “the state of being bound or obliged in law or justice to do, pay, or make good something.”¹⁴¹

Works by the International Law Commission have led to the creation of a distinction between the two concepts. Accordingly, “responsibility” arises from unlawful acts, while “liability”

¹³⁹ Jutta Brunee, *supra* note 16

¹⁴⁰ Clyde Eagleton, *The Responsibility of States in International Law* (New York: Kraus Reprint Co. 1970) at 22

¹⁴¹ Black’s Law Dictionary, 5th edition (St Paul: West Publishing, 1979)

encompass both lawful and unlawful activities.¹⁴² This distinction is evident in the creation of a separate system that considers liability for lawful acts, and responsibility for unlawful acts. As a result the legal consequences of environmental harm cover both state responsibility for violation of international law and liability for harm resulting from activities not prohibited by international law. Brownlie¹⁴³ has made the argument that the normal principles of state responsibility can well sustain liability, particularly as it concerns extra-hazardous operations, since either way leads to reparation and compensation. Seemingly, as a result of this view, the term state responsibility and international liability are often used interchangeably to refer to the principle that holds states accountable in interstate claims under international law.¹⁴⁴

Regarding the States' responsibility, breach of obligation depends on what its international obligations are, which may vary from State to State. State responsibility for environmental cases will normally arise either because of a breach of one of the several treaties or customary obligations. Responsibility for environmental harm is now an established principle of customary international law and as such is binding on all States. The effect is that the remedies are not only reparation and compensation but general enforcement of international obligations concerning the environment. Cases such as the nuclear test cases¹⁴⁵ confirm the principle that a state has a responsibility to ensure that its own activities do not cause damage to the environment of any other state but several obligations have now attached to this principle such as the duty to notify

As stated by Francisco Orrego Vicuña, State Responsibility, Liability, and Remedial Measures Under International Law: New Criteria for Environmental Protection, in *Environmental Change and International Law: New Challenges and Dimensions* Edith Brown Weiss (ed)(Tokyo: United Nations University Press, 1992).

¹⁴³ I. Brownlie, *System of the Law of Nations: State Responsibility* (Part 1) (Oxford: Clarendon Press, 1983) at 50

¹⁴⁴ Patricia Birnie and Alan Boyle, *supra* note 19 at 181

¹⁴⁵ *New Zealand v. France*, Order 22 IX 95, ICJ Rep. (1995) 288

and consult, the need to obtain prior consent of other states for given activities and environmental impact assessments to name a few. Failure to adhere to these obligations incurs the states' responsibility and the requirement to do so. Despite this assertion, Brunee holds that the picture is not settled as there is strikingly little state practice and most transnational environmental concerns are resolved through negotiation or adoption of an agreement that regulates the issue at hand. While the resulting decisions provide some clues regarding the primary rules of international environmental law, they actually offer little insight into State responsibility for environmental harm.¹⁴⁶

There are two standards of responsibility/liability in international law: it can be on the basis of fault or objective/absolute. In environmental law, fault is rarely used as a basis for responsibility, particularly as referring to intention, malice, recklessness or negligence on the part of the state. It is instead referred to as a lack of due diligence. Due diligence requires the introduction of legislation and administrative control that effectively protect other states and the environment. It does not however express what legislation or controls are required of States, which results in differing degrees of diligence.¹⁴⁷ Most treaties rely on general obligations of cooperation or commitment to take appropriate measures to prevent pollution, a due diligence obligation. What that means is that the standard does not make the state an absolute guarantor of the prevention of harm.

The objective standard is related to an obligation of result. Violation of this obligation not to damage the environment engages responsibility regardless of fault. For example The Kyoto

¹⁴⁶ Jutta Brunee, *supra* note 16

¹⁴⁷ Patricia Birnie & Alan Boyle, *supra* note 19 at 112

Protocol to the Climate Change Convention sets legally enforceable targets for specific countries and those that do not meet their targets at the end of the first commitment period 2012 will be in breach of an international legal obligation of result. Though almost identical to the objective standard, the principle of absolute responsibility is more stringent in that there are less exculpatory factors to negative responsibility. Responsibility or liability for harm caused by ultra-hazardous activities is most often determined using this stricter standard because of the seriousness of the potential harm and the fact that there is an absence of reciprocal acceptance of risk on the part of potential victims.

With respect to activities in outer space, Articles VI and VII of the Outer Space Treaty provides for the *responsibility* and *liability* of participating states. Article VI of the Outer Space Treaty imposes *responsibility* for national activities in outer space whether they are performed by governmental or non governmental entities. The responsibility is to ensure that activities are performed safely and with strict conformity to the provisions of the Outer Space Treaty and national regulations. Keeping in line with this, the activities of the non-government entities shall require authorization and continuing supervision by that state party.

Failure to ensure that activities are performed safely or if activities are not authorized will lead to responsibility of the state. The debatable point is whether the States responsibility can be engaged if there is no damage or harm caused by the failure. It seems that the courts frequently award declaratory relief which avoids repetition for the conduct rather than to obtain any

compensation.¹⁴⁸ Article VII states that each state party that causes damage to another is internationally liable for damage caused to another state party to the Treaty. This provision is elaborated in the *Liability Convention* whereby a strict/absolute liability doctrine is imposed on the state for any damage caused. Both provisions alongside the *Liability Convention* encompasses the legal consequences of national activities in outer space, principally the obligation to reparate in case of violations of international obligations by public or private entities, and also the obligation to compensate damage.

From State Liability to Civil Liability

Idealistically, environmental rules should be uniform and applicable to all areas of environmental law but treaties addressing liability for environmental damage, have been developed on a sectoral basis. As a result there is very little coordination pertaining environmental liability rules.¹⁴⁹ The creation of the 1993 Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (*Lugano Convention*),¹⁵⁰ sought to unify the liability regimes and create a sophisticated general regime applicable to all activities dangerous to the environment. Though not in force, it epitomizes the shift from state liability to civil based liability for environmental damage as strict and unlimited liability is geared solely towards the operator.

4.2 Environmental Liability Regimes for Hazardous Activities

The rudimentary and thus linking factor in liability regimes is that they seek to balance competing concerns. As expressed by Brune, on the first part the regime must promote and

¹⁴⁸ J Crawford and Simon Elleson, *The Nature and Forms of International Responsibility in International Law*, Malcom Evans(ed.) (Oxford: Oxford University Press, 2003) at 461

¹⁴⁹ Philippe Cullet, "Liability and GMOs: Towards a Redress Regime in Biosafety Protocol" (14 February 2004) *Economic and Political Weekly* at 615

¹⁵⁰ Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, June 21, 1993, 32 I.L.M. 1228 [hereinafter *Lugano Convention*]

encourage claims for compensation of pollution damage resulting from harmful activities whilst also protecting operators of beneficial activities from the deterrent effects of excessive claims.¹⁵¹ As a result, the focus in contemporary environmental liability regimes is to channel costs directly to owners or operators of high risk undertakings but also set limits on liability that protect the industry providing the good or service.

4.2.1 Nuclear Power

States acknowledged their international responsibility for the safe conduct of their nuclear activities and recognized the need to control risks and prevent damage to the global environment even before international agreements on nuclear safety stressed the need for them to do so.¹⁵² This need to protect individuals and the society as well as the environment from nuclear damage is particularly important because the damage caused by nuclear accidents is on a wide scale and has far reaching and potentially long term effects. The 1986 Chernobyl disaster showed how serious the risk to health, agriculture and the environment posed by nuclear power and it went far in intensifying the need for the creation of an improved liability regime, particularly with respect to ensuring that environmental costs are recoverable.

An acknowledgement of responsibility brings along with it liability. Under the nuclear liability regime, the states responsibility is residuary. Primary liability for damage is borne by the operators of nuclear installations. The state is not directly liable for the damage but acts as guarantor of the operators' strict liability, or by providing additional compensation funds. The state has a responsibility to maintain diligent control over the industry and ensure that

¹⁵¹ Jutta Brunnee, *supra* note 16 at 357

¹⁵² For an overview on the control of nuclear risks see, Patricia Birnie and Alan Boyle, *supra* note 19 at 467

compensation claims are met. The distinguishing factor of this regime is the complementary nature of the private and public liability system.

The backbone of the international liability regime governing nuclear activities can be found in two principal instruments: the OECD Paris Convention on Third Party Liability in the Field of Nuclear Energy of 1960¹⁵³, applicable to incidents within Western Europe and the comparable IAEA Vienna Convention on Civil Liability for Nuclear Damage of 1963¹⁵⁴ open to the world at large. Further improvements were made to the *Vienna Convention* by the adoption of the 1997 revision to the *Vienna Convention*¹⁵⁵ and the Convention on Supplementary Compensation for Nuclear Damage,¹⁵⁶ which aim to provide for higher compensation to more people for a wider scope of nuclear damage. The 1988 Joint Protocol¹⁵⁷ was adopted to resolve potential conflicts between the two Conventions in respect of the same incident.

¹⁵³ The European regime is made up of the following treaties, Paris Convention on Third Party Liability in the Field of Nuclear Energy, 29 July 1960 reprinted in 1041 UNTS 358 [hereinafter *Paris Convention*] The Convention was further amended in 1964, 1982 and 2004. See Protocol to Amend the Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960 as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982, February 12 2004. This is supplemented by the Brussels Convention Supplementary to the 1960 Convention on Third Party Liability in the Field of Nuclear Energy 31 January 1963 reprinted in 956 UNTS 264. The Convention was amended in 1964, 1982 and 2004. See 2004 Protocol to Amend the Convention of 31 January 1963 Supplementary to the Paris Convention of 29 July 1960 on Third Party Liability in the Field of Nuclear Energy as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982, February 12 2004

¹⁵⁴ Vienna Convention on Civil Liability for Nuclear Damage, 21 May 1963, 1063 UNTS 265 [hereinafter *Vienna Convention*]

¹⁵⁵ Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage, 12 September 1997, reprinted in 36 ILM 1454

¹⁵⁶ Convention on Supplementary Compensation for Nuclear Damage, 12 September 1997 reprinted in 36 ILM 1473 (1997)

¹⁵⁷ Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention, 21 September 1988 reprinted in 42 Nuclear Law 56 (NEA, 1988)

The permeating factor of this regime is that it seeks to ensure facilitation of claims for the innocent victims who are involuntarily exposed to potential risk. As such the scheme aims to shift the heavy burden of proof from the victim to the liable party. To achieve this, liability is made strict. Due to the potentially hazardous nature of the activity and its complexity, it is a widely accepted view¹⁵⁸ that strict liability is the most appropriate basis of liability to safeguard the victims of the risk. It has been contended¹⁵⁹ that the growth of strict liability as a standard “may to some extent arise out of the helpless exposure of most individuals to the results of decisions and activities which have multifarious effects in many areas of society- thanks to a rapidly changing technology which operates to disassociate the individual.” The effect of strict liability is that liability occurs solely from the establishment of a causal link between the damaging incident and the damage, and negligence or any type of fault is not a necessary requirement.¹⁶⁰

In line with the above objectives of facilitating the bringing of claims for victims is that of legal channeling of liability to the operator of a nuclear installation, who is exclusively liable for nuclear damage.¹⁶¹ This establishes a distinct line of responsibility whereby victims, and to a certain extent operators, can appreciate the benefit of legal certainty which such channeling guarantees. Though the Conventions allow the operator a right of recourse against other

¹⁵⁸ William JK. Jones, “Strict Liability for Hazardous Enterprise” (Nov 1992) 92: 7 Columbia Law Review 1705

¹⁵⁹ L. F. E Goldie, Some Problems of Liability Arising out of Space Activities, Proceedings of the Sixth Colloquium on Space Law (Paris: IISL, 1963)

¹⁶⁰ C. Stoiber et al., *Handbook on Nuclear Law*, (Vienna: International Atomic Energy Agency, 2003) at 111

¹⁶¹ *Vienna Convention*, Article II, *supra* note 154

parties,¹⁶² fundamentally liability is focused on the operator. It has been contended,¹⁶³ not without dispute, that the focus on the operator is based on the assumption that the operator is best equipped to exercise effective responsibility for it and secure adequate insurance. Interesting to note that during the early years of the exploitation of nuclear power, the supply industry was under no circumstances prepared to take over any of the risks involved and this seriously threatened the development of the new technology, as their co-operation was absolutely vital. As a result it was left to either the operator or the state to take over liability.¹⁶⁴ The effect of this is that all other parties involved in the development of nuclear energy were exonerated from any obligation to compensate for nuclear damage principally to sustain the growth of the industry. This position still stands despite the development of the industry.

That notwithstanding, the nature of the risk and the sheer magnitude of potential harm are such that liability must be distributed in part so as not to completely discourage people from nuclear related activities for fear of high compensation claims! To reduce the burden the Conventions specify that operators must hold adequate insurance or other financial security covering their liability for nuclear damage in such amount, such type and in such terms as the installation state may specify.¹⁶⁵ In order to access such insurance the liability of the operators may be limited by the installation state and given a ceiling.¹⁶⁶ In essence the risks are pooled so as to guarantee that funds will be available for compensation to the victims as well as ensure that the industry is protected.

¹⁶² *Vienna Convention*, Article X, *ibid*

¹⁶³ Patricia Birnie & Alan Boyle, *supra* note 19 at 479

¹⁶⁴ T. Gehring & M. Jachtenfuchs, "Liability for Transboundary Environmental Damage; Towards a General Liability Regime?" (1993) 4 *Eur J Int. Law* 92-106

¹⁶⁵ *Vienna Convention*, Article VII *supra* note 154

¹⁶⁶ *Vienna Convention*, Article V *supra* note 154

The installation state has a residual responsibility to ensure that compensation claims are met if funds are insufficient and is obliged to make up the difference up to the limit of the operator's liability.¹⁶⁷ This was particularly important in a time where the insurance industry did not have the capacity to meet compensation claims adequately.

The earlier Conventions, particularly the *Vienna Convention* provided for a relatively low ceiling for liability. The limits of the *Paris Convention* were also low but were supplemented by additional compensation funds, unlike the *Vienna Convention* which placed the entire burden on the operator alone. These additional funds were provided for on the one level by the installation state and on the second level from a fund supported by all the other contracting parties.¹⁶⁸ This meant there were three million Special Drawing Rights (SDR) available as compared to the position under the *Vienna Convention*, which was set at five million dollars.¹⁶⁹

The 1997 revisions to the *Vienna Convention* provided for higher compensation by not only increasing the limit of liability of operator to a minimum of three hundred million SDR but the Convention on Supplementary Compensation also introduced to the Vienna scheme the system of state funded compensation similar to that available under the *Paris Convention* whereby the installation state will ensure availability of a minimum of three hundred million SDRs and

¹⁶⁷ *Vienna Convention*, Article VII(1) *supra* note 154

¹⁶⁸ 1963 Brussels Supplementary Convention on Third Party Liability in the Field of Nuclear energy as amended by a Protocol of 1982

¹⁶⁹ 1982 Protocol to Paris Convention, Article 12 and Vienna Convention, Article V

beyond that an international fund is available from the other contracting states.¹⁷⁰ Contributions to the fund are based on a formula whereby the majority of the contributions come from nuclear power generating countries on the basis of their installed nuclear capacity, while the remaining portion comes from all member countries on the basis of their United Nations rate of assessment. There is a proviso that states on the minimum UN rate of assessment with no nuclear reactors are not required to make contributions¹⁷¹ that means that the poorer states and those that have no nuclear facilities contribute less or nothing at all but still have access to the fund.

The Convention on Supplementary Compensation is open to parties of either of the conventions and the 2004 amending protocols to the *Paris Convention* raised the operators liability limits in line with the revised *Vienna Convention* as mentioned above to the effect that both the Paris and Vienna Conventions are more at par with each other ensuring a more uniform application of the regime.

From the context of protection of the environment and ensuring that liability rules provide for the ability to do so in the event of damage, a broader definition of nuclear damage was given to the regime bringing about a welcome change. The meaning of damage was extended from the general loss or damage to life and property to include the costs of measures of reinstatement of impaired environment and preventative measures as well as certain economic losses.¹⁷² The effect of this enhanced definition is that there is certainty that those reasonable costs of

¹⁷⁰ Convention on Supplementary Compensation, Article III(1)(a) and (b); Article IV, *supra* note 156

¹⁷¹ Convention on Supplementary Compensation, Article IV(1)(b) *supra* note 156

¹⁷² Convention on Supplementary Compensation, Article I(f); Article II(2) *ibid*, Vienna Convention as amended, Article I(k) *supra* note 154

reinstatement of the impaired environment as well as preventative measures taken to prevent or minimize damage will be compensated

The overall effect of the revisions in the latter instruments are that the burden of compensation is spread and distributed in a more realistic way so as to actually minimize the physical effect of environmental damage.

4.2.2 Oil Pollution

The liability regime for oil pollution was based on the earlier nuclear liability conventions as discussed above. Both share many of the same features but the substantial difference is that states have no liability obligations under the liability regime for damage caused by oil pollution. During negotiations for the establishment of the regime it was stressed that states should not be held liable for risks created by a private industry for its own economic interest.¹⁷³ If an industry is sufficiently profitable, as with the oil industry, and the insurance capacity is such that it can bear the risk, then there should be no need for the state to also share in the burden. As such the distinctive factor in this international liability regime is that it is catered for exclusively by the industry itself.

The original conventions for the liability regime concerning oil pollution have been modified and improved such that the regime of liability for damage caused by maritime transport of oil is said to constitute a model for modern environmental liability agreements.¹⁷⁴ There are two principal conventions, namely the 1969 International Convention on Civil Liability for Oil Pollution

¹⁷³ T. Gehring & M. Jachtenfuchs, *supra* note 164

¹⁷⁴ *Ibid*

Damage¹⁷⁵ and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage.¹⁷⁶ These Conventions made up what can be referred to the “old regime” as 2 protocols¹⁷⁷ amending the Conventions were adopted in 1992, which substantially altered the regime. These new Conventions will be discussed and are referred to as the 1992 Civil Liability Convention and 1992 Fund Convention.¹⁷⁸

The Conventions cover compensation of oil pollution damage in the territory, territorial sea and exclusive economic zone or within 200 miles of a contracting state.¹⁷⁹ It has been contended¹⁸⁰ that there is no inherent reason why damage to the high seas could not be compensated for under liability schemes, but the question is whether it would be the best way to deal with the problem this perhaps in part is due to the problems inherent with compensating for damage that does not affect a territory as there is no measurable loss. At best the discharge of oil at the high sea is generally regulated by conventions including the 1969 International Convention Relating to

¹⁷⁵ International Convention on Civil Liability for Oil Pollution Damage , 29 November 1969, 973 UNTS 3 [hereinafter *Civil Liability Convention*]

¹⁷⁶ International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 18 December 1971, 1110 UNTS 57 [hereinafter *Fund Convention*]

¹⁷⁷ Protocol to Amend the International Convention on Civil Liability for Oil Pollution Damage 27 November 1992, Protocol to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 27 November 1992.

¹⁷⁸ For the amended Conventions see, International Oil Compensation Fund Publication, Liability and Compensation for Oil Pollution Damage, Text of the 1992 Conventions and the Supplementary Fund Protocol, 2005 edition. Online: iopcfund<<http://www.iopcfund.org/npdf/Conventions%20English.pdf>>

¹⁷⁹ Under Article 2 of the old Civil Liability Convention the exclusive economic zone was not included. Article 3 of the 1992 Convention widened the scope to cover pollution damage caused in the exclusive economic zone (EEZ) or equivalent area of a State Party

¹⁸⁰ Patricia Birnie and Alan Boyle *supra* note 19 at 385

Intervention on the High Seas in Cases of Oil Pollution Casualties and the Law of the Sea Convention of 1982.¹⁸¹

The regime channels strict liability to the owner of the ship from which the polluting oil escaped or was discharged and specifies that insurance or other financial security must be carried out for this purpose.¹⁸² Liability under the 1992 Civil Liability Convention may be limited according to a formula related to the ships carrying capacity.¹⁸³ That notwithstanding, the ship owner shall not be entitled to avail himself of the limitation if it is proved that the pollution damage resulted from the ship owners personal act or omission, committed with the intent to cause such damage, or recklessly and with knowledge that such damage would probably result.¹⁸⁴ This means that the extent of the ship owners' liability differs depending on who is at fault. If the owner is at fault then his liability is unlimited, if he is not at fault then he is liable only up to a certain limit. In a strict liability regime, it is only fair that the benefits that accrue from the limitations are available only to those defendants who are "innocent" parties so as to encourage responsible behaviour. The benefit of the limitation is that they are able to ascertain the full extent of their liability and for the most serious cases where compensation claims are very large; their liability does not surpass the set limit despite the size of the claim.

If the damage surpasses that which can be covered by the owners' liability, then by virtue of the 1992 International Fund Convention, the International Oil Pollution Compensation Fund (IOPC Fund) is liable to compensate for any damage above the owners liability. Unlike under the old regime, recourse can not be had to the fund to relieve any portion of the ship owner's liability if

¹⁸¹ As stated in I. Brownlie, *supra* note 143 at 240

¹⁸² *Civil Liability Convention*, Article VII (1), *supra* note 178

¹⁸³ *Civil Liability Convention*, Article V, *ibid*

¹⁸⁴ *Civil Liability Convention*, Article V(2), *ibid*

the total damage does not exceed the ship owner's liability. The ship owners must bear the costs of any damage to the full limit of their liability before the funds resources can be utilized.¹⁸⁵ The effect is that costs are more equitably spread as the owners now have a greater responsibility to ensure that they fully meet their liability requirements.

The IOCP Fund is financed by contributions levied on any person who in one year has received into tankage or storage more than 150 000 tonnes of crude oil and heavy fuel oil in a state party to the 1992 Fund convention.¹⁸⁶ As such, it follows that those who receive such large amounts of oil are most likely to be oil companies and though the ship-owners are held primarily responsible, these cargo owners, who gain substantial profits from the transport of oil, alongside the ship-owners who transport the oil, are in the serious cases, jointly treated as polluters.¹⁸⁷ The effect of this is that all liability costs are directed to the principal pollutants who share equitably the cost of accidental pollution as promulgated by the polluter pays principle.

There is no explicit reference to environmental damage in the 1992 Civil Liability Convention, however pollution damage is defined therein¹⁸⁸ and is interpreted by the IOPC fund in a way as to cater for the environmental damage that ensues from oil spills. The Convention makes mention indirectly that compensation for damage to the environment is recoverable but this is limited to the extent of reasonable measures of reinstatement actually undertaken or to be

¹⁸⁵ The 1992 protocols abolished the right to relieve a portion of the ship owners liability under Article V of the 1971 Fund Convention, *supra* note 176

¹⁸⁶ *Fund Convention*, Article 10, *ibid*

¹⁸⁷ Patricia Birnie & Alan Boyle, *supra* note 19 at 386

¹⁸⁸ *Civil Liability Convention*, Article I(a)- pollution damage is defined as "loss or damage caused outside the ship carrying oil by contamination resulting from the escape or discharge of oil from the ship, wherever such escape or discharge may occur, and includes the costs of preventive measures and further loss or damage caused by preventive measures" *supra* note 178

undertaken.¹⁸⁹ In essence there must be an interpretation of what amounts to reasonable measures before an award can be given. Though this takes place after the damage has occurred and after those measures have already been taken, the reasonability test certainly means that not all types of environmental damage can be compensated for under the regime.

As far as compensation claims, the Fund covers costs incurred in clean up operations at sea and on the beach, preventative measures to minimize environmental damage, additional costs and a proportion of the fixed costs incurred by the public authorities in maintaining a pollution response capability. These costs are so great that they may even surpass the amounts stipulated by the liability limits. Concerted efforts have been made to ensure greater compensation for damage. The introduction of the 1992 protocols raised the limits of the ship owner's liability as well as that of the Funds compensation for damage. Further resolutions adopted in 2000 raised the original compensation limits by over 50% compared to the limits set in the 1992 Protocols. Further still, under a protocol adopted in 2003¹⁹⁰ another tier of compensation was established by means of another International Oil Pollution Compensation Supplementary Fund to provide additional compensation for pollution damage in states that are parties to the protocol. As a result, the total amount available for compensation for each incident for pollution damage in the states which become members of the Supplementary Fund is seven hundred and fifty million SDR¹⁹¹ as well as what is already available under the Liability and Fund Conventions. This is a

¹⁸⁹ *Civil Liability Convention*, Article I (6)(a) *ibid*

¹⁹⁰ Protocol of 2003 to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 3 March 2005 see, International Oil Compensation Fund Publication, Liability and Compensation for Oil Pollution Damage, Text of the 1992 Conventions and the Supplementary Fund Protocol, 2005 edition. Online: iopcfund<<http://www.iopcfund.org/npdf/Conventions%20English.pdf>>

¹⁹¹ *Ibid*, Article 4(2)(a)

substantial increase which should go further in compensating states for damage and enabling them to minimize the effects of the polluting activity on the environment.

4.3 Liability Regime for Activities in Outer Space – Similarities and Points of Departure

Issues relating to the use of this area were discussed in a political forum: the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), whereas the forums for negotiation for the nuclear and oil regimes were held in a non political technical arena under the auspices of the IAEA/OECD and IMO, respectively. That distinction is evident from the focus of the outer space liability regime which was developed with the principal notion of facilitation and promotion of peaceful exploration rather than on how to economically apportion liability.

The principal instrument governing the legal regime for outer space activity is the *Outer Space Treaty*.¹⁹² As earlier mentioned, the foundational principles contained therein provide that the exploration and use of outer space shall be carried out for and in the interests of all countries irrespective of their degree of scientific or economical development.¹⁹³ That is outer space is an area free for use to all without discrimination. This freedom is not unlimited, outer space is only to be used for peaceful purposes and all benefits accrued from its use must be for the benefit of mankind. As such pollution and any type of environmental damage which limits the use and potential of the outer space environment cannot be condoned. The Treaty obliges states to supervise and control all space activities starting from their territory and renders them liable for damage resulting from these activities.¹⁹⁴ By this provision, a foundation was laid for general principle of tortious liability on the

¹⁹² Citation at note 45

¹⁹³ *Outer Space Treaty*, Article 1, *ibid*

¹⁹⁴ *Outer Space Treaty*, Article VI and VII *ibid*

part of the state. Elaborating on this fundamental provision was the *Liability Convention*,¹⁹⁵ established in 1972, which set out the basis for liability as well as the grounds and conditions for it.

The most distinguishing factor of the liability regimes for oil pollution and nuclear power which differ fundamentally from the space liability regime is that the Conventions governing the former are based on strict civil liability whereas The outer space *Liability Convention* focuses on exclusive state liability. Under this principle, the state is liable for damage caused whether it's a governmental or a private non governmental entity undertaking the activity. Reparation for damage to private victims can only take place if the victim convinces their government to pursue a claim on their behalf. The effect of this is that the issue of liability is determined exclusively by states unlike with the other regimes. The private entity polluters are not liable under the *Liability Convention* for any damage that their activity causes and individual victims have no independent redress from the liable party, all private individuals whether claimants or defendants, remain outside the regime.

But who exactly are the liable parties? Under the regimes for nuclear power generation and oil pollution, the operator of a nuclear installation and the ship owner are held liable for environmental damage caused by their activities. The liable party under the space *Liability Convention* is not the operator or owner of a space object but the Launching State. This is a state which launches or procures the launching of a space object or a state from whose territory or facility a space object is launched.¹⁹⁶ By this more than one state can be termed the Launching State and as such each state is jointly and severally liable. The effect of this is that the victim can pick any of the states termed Launching State to make his claim against and in turn the state which pays compensation can claim

¹⁹⁵ Citation at note 18

¹⁹⁶ *Liability Convention*, Article I (c), *ibid*

indemnification from the other participants in the launching.¹⁹⁷ Just like with the other regimes it facilitates the claiming process for the victim.

The liability of the state is both absolute and fault based depending on where the damage takes place. The Launching State is absolutely liable for damage that occurs on the surface of the earth or to aircraft in flight.¹⁹⁸ In the event of damage caused elsewhere than on the surface of the earth liability is based on fault.¹⁹⁹ This is a clear difference from the other regimes which are consistent with respect to the basis for liability. Fault is not a criterion as liability results exclusively from the risk. Though with oil pollution liability regime fault determines whether the owners' liability will be limited or unlimited,²⁰⁰ but it does not preclude absolute liability. Absolute liability under the *Liability Convention* is for damage on the surface of the Earth caused by a space object. A space object is defined, rather ambiguously as "including component parts of a space object as well as its launch vehicle and parts thereof."²⁰¹ The addition of fault for damage caused elsewhere other than the surface of the earth is with respect to damage caused to a space object or to persons or property on board a space object. What this means is that if we impute damage to include environmental damage, it is only damage caused by a space object on the surface of the Earth that is covered and not damage that occurs in outer space or anywhere else because damage elsewhere than the surface of the Earth is only applicable to a damaged space object or person or property on board and nothing else. Article 4 broadens the scope of this if damage occurs to a 3rd state in the event of damage in

¹⁹⁷ *Liability Convention*, Article V(2), *ibid*

¹⁹⁸ *Liability Convention*, Article II, *ibid*

¹⁹⁹ *Liability Convention*, Article III, *ibid*

²⁰⁰ *Civil Liability Convention*, Article V (2) - the owner is not entitled to limit his liability if it is proved that the damage resulted from his own act/omission with intent or recklessly or with knowledge that the damage would occur *supra* note 178

²⁰¹ *Liability Convention*, Article I(d) *supra* note 18

outer space (or elsewhere than on the Earths' surface), the two states causing the damage will be jointly liable and in such circumstance environmental damage may be covered but this would be dependent on the claimant State being able to show actual damage to itself specifically.

Exoneration from liability is permitted to the extent that, anywhere other than the surface of the Earth, the Claimant State (or its nationals) contributed to the damage by gross negligence or an intentional act or omission subject to the provision that no exoneration be granted where damage results from activities not in conformity with international law.²⁰² With respect to nuclear liability, the nuclear convention allows the operator a right of recourse against those who cause nuclear damage intentionally²⁰³ and with respect to liability for oil pollution, there is no liability where loss was wholly caused intentionally by a 3rd party or by the negligence of those responsible for navigational aids.²⁰⁴ What we see here is that all the regimes maintain a strict liability system which exonerates or reduces liability if there was an intentional contribution to damage from another party. The outer space regime is the strictest because liability is only exonerated if the contributory is the claimant unlike the other regimes where it may be a 3rd party. There is no exoneration for damage that occurs on the surface of the Earth - not even for the basic force majeure events such as war, hostilities, insurrection and natural phenomenon as in the other regimes.

The liability of the owner/operator in the oil and nuclear regime is limited to an amount according to the tonnage of the ship or to the set minimum limits as prescribed in the nuclear conventions. The cost of damage is met by the supplementation of compensation funds contributed to by the oil industry

²⁰² *Liability Convention*, Article VI (1) and (2) *supra* note 18

²⁰³ *Vienna Convention*, Article V *supra* note 154

²⁰⁴ *Civil Liability Convention*, Article III(2) *supra* note 178

or the installation states and other contracting states to the nuclear conventions. Liability for damage in the space regime on the other hand is unlimited and is such that full repatriation of damage is assured irrespective of its amount. From the foregoing it seems that one of the principal reasons for limiting liability in environmental liability regimes is so that adequate insurance can be obtained and protection of the industry is ensured, but the problem with set limits is that with even with additional compensation payable under external funds, full compensation for the largest accidents, particularly environmental damage, may not always be guaranteed. For example if a ship owner is financially incapable of meeting his obligations, the fund is available to provide extra security²⁰⁵ but the fund itself is also limited and there are certain situations where the fund is also exonerated from liability such as when the source of oil from a spill is unidentified.²⁰⁶

The effect of this is that the victim may in some situations not be compensated. This cannot be the case under space liability regime, at least with respect to damage on the surface of the Earth, because the Launching State is liable for the full extent of the damage. As such it has been asserted²⁰⁷ that this principle of full compensation is one of the greatest merits of the *Liability Convention*. The lack of a specified minimum limit, one could say, could lead to insufficient compensation from the liable state particularly if one bears in mind the expensive costs involved in restoration of the environment in the event of environmental damage. Diederiks²⁰⁸ was of the opinion that the lack of state guarantee of compensation as well as no set limitation of liability is a

²⁰⁵ *Fund Convention*, Article IV(1)b, *supra* note 176

²⁰⁶ *Fund Convention*, Article IV(2) and (3), *ibid*

²⁰⁷ Aldo Armando Cocca, The Principle of “Full Compensation” in the Convention on Liability for Damage Caused by Objects Launched into Outer Space, Proceedings of the 15th Colloquium on the Law of Outer Space, Austria, 1972

²⁰⁸ I.H. Ph. Diederiks- Verschoor, The Convention on International Liability Caused by Space Objects, Proceedings of Fifteenth Colloquium on the Law of Outer Space, Austria, 1972

regrettable feature of the convention. The safeguard is in the fact that compensation shall be determined in accordance with international law, the principles of justice and equity in order to restore the person to the condition which would have existed if the damage had not occurred.²⁰⁹ That would mean that the amount of compensation would have to be such that would restore the environment back to the condition it was pre-damage.

The provisions under the Convention are not applicable to nationals of the Launching State or foreign national participants.²¹⁰ Also states that are not parties to the *Liability Convention* cannot rely on any of its provisions in the event of damage. This differs from the nuclear regimes where accesses to the benefits are slightly wider and greater participation is encouraged. For example, the Convention on Supplementary Compensation for Nuclear Damage is applicable whether or not states are parties to the nuclear conventions so long as the law of the states complies with the provisions of the Annex to the Convention.²¹¹ This basically means that so long as the general laws of the land pertaining to nuclear liability follow the basic principles of the regime, parties can still benefit from the provisions therein. The rationale behind limiting access to regimes to member states alone is obvious. Those who stand to gain and benefit from membership should also be bound and adhere to the same rules and restrictions. In a scenario where states are so unevenly balanced due to the difference of capabilities, it may not be possible or indeed equitable for all States to be bound under the same conditions, hence principle 7 of the Rio Convention,²¹² which refers to states

²⁰⁹ *Liability Convention*, Article XII *supra* note 18

²¹⁰ *Liability Convention*, Article VII *supra* note 18

²¹¹ Convention on Supplementary Compensation, Article II, *supra* note 156

²¹² “States shall co-operate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of

as having common but differentiated responsibilities. This principle is evident in the nuclear regime as contributions to the compensation fund are calculated based on the UN rate of assessment for all the contracting states and those states on the minimum UN rate of assessment are not required to contribute at all. The outer space regime, on the other hand, which as it stands is based on the notion of equality and co-operation between states despite the degree of economic development, makes no provision for differentiated responsibility as far as liability for damage is concerned.

The procedural provisions set out where, when and how compensation for damage can be claimed. Bearing in mind that the Convention was agreed upon on the belief that the establishment of the Convention would contribute to strengthening international cooperation, the claims procedure is very unrestricted and its interpretation is reliant on the basis of that perceived mutual cooperation. Claims for oil pollution damage can be brought in the courts of the state party where the damage occurs,²¹³ likewise exclusive jurisdiction over a nuclear incident lies with the court of the member country where the incident occurs.²¹⁴ Both regimes specify that principally it is the place where the damage occurs that claims shall be brought. The outer space *Liability Convention* does not state in these terms where claims will be brought instead it states that claims shall be presented to a Launching State through diplomatic channels.²¹⁵ It is clear that nothing prevents pursuance of a claim in the Launching State so long as the claim is not also presented under the Convention for the same damage.²¹⁶ But, there is no generally specified jurisdiction because parties are encouraged to

sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.” Principle 7, Rio Declaration on Environment and Development 1992 A/CONF.151/26 (Vol. I)

²¹³ *Civil Liability Convention*, Article IX, *supra* note 178

²¹⁴ *Vienna Convention* as amended, Article XI *supra* note 154

²¹⁵ *Liability Convention*, Article IX, *supra* note 18

²¹⁶ *Liability Convention*, Article XI(2) *supra* note 18

settle diplomatically, either through their consular, ambassadorial or foreign offices. Alternative dispute resolutions are favored over the adversarial nature of court actions. The aim is to encourage expeditious resolution of claims and to maintain international relations. The difficulty with this is that there is no structure to the informal negotiations.

Despite that, agreement was reached between Canada and the USSR in the Cosmos 954 claim in this manner. Both parties were involved in informal negotiations and mutually agreed on how much compensation should be paid. Though Canada's full costs were fourteen million dollars, they claimed only six million dollars and settled for three million dollars.²¹⁷ It seems then that whether this figure would restore the environment back to its original position was not the determining factor but rather the compensation amount was based on a negotiation whereby various equitable factors were taken into account. This goes against the notion that full restorative compensation can be guaranteed, it all depends on the individual circumstances of the case. If this type of dispute resolution mechanism should fail there is provision for the establishment of a claims commission, comprised of a member appointed by both parties respectively and a mutually appointed Chairman.²¹⁸ The Commissions' decision is binding upon agreement of the parties.²¹⁹

Claims for compensation are made subject to a 1year period following the date of the occurrence of the damage.²²⁰ This is qualified by allowing for the presentation of claims where harm was

²¹⁷ Patricia Birnie & Alan Boyle, *supra* note 19 at 193

²¹⁸ *Liability Convention*, Article XV *supra* note 18

²¹⁹ *Liability Convention*, Article XIX(2), *ibid*; For an analysis of the merits and demerits of the procedural provisions see Morris Forkosh, *supra* note 21 at 87-94

²²⁰ *Liability Convention*, Article X (1) *supra* note 18

discovered at a later point in time.²²¹ Under the oil pollution damage regime, claims are to be made within three years from the date the damage occurred²²² but the earlier nuclear convention provided for a time limit of ten years from the date of the incident²²³. States have generally increased this limit due to the fact that the nature of nuclear radiation is such that its effects may not be known immediately. As a result of this the 1997 Vienna revision extended the limitation to thirty years but that is only in respect of loss of life and personal injury and not to other types of damage such as environmental damage.²²⁴ For other types of damage the limit remains ten years.

The outer space regime allows for claims to be brought up to one year after the full extent of the damage is known regardless of when the damage took place.²²⁵ Greater flexibility is maintained in the regime because claims can still be brought even if the damaging incident occurred several years before. This however is dependent on the determination that the state learned of the facts of the incident within a reasonable time, through the exercise of due diligence.²²⁶

221 *Liability Convention*, Article X (2) and (3), *supra* note 18

222 *Civil Liability Convention*, Article VIII, *supra* note 178

223 *Vienna Convention*, Article VI, *supra* note 154

224 *Vienna Convention as amended*, Article VI, *supra* note 154

225 *Liability Convention*, Article X(2) and (3), *supra* note 18

226 *Liability Convention*, Article X(2), *ibid*

Chapter 5: Conclusion

Legally, a definition of damage that acknowledges the importance of maintaining the environment and holds parties liable for its adverse modification will go further in ensuring that space users are conscious of the need to keep the environment free from further debris by adhering to the technical mitigation standards and practices as they are determined.

It may not be timely going into discussion as to creating new conventions or amending the *Liability Convention* to consider environmental damage caused by activities in space, though it has been proposed that a principles approach similar to that followed for the Principles on the Use of Nuclear Power Sources in Space could be adopted which would cover issues of liability and deal with major problems such as definition of terms. What ever approach is determined to address the issue of protection of the space environment with respect to liability for damage caused by activities in outer space, the system of compensation for damage will be more effective and timely if the rules reflect some of the contemporary trends in international environmental law.

This thesis has identified some broad trends in the development of civil liability regimes.

- Strict liability of owners or operators of hazardous ventures
- Liability limited to a maximum amount
- Potentially liable parties carry insurance coverage
- Establishment of compensations funds for damage in excess of the agreement's liability limit.

These trends would seem to suggest slow but steady progress towards acceptance of environmental liability as an important international policy tool. However, according to Brunee whether or not the environmental liability approach makes sense in the circumstances remains uncertain for a variety of reasons. Notably that the broad trends mask the vast array of unresolved issues:

1. there is no sufficient uniformity to draw general conclusions on civil liability regimes
2. shaky pattern of support for international liability regimes
3. whether liability regimes, assuming their entry into force, could actually meet the high expectations that their proponents have of them.

Based on international and domestic experience, it seems unlikely that liability regimes will play a significant role as a tool for environmental protection. In the right circumstances, they may facilitate compensation of pollution-related damage, including restoration or clean-up costs. Brunee says, it does not follow that even the goals of loss allocation and compensation are always best served through the negotiation of a liability regimes. While it might not be a complete answer it is a step in the right direction and the defects would need to be addressed if an environmental liability regime is to be developed for outer space.

One of the fundamental principles of environmental law as earlier mentioned is the notion that it is the polluter that should bear the expense of carrying out measures to ensure that the environment is in an acceptable state. As reflected in principle 16 of the Rio Convention, the idea is that the economic costs of pollution control, clean up as well as protection measures should be geared towards the pollutants themselves. By allowing direct recourse against the specific enterprise causing damage (which is not only the space craft operator but would include the party organizing managing or exercising control over the space activity), then the liability regime will

be more in line with current international environmental law. Strict and unlimited liability for damage is the best approximation of the principle,²²⁷ a standard already available under the outer space liability regime, but as it stands rather than making the entity fully liable, particularly if one bears in mind the new emergence of private entities and developing nations, an equitable system of loss distribution between space users would be preferable. One can see from environmental treaties that this notion of polluter pays is not a rigid rule of universal application and its means of implementation vary. It may not be feasible for the industry to bear the burden of liability alone; hence the terminology used in the principle itself is not in mandatory terms.

The establishment of a compensation fund similar to that relating to oil pollution damage is increasingly used as an effective mechanism to satisfy liability.²²⁸ This idea should be developed for damage caused by space activities. The fund should be contributed to by all space faring states based on the capacity of the state and their level of space activity as in the nuclear liability regime. If prevention is the focus then contributions to the fund should be also made by all factions of the industry particularly if one considers that the elimination of space debris calls for input from the designers, manufactures, operators as well as service providers. The likely hood of third parties agreeing to be made liable or to contribute to a fund may not prove popular, as was the case during the development of the nuclear industry but as we can see from the oil pollution regime treating multiple parties as joint polluters or at least having contributions coming from a greater range of sources seems a necessary consideration to ensure that liability is

227 Patricia Birnie & Alan Boyle *supra* note 19.

228 As evidenced by the World Heritage Fund, United Nations Environmental Programme Trust Funds for the Marine Environment,, Antarctic Minerals Regime and World Atmosphere Fund

distributed broadly and widely and that the focus point, which is that damage to the environment is compensated remains the priority.

These lessons learned from Environmental liability regimes can serve the development of evolving regimes towards ensuring the long term sustainability of space activities through preservation of the outer space environment.

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