

# Towards a New Regime for the Protection of Outer Space as the “Province of All Mankind”

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## I. INTRODUCTION

The notion of states sharing a common interest in the exploration and use of outer space has led the international community to declare outer space to be the "province of all mankind."<sup>1</sup> There is a preponderance of literature largely preoccupied with the freedom of exploration and use of outer space<sup>2</sup> and comparatively little on the need to protect it from environmental damage.<sup>3</sup> The concept of outer space as the "province of all mankind" is not confined merely to the prohibition on national appropriation of resources in outer space or the sharing of benefits derived from exploitation of the space environment. Despite criticisms of its amorphous and ideologically abstract nature, the "province of all mankind" has the potential to acquire a legal prescription within a new regime that requires states to conserve and preserve the outer-space environment for all of humanity—for present and future generations. However, this will not be achieved by resorting to hard law, like conventional rules, customary norms, or principles of *jus cogens*. On the contrary, the solution may be found in a softer but more sophisticated regime formation and elaboration process with a clear goal of environmental orientation.

Just as we are beginning to view human interaction with the atmosphere, oceans, and other biological species as an integrated ecosystem, this same environmental paradigm should be extended to outer space to encompass a holistic stellar-ecosystem. In order to fully comprehend the magnitude of the problem of space pollution, Part II will highlight and discuss the current issues regarding pollution of the space environment—particularly in relation to the use of nuclear power sources and the proliferation of space debris. The growing concern regarding the risks caused by nuclear power sources and space debris, for space activities and for the outer-space environment, has led the International Law Association (ILA) to produce a draft instrument on the protection of the outer-space environment from damage caused by space debris.<sup>4</sup> At the same time, the United Nations Committee on the Peaceful Uses

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1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, art. 1, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter *Outer Space Treaty*].

2. See, e.g., Bin Cheng, *The 1967 Space Treaty*, 95 JOURNAL DU DROIT INTERNATIONAL [J. DROIT INT'L] 532 (1968); Stephen Gorove, *Property Rights in Outer Space: Focus on the Proposed Moon Treaty*, 2 J. SPACE L. 27 (1974); He Qizhi, *Certain Legal Aspects of Commercialization of Space Activities*, 15 ANNALS AIR & SPACE L. 333 (1990); Vladimir Kopal, *The Question of Defining Outer Space*, 8 J. SPACE L. 154 (1980); H.A. Wassenbergh, *Speculations on the Law Governing Space Resources*, 5 ANNALS AIR & SPACE L. 611 (1980).

3. Academic writings from the 1970s to the late 1980s were primarily concerned with geopolitical issues that had implications on the commercial usage of outer space. In the last decade, an increasing number of writings on the law of outer space have directly addressed the problems of space pollution. See, e.g., Albert Gore, Jr., *Outer Space, the Global Environment, and International Law: Into the Next Century*, 57 TENN. L. REV. 329 (1990); Nicolas Mateesco Matte, *Environmental Implications and Responsibilities in the Use of Outer Space*, 14 ANNALS AIR & SPACE L. 419 (1989); D.E. Reibel, *Environmental Regulation of Space Activity: The Case of Orbital Debris*, 10 STAN. ENVTL. L.J. 97 (1991).

4. See Buenos Aires International Instrument on the Protection of the Environment from

of Outer Space (COPUOS) has commenced formal discussions on the steps that should be taken to address the problem of pollution in outer space.<sup>5</sup> The ominous threat of space pollution to manned and unmanned space activities cannot be ignored. It is only with a knowledge of these space environmental issues that we can better appreciate the inadequacies of the present treaties in protecting the space environment. Part III will introduce the existing space treaties framework and provide an outline of the relevant principles governing the conduct of space activities. While the Legal Subcommittee of COPUOS has been assigned to review the five international legal instruments governing outer space,<sup>6</sup> it appears that there are no immediate plans to consider a new regime of the kind proposed here.

Article I of the Outer Space Treaty declares outer space to be the "province of all mankind" without endowing that phrase with a precise definition,<sup>7</sup> while article III requires that states conduct their space programs "in accordance with international law."<sup>8</sup> Part IV will advance the proposition that the concept of the "province of all mankind" limits the freedom of exploration and use of outer space, drawing support from the notions of common interest and *res communis*. Part V will analyze whether, and how, this freedom is qualified by established principles of international law, and will conclude that neither the present space treaties framework nor customary international law can effectively cope with the emerging problem of pollution of the outer-space environment in the form of nuclear power sources and space debris. Furthermore, the "province of all mankind" is at present incapable of qualifying for the status of a peremptory norm. In any event, compliance cannot be secured overnight. A new regime will only emerge after decades of information-building, clarification, elaboration, refinement, and

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Damage Caused by Space Debris, reprinted in 23 J. SPACE L. 113 (1995) [hereinafter Buenos Aires International Instrument]; see also Maureen Williams, *The ILA Finalizes Its International Instrument on Space Debris in Buenos Aires, August 1994*, 23 J. SPACE L. 47 (1995) (providing historical background from the report by the Rapporteur of the ILA Space Law Committee).

5. The papers presented at the 15th Scientific-Legal Roundtable of COPUOS on Oct. 23, 1993 generated much concern regarding the problems posed by space debris. See Katherine Gorove, *Space Debris Issues*, 21 J. SPACE L. 178 (1993). The issue of space debris was placed on the agenda of the Scientific and Technical Subcommittee of COPUOS for the first time at the 31st Annual Session of the Scientific and Technical Subcommittee of COPUOS, held from February 21 to March 3, 1994. The Subcommittee also continued its consideration of the use of nuclear power sources in outer space and resolved to continue discussing the issue the following year. On space debris, "the Subcommittee agreed that it should develop a continuing, deliberate, and specific multi-year plan for its work on this agenda item." Matthew Sanidas, *The 1994 Session of the Scientific and Technical Subcommittee of UNCOPUOS Takes Place in a Constructive Atmosphere—Space Debris Issue for the First Time on Its Agenda*, 22 J. SPACE L. 115, 119 (1994). Although the Legal Subcommittee of COPUOS has yet to place these issues on its agenda, immediately before the opening of the 34th session of the Legal Subcommittee on March 27, 1995, a symposium was organized by the International Institute of Space Law (IISL) and the Institute of Air and Space Law (IASL), at which the dangers of radioactive and debris pollution were highlighted. Members of the Legal Subcommittee were also in attendance.

6. *Report of the Legal Subcommittee on the Work of Its Thirty-Eighth Session*, U.N. GAOR, COPUOS, paras. 42–55, U.N. Doc. A/AC.105/721 (1999).

7. See Outer Space Treaty, *supra* note 1, art. I, 18 U.S.T. at 2410, 610 U.N.T.S. at 205.

8. *Id.* art. III, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

international cooperation. An essential first step is to make the notions of sustainable development and intergenerational responsibility applicable to the outer-space environment, and to clarify the meaning of the "province of all mankind" in order to provide a new language for dialogue within a regime-building framework.

Finally, Part VI will address the contribution of soft law to international environmental law-making and the attraction of a regime-building approach to treaty-making, which was adopted by the drafters of the Ozone Layer Convention.<sup>9</sup> Reference will also be made to the protective regime set up under the United Nations Convention on the Law of the Sea (UNCLOS)<sup>10</sup> and the Antarctic Treaty<sup>11</sup> in order to draw some guidance for the formulation of working principles for the proposed Framework Convention on the Protection of the Outer Space Environment and the establishment of an international agency on outer-space activities that has the capability to coordinate the activities of epistemic communities.

The conclusion will demonstrate that, while the precise definition of the "province of all mankind" may be unclear, the very nature of the outer-space environment demands special recognition by the international community as a whole—that it must be transmitted in a substantially unimpaired state to future generations. The common interest of states and the freedom of exploration and use of outer space will be jeopardized unless the international community takes immediate steps to protect the space environment from pollution. In balancing delicate political and economic interests, the protection of the outer-space environment from pollution would best be achieved by the adoption of a Framework Convention on the Protection of the Space Environment and the establishment of an International Space Agency. This Article does not attempt to suggest that it has the regime blueprint for success; its aspiration is to provide a springboard for discourse and action by legal scholars, practitioners, and policy-makers on the colonization of outer space in the new millennium.

## II. UNDERSTANDING POLLUTION IN THE OUTER-SPACE ENVIRONMENT

The issues of pollution in outer space are more complex than environmental pollution on Earth, and may appear to many as far-fetched or too insignificant to merit the attention of international lawyers and jurists. This Article argues that space pollution is a problem that deserves closer scrutiny, both under the classical international law approach (focusing on sources and hard-law obligations), as well as under a soft-law regime (focusing on the role of institutions, non-governmental organizations, and the

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9. Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, S. TREATY DOC. No. 9 (1985), 26 I.L.M. 1516 (1987) (entered into force Sept. 22, 1988) [hereinafter Ozone Layer Convention].

10. *Opened for signature* Dec. 10, 1982, U.N. Doc. A/CONF 62/122, 21 I.L.M. 1261 (1982) (entered into force Nov. 16, 1994) [hereinafter UNCLOS].

11. Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71 (entered into force June 23, 1961).

active management of compliance). But first, we need a better understanding of the *sui generis* character of pollution in the outer-space environment.

#### A. *Nuclear Power Sources*

The use of nuclear power sources (NPS) in outer space is aimed at providing electric power for spacecraft sub-systems such as altitude control, communications, and command, as well as for the operations of various equipment on board. There are two types of NPS presently in use in outer space. The first is the isotopic source in which energy is obtained from the decay of a radioactive isotope like plutonium-238. The second is the nuclear reactor, which derives its thermal energy from a controlled fission process. The advantages of NPS over other non-nuclear sources of power, such as long life, compactibility, and the ability to operate independently of solar radiation, seem to entrench its position as a preferred technical choice for space missions. The escalating use of nuclear energy to power an increasingly wide variety of spacecraft is perhaps inevitable, and the trend continues unabated.<sup>12</sup> However, the hazards associated with the increasing utilization of NPS have raised widespread concern in the international community.

The interconnectedness of the Earth's environment and outer space means that any damage or harm to the space environment is likely to have a spillover effect on Earth.<sup>13</sup> This is evidenced by the Cosmos-954 incident in 1978, where a nuclear-powered satellite disintegrated upon re-entry, scattering a significant amount of highly radioactive debris across Canadian territory. Similarly, in 1983, Cosmos-1402, carrying 45 kilograms of uranium-235,

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12. The remarkable success of the cooperative work by 10 astronauts and cosmonauts of the U.S. Atlantic mission and the Russian space station Mir is to be applauded, as it foreshadows a truly international venture, comprising the United States, Russia, Canada, Japan, and Europe, to build a global space station. There will be Japanese and European science laboratories, a Canadian mechanical arm, and Russian power plants. Begun in 1997, the International Space Station is expected to be completed by the year 2004. Manned and unmanned spacecraft will lift off from Earth at a rate of more than one a month and gather in outer space to assemble modules that have never been fitted together on the ground. See Sharon Begley et al., *The Ultimate Thrill Ride*, NEWSWEEK, Nov. 30, 1998, at 54; see also U.S. NAT'L COMM'N ON SPACE, PIONEERING THE SPACE FRONTIER 95, 100 (1986) ("High-performance nuclear-electric power systems make possible exploration of the outer reaches of the Solar System, and are important for future space ports and Moon bases" and are "critical for some future key missions, such as an outer planetary ring exploration and human settlements on the Moon and Mars, and offer lower cost and higher reliability for others.") Thus, with the hyperbolic acceleration in space activities in the near future, it appears that the environmental hazards posed by the use of the NPS will assume unprecedented significance. In the last two years, the United States alone has suffered at least six major launching failures—three of the payloads have been destroyed, with the other three in useless orbit. See Warren E. Leary, *String of Rocket Mishaps Worries Industry*, N.Y. TIMES, May 12, 1999, at A1.

13. See generally R.I.R. Abeyratne, *The Use of Nuclear Power Sources in Outer Space and Its Effect on Environmental Protection*, 25 J. SPACE L. 17 (1997) (discussing the legal responsibilities of states in relation to space objects, and how international environmental law applies to space exploration); Kopal, *supra* note 2 (reviewing the history of, analyzing, and proposing a solution to the question of how to demarcate the line between airspace and outer space); Stanley B. Rosenfield, *Where Air Space Ends and Outer Space Begins*, 7 J. SPACE L. 137 (1979) (discussing how scholars and treaties attempt to draw the line between airspace and outer space).

malfunctioned and broke into three parts upon re-entry.<sup>14</sup> The hazards to humankind from NPS in outer space will primarily be radiological, arising from radiation exposure through "both direct external radiation and internal radiation from inhalation or ingestion."<sup>15</sup> The freedom of exploration and use of outer space must be "for the benefit and in the interests of all countries."<sup>16</sup> It is in the interest of states that the space environment be free from the radioactive pollution caused by NPS since any radiological contamination of outer space is likely to have an adverse effect on the Earth's environment. The problem is exacerbated by the direct effect the increasing use of NPS has on the accumulation of space debris. Upon the malfunctioning of a nuclear-powered satellite usually stationed in the geostationary orbit, not only do the component parts contribute to the space debris, but the radioactive materials pose an additional hazard to human life, in particular to manned space stations.

In view of such possible dangers, the Scientific and Technical Sub-Committee of COPUOS has discussed the possibility of establishing international standards and safety regulations governing the use of NPS in the outer-space environment.<sup>17</sup> The efforts of this Committee are paralleled by studies of legal implications by the Legal Sub-Committee of COPUOS.<sup>18</sup> After repeated discussions and informal consultations, the Legal Sub-Committee has developed a proposal containing seven draft principles on the use of NPS in outer space.<sup>19</sup> Unfortunately, the consensual approach adopted by COPUOS fails to address the problems in a satisfactory and expedient manner; after almost two decades, many issues still remain unresolved.<sup>20</sup>

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14. See Abeyratne, *supra* note 13, at 17; He Qizhi, *Towards a New Legal Regime for the Use of Nuclear Power Sources in Outer Space*, 14 J. SPACE. L. 95, 97 (1986).

15. *Question Relating to the Use of Nuclear Power Sources in Outer Space*, U.N. GAOR, COPUOS, 15th Sess., at 14, U.N. Doc. A/AC.105/220 (1978). Recent studies conducted in the United States at the Long Duration Exposure Facility indicate that there is nuclear pollution in space, at an altitude of about 600 miles, emanating from Russian nuclear power sources. See *Events of Interest*, 23 J. SPACE. L. 43, 97 (1995).

16. Outer Space Treaty, *supra* note 1, art. I, 18 U.S.T. at 2412, 610 U.N.T.S. at 207.

17. See *Summary Record of the 188th Meeting*, U.N. GAOR, COPUOS, 15th Sess., at 6, U.N. Doc. A/AC.105/C.1/SR.188 (1978); *Proposed Terms of Reference for Ad Hoc Working Group of Scientific and Technical Sub-Committee on "Questions Relating to the Uses of Nuclear Power Sources in Outer Space,"* U.N. GAOR, COPUOS, 15th Sess., U.N. Doc. A/AC.105/C.1/L.103 (1978). The Working Group concluded that NPS can safely be used in outer space, provided certain safety requirements are met. See *Proposed Terms of Reference, supra*.

18. See *Use of Nuclear Power in Outer Space*, U.N. GAOR, COPUOS, 15th Sess., U.N. Doc. A/AC.105/C.2/L.115 (1978).

19. See *The Elaboration of Draft Principles Relevant to the Use of Nuclear Power Sources in Outer Space*, U.N. GAOR, COPUOS, 26th Sess., U.N. Doc. A/AC.105/C.2/L.154/Rev.2 (1987) [hereinafter *NPS Principles*]. These Principles include safety criteria necessary to cope with unplanned re-entry into the atmosphere and the obligation to prevent radiological contamination on Earth by placing space objects with NPS on board in a nuclear safe orbit (NSO). See Andrew J. Young, *Legal and Techno-Political Implications of the Use of Nuclear Power Sources in Outer Space*, 12 RUTGERS COMPUTER & TECH. L.J. 305, 319-32 (1986-87) (discussing the political acceptability of the proffered solutions).

20. See HOWARD A. BAKER, *SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS* 107 (1989). The shortcomings of the consensual approach will be discussed in detail in Part V, *infra*.

## B. *Space Debris*

In recent years, man-made space debris<sup>21</sup> or space refuse has been an environmental hazard whose seriousness is a shared concern of many scientists and policy-makers in the international community.<sup>22</sup> The deployment of an ever-increasing number of man-made objects into outer space has created a potential for malfunctioning and decay. It has also resulted in a concomitant rise in the number of defunct, damaged, or abandoned objects, which, together with other debris caused by explosions and collisions, has fast become a threat to space activities. It has been estimated that there are over 7000 trackable man-made objects in space and a substantially larger number of untrackable objects.<sup>23</sup> Most of the trackable objects are located in low-earth-orbit (LEO)<sup>24</sup> with a significant number in geosynchronous orbit (GEO)—an area of intense space activity.<sup>25</sup> The limited empirical data reveal

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21. The ILA has defined space debris to mean “man-made objects in outer space, other than active or otherwise useful satellites, when no change can reasonably be expected in these conditions in the foreseeable future.” Buenos Aires International Instrument, art. 1(c), *supra* note 4, at 113. The International Academy of Astronautics expert group, however, defines space 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.” Ernst Fasan, *Technical and Policy Issues Related to the Use of the Space Environment*, 23 J. SPACE L. 89, 91–92 (1995).

22. See, e.g., Howard A. Baker, *Current Space Debris Policy and Its Implications*, in PROCEEDINGS OF THE THIRTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 59 (1990); Howard A. Baker, *The Sci-Lab Perception: Its Impact on Protection of the Outer Space Environment*, in PROCEEDINGS OF THE THIRTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE 121 (1988); Nicholas L. Johnson, *Hazards of the Artificial Space Environment*, in PROCEEDINGS OF THE THIRTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE, *supra*, at 482. The International Aeronautical Federation recognized in a 1984 study that space debris was a “particularly serious” and “real” problem in the low-earth-orbit (LEO) and that international action was “imperative” in order to resolve the problem. *Implications to International Cooperation of Large-Scale Space Systems*, U.N. GAOR, COPUOS, at 19, U.N. Doc. A/AC.105/349 (1984).

23. See STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW: ISSUES AND POLICIES 156, 164 (1991). This number comprises about 0.2% of the total number of space objects, which is estimated at over 3.5 million. On the sources of space debris, see BAKER, *supra* note 20, at 3–9. Generally, space debris larger than one centimeter can be detected from the ground; smaller debris pieces must be measured in space. The majority of equipment used is ground-based and includes optical sensors, such as the Ground-Based Electro-Optical Deep Space Surveillance system, and a radar sensor, the Perimeter Acquisition and Attack Characterization System. All these instruments are operated by the North American Aerospace Defense Command (NORAD). See *id.* at 27.

24. As one author on the topic noted, “LEO is a spherical shell, bounded below at about 200 km by the Earth’s atmosphere and above at about 4,000 km by the Van Allen belts. . . . Since LEO is the easiest region of outer space to reach from Earth, it offers endless scientific, commercial and public use opportunities, . . . an experimental and manufacturing environment free from Earth’s gravitational and atmospheric effects, and a shelter from the potentially destructive radiation produced by solar winds.” BAKER, *supra* note 20, at 23. The majority of man-made objects residing in LEO are debris, with heavy concentrations at around 1400 km, due to Delta rocket explosions, and at 800 km, possibly as a result of Soviet antisatellite weapons tests. See *id.* at 23–24.

25. The term “geosynchronous” applies to all orbits having a period of rotation corresponding to that of Earth (about 23 hours, 56 minutes). It is a unique natural resource of vital importance for myriad space activities, including communications, meteorology, broadcasting, remote sensing, data relay, and tracking. Presently the entire civil telecommunication satellite industry is located in GEO. The presence of space debris makes GEO an “endless shooting gallery”; active payloads, otherwise known

that objects of sizes between 0.01 and 1 centimeter can cause significant damage upon impact. Objects larger than 1 centimeter can produce catastrophic effects.<sup>26</sup> Present spacecraft systems are particularly vulnerable as they have not been designed with these threats in mind.<sup>27</sup> If the growth in numbers is permitted to continue without adequate measures to safeguard active space objects from damage caused by explosion, collision, or harmful radiation, it could easily result in serious accidents involving the loss of human lives or substantial property damage. Collision and interference are the major risks space debris poses to human life and active payloads. Perhaps the most serious consequence of collisions with space debris is the cascade effect: (1) As the number of space objects in earth-orbit increases, the probability of collisions between them also increases; (2) collisions would produce new orbiting fragments (secondary debris), each of which would heighten the risk of further collisions; (3) collisions and any ensuing cascading would lead to an exponential increase of debris flux and could lead to the formation of a debris belt around the Earth by the end of this century; and (4) the near-earth environment could become so populated with space debris that portions of

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as functioning space objects, are "sitting ducks." David H. Suddeth, *Debris in the Geostationary Orbit Ring: "The Endless Shooting Gallery"—The Necessity for a Disposal Policy*, in *ORBITAL DEBRIS* 349, 356 (Donald J. Kessler & Shin-Yi Su eds., 1985).

26. The number of objects this large is estimated to be about 0.5% of the total trackable debris population. Objects between 0.1 and 1 centimeter account for about 99.3%. See REPORT ON ORBITAL DEBRIS BY INTERAGENCY-GROUP (SPACE) FOR NATIONAL SECURITY COUNCIL 4-5 (1989), cited in GOROVE, *supra* note 23, at 164. The penetration depth, or damage potential, of an impacting object depends on its mass, density, velocity, and shape, and on the material properties of the shield of the spacecraft. If a debris object over one centimeter in diameter struck a manned space station, it could penetrate the pressurized crew module, killing the crew and causing the station to break up. The same object could also disable a satellite in GEO, since the collision would eject from the satellite a mass of 115 times the mass of the impacting debris. See D.M. Wanland, *Hazards to Navigation in Outer Space: Legal Remedies and Salvage Law* 8-9 (research prepared for the NASA-AMES/University Consortium for Astrolaw Research, Hastings College of Law, University of California), cited in BAKER, *supra* note 20, at 127 nn.104 & 106. Approximately 12% of the present catalogued orbital debris population consists of objects discarded during normal satellite deployment and operations. Typical objects in this category include fasteners, yaw and yo-yo weights, nozzle covers, lens caps, and multiple-payload mechanisms. It is normally relatively easy, both technically and economically, to take mitigation measures against these objects. Many space agencies are reported to have taken such action. For example, clamp bands and sensor covers should be retained by parent bodies, and all fragments of explosive bolts should be captured. Other mission-related particles may be generated unintentionally, as in the release of slag (up to several centimeters in diameter) during and after the burn of solid rocket motors. The precise nature of the amount and distribution of these slag ejecta is unclear, and the improvement of solid propellant and motor insulation to minimize the released solids is difficult. Attempts should be made to inhibit the generation of very small debris from the effects of the space environment, for example, atomic oxygen erosion, solar radiation effects, and the bombardment of small meteoroids. The application of more long-lasting paint and protective covering could be an effective short-term remedial measure. See GEORGE T. HACKET, *SPACE DEBRIS AND THE CORPUS IURIS SPATIALIS* 17-52 (1994); G.C.M. REIJNEN & W. DE GRAAFF, *THE POLLUTION OF OUTER SPACE, IN PARTICULAR OF THE GEOSTATIONARY ORBIT* 33-44 (1989); see also Nandasiri Jasentuliyana, *Space Debris and International Law*, 26 J. SPACE L. 139, 146-58 (1998) (describing the recent developments in the study and analysis of space debris issues by the United Nations).

27. See Craig Fishman, *Space Salvage: A Proposed Treaty Amendment to the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Space*, 26 VA. J. INT'L L. 965, 995 (1986).



LEO would be unusable.<sup>28</sup> Moreover the majority of NPS satellites reside in the most densely populated regions of LEO, thereby enhancing the danger of collision with space debris.<sup>29</sup> The impact of a spent NPS fuel core colliding with a space station could cause devastating radioactive contamination in addition to structural damage, because the half-life of uranium-235 is in excess of 700,000 years.

Russia, as successor state to the Soviet Union, has unofficially acknowledged that space debris poses a hazard to the outer-space environment. In a statement eventually omitted from COPUOS, the Soviet representative was of the view that the space debris problem affecting the "space environment must be dealt with immediately, rather than leaving it until late in the day as had happened with the Earth's environment."<sup>30</sup> Ironically, the abandonment in 1999 of Mir, the "rust-stained, rattling, 13-year-old Russian space station,"<sup>31</sup> will only exacerbate this problem. While Mir is scheduled to leave outer space in spring of 2000, no money has been earmarked yet to build the two booster rockets necessary to take a clean-up crew to Mir and deliver a cargo ship that would push the station toward Earth.<sup>32</sup>

Similarly, U.S. Vice President Al Gore has indicated that the problems of orbital debris and radioactive pollution from space-based nuclear reactors merit international concern.<sup>33</sup> Unfortunately, these concerns have not been crystallized into plans for concrete action, but are instead mired in a bureaucracy of committees and symposiums. Since as early as 1987, it has been noted in COPUOS that increased pollution of the outer-space environment resulting from the proliferation of NPS and space debris is creating a global hazard.<sup>34</sup> In COPUOS's Fifteenth Scientific-Legal

28. See BAKER, *supra* note 20, at 13. Dr. Paolo Farinella, in his paper to the Space Law Committee entitled *Runaway Proliferation of Orbital Debris: Security Implications and Possible Cooperative Measures*, also "pointed out that the collisional breakup of orbiting objects can give rise to a sort of a chain reaction, with an increase of the probability of new catastrophic collisions in the near future and a subsequent exponential growth of orbiting fragments." Vladimir Bogomolov, *Prevention of an Arms Race in Outer Space—Developments in the Conference on Disarmament in 1994*, 23 J. SPACE L. 43, 46 (1995).

29. LEO is the easiest region to reach from Earth and it offers limitless scientific, military, and commercial opportunities. However, most man-made objects residing there are debris. If cascading begins, LEO will be plagued by a continually increasing amount of space debris rendering collisions with an NPS satellite very likely. See BAKER, *supra* note 20, at 23–24, 35–37.

30. U.N. Press Release, *Outer Space Committee Considers Agenda of Legal Sub-Committee*, OS/1259 (Jun. 11, 1986) 3, cited in BAKER, *supra* note 20, at 146 n.482.

31. *Last Full Crew Leaves Mir, To Be Abandoned After 13 Years*, N.Y. TIMES, Aug. 28, 1999, at A6.

32. See *id.*

33. See Gore, *supra* note 3, at 334. The Scientific and Technical Subcommittee of COPUOS also agreed that "consideration of space debris was important and that international cooperation was needed to expand appropriate and affordable strategies to minimize the potential impact of space debris on future space missions." *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Sixth Session*, U.N. GAOR, COPUOS, para. 20, U.N. Doc. A/AC.105/719 (1999).

34. See *Thirtieth Session of the Committee on the Peaceful Uses of Outer Space*, U.N. GAOR, COPUOS, para. 18, U.N. Doc. A/AC.105/SR.294 (1987) (remarks by the Pakistani representative on the

Roundtable, held on October 20, 1993 on the "Scientific and Legal Aspects of Space Debris," various well-known experts in this area advocated that policy-makers should support an international legal regime that has as its principal purpose the minimization of the presence of man-made debris.<sup>35</sup> In particular, Walter Flury reported that cleaning up debris is "neither practical nor economically feasible, therefore preventive measures are being used."<sup>36</sup> However, much data-gathering and analysis by experts from different disciplines will be needed to determine the most appropriate course of action for the future. The data to be acquired include the nature and form of space debris, their size and numbers, the types of debris (whether they are defunct satellites, exhausted motors, spent fuel elements, explosion devices, radioactive materials, or other mission-related objects), their orbital location, and the velocity at which they travel. Moreover, more detailed information is required on "the extent of harm or damage to people, and manned or unmanned objects, that each type of debris may cause and the possibility of its occurrence either by impact (collision, explosion) or harmful radiation or by any other means in space."<sup>37</sup> Although a completely accurate picture of the dangers posed by space debris is currently unavailable, there are already compelling scientific data available to ascertain the emerging threat of identifiable space debris.<sup>38</sup> It is with these environmental hazards in mind that

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effects of NPS and space debris).

35. See Gorove, *supra* note 5, at 178 (summarizing Carl Christol, *Scientific and Legal Aspects of Space Debris*). When the Scientific and Technical Subcommittee of the COPUOS held its 35th Session at the United Nations Office at Vienna from February 9 to 20, 1998, under the chairmanship of Dietrich Rex of Germany, the Subcommittee agreed that consideration of space debris was important and that international cooperation was needed to devise appropriate and affordable strategies to minimize the potential impact of space debris on future space missions. The Subcommittee took note of a number of programs of member states and organizations on the acquisition and understanding of data on the characteristics of the space debris environment and on measuring, modeling, and mitigating the orbital debris environment. In addition, "the Subcommittee agreed that Member States should pay more attention to the problem of collisions of space objects, including those with nuclear power sources on board, with space debris and other aspects of space debris." *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Fifth Session*, U.N. GAOR, COPUOS, at 3, U.N. Doc. A/JAC.105/707 (1998); see also *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Sixth Session*, *supra* note 33, para. 21.

36. Gorove, *supra* note 5, at 178 (summarizing Walter Flury's report on the First European Conference on Space Debris).

37. GOROVE, *supra* note 23, at 158. This is perhaps a task that should be undertaken by an international space organization; it will be discussed further in Part VI, *infra*.

38. Probably one of the most important mitigation measures has been the increased awareness of the threats posed by the orbital debris environment and of the many sources of orbital debris. Orbital debris shields for both manned and unmanned spacecraft can be quite effective. Protection against particles of 0.1 to 1.0 centimeter in size can be achieved by shielding spacecraft structures. Objects 1 to 10 centimeters in size cannot currently be dealt with by on-orbit shielding technology, nor can they be tracked by operational surveillance networks. However, protection against particles 1 to 10 centimeters in size can be achieved through special features in the design of space systems (e.g., redundant subsystems, frangible structures, pressure vessel isolation capabilities). Protection strategies for manned missions have to incorporate both shielding measures and on-orbit repair of damage caused by penetrations. The probability of no penetration (PNP) is the main criterion for shield design. PNP calculations are based on meteoroid and debris environment models and on the ballistic limit curves obtained in hydrocode simulations and hypervelocity impact experiments. The reliability of the PNP

we next assess the adequacy of the existing principles in international law in the protection of the space environment.

### III. AN OVERVIEW OF THE PRINCIPLES OF THE LAW OF OUTER SPACE

This section provides an introduction to the historical development of the present space treaties and their aims. Many skeptics question what role legal rules really play in a highly politicized international arena.<sup>39</sup> An international treaty or convention is the most basic multilateral document that attempts to secure agreement among sovereign nations to act in a particular manner, or to refrain from certain behavior. The closest parallels to the treaties relating to outer space are those that regulate the use of the Earth's environment and resources. The reasons why states ratify and comply with environmental treaties generally fall into three categories: (a) because the signatory states have a "genuine concern for the issue or a stake in the regulated industry and want to influence treaty rulemaking;"<sup>40</sup> (b) because the cost of compliance is relatively low compared to the higher cost of noncompliance;<sup>41</sup> and (c) because of fear of the consequences of noncompliance.<sup>42</sup> In the case of the negotiation and ratification of the space treaties from the late 1950s to the 1970s, the spacefaring nations were competing to optimize the use and exploration of outer space, while the non-spacefaring states were concerned with influencing rulemaking to constrain the activities of those states and to protect their own future interests. Perhaps it is true that the incentive to deploy weapons in outer space was originally low, but it was not inconceivable that in the absence of these treaties, one or the other superpower would have begun experimenting with such deployments. These fascinating geopolitical forces resulted in the birth of five space treaties without an overarching framework of the kind proposed in Part VI.

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calculations is strongly linked to the accuracy of the debris and meteoroid environment model. The degree of shielding required is highly dependent upon the nature (e.g., material, thickness), location, and orientation of the surface to be protected. Consequently, the International Space Station, when completed in 2004, will employ over 200 different types of orbital debris and micrometeoroid shields. See *Draft Technical Report on Space Debris of the Scientific and Technical Subcommittee*, U.N. GAOR, COPUOS, 35th Sess., U.N. Doc. A/AC.105/707 (1998); *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Fifth Session*, U.N. GAOR, COPUOS, U.N. Doc. A/AC.105/697 (1998); *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Fourth Session*, U.N. GAOR, COPUOS, U.N. Doc. A/AC.105/672 (1997). In 1999, the final draft technical report on space debris was adopted by the Subcommittee at its 36th Session in Vienna. See *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Sixth Session*, *supra* note 33, para. 35.

39. For a brief account of how legal norms work in the international arena, see ABRAM CHAYES & ANTONIA HANDLER CHAYES, *THE NEW SOVEREIGNTY: COMPLIANCE WITH INTERNATIONAL REGULATORY AGREEMENTS* 112-24 (1995).

40. Daniel Vice, *Implementation of Biodiversity Treaties: Monitoring, Fact-Finding, and Dispute Resolution*, 29 N.Y.U. J. INT'L L. & POL. 577, 631 (1997).

41. See *id.* at 632.

42. See *id.* There is a wealth of literature on why states comply with environmental treaties, and a more rigorous discussion is beyond the scope of this paper. See, e.g., DAVID HARLAND, *KILLING GAME: INTERNATIONAL LAW AND THE AFRICAN ELEPHANT* 8-10 (1994).

### A. *A Brief History of the International Space Treaties*

The Ad Hoc Committee on the Peaceful Uses of Outer Space was established by the U.N. General Assembly at its thirteenth session in 1958,<sup>43</sup> and was replaced a year later by a permanent body.<sup>44</sup> The preliminary work of COPUOS resulted in the adoption of the 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.<sup>45</sup> This declaration formed the basis for the 1967 Outer Space Treaty,<sup>46</sup> which introduced many fundamental principles of outer-space law and has been regarded by numerous scholars as the "Magna Charta" of outer space.<sup>47</sup>

The 1967 Outer Space Treaty laid down broad fundamental principles pertaining to the exploration and use of outer space.<sup>48</sup> It was understood that further conventions would have to be negotiated to provide more specific rules. Thus, the impetus provided by the Outer Space Treaty led to the successful conclusion of four other major international conventions, which provide the international legal framework regulating the conduct of space activities. They are:

- (1) the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space;<sup>49</sup>
- (2) the 1976 Convention on the Registration of Objects Launched into Outer Space;<sup>50</sup>
- (3) the 1977 Convention on the International Liability for Damage Caused by Space Objects;<sup>51</sup> and

43. See *Question of the Peaceful Use of Outer Space*, G.A. Res. 1348, U.N. GAOR, 13th Sess., 792d plen. mtg., U.N. Doc. A/RES/1348 (1958).

44. See *International Co-operation in the Peaceful Uses of Outer Space*, G.A. Res. 1472, U.N. GAOR, 14th Sess., 856th plen. mtg., U.N. Doc. A/RES/1472 (1959).

45. G.A. Res. 1962, U.N. GAOR, 18th Sess., 1280th plen. mtg., U.N. Doc. A/RES/1962 (1963); see also G.A. Res. 1721, U.N. GAOR, 16th Sess., 1085th plen. mtg., U.N. Doc. A/RES/1721 (1961) (setting expectations and reviewing progress of COPUOS); G.A. Res. 1802, U.N. GAOR, 17th Sess., 1192d plen. mtg., U.N. Doc. A/RES/1802 (1962) (same); G.A. Res. 1884, U.N. GAOR, 18th Sess., 1244th plen. mtg., U.N. Doc. A/RES/1884 (1963) (calling upon states not to deploy weapons of mass destruction in outer space).

46. The Outer Space Treaty has entered into force for over 90 states, including the United States, Russia, and the People's Republic of China. It has been signed but not yet ratified by about 30 countries. See *supra* note 1, 18 U.S.T. at 2410, 610 U.N.T.S. at 205.

47. See Walter W.C. de Vries, *The Creation of a Concept of the Law of Outer Space*, in *SPACE LAW: VIEWS OF THE FUTURE*, 21, 29 (Tanja Zwaan et al. eds., 1988) [hereinafter *VIEWS OF THE FUTURE*].

48. These consist of, inter alia, the freedom of exploration and use of outer space in accordance with the fundamental principles of international law, including the Charter of the United Nations. See Ida Bagus R. Supancana, *The Contribution of the Developing Countries to the Legal Formulation of Future Space Law*, in *VIEWS OF THE FUTURE*, *supra* note 47, at 113, 117.

49. Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 (entered into force Dec. 3, 1968) [hereinafter *Astronaut Agreement*]. It has entered into force for over 75 countries. The European Space Agency is also a party.

50. *Opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 (entered into force Sept. 15, 1976) [hereinafter *Registration Convention*]. It has been ratified by 37 states.

- (4) the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.<sup>52</sup>

None of the five major space treaties deals with the protection of either the space environment or the Earth's environment in a satisfactory fashion. Any protection of the environment appears to be incidental. Other treaties that govern space activities and have some bearing on environmental protection are the 1963 Partial Nuclear Test Ban Treaty,<sup>53</sup> the 1972 ABM Treaty,<sup>54</sup> and the 1977 ENMOD Convention.<sup>55</sup>

In broad terms, international space law enables a kaleidoscope of activities to be conducted in the space environment. They include the launch of satellites, the performance of scientific research and experiments, and the operation of commercial telecommunication services. But does current international space law adequately address the problems associated with the increasing use of NPS to power satellites or the rapid proliferation of space debris? The simple answer is no. The five space treaties were not formulated to address, and did not foresee, the complex problems of space pollution we face in the twenty-first century. The next section illustrates the underlying inadequacies and the need for a new approach to treaty-making and regime-building that allows states to take account of longer-term consequences.

## B. *The Space Treaties*

### 1. *The 1967 Outer Space Treaty*

In addition to proclaiming outer space to be the "province of all mankind," article I of the Outer Space Treaty also declares that outer space is "free for exploration and use by all states without discrimination of any kind, on a basis of equality," and that "[t]here shall be free access to all areas of

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51. Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 (entered into force Oct. 9, 1973) [hereinafter *Liability Convention*]. It is presently binding in over 70 countries.

52. *Opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 3 (registered *ex officio* July 11, 1984) [hereinafter *Moon Agreement*]. The Moon Agreement has been ratified by Austria, Australia, Chile, the Netherlands, Pakistan, the Philippines, and Uruguay; it has also been signed by France, Guatemala, India, Morocco, Peru, and Romania. It is perhaps unsurprising that the Moon Agreement has not been ratified by the major developed states, namely, Canada, France, Germany, Japan, Russia, the United Kingdom, and the United States. Because they possess the technological capabilities to engage in ongoing space activities, the regime of equitable sharing and distribution as proposed in the Agreement remains highly unsatisfactory to the spacefaring nations.

53. *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water*, Aug. 5, 1963, 14 U.S.T. 1313, 480 U.N.T.S. 43 (entered into force Oct. 10, 1963) [hereinafter *Partial Nuclear Test Ban Treaty*].

54. *Treaty on the Limitation of Anti-Ballistic Missile Systems*, May 26, 1972, U.S.-U.S.S.R., 23 U.S.T. 3435 (entered into force Oct. 3, 1972) [hereinafter *ABM Treaty*].

55. *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques*, May 18, 1977, 31 U.S.T. 333, 1108 U.N.T.S. 151 (entered into force Jan. 17, 1980) [hereinafter *ENMOD Convention*].

celestial bodies."<sup>56</sup> Article II states that outer space, including the Moon and other celestial bodies, is not subject to national appropriation "by claim of sovereignty, by means of use or occupation, or by any other means."<sup>57</sup> States are thus barred from extending to outer space, and exercising within it, those rights that constitute attributes of territorial sovereignty. Although article II prohibits national appropriation, states are allowed free access to all areas of celestial bodies; this access includes the collection of mineral samples, scientific research, and the exploitation of geostationary orbits.<sup>58</sup> Article VII imposes international liability on states for damage caused by an object launched into space, while article IX makes no direct reference to the need to protect the space environment against harm, requiring only that space activity be undertaken "with due regard to the corresponding interests of all other States Parties to the Treaty."<sup>59</sup> Finally, apart from the freedom of exploration, another fundamental principle is laid down in article III—the exploration and use of outer space shall be governed by international law and the U.N. Charter. This is not a simple question of applying existing norms of international law to this new environment *in toto*. The *sui generis* space environment demands the revision and adaptation of numerous principles of transboundary harm and state responsibility, and inevitably in many situations, new principles, destined purely for outer space, must be created. The content of international law in this area is difficult to determine with any useful clarity; this is a problem we shall explore in Parts IV and V.

## 2. *The 1968 Astronaut Agreement*

The 1968 Astronaut Agreement establishes specific procedures to provide assistance to distressed astronauts who may be victims of environmental or other adversities.<sup>60</sup> Moreover, article 5(4) of the Astronaut Agreement stipulates that if a state party "has reason to believe that a space object or its component parts discovered in territory under its jurisdiction, or recovered by it elsewhere, is of a hazardous or deleterious nature,"<sup>61</sup> it may so notify the launching authority, which is immediately required to take effective measures to eliminate possible danger of harm.<sup>62</sup>

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56. Outer Space Treaty, *supra* note 1, art. I, 18 U.S.T. at 2413, 610 U.N.T.S. at 207-08.

57. *Id.* art II, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

58. "Both international law and space law are silent on the free use of natural resources." Wassenbergh, *supra* note 2, at 611, 616 (1980). Unfortunately, the law of outer space is also deficient on a definition of free access to areas of outer space other than on celestial bodies. *See id.* The principles enunciated in articles I and II of the Outer Space Treaty appear in practice to be in conflict with each other, as evidenced in the Bogotá Declaration, in which eight equatorial nations tried to extend their sovereignty to the geostationary orbit. *See Bogotá Declaration, Dec. 3, 1976, reprinted in 6 J. SPACE. L. 193 (1978).*

59. Outer Space Treaty, *supra* note 1, art. IX, 18 U.S.T. at 2416, 610 U.N.T.S. at 210.

60. *See Astronaut Agreement, supra* note 49, arts. 1-5, 19 U.S.T. at 7573-75, 672 U.N.T.S. at 121-23.

61. *Id.* art. 5(4), 19 U.S.T. at 7575, 672 U.N.T.S. at 123.

62. The protection of astronauts in the Astronaut Agreement is a result of an elaboration of the

### 3. *The 1972 Liability Convention*

The 1972 Liability Convention provides specific rules as an elaboration of article VII of the Outer Space Treaty and determines liability for damage caused by a space object.<sup>63</sup> The definition of "space object"<sup>64</sup> is controversial; a major issue is whether a space object remains a space object after its breakup, deterioration, loss, or abandonment, or whether it becomes space debris. Moreover, the "damage" as defined by the Convention may involve loss of life, personal injury, or damage to property, but no mention is made of damage to the environment.<sup>65</sup> The space debris problem and the deficiencies of the Liability Convention in this area will be comprehensively dealt with in Part V.

### 4. *The 1976 Registration Convention*

The primary purpose of the Registration Convention is to facilitate the identification of the space object causing damage. The launching state party is required to maintain a national registry and enter into it each object launched into space.<sup>66</sup> Furthermore, information must be furnished to the U.N. Secretary-General on each space object launched for the purposes of international registration.<sup>67</sup> Notice must also be given regarding objects on which information has previously been provided and which have been but are no longer in earth-orbit.<sup>68</sup>

### 5. *The 1979 Moon Agreement*

The Moon Agreement is intended to supplement the 1967 Outer Space Treaty. It is not intended to derogate from or restrict the provisions of the Outer Space Treaty; the Outer Space Treaty will continue to apply where the Moon Agreement does not enunciate more specific provisions.<sup>69</sup> Although article IX of the Outer Space Treaty already provides for the protection of the environment, both in space and on Earth, article VII of the Moon Agreement further requires states parties to take measures to prevent the "disruption of

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earlier general directive under article V of the Outer Space Treaty, where states parties are obliged to inform other states, or the Secretary-General of the United Nations, of any phenomena they may discover in the course of exploration and scientific investigation that "could constitute a danger to the life or health of astronauts." Outer Space Treaty, *supra* note 1, art. V, 18 U.S.T. at 2414, 610 U.N.T.S. at 209.

63. See Liability Convention, *supra* note 51, art. II, 24 U.S.T. at 2392, 961 U.N.T.S. at 189.

64. "Space object" is defined as "component parts as well as the launch vehicle and parts thereof." *Id.* art. I.

65. *Id.*

66. See Registration Convention, *supra* note 50, art. II, 28 U.S.T. at 698-99, 1023 U.N.T.S. at 17.

67. See *id.* art. IV(1), 28 U.S.T. at 699, 1023 U.N.T.S. at 17.

68. See *id.* art. IV(3), 28 U.S.T. at 700, 1023 U.N.T.S. at 17.

69. See Wassenbergh, *supra* note 2, at 617.

the existing balance" of the celestial bodies and avoid harm to the environment of the Earth.<sup>70</sup> The Moon Agreement also refers to the applicability of international law and the U.N. Charter in articles 2, 6(1), and 11(4). In addition to the prohibition on national appropriation by occupation in article 11(2), the Moon Agreement further requires an "equitable sharing" by all states parties in the benefits derived from the resources, taking into account the interests and needs of developing countries as well as the contributions made by the developed nations in their operational activities.<sup>71</sup> The possibility of establishing a new international legal regime designed to facilitate exploitative and sharing activities when such exploitation becomes feasible is recognized in article 11(5).

The Outer Space Treaty and the Moon Agreement are far more concerned with the exploration and use of the outer-space environment than with its preservation in a substantially unimpaired condition for future generations. The non-renewable resources of outer space should be protected from abuse by the developed nations; international law must "maximize the interests and values of all peoples."<sup>72</sup> The question is how we determine the "interests and values of all peoples." Is there such a thing as "common interest"? Is the concept of the "province of all mankind" in article I of the Outer Space Treaty predicated on the "common interest"?

#### IV. THE MEANING OF "COMMON INTEREST" AND THE "PROVINCE OF ALL MANKIND" IN INTERNATIONAL LAW

In theory, the sovereign state may elect to pursue its own agenda without regard to the reactions of others. However, this option is usually not open in contemporary international society. The assumption that there can be a common interest in the affairs of states is based on the view that states, in seeking to protect their mutual advantages, generally conform to international law. An investigation "into the common interest is relevant even though degrees of national interdependence may vary and the perceptions of common interest may diverge."<sup>73</sup> Although no person, organization, or state is charged singularly with the identification of the common interest, each can participate in the formation and interpretation of the common interest. Indeed Carl Christol argues that "the concept of the common interest acknowledges that individual gains can be accompanied by social integration so that there might be the ultimate realization of a large degree of human perfectability [sic]."<sup>74</sup>

The concept of common interest becomes relevant when one considers claims to resources located in areas outside territorial sovereignty or beyond

70. Moon Agreement, *supra* note 52, art. 7, 1363 U.N.T.S. at 24.

71. *See id.* art. 11(2), 1363 U.N.T.S. at 25.

72. CARL CHRISTOL, SPACE LAW: PAST, PRESENT, AND FUTURE 347 (1991).

73. *Id.* at 376.

74. *Id.* at 378; *see also id.* at 391 ("Interdependence founded on a sense of sharing may predominate over an anachronistic divine right of grab.").



national jurisdictions.<sup>75</sup> The *res nullius* concept was associated with the view that no national sovereignty existed in certain areas and that states had the right to assert sovereignty. The alternative view is that some resources, like airspace, the deep sea-bed, solar energy, and radio spectra, are commonly needed by humanity as a condition of survival and are to be used for the common benefit (*res communis*); such resources cannot be subject to private ownership or state sovereignty.<sup>76</sup> In pursuit of the common benefit, the members of the international community are able to determine the conditions under which the exploitation or use of such resources is to take place. Gyula Gál discusses the notion of space exploration and use as being the joint venture of all humankind and therefore deems outer space to be a *res communis omnium*.<sup>77</sup> Such a theory assumes that states share a common interest in the exploitation and use of the indicated commons. The 1963 Declaration of Legal Principles relied on strong principles of equity, fairness, and common interest.<sup>78</sup> It was later enshrined in article I(1) of the Outer Space Treaty, wherein the exploration and use of outer space must not only be carried out “for the benefit and in the interests of all countries,” but also are declared the “province of all mankind.” Thus the “interests” of *all* states are protected—both those engaged and those not engaged in outer-space activities. Over one hundred nations have signed the Outer Space Treaty, including the five major space powers who possess the capability to launch a mission into outer space: the United States, Russia, the People’s Republic of China, Japan, and the European Space Agency nations. Unfortunately, the

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75. See G.A. Res. 1348, *supra* note 43 (recognizing “the common interest of mankind in outer space”); see also G.A. Res. 1472, *supra* note 44 (calling for international cooperation in the peaceful use of outer space); G.A. Res. 1721, U.N. GAOR, 16th Sess., 1085th plen. mtg., U.N. Doc. A/RES/1721 (1961) (asserting that the use and exploration of outer space should be “for the benefit of mankind”).

76. While the *res communis* principle prohibits the establishment of sovereignty in the common areas, the *res nullius* principle allows sovereignty to be established pursuant to the satisfaction of suitable criteria. For a discussion of the formulation of draft article 9 of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction, see A.O. Adede, *The System for the Exploitation of the “Common Heritage of Mankind” at the Caracas Conference*, 69 AM. J. INT’L L. 31 (1975). See also Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Beyond the Limits of National Jurisdiction, G.A. Res. 2749, U.N. GAOR, 25th Sess., 1933d plen. mtg., U.N. Doc. A/RES/2749 (1970) (declaring the sea-bed and ocean floor open to use for peaceful purposes by all states and not subject to appropriation by any). The resolution was adopted by a vote of 108 to zero with 14 abstentions from the Soviet Union and its allies.

77. GYULA GÁL, *SPACE LAW* 189–90 (1969). Note also the comments of Judge Lachs: “Not only must [man] see to it that the law be established in the interest of mankind as a whole, and prevent whatever dangers human action in outer space may produce to life and security on our globe, but he is also bound to provide adequate safeguards to ensure that nothing be done to upset the balance of nature or possibly jeopardize non-terrestrial life whether or in whatever form in which it may exist.” MANFRED LACHS, *THE LAW OF OUTER SPACE* 23 (1972); see also S. HOUSTON LAY & HOWARD J. TAUBENFELD, *THE LAW RELATING TO ACTIVITIES OF MAN IN SPACE* 54 (1970) (examining the allocation of authority in areas lacking a territorial sovereign). Some authors also use the term *res extra commercium*. See Sylvia Williams, *The Law of Outer Space and Natural Resources*, 36 INT’L & COMP. L.Q. 142, 147 (1987); LACHS, *supra*, at 48.

78. See ANDREW J. YOUNG, *LAW AND POLICY IN THE SPACE STATIONS’ ERA* 192 (1989) (discussing G.A. Res. 1962, *supra* note 45).

expression "province of all mankind" is not defined in the Treaty.<sup>79</sup> As a result, international jurists disagree as to the correct interpretation of this paragraph.<sup>80</sup> It should be emphasized that the concept of the "province of all mankind" is not to be equated or confused with the notion of the "common heritage of mankind" (CHM).<sup>81</sup>

The notion of *res communis humanitatis* was introduced by Aldo Armando Cocca. It is based upon the rights of mankind and is derived from "the community of interests and benefits recognized in favour of mankind in outer space and celestial bodies."<sup>82</sup> The *res communis humanitatis* principle was refined to the CHM, which proposes that certain common areas and their resources are open to inclusive use and that there may not be exclusive uses. Furthermore it asserts that the benefits and values so derived must be shared. CHM is defined in the Moon Agreement; according to article XI(1) of the Moon Agreement, "the Moon and its natural resources are the common heritage of mankind,"<sup>83</sup> and the CHM principle has been interpreted to have limited spatial coverage—it applies only to the Moon and the Moon's orbits and trajectories, but not to the outer-space environment generally.<sup>84</sup>

On the other hand, the exploration and use of outer space as the "province of all mankind" in article I(1) of the Outer Space Treaty is not defined by the Treaty but is, according to article III, governed by "international law and the Charter of the United Nations."<sup>85</sup> Does the "province of all mankind" then have a particular meaning in international law? First it may be argued that "mankind" in article I(1) of the Outer Space Treaty may be understood to be a beneficiary of space exploration and may be considered a new legal subject of international law. There are numerous statements on the definition of "mankind," but only Professor Stephen Gorove has come close to a working definition of the term:

79. Does the term "mankind" mean (a) all states; (b) all states, particularly developing states; (c) all nations; (d) all living human beings; or (e) all human beings, present and future? See CHRISTOL, *supra* note 72, at 389; Ernst Fasan, *The Meaning of the Term "Mankind" in Space Legal Language*, 2 J. SPACE. L. 125, 131 (1974).

80. See YOUNG, *supra* note 78, at 192.

81. But see NICOLAS MATEESCO MATTE, *AEROSPACE LAW: TELECOMMUNICATIONS SATELLITES 77* (1982) (equating the two notions).

82. Aldo Armando Cocca, *The Principle of the "Common Heritage of All Mankind" as Applied to Natural Resources from Outer Space and Celestial Bodies*, in PROCEEDINGS OF THE SIXTEENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 172, 174 (1974) (quoting the Conclusion of the VIII Hispano-Luso-American Congress on International Law, Buenos Aires, 1969); see also Fasan, *supra* note 79, at 129 (same).

83. Article XI(1) states: "The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular paragraph 5 of this article." Moon Agreement, *supra* note 52, art. 11(1), 1363 U.N.T.S. at 25. Article 11(5) imposes an obligation on signatory states to establish an international regime to facilitate equitable sharing by all states parties in the benefits derived from the use of lunar resources and to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible. See *id.* art. 11(5), 1363 U.N.T.S. at 25.

84. See CHRISTOL, *supra* note 72, at 406-26.

85. Outer Space Treaty, *supra* note 1, art. III, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

[M]ankind as a concept should be distinguished from that of man in general. The former refers to a collective body of people, whereas the latter stands for individuals making up that body. Therefore, the rights of mankind should be distinguished, for instance, from the so-called human rights. Human rights are rights to which individuals are entitled on the basis of their belonging to the human race, whereas the rights of mankind relate to the rights of the collective entity and would not be analogous with the rights of the individuals making up that entity.<sup>86</sup>

In contrast, there has been no attempt to define the word “province”; this has made the task of discovering the meaning of the phrase the “province of all mankind” an uphill battle. Some have argued that the CHM principle is designed to replace the abstract “province of all mankind” with a more meaningful legal framework,<sup>87</sup> but the remarkably poor ratification of the Moon Agreement by only ten states and the specificity of various provisions in the Agreement weigh against this conclusion.

At this point, we know what the “province of all mankind” does *not* mean, but do we have a clearer idea of what it might mean? Words have the uncanny ability of assuming new and different meanings at different places and times; this is particularly true of legal concepts, which are shaped by contemporary politics and social conditions. This view was expressed by Justice Oliver Wendell Holmes of the U.S. Supreme Court, who observed that “[a] word is not a crystal, transparent and unchanged, it is the skin of a living thought and may vary greatly in color and content according to the circumstances and the time in which it is used.”<sup>88</sup>

The meaning that may have been ascribed to the phrase in 1967 may be different from the understanding that should be accorded to it today. The Outer Space Treaty was concluded over thirty years ago in a political climate dominated by a superpower arms race and a great ideological divide, where both spacefaring and non-spacefaring nations alike were determined not to allow any state to colonize space for strategic weapons deployment or commercial exploitation. It was thus agreed that space was the “province of all mankind” and could not be subverted under the exclusive sovereignty of

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86. Stephen Gorove, *The Concept of “Common Heritage of Mankind”: A Political, Moral or Legal Innovation?*, 9 SAN DIEGO L. REV. 390, 393 (1972). “Mankind” has also been described to be “an interspatial and intertemporal concept and includes not only those who are present but also those who are to come.” Williams, *supra* note 77, at 150–51. This definition is similar to the notion of intergenerational equity as proposed in EDITH BROWN WEISS, *IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY, AND INTERGENERATIONAL EQUITY* 17–46 (1989). See *infra* note 158 and accompanying text.

87. See Aldo Armando Cocca, *The Advances in International Law Through the Law of Outer Space*, 9 J. SPACE L. 13, 16 (1981). The Soviet willingness to accept the “province of all mankind” principle stands in contrast to their fierce resistance to the CHM concept. See *Report of the Legal Subcommittee on the Work of Its Sixteenth Session*, U.N. GAOR, COPUOS, Annex 1, at 11–12, U.N. Doc. A/AC.105/196 (1977); Nicolas Mateesco Matte, *The Draft Treaty on the Moon, Eight Years Later*, 3 ANNALS AIR & SPACE L. 511, 531 (1978). More recently, Baslar has argued, *inter alia*, that in a third millennium scenario, the CHM concept would become the nucleus of a new discipline, planetary resources management law. See KEMAL BASLAR, *THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW* 91–111 (1998).

88. *Towne v. Eisner*, 245 U.S. 418, 425 (1918).

any state. In the new millennium, while these same nations are now cooperating on the ISS and various space initiatives and scientific research, the "province of all mankind" must mean something different. The lofty aspirations of the expression as understood in 1967—the freedom of use and exploration for the benefit of all nations—must be brought down to Earth.<sup>89</sup>

The meaning of the "province of all mankind" should include the concept of sustainable development. Our exploration and use of the outer-space environment should leave it in a substantially unimpaired condition for the enjoyment and benefit of future generations. The purpose of the existing space treaties was to ensure that no state would arrogate exclusive rights to itself or use them at the expense of others. The freedom of action of states in outer space or on celestial bodies is neither unlimited, absolute, or unqualified, but is determined by the rights and interests of other states and all humanity: "The freedom to use outer space which is granted to everyone must find its limits in the freedom of others."<sup>90</sup> Perhaps this limit is found in article III of the Outer Space Treaty, which requires that the exploration and use of outer space be "in accordance with international law."<sup>91</sup> Unfortunately, international law is notoriously vague; over the last few decades, jurists and academics have been grappling with the elusive nature of customary international law and the criteria for norms of *jus cogens* in a miasma of confusion. Article 38 of the Statute of the International Court of Justice enumerates the sources of international law as being international conventions, custom, the general principles of law recognized by civilized nations, and, under certain circumstances, "judicial decisions and the teachings of the most highly qualified publicists of the various nations."<sup>92</sup> It is to these sources of international law that we turn next in order determine whether, and how, this freedom is qualified by established principles of international law.

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89. The generality of the language used in treaty requirements is not unique to international treaties; rather, it is characteristic of all legal norms. "The notion that law is an interpretative practice, in which legal materials must be given meaning by purposive agents" has become a modern legal truism. Richard H. Fallon, Jr., *Reflections on Dworkin and the Two Faces of Law*, 67 NOTRE DAME L. REV. 553, 554 (1992); see also FRIEDRICH V. KRATOCHWIL, RULES, NORMS AND DECISIONS: ON THE CONDITIONS OF PRACTICAL AND LEGAL REASONING IN INTERNATIONAL RELATIONS AND DOMESTIC AFFAIRS 97 (1989) ("The prescriptive force of norms appears then as a claim to validity which is mediated by language and which can be validated discursively.").

90. OGUNSOLA OGUNBANWO, INTERNATIONAL LAW AND OUTER SPACE ACTIVITIES 66 (1975).

91. Outer Space Treaty, *supra* note 1, 18 U.S.T. at 2413, 610 U.N.T.S. at 208. *But see* SEYOM BROWN ET AL., REGIMES FOR THE OCEAN, OUTER SPACE AND WEATHER 130 (1977), *quoted in* YOUNG, *supra* note 78, at 193 (observing that the "province of all mankind" concept was "accepted by the space powers on the general assumption that it will not really burden their programs and, in any case, that they themselves will determine *unilaterally* how it is to be implemented" (emphasis added)).

92. Statute of the International Court of Justice, 1978 I.C.J. Acts & Docs. 59, 77.

V. THE PROTECTION OF THE SPACE ENVIRONMENT: AN ANALYSIS OF  
CONVENTIONAL LAW AND CUSTOMARY INTERNATIONAL LAW

In theory, the role of legal norms—whether conventional or customary—in classical international law appears to be a fairly straightforward one. To put it succinctly, they are prescriptions for action in situations of choice, carrying a sense of obligation that they ought to be followed. Where the conduct in question is in an area governed by a treaty or custom, the choice of governing principle may be simplified, though it will not necessarily be clear. Even then, there is no precise linear path that dictates the application of a norm to a specific conduct. As Chayes and Chayes so aptly stated, “the need to operate in a multifaceted, interacting, and interdependent international environment with relatively diffuse power tends to lengthen the time horizon of states and lead them to take account of longer-term consequences.”<sup>93</sup>

A. *Conventional Law—and Its Problems*

1. *The Process of Treaty-Making*

Motivated by the highest of ideals, but constrained by political compromises, the consensus methodology employed by both the fifty-three-member COPUOS and the forty-member Conference on Disarmament has consistently failed to produce any treaties in the outer-space context that are applicable to the needs of the present and the immediate future. The consensus methodology, also known as the rule of unanimous consent, impels each negotiating member to search for the lowest common denominator. It contributes to the difficulty of negotiations because sometimes a single state can resist the development of a common position and demand concessions as the price of securing unanimous consent. “Compromises or ‘package deals’ achieved in small circles”<sup>94</sup> may or may not survive to become the final conference result. Traditionally, the “international regime” that emerges at the end of the day “frequently involves intense bargaining that leads to critical compromises”<sup>95</sup> and becomes manifest in conceptual creations rather than concrete entities. An advantage, however, is that the treaty secures immediate widespread acceptance. The provision of a treaty does not of itself ensure a hard obligation. If a treaty is to be regarded as creating “hard” obligations, i.e., possessing some autonomous binding norms, it must be precisely worded and specify the exact obligations undertaken by signatory states. Where a treaty provides only for general goals and statements of policy, it is itself “soft” and

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93. CHAYES & CHAYES, *supra* note 39, at 124.

94. Winfried Lang, *Diplomacy and International Environmental Law-Making: Some Observations*, 3 Y.B. INT'L ENVTL. L. 108, 113 (1992).

95. ORAN YOUNG, *INTERNATIONAL COOPERATION: BUILDING REGIMES FOR NATURAL RESOURCES AND THE ENVIRONMENT* 22 (1989).

is devoid of any significant legal content.<sup>96</sup> Controlled largely by the constellation of spacefaring states, the present space treaties never matured beyond the level of soft law and could not rely on an institutional underpinning.

Under the "unanimous consent" approach, the cumbersome and time-consuming process of political negotiation, signature, and ratification often results in events overtaking the convention.<sup>97</sup> In addition, the problem of extensive reservations may also render obligations under conventional international law more apparent than real. The permissibility of reservations to the present space treaties only serves to undermine the rudimentary protection offered to the outer-space environment. At the same time, we must also acknowledge the political reality of the exploration and use of outer space and the different sovereign interests involved. Part VI will examine new methods of international environmental law-making—in particular, a "regime-building" approach—and their contribution to the future of the law of outer space.

## 2. *The Adequacy of the Existing Space Treaties in the Control of Space Pollution*

Article VI of the Outer Space Treaty states:

States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.<sup>98</sup>

The general terms of article VI resulted in the 1972 Liability Convention and the 1975 Registration Convention. However, both treaties fail to refer directly to the problem of space debris or nuclear power sources. In orbit, situations endangering property and life may be brought about by the overcrowding of space objects in a particular area, the close proximity of two or more space objects, the conduct of military maneuvers and weapons testing, and the release of harmful radiation from NPS.

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96. See R.R. Baxter, *International Law in "Her Infinite Variety,"* 29 INT'L & COMP. L.Q. 549, 550 (1980) (examining the nature of "soft" international law); C.M. Chinkin, *The Challenge of Soft Law: Development and Change in International Law,* 38 INT'L & COMP. L.Q. 850, 851 (1989) (defining "soft" and "hard" law).

97. See IAN BROWNLIE, *THE PRINCIPLES OF PUBLIC INTERNATIONAL LAW* 287–88 (4th ed. 1990); Geoffrey Palmer, *New Ways To Make International Environmental Law,* 86 AM. J. INT'L L. 259, 271–78 (1992). See also the Hague Declaration on the Environment, Mar. 11, 1989, 28 I.L.M. 1308 (1989), in which 24 states accepted the abolition of the unanimous consent rule.

98. Outer Space Treaty, *supra* note 1, art. VI, 18 U.S.T. at 2415, 610 U.N.T.S. at 209.

(a) *Nuclear Power Sources*

Article IV of the Outer Space Treaty specifically forbids *only the stationing of nuclear weapons or any other weapons of mass destruction* in outer space. It does not regulate the use of NPS. It provides: "States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner."<sup>99</sup> Similarly, article III of the Moon Agreement carries the same prohibition relating to the Moon and other celestial bodies.<sup>100</sup> Regrettably, the restrictions in the Outer Space Treaty apply only to space objects in orbit and to the stationing of identified kinds of weapons in space.<sup>101</sup> Furthermore, although articles IV and IX of the Outer Space Treaty and articles III and VII of the Moon Agreement require states parties to avoid the harmful contamination of outer space and the Moon environment and forbid the deployment of nuclear weapons, they do not require states to transfer space objects with NPS on board to a nuclear-safe orbit (NSO).<sup>102</sup>

Other treaties that are not strictly part of the current space treaties framework can also impose some control on radioactive pollution in space. For example, the testing and deployment of a space-based anti-missile system envisioned by the Strategic Defense Initiative (SDI) program would certainly violate the provisions of the U.S.-Soviet ABM Treaty.<sup>103</sup> Russia has put a series of proposals before the United Nations that have the effect of imposing

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99. *Id.* art. IV, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

100. See Moon Agreement, *supra* note 52, art. 3, 1363 U.N.T.S. at 23. The demilitarization of the CHM area is perhaps ideologically utopian, prohibiting the installation of weapons systems and the testing of weapons. The Moon has remained relatively untainted by military activities in the face of the East-West space race. However, the space defense program budgets of the United States and Russia are staggering. See Gore, *supra* note 3, at 332; see also Abram Chayes & Antonia Handler Chayes, *Testing and Development of "Exotic" Systems Under the ABM Treaty: The Great Reinterpretation Caper*, 99 HARV. L. REV. 1956 (1986) (evaluating President Reagan's reinterpretation of the ABM Treaty to allow testing of novel technologies in space); Marko G. Markoff, *Disarmament and "Peaceful Purposes" Provisions in the 1967 Outer Space Treaty*, 4 J. SPACE L. 3 (1976) (analyzing interpretations of "peaceful" in the Outer Space Treaty); Abraham D. Sofaer, *The ABM Treaty and the Strategic Defense Initiative*, 99 HARV. L. REV. 1972 (1986) (discussing possible interpretations of the ABM Treaty in terms of the Strategic Defense Initiative (SDI)). In relation to the law of the seas, note the inclusion of the principle of demilitarization in UNCLOS, *supra* note 10, art. 141, 21 I.L.M. at 1294 (stating that the use of the area will be "exclusively for peaceful purposes").

101. See CHRISTOL, *supra* note 72, at 471-72. Such restrictions are on weapons systems that can be classified as nuclear weapons or weapons of mass destruction. See Gennady Danilenko, *The Progressive Development of Space Law: New Opportunities and Restraints*, in VIEWS OF THE FUTURE, *supra* note 47, at 99, 109.

102. An NSO is an orbit that gives sufficient time for radioactive materials to decay to an acceptable level at the end of a space mission. In order to prevent radiological contamination on Earth by space objects with NPS on board, states should attempt to place such objects in an NSO for periods as long as 300 years, or at least 10 times the half-life of the isotope or isotopes used in the case of a radio-isotope reactor. See *NPS Principles*, *supra* note 19, principle 3(2).

103. For a discussion of the effect of the ABM Treaty on the SDI, see V.S. Vereshchetin, "Strategic Defense Initiative" and International Law, in PROCEEDINGS OF THE TWENTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 94 (1987).

a prohibition on the testing, deployment, and use of space weapons.<sup>104</sup> Such an effort to demilitarize the space environment is commendable. But because NPS is usually used for non-military purposes in communication satellites and in space stations, where research and manufacturing take place, the regulation of its use falls outside the ambit of the various space weapons treaties. Satellite remote sensing is continuing to make valuable contributions to environmental monitoring, planning sustainable development, water-resource development, monitoring crop conditions, and predicting and assessing drought. Meteorological and atmospheric research satellites are similarly important to the study of global climate change, the greenhouse effect, the degradation of the ozone layer, and other oceanic and global environmental processes.<sup>105</sup> Studies of human and animal psychology conducted in space led to important advances in medical knowledge, in such areas as "blood circulation, hypertension, osteoporosis, cardiovascular physiology, sensory perception, immunology, and the effects of cosmic radiation."<sup>106</sup> Hence the threat to the outer-space environment from nuclear power sources remains largely unchecked, perhaps masked by the significant advances that NPS has made possible.

(b) *Space Debris*

The specificity of damage, the requirement of fault, and the difficulty of identification all contribute to the impotence of the Liability Convention and the Registration Convention in the protection of the outer-space environment from debris pollution.

In order to ascertain whether the present space treaties are applicable to space debris, a determination must be made whether space debris can be classified as a space object. Under the 1972 Liability Convention, in order for liability to arise, there must be "damage" caused by a "space object." Without damage, there can be no state liability for environmental risks, much as there is no liability if damage is not caused by a space object. "Damage," as defined in article I(a), is limited to physical and direct damage, and does not cover indirect damage or non-physical damage, i.e., it does not deal with environmental dangers created by space activities, particularly radioactive hazards presented by NPS. The term "damage" means loss of life, personal injury, or other impairment of health; loss of or damage to property of states or of persons, natural or juridical; or damage to property of international

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104. See, e.g., *Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space*, U.N. GAOR, 36th Sess., Annex, U.N. Doc. A/36/192/Annex (1981) (annex to a request for the inclusion of a supplementary item on the agenda); *Draft Treaty on the Prohibition of the Use of Force in Outer Space and From Space Against the Earth*, U.N. GAOR, 38th Sess., Annex, U.N. Doc. A/38/194/Annex (1983) (same).

105. See *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Fifth Session*, *supra* note 38, paras. 126-27.

106. *Id.* para. 131.



intergovernmental organizations.<sup>107</sup> If damage is to the elements of the space environment that are not property of states, persons, or international intergovernmental organizations, for example, radioactive leakage from nuclear reactors in space, there appears to be no legitimate recourse under the Liability Convention.

Under article II of the Liability Convention, the absolute liability of the launching state is limited to damage caused by the fall of a space object "on the surface of the Earth or to aircraft in flight."<sup>108</sup> There is no absolute liability for any damage to objects in the outer-space environment; fault must be proved by the state seeking compensation.<sup>109</sup> This requirement of fault for damage caused in outer space presents a significant impediment to a successful claim under the Liability Convention. Moreover, the potential recovery for damage caused by space debris is often seriously hampered by the identification of the launching state associated with the space object.<sup>110</sup> Arguably, articles VI, VII, and XI of the Outer Space Treaty, articles IV and VI of the Registration Convention, and article 5 of the Astronaut Agreement all contribute in varying degrees to the imposition of international responsibility for dangers created by space debris. But the identification problem remains an insurmountable hurdle to any compensation claim.<sup>111</sup>

Many of the treaty provisions are outdated and incapable of coping adequately with the emerging threats of space debris. For example, under a strict interpretation of article XI of the Outer Space Treaty, if the space activity results in space debris, the launching state is required to inform the U.N. Secretary-General and the international scientific community of the debris resulting from the activity.<sup>112</sup> Provisions of the Registration Convention require the state of registry to give notice of objects that are no longer in earth-orbit and to assist in the identification of hazardous or deleterious space objects.<sup>113</sup> These existing treaty provisions unfortunately are not preventive in character: There is no system of obligatory safety assessment prior to launching, and no appropriate quality-control program in place. Finally, piecemeal treaty provisions relevant to environmental protection in outer space are present in the Partial Nuclear Test Ban Treaty, the ENMOD

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107. See Liability Convention, *supra* note 51, art. I(a), 24 U.S.T. at 2397, 961 U.N.T.S. at 189. Damage may be caused on the surface of the Earth, *see id.* art. II, 24 U.S.T. at 2392, 961 U.N.T.S. at 189, to aircraft in flight, *see id.*, or elsewhere other than on the surface of the Earth, *see id.* arts. III and IV, 24 U.S.T. at 2392-93, 91 U.N.T.S. at 189-90.

108. *Id.* art. II, 24 U.S.T. at 2392, 961 U.N.T.S. at 189.

109. *See id.* art. III, 24 U.S.T. at 2392, 961 U.N.T.S. at 190.

110. The problem of identification is further compounded in the case of smaller-sized debris. The current space technology is probably incapable of providing unequivocal accuracy and reliability in identifying the precise source of debris. *See GOROVE, supra* note 23, at 154.

111. The Registration Convention does not even provide for any obligatory marking of space objects. *See Vladimir Kopal, Some Considerations on the Legal Status of Aerospace Systems*, 22 J. SPACE L. 57, 62 (1994).

112. *See Outer Space Treaty, supra* note 1, art. XI, 18 U.S.T. at 2418, 610 U.N.T.S. at 210.

113. *See Registration Convention, supra* note 50, 28 U.S.T. at 700-01, 1023 U.N.T.S. at 17-18.

Convention, and the International Telecommunication Convention.<sup>114</sup> These treaties, however, do not protect the outer-space environment per se, and their provisions only apply to the few signatory states. The inadequacies of the existing multilateral treaty regime in the regulation of pollution in space should be ameliorated by the adoption of a framework convention that deals specifically with the pollution of the space environment. Part VI will provide the outline of such a convention.

## B. Customary International Law—and Its Problems

### 1. The Process of the Formation of Custom

As discussed in Part IV, the exploration and use of outer space must be in accordance with international law. However, international law as currently formulated does not provide a comprehensive framework for dealing with space exploration and use. Custom, or customary international law, is accepted as one of the major sources of international law and might fill the gaps in the existing space treaties. Traditional theories of the nature of obligation in international law are positivist and individualistic, reflecting a preoccupation with the preservation of state sovereignty: States are bound by international law only insofar as they consent to its rules.<sup>115</sup> But recently a new jurisprudence based on communal interests, solidarity, idealism, and the vision of a new world order has emerged.<sup>116</sup> While treaty law binds only those states which have accepted its obligations, customary international law binds states generally, whether or not they have formally consented to its rules.<sup>117</sup> This feature of custom may, however, be reconciled with the consensual theory of international law by the controversial “persistent objector” principle, which permits a state to opt out of a particular customary norm in the process of formation.<sup>118</sup> Nevertheless the persistent objector principle is consistently

114. See Partial Nuclear Test Ban Treaty, *supra* note 53; ENMOD Convention, *supra* note 55; International Telecommunication Convention, Oct. 25, 1973, 28 U.S.T. 2495, 1209 U.N.T.S. 32.

115. See ANTONIO CASSESE, INTERNATIONAL LAW IN A DIVIDED WORLD 110–19 (1986); LOUIS HENKIN, INTERNATIONAL LAW: POLITICS, VALUES AND FUNCTIONS 45–46 (1989); Michael Akehurst, *Custom as a Source of International Law*, 47 BRIT. Y.B. INT'L L. 1, 51 (1974–75) [hereinafter Akehurst, *Custom as a Source*]; Michael Akehurst, *Nicaragua v. United States of America*, 27 INDIAN J. INT'L L. 357, 360 (1987); Prosper Weil, *Towards Relative Normativity in International Law*, 77 AM. J. INT'L L. 413, 420 (1983).

116. See, e.g., Jonathan Charney, *Universal International Law*, 87 AM. J. INT'L L. 529, 543–47 (1993); John Quigley, *The New World Order and the Rule of Law*, 18 SYRACUSE J. INT'L L. & COM. 75, 108–09 (1992).

117. See Akehurst, *Custom as a Source*, *supra* note 115, at 23; Jonathan Charney, *The Persistent Objector Rule and the Development of Customary International Law*, 56 BRIT. Y.B. INT'L L. 1, 18 (1986); Christian Tomuschat, *Obligations Arising for States Without or Against Their Will*, 241 RECUEIL DES COURS 194, 281–82 (1993).

118. See Nuclear Tests (Austl. v. Fr.; N.Z. v. Fr.), 1974 I.C.J. 253, 286–93 (Dec. 20); Fisheries (U.K. v. Nor.), 1951 I.C.J. 116, 131 (Dec. 18); Asylum (Colom. v. Peru), 1950 I.C.J. 266, 277–78 (Nov. 20); see also Herbert Briggs, *The Colombian-Peruvian Asylum Case and Proof of Customary International Law*, 45 AM. J. INT'L L. 728, 730 (1951) (“The existence of a conception that a practice is

accorded a very restricted scope and is regarded as inapplicable to a norm of *jus cogens*.<sup>119</sup>

Custom comprises two elements: the usage or practice of customary international law ("state practice") and *opinio juris sive necessitatis*, the belief that the usage is a legal right ("*opinio juris*"). This deceptively simple formula was described by the International Court of Justice (ICJ) as "axiomatic,"<sup>120</sup> but it has generated tremendous controversy both in the manner of its satisfaction and in the relationship between its two components.<sup>121</sup>

## 2. *International Custom in Relation to the Space Environment*

The principle of the "province of all mankind" as a limitation on the freedom of exploration appears to lack the requisite *opinio juris* to attain the status of a customary norm. It does not "constitute a principle sufficiently normative in character that it becomes capable of generating specific legal effects or enhancing particular value expectations."<sup>122</sup> First, the use and exploration of outer space as the "province of all mankind" is not well-defined enough to impose any concrete obligations on states to avoid harm to the space environment in their use and exploration of it. Second, there is no

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required or forbidden before a customary rule of international law may be said to exist . . . is one of the psychologized elements which has created more difficulties in theory than in practice."); David Colson, *How Persistent Must the Persistent Objector Be?*, 61 WASH. L. REV. 957, 965-70 (1986) (arguing that "an analysis of the objector's role will bring us to a better understanding of the formation and operation of customary international law itself"); Ted Stein, *The Approach of the Different Drummer: The Principle of the Persistent Objector in International Law*, 26 HARV. INT'L L.J. 457, 458-63 (1985) (arguing that while the persistent objector principle has played a limited role in past international relations, it will play a larger role in future controversies).

119. See Vienna Convention on the Law of Treaties, May 23, 1969, arts. 53-54, 1155 U.N.T.S. 331 [hereinafter Vienna Convention].

120. *Continental Shelf (Libya v. Malta)*, 1985 I.C.J. 13, 20 (June 3).

121. An analysis of the problems associated with the formation of custom is beyond the scope of this paper. There is a wealth of literature on the nature of customary international law. See, e.g., MICHAEL BYERS, *CUSTOM, POWER AND THE POWER OF RULES* 129-203 (1999); MARTTI KOSKENNIEMI, *FROM APOLOGY TO UTOPIA* 363, 388-89 (1989); Hilary Charlesworth, *Customary International Law and the Nicaragua Case*, 11 AUST. Y.B. INT'L L. 1, 9 (1984-87); Jonathan Charney, *International Agreements and the Development of Customary International Law*, 61 WASH. L. REV. 971, 983 (1986); Bin Cheng, *United Nations Resolutions on Outer Space: "Instant" International Customary Law?*, 5 INDIAN J. INT'L L. 23, 37 (1965); Hiram Chodosh, *Neither Treaty nor Custom: The Emergence of Declarative International Law*, 26 TEX. INT'L L.J. 87, 100-05 (1991); Wladyslaw Czaplinski, *Sources of International Law in the Nicaragua Case*, 38 INT'L & COMP. L.Q. 151, 152-66 (1989); Anthony D'Amato, *Trashing Customary International Law*, 81 AM. J. INT'L L. 101, 102 (1987); Frederic Kirgis, *Custom on a Sliding Scale*, 81 AM. J. INT'L L. 146, 147-51 (1987); Josef Kunz, *The Nature of Customary International Law*, 47 AM. J. INT'L L. 662, 667 (1952); Blaine Sloan, *General Assembly Resolutions Revisited (Forty Years Later)*, 58 BRIT. Y.B. INT'L L. 39, 68-77 (1987). The ICJ has made numerous pronouncements on customary law. See, e.g., *Military and Paramilitary Activities (Nicar. v. U.S.)*, 1986 I.C.J. 14, 98, 100, 106-07, 193, 202-05 (June 27); *Nuclear Tests (Austl. v. Fr.; N.Z. v. Fr.)*, 1974 I.C.J. 253, 286-93 (Dec. 20); *Fisheries Jurisdiction (U.K. v. Ice.)*, 1974 I.C.J. 3, 23-36 (July 25); *North Sea Continental Shelf (F.R.G. v. Den.; F.R.G. v. Neth.)* (Feb. 20), 1969 I.C.J. 3, 43; *Rights of Passage over Indian Territory (Port. v. India)*, 1960 I.C.J. 6, 44 (Apr. 20); *Fisheries (U.K. v. Nor.)*, 1951 I.C.J. 116, 131 (Dec. 18).

122. Christopher Joyner, *Legal Implications of the Concept of the Common Heritage of Mankind*, 35 INT'L & COMP. L.Q. 190, 197 (1986).

sufficiently broad-based state conduct and behavior to attest to its widespread acceptance. Finally, there have been no adaptations in state practice to comply with the development of the notion of the "province of all mankind" as a limitation on the freedom of exploration and use of outer space, and there is no evidence of *opinio juris*. The entry into force of the Astronaut Agreement, the Registration Convention, and the Liability Convention cannot be evidence of a recognition by states that they are bound by the customary norm of equitable use and conservation of a shared resource, i.e., the outer-space environment, and at the same time be indicative of positive efforts to provide a practical framework for resolving conflicts of interests regarding shared resources. The obligations under the Astronaut Agreement are mainly concerned with the rescue of astronauts and the return of space objects that have returned to Earth to their launching state. As mentioned in Part III, the purpose of the Registration Convention is to assist in the identification of space objects, while the Liability Convention allows for compensation to victims of damage caused by space objects. The concern of these space treaties is neither the protection nor the conservation of the space environment.

According to Jonathan Charney's criteria,<sup>123</sup> one could contend that the preservation of the outer-space environment has merited international attention and generalized concern as evidenced in the numerous U.N. General Assembly declarations and the formation of COPUOS and its integral role in the making of international space treaties. However, none of the treaty obligations under the framework of the present space treaties contains a discrete, well-defined customary rule that imposes a duty on states to avoid harm to the space environment.

Nevertheless, the generalized concern for the protection of the space environment is reflected in the Sixty-Sixth Conference of the ILA, which adopted the Buenos Aires International Instrument on the Protection of the Environment From Damage Caused by Space Debris,<sup>124</sup> and in the Scientific Subcommittee of COPUOS. It appears that protection of the space environment is currently a pressing issue on the agenda of many expert groups and international bodies. As discussed above, existing treaty rules and custom do not impose concrete obligations on states to prevent pollution to the space environment. Is there some other way that the outer-space environment may be protected from pollution by NPS or debris?

The International Law Commission took the view that "[i]t is not the form of a general rule of international law but the particular nature of the subject-matter with which it deals that may . . . give it the character of *jus cogens*."<sup>125</sup> This statement seems to suggest that the very nature of a subject

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123. See Charney, *supra* note 116, at 543-47.

124. See Buenos Aires International Instrument, *supra* note 4, at 112.

125. *Reports of the Commission to the General Assembly*, U.N. Doc. A/6309/Rev.1 (1966), reprinted in [1966] 2 Y.B. Int'l L. Comm'n 169, 248, U.N. Doc. A/CN.4/SER.A/1966/Add.1.

matter, independent of any reference to custom, may qualify it as a norm of *jus cogens*. What the current literature fails to address is whether the protection and conservation of the outer-space environment as the “province of all mankind” qualifies as a norm of *jus cogens*.<sup>126</sup> Discussions center around the application of the “province of all mankind” and the CHM principles to the use and exploitation of outer space, and rarely address environmental concerns specific to the preservation of the outer-space environment. The notion of *jus cogens* is supported by the view that the satisfaction of the higher interest of the entire community should prevail over often contradictory national preferences.<sup>127</sup>

In general, norms of *jus cogens* possess the following characteristics:

- (1) they reflect significant, morally-based social values or the “conscience universelle” of all human beings;<sup>128</sup>
- (2) they contribute to the development of a maturing, meaningful, and structured international legal system, and to the operation of an acceptable degree of community order;<sup>129</sup>
- (3) juridical and natural persons will commit themselves to such principles and be guided by them in their actions, i.e., the norms must be recognized by the community of nations as a whole;<sup>130</sup>
- (4) the candidates will contribute to the formation of norms that will assist in the alleviation of tensions among international juridical persons, including states and international bodies;<sup>131</sup>
- (5) they “serve the higher values and interests of States and of mankind at large”;<sup>132</sup> and
- (6) the candidates must be able to demonstrate that the substance of the norm being considered for *jus cogens* status is so important, and the need for protection so overwhelming, that non-inclusion would be *contra bonos mores*.<sup>133</sup>

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126. See, e.g., CHRISTOL, *supra* note 72, at 443.

127. See Alfred von Verdross, *Forbidden Treaties in International Law*, 31 AM. J. INT’L L. 571, 574 (1937). See generally Gordon Christenson, *The World Court and Jus Cogens*, 81 AM. J. INT’L L. 93 (1987) (discussing the World Court’s conclusion in *Military and Paramilitary Activities (Nicar. v. U.S.)*, 1986 I.C.J. 14 (June 27), that the prohibition of the use of force is a principle of customary international law).

128. Carl Christol, *Judge Manfred Lachs and the Principle of Jus Cogens*, 22 J. SPACE L. 33, 38 (1994); see also Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide, 1951 I.C.J. 15, 23 (May 28) (“[I]t was the intention of the United Nations to condemn and punish genocide as ‘a crime under international law’ involving a denial of the right of existence of entire human groups, a denial which shocks the conscience of mankind and results in great losses to humanity . . .”)

129. See CHRISTOL, *supra* note 72, at 452.

130. See *id.*

131. See *id.*

132. Christol, *supra* note 128, at 35.

133. See CHRISTOL, *supra* note 72, at 452; Christol, *supra* note 128, at 39; Verdross, *supra* note 127, at 572–76.

Article 53 of the 1969 Vienna Convention on the Law of Treaties defines norms of *jus cogens* or peremptory norms as those rules "accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted . . . ."<sup>134</sup> Article 64 further provides that: "If a new peremptory norm of general international law emerges, any existing treaty which is in conflict with that norm becomes void and terminates."<sup>135</sup> Prosper Weil argues that the *jus cogens* principle isolates certain norms (the peremptory or elite norms) whose applicability cannot be set aside by particular agreements and places them at the summit of a hierarchy; below them resides the great mass of merely binding norms known as ordinary customary or conventional rules.<sup>136</sup> Examples of such peremptory norms have been said to include prohibitions of torture, genocide, slavery, and racial discrimination.<sup>137</sup>

The quintessential element of the *jus cogens* principle is that it must be recognized by the international community "as a whole"<sup>138</sup> and that the realization of valued goals can be achieved only through processes that

134. Vienna Convention, *supra* note 119, art. 53, 1155 U.N.T.S. at 344. When the peremptory norms draft provisions were first introduced in the International Law Commission, Hersch Lauterpacht regarded the notion of *jus cogens* to be consistent with the "overriding principles of international law which may be regarded as constituting principles of international public policy." Egon Schwelb, *Some Aspects of International Jus Cogens as Formulated by the International Law Commission*, 61 AM. J. INT'L L. 946, 949 (1967) (quoting *Report by Mr. H. Lauterpacht, Special Rapporteur, Law of Treaties*, [1953] 2 Y.B. INT'L L. COMM'n 90, 155, U.N. Doc. A/CN.4/63).

135. Vienna Convention, *supra* note 119, art. 64, 1155 U.N.T.S. at 347.

136. See Prosper Weil, *Towards Relative Normativity in International Law*, 77 AM. J. INT'L L. 413, 423-24 (1983). Unfortunately, a thorough discussion on the controversial theory of *jus cogens* is beyond the scope of this paper. For treatments of this problem, see, for example, LAURI HANNIKAINEN, PEREMPTORY NORMS (JUS COGENS) IN INTERNATIONAL LAW: HISTORICAL DEVELOPMENT, CRITERIA, PRESENT DEVELOPMENT (1988); Anthony D'Amato, *It's a Bird, It's a Plane, It's Jus Cogens!*, 6 CONN. J. INT'L L. 1 (1990); Mark Janis, *The Nature of Jus Cogens*, 3 CONN. J. INT'L L. 359 (1988); Jordan Paust, *The Reality of Jus Cogens*, 7 CONN. J. INT'L L. 81 (1991); Mary Ellen Turpel and Philippe Sands, *Peremptory International Law and Sovereignty: Some Questions*, 3 CONN. J. INT'L L. 364 (1988).

137. See, e.g., *Koowarta v. Bjelke-Petersen* [1982] 153 C.L.R. 168, 204, 220 (Austl.); *Military and Paramilitary Activities (Nicar. v. U.S.)*, 1986 I.C.J. 14, 97-100 (June 27); *Advisory Opinion on Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) Notwithstanding Security Council Resolution 276 (1970)*, 1971 I.C.J. 16, 57 (June 21); *Barcelona Traction, Light and Power Co. (Belg. v. Spain)*, 1970 I.C.J. 4, 32; see also Eduardo Jiménez de Aréchaga, *International Law in the Past Third of a Century*, 159 RECUEIL DES COURS 1, 174-77 (1978) (asserting that the prohibition of racial, sexual, linguistic, and religious discrimination "is an unqualified obligation, of a self-executing character, which results directly from express and reiterated provisions in the Charter"); Charney, *supra* note 116, at 541 (1993) (noting the inapplicability of the persistent objector rule to international law prohibiting genocide, slavery, war crimes, and crimes against humanity); Theodor Meron, *On a Hierarchy of International Human Rights*, 80 AM. J. INT'L L. 1, 15 (1986) (stating that treaties violating human rights are void); Egon Schwelb, *The International Court of Justice and the Human Rights Clauses of the Charter*, 66 AM. J. INT'L L. 337, 338 (1972) (examining the legal enforceability of U.N. human rights provisions); Kotaro Tanaka, *Some Observations on Peace, Law and Human Rights*, in *TRANSNATIONAL LAW IN A CHANGING SOCIETY* 242, 248 (W. Friedmann et al. eds., 1972) (describing U.N. anti-discrimination statutes). See generally Bruno Simma & Philip Alston, *The Sources of Human Rights Law: Custom, Jus Cogens, and General Principles*, 12 AUST. Y.B. INT'L L. 82 (1988-89) (describing the sources of human rights law).

138. Manfred Lachs, *The Development and General Trends of International Law in Our Time*, 169 RECUEIL DES COURS 9, 210 (1984).

depend upon a superior-inferior hierarchy of norms, and hence the presence of both higher and lower ranges of responsibility and authority. Manfred Lachs explained that the words "as a whole" indicated that "acceptance is not required by each and every member of the international community."<sup>139</sup> If we compare the interpretations accorded to the phrase "international community as a whole" with the prerequisites for "general practice" eventually leading to the formation of custom, it would appear that the threshold requirement for the emergence of *jus cogens*, namely the generality of acceptance and recognition, is set at least as high as that necessary for the development of custom.<sup>140</sup> Because of its perceived potency, a peremptory norm is even more difficult to establish than a usually controversial rule of customary international law.<sup>141</sup>

As discussed above, the concept of the "province of all mankind" as contained in article I of the Outer Space Treaty has not attained the status of a customary rule. This failure to satisfy the customary-rule threshold disqualifies its candidacy as a norm of *jus cogens*.<sup>142</sup> In other words, the notion of the "province of all mankind" does not command states' general acceptance that the need for protection of the outer-space environment is so overwhelming that non-inclusion as a norm of *jus cogens* would be *contra bonos mores*. Unfortunately, the most that can be said of the protection of the space environment as the "province of all mankind" at present is that it may indicate an *emergent* principle of international law and is not as yet a customary rule and certainly not a norm of *jus cogens*.

What many spacefaring nations fail to understand is that the freedom of exploration and use of outer space must be constrained by a prohibition on pollution of the outer-space environment. The freedom is enhanced and protected by such a prohibition. Both freedom and prohibition are symbiotic and complementary, and should not be viewed as conflicting concepts. States cannot reap the benefits that flow from the use, exploration, and exploitation of outer space without shouldering the responsibility of protecting the space environment from pollution.<sup>143</sup> Although the content of the "province of all mankind" is disputed, it nevertheless, at a minimum, imposes a duty upon states to use outer space in a manner that jeopardizes neither the interests of present spacefaring states nor the potential interests of other states. According to Delbert Smith, "the advantages to be derived from rapid development of

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139. *Id.*

140. See Simma & Alston, *supra* note 137, at 103. In its advisory opinion, *Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide*, 1951 I.C.J. 15 (May 28), the World Court observed that "the principles underlying the Convention are principles which are recognized by civilized nations as binding on States, even without any conventional obligation." *Id.* at 23 (emphasis added). Thus it appears that at a bare minimum, there must be some inherent recognition by a substantial majority of states that they must abstain from a particular act before such an obligation can attain the status of a norm of *jus cogens*.

141. See Janis, *supra* note 136, at 362.

142. See *supra* notes 128–133 and accompanying text.

143. See, e.g., YOUNG, *supra* note 78, at 197.

outer space must be balanced against the requirement that the development be carried out in a manner beneficial to all members of the international community."<sup>144</sup> Quite simply, the principle of sustainable development provides the theoretical and pragmatic basis for the development of the "province of all mankind"—"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."<sup>145</sup>

It appears from the foregoing analysis that international law presently does not recognize the "province of all mankind" as possessing any legal prescription pertaining to the protection of the space environment from pollution flowing from space activities. However, it is in the common interest of all states that the exploration and use of outer space should, at the bare minimum, be "sustainable." The next section explains why.

### 3. *The Emerging Norm of Sustainable Development*

Concern for future generations figured prominently in the 1972 Stockholm Declaration of the U.N. Conference on the Human Environment, which was adopted by the U.N. General Assembly by 112 votes in favor and none against (with ten abstentions).<sup>146</sup> Principle 1 of the Declaration declares that we have a "solemn responsibility to protect and improve the environment for present and future generations."<sup>147</sup> The Declaration also contains provisions and principles concerning management of natural resources and pollution threats (principles 2-7);<sup>148</sup> planning and environmental and demographic policy (principles 13-17);<sup>149</sup> and state obligations to prevent environmental damage in other countries or in areas outside their jurisdiction. States must also cooperate in the development of international law regarding liability and compensation for such environmental damage (principles 21-22).<sup>150</sup> Since the Declaration, about 300 multilateral agreements and 900 bilateral treaties have been concluded on the environment.<sup>151</sup> On October 29, 1982, the U.N. General Assembly—with 111 votes in favor and 1 against (the United States)—proclaimed the World Charter for Nature, which explicitly states that governments have a duty to pass on humanity's natural heritage to future generations.<sup>152</sup> In 1987 the World Commission on Environment and

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144. DELBERT SMITH, *SPACE STATIONS: INTERNATIONAL LAW AND POLICY* 96 (1979).

145. WORLD COMM'N ON ENV'T AND DEV., *OUR COMMON FUTURE* 43 (1987) [hereinafter *OUR COMMON FUTURE*].

146. See G.A. Res. 2994, U.N. GAOR, 27th Sess., 2112 plen. mtg., U.N. Doc. A/RES/2994 (1972).

147. *United Nations Conference on the Environment: Final Documents*, U.N. Doc. A/CONF.48/14, reprinted in 11 I.L.M. 1416, 1418 (1972).

148. See *id.*, 11 I.L.M. at 1418.

149. See *id.*, 11 I.L.M. at 1419.

150. See *id.*, 11 I.L.M. at 1420.

151. See Veit Koester, *From Stockholm to Brundtland*, 20 ENVTL. POL'Y & L. 14, 15 (1990).

152. See G.A. Res.37/7, U.N. GAOR, 37th Sess., 48th plen. mtg., U.N. Doc. A/RES/37/7 (1982).



Development (WCED) published its report on environment and sustainable development, known as the "Brundtland Report."<sup>153</sup> The main guidelines of the Report were *unanimously* endorsed by the U.N. General Assembly in 1987 as a framework for future environmental cooperation.<sup>154</sup> Unfortunately, the contours of many concepts are blurred and the precise contents of the customary rules are unclear.<sup>155</sup> Nevertheless, such developments are in line with the view of Judge Alvarez in the *Fisheries* case, which provided that states have a duty in customary law not merely to allocate common resources equitably, but also to conserve them for future benefit in the interests of sustainable utilization.<sup>156</sup> Although space was not directly referred to as a common resource, in view of the interconnectedness of the Earth's environment and outer space, such a principle should be extended without much difficulty to encompass the sustainable utilization of the outer-space environment.

Two decades after the Stockholm Declaration, over 170 countries gathered at the Rio Convention to reaffirm their commitment to the protection of the environment for present and future generations, and to implement the goals of sustainable development.<sup>157</sup> Although such international declarations were focused primarily on the protection of the Earth's environment, the theoretical justifications for intergenerational responsibility and sustainable development that underpin the U.N. declarations relating to the human environment are no different from the concept of the transmission of the outer-space environment substantially unimpaired to future generations under the "province of all mankind" principle. Hence such environmental policies should apply equally to the outer-space environment.

Edith Brown Weiss has advanced the theory of "intergenerational equity," which provides for generational rights and obligations.<sup>158</sup> Her thesis consists of a normative framework of intersecting theories of intergenerational

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153. OUR COMMON FUTURE, *supra* note 145.

154. See G.A. Res. 42/186, U.N. GAOR, 42d Sess., U.N. Doc. A/RES/42/186 (1988); G.A. Res. 42/187, U.N. GAOR, 42d Sess., 96th plen. mtg., U.N. Doc. A/RES/42/187 (1988).

155. See Günther Handl, *Environmental Security and Global Change: The Challenge to International Law*, 1 Y.B. INT'L ENVTL. L. 3, 3-4 (1990); Louis Sohn, *The Stockholm Declaration on the Human Environment*, 14 HARV. INT'L L.J. 423 (1973).

156. See *Fisheries* (U.K. v. Nor.), 1951 I.C.J. 116, 148-53 (Dec. 18) (separate opinion of Judge Alvarez).

157. See Rio Declaration on Environment and Development, adopted June 14, 1992, U.N. Doc. A/CONF.151/26, vol. I, reprinted in 31 I.L.M. 874 (1992) [hereinafter Rio Declaration].

158. See generally WEISS, *supra* note 86, at 17-46 (arguing that each generation is obliged to conserve the planet in trust for the next). An alternative theory of our responsibility to future generations was recently put forward in CHRISTOPHER STONE, *EARTH AND OTHER ETHICS: THE CASE FOR MORAL PLURALISM* 84-91 (1987) and was further developed in Gary P. Supanich, *The Legal Basis of Intergenerational Responsibility: An Alternative View—The Sense of Intergenerational Identity*, 3 Y.B. INT'L ENVTL. L. 94, 99-105 (1992). Supanich argued that the legal basis of intergenerational responsibility should be viewed as a question regarding "our self-understanding about our place in time vis-à-vis past and future generations" and the "responsibility in the moral-psychological harm to our self-image as members of a species whose situation on this planet is unique." Supanich, *supra* at 100-01.

and intragenerational equity that are derived from an underlying planetary trust, embodying the notion that generations act as stewards to sustain the welfare and well-being of all generations. This planetary trust obliges "each generation to preserve the diversity of the resource base and to pass the planet to future generations in no worse condition than it receives it."<sup>159</sup> The principle of the conservation of options requires each generation "to conserve the diversity of the natural and cultural resource base, so that it does not unduly restrict the options available to future generations in solving their problems and satisfying their own values, and should be entitled to diversity comparable to that enjoyed by previous generations."<sup>160</sup> The theory of intergenerational equity is an appealing one. Unfortunately, Weiss's model generally rests upon an intertemporal human rights model for preserving the global environment. This presents many problems, ranging from the questionable existence of the right to a decent environment to the issue of remedies in respect of claims made by future generations against present generations.<sup>161</sup>

Whether the global awareness of the harm to our sense of intergenerational identity, as evidenced by the various U.N. General Assembly resolutions and numerous international conventions, will be sufficient to mobilize the implementation and enforcement of effective legal measures on behalf of future generations is doubtful. But more importantly, the notions of intergenerational identity and sustainable development will prove to be invaluable concepts in framing the discussion in Part VI.

Current literature has concentrated on the notion of sustainable development as involving the integration of economic and environmental considerations at all levels of decision-making.<sup>162</sup> But the outer-space

159. Edith Brown Weiss, *The Planetary Trust: Conservation and Intergenerational Equity*, 11 *ECOLOGY L.Q.* 495, 499 (1984); see also Edith Brown Weiss, *Our Rights and Obligations to Future Generations*, 84 *AM J. INT'L L.* 198 (1990) [hereinafter Weiss, *Our Rights and Obligations*] (developing her thesis on intergenerational equity in greater detail). Intergenerational equity consists of three basic principles: the "conservation of options," the "conservation of quality," and the "conservation of access." WEISS, *supra* note 86, at 41-45.

160. Weiss, *Our Rights and Obligations*, *supra* note 159, at 202.

161. See, e.g., STONE, *supra* note 158, at 85-89; Philip Alston, *A Third Generation of Solidarity Rights: Progressive Development or Obfuscation of International Human Rights Law?*, 29 *NETH. INT'L L. REV.* 307 (1982); Brian Barry, *Justice Between Generations*, in *LAW, MORALITY AND SOCIETY* 270-76 (P. Hacker & J. Raz eds., 1977); Günther Handl, *Human Rights and Protection of the Environment: A Mildly "Revisionist" View*, in *DERECHOS HUMANOS, DESARROLLO SUSTENTABLE Y MEDIO AMBIENTE [HUMAN RIGHTS, SUSTAINABLE DEVELOPMENT AND THE ENVIRONMENT]* 117 (A. Cancado Trindade ed., 1992); Supanich, *supra* note 158, at 96-98; Gordon A. Christenson, *Book Review*, 1 *Y.B. INT'L ENVTL. L.* 392, 396 (1990) (reviewing EDITH BROWN WEISS, *IN FAIRNESS TO FUTURE GENERATIONS* (1989)); see also Alan Boyle, *Book Review*, 40 *INT'L & COMP. L.Q.* 230, 230 (1991) (reviewing EDITH BROWN WEISS, *IN FAIRNESS TO FUTURE GENERATIONS* (1989)) (describing Weiss's thesis as "wildly unrealistic" and "misplaced utopianism").

162. See, e.g., PATRICIA BIRNIE & ALAN BOYLE, *INTERNATIONAL LAW AND THE ENVIRONMENT* 119 (1992) ("The protection of common spaces . . . is thus a complex issue in which scientific, moral, ethical, political, economic, social, and technological issues are inextricably intertwined and on which these interests do not always coincide."); see also Alexandre S. Timoshenko, *From Stockholm to Rio: The Institutionalization of Sustainable Development*, in *SUSTAINABLE DEVELOPMENT AND INTERNATIONAL LAW* 143 (Winfried Lang ed., 1995) (chronicling the development and legitimization of

environment has been largely ignored, as if it were simply economic development on Earth that must be environmentally sound. There is no reason, however, why the precautionary principles that emerge from the concept of sustainable development in the Stockholm Declaration, the Rio Declaration, and the World Charter for Nature should not apply equally to the outer-space environment. Few states, if any, will take issue with the proposition that the exploration and use of outer space should be *sustainable*. It is in the common interest of all states, whether spacefaring or otherwise, to subscribe to a regime that allows for the development of space activities in a manner that leaves the space environment in a substantially unimpaired condition for future generations. One might even ultimately find that the uniqueness and vulnerability of the outer-space environment demand that the international community as a whole recognize sustainable development as a “global ethic”<sup>163</sup> that transcends terrestrial boundaries, as a peremptory norm that prohibits “policies and practices that support current living standards by depleting the productive base, including natural resources, and that leaves future generations with poorer prospects and greater risks than our own.”<sup>164</sup>

We should not confine our actions to those we are now able to determine as directly or indirectly benefiting ourselves or our descendants. On the contrary, we should “cultivate our natural sense of obligation not to act wastefully or wantonly even when we cannot calculate how such acts would make any present or future persons worse off.”<sup>165</sup> It seems impossible to find universally agreed-upon limits on the freedom of exploration and use of outer space. Rather than focus on indeterminate rules of custom-formation, we should concentrate on establishing fair and workable arrangements and institutions that can successfully accommodate the competing interests of all nations. With these guidelines in mind, we will now examine new methods of treaty-making that will enhance the willingness of states to participate in an environmental program that seeks to achieve an acceptable balance between pollution control and freedom of space exploration.

## VI. SOME PROPOSALS

### A. *New Principles of International Environmental Law-Making*

#### 1. *Soft Law and a Regime-Building Approach*

As discussed in Part V, the consensus approach to treaty-making adopted by COPUOS results in an ineffective space-treaties regime that fails

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the notion of sustainable development beginning with the Stockholm Conference in 1972).

163. Supanich, *supra* note 158, at 107.

164. ROBERT REPETTO, *WORLD ENOUGH AND TIME: SUCCESSFUL STRATEGIES FOR RESOURCE MANAGEMENT* 15 (1986), *quoted in* Supanich, *supra* note 158, at 107.

165. Anthony D’Amato, *Do We Owe a Duty to Future Generations To Preserve the Global Environment?*, 84 AM. J. INT’L L. 190, 198 (1990).

to address adequately the current problems that plague the space environment. Moreover, the examination of customary international law in this area revealed only its impotence in the effective regulation of space pollution. Where hard law has failed, "soft law," combined with a committed regime-building approach, may triumph. Protection of the outer-space environment can only be achieved on the pragmatic level through a sophisticated understanding of regime formation and elaboration, combined with a determined pursuit of knowledge-sharing and cooperation. A proposed conceptualization of the protection of the space environment must acknowledge "the continuing interplay between competitive statist behavior and an admission that concern for the environment per se and the interests of people might push states toward more cooperative strategies."<sup>166</sup> International life in this new millennium will be characterized by what David Kennedy calls "the move to institutions."<sup>167</sup> It will be these collective arrangements that will intensify the legal content of discourse and heighten the actualization of international legal norms.

Environmental regimes are not static structures. Like human rights treaty regimes, they evolve along a continuum from dialogue to the sharing of information and expertise, to more defined framework conventions for cooperation, to more precise binding legal norms contained in protocols. Each point in the continuum progresses sequentially from one to the other, each as important as the other in a relationship of interdependence. The contextual stage of regime formation, for example, establishing roundtables and colloquia with a view to developing a framework convention, is typically a precursor to the final enunciation of international binding norms. This continuum of regime formation, in both a substantive and a procedural sense, is not always linear, as it allows for "overlapping cycles of cooperation and competition."<sup>168</sup> A space environment regime must include the concepts of sustainable development and intergenerational equity and, at the same time, respect the sovereign interests of states. The regime is like a living organism: When a regime is established through practice and a convergence of interests and expectations around that practice, its interests and expectations may persist even after the forces that shaped its evolution have changed.<sup>169</sup>

In order for the space environment regime to be successful, we must emphasize implementation as a measure of effectiveness and overcome our

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166. Jutta Brunnée & Stephen J. Toope, *Environmental Security and Freshwater Resources: Ecosystem Regime Building*, 91 AM. J. INT'L L. 26, 27 (1997).

167. David Kennedy, *The Move to Institutions*, 8 CARDOZO L. REV. 841, 841 (1987).

168. Brunnée & Toope, *supra* note 166, at 28; *see also* Stephen D. Krasner, *Structural Causes and Regime Consequences: Regimes as Intervening Variables*, in INTERNATIONAL REGIMES 1 (Stephen D. Krasner ed., 1983) (summarizing different approaches to regime formation); John K. Setear, *An Iterative Perspective on Treaties: A Synthesis of International Relations Theory and International Law*, 37 HARV. INT'L L.J. 139, 142-47 (1996) (summarizing various works that combine institutionalism with international law).

169. *See* Stephen D. Krasner, *Regimes and the Limits of Realism: Regimes as Autonomous Variables*, 36 INT'L ORG. 497, 500 (1982).

obsession with mechanisms of dispute settlement. The traditional rhetoric of enforcement will not ensure compliance. Instead, the framework-protocol approach is the best model for the protection and preservation of the space environment, and is well tested in international environmental law.<sup>170</sup> The discursive elaboration and the search for a common understanding is at the heart of the compliance process. Although the principle of unanimous consensus adopted as the working procedure of COPUOS can cause and has resulted in drawn-out negotiations, it has encouraged compromise.<sup>171</sup> On the other hand, a space treaties regime based on excessive influence by the space powers would eventually be rejected by subsequent spacefaring nations and could jeopardize the orderly operations of space activities in the future. Thus it is important to concentrate on finding the right balance between political exigencies and the need for precise legal wording that imposes obligations on signatory states. The acceptable balance may be found in "soft law."

Soft law, "where international law and international politics combine to build new norms,"<sup>172</sup> has become a fashionable phrase in international environmental law, as it acknowledges the inextricability of law and politics. Treaty-making in an environmental context goes beyond the consideration of traditional treaty-making techniques and cannot be viewed in isolation from international declarations and recommendations that have not yet attained the binding force of international law, but which embody a certain degree of political commitment and hence give rise to expectations for future behavior.<sup>173</sup> The advantages of soft law include range, flexibility, and frequent adherence by the governments that made such declarations. Its shortcomings include the lack of precision in such political commitments and the absence of enforceable legal sanctions.<sup>174</sup> However, although individual states might be tempted by short-term gains to violate their soft-law obligations, in many

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170. A detailed examination of the various approaches to treaty-making is beyond the scope of this article. For a comprehensive treatise on the merits of different approaches to treaty-making, see CHAYES & CHAYES, *supra* note 39.

171. Nandasiri Jasentuliyana, *Treaty Law and Outer Space: Can the United Nations Play an Effective Role?*, 11 ANNALS AIR & SPACE L. 219, 223 (1986). The consensus approach appears to have accounted for the wide acceptance of the space treaties. Under this approach, the treaties were negotiated taking into account myriad and diverse interests, and ensuring in particular the concurrence of the major space powers, without which the legal rules would possess little significance. *See id.*

172. Palmer, *supra* note 97, at 269; *see also* John Gerard Ruggie, *International Regimes, Transactions, and Change: Embedded Liberalism in the Postwar Economic Order*, 36 INT'L ORG. 379, 382 (1982) (emphasizing the importance of analyzing both power and social purpose in understanding international economic orders and regimes).

173. *See* Military and Paramilitary Activities (Nicar. v. U.S.), 1986 I.C.J. 14, 99 (June 27); Alexandre Kiss & Diane Shelton, *Systems Analysis of International Law: A Methodological Inquiry*, 17 NETH. Y.B. INT'L L. 45, 67 (1986).

174. *See* C.M. Chinkin, *The Challenge of Soft Law: Development and Change in International Law*, 38 INT'L & COMP. L.Q. 850, 859-62 (1989) (commenting on the choice of soft-law forms); Blaine Sloan, *supra* note 121, at 106-25 (analyzing the difficulties of measuring or even categorizing the force of a given norm, as well as the problems involved in attempting to measure its effects); Paul C. Szasz, *International Norm-Making*, in ENVIRONMENTAL CHANGE AND INTERNATIONAL LAW: NEW CHALLENGES AND DIMENSIONS 41, 69-72 (Edith Brown Weiss ed., 1992) (noting that while soft law may not be binding, in practice it is observed).

situations they will find that their long-term goals are likely to be served better by compliance.<sup>175</sup> Conventional international law requires time to develop; in any event, regimes are not synonymous with custom. Yet in the absence of *lex lata*, soft law may succeed.<sup>176</sup> Soft-law instruments have been said to include the Stockholm<sup>177</sup> and Rio Declarations,<sup>178</sup> and the 1989 Hague Declaration on the Environment,<sup>179</sup> where the establishment of a comprehensive regulatory regime is contemplated. These should be distinguished from “soft provisions” of treaties, where the treaty in its final form imposes vague and imprecise obligations.<sup>180</sup>

Perhaps one can avoid the rule of unanimous consent by adopting a Framework Convention on the Protection of the Outer Space Environment (the Space Environment Framework Convention or SEFC), much like the 1985 Vienna Convention for the Protection of the Ozone Layer,<sup>181</sup> which established general obligations to cooperate. The Vienna Convention paved the road toward the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer,<sup>182</sup> the 1989 Helsinki Declaration on the Protection of the Ozone Layer,<sup>183</sup> and the 1990 London Amendments,<sup>184</sup> each adding an element of specificity to the general obligations contained in the framework Ozone Layer Convention. This successful regime-building approach has its genesis in a contextual framework and then moves effectively through the continuum to eventuate in a legally binding regime with a convergence of interests. Despite the emphasis by some contemporary international regime theorists on the significance of the influence of norms on the establishment of “negotiating frameworks” and in the coordination of “actor expectations,”<sup>185</sup> claims of legal

175. See Charney, *supra* note 116, at 532.

176. See, for example, the 1989 Langkawi Declaration on the Environment, in which the Commonwealth heads of government committed themselves to a program of action that stresses the need to promote “economic growth and sustainable development, including the eradication of poverty.” Reprinted in 5 AM. U. J. INT’L L. & POL’Y 589, 589 (1990). It seems likely that a more comprehensive program will be established in the future—a program that builds on the broad principles agreed upon in the 1989 Declaration—as Asia recovers from the economic malaise that struck in the second half of the 1990s.

177. See *supra* note 146 and accompanying text.

178. See *supra* note 157 and accompanying text.

179. The Hague Declaration was signed by 24 nations at the International Summit on the Protection of the Global Atmosphere, March 11, 1989. See Hague Declaration on the Environment, 28 I.L.M. 1308 (1989).

180. See Lang, *supra* note 94, at 109, 116. Examples of soft obligations include articles 2 and 6 of the 1979 Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, 34 U.S.T. 3043, 3046–47, 18 I.L.M. 1442, 1443–44 (1979).

181. Ozone Layer Convention, *supra* note 9.

182. Sept. 16, 1987, S. TREATY DOC. NO. 100-10, 26 I.L.M. 1541 (1987) (entered into force Jan. 1, 1989) [hereinafter Montreal Protocol].

183. May 2, 1989, 28 I.L.M. 1335 (1989).

184. Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer, June 29, 1990, S. TREATY DOC. NO. 102-4, 30 I.L.M. 537 (1991) [hereinafter London Amendments].

185. Robert O. Keohane, *The Demand for International Regimes*, 36 INT’L ORG. 325, 338–39 (1982); see also Oran R. Young, *Regime Dynamics: The Rise and Fall of International Regimes*, 36 INT’L ORG. 277, 277 (1982) (describing the role of regimes at the international as compared to the domestic level).

normativity remain a formidable challenge for many international lawyers, who must learn a new vocabulary of shared understanding and pragmatic management.

Although the modifications to the Ozone Layer Convention have not all enjoyed widespread ratification,<sup>186</sup> the best course of action still appears to be a regime-building approach. Any convention that attempts to impose hard obligations at the outset without taking into account the interests of the space powers will be condemned to obsolescence.<sup>187</sup> As discussed earlier, one example is the introduction of the CHM regime in the Moon Agreement, which establishes an international regime of equitable sharing by all states parties in the benefits derived from the natural resources of the Moon. The regime-building approach is supported by Nandasiri Jasentuliyana who suggested that "in view of the complex and evolving technology, the United Nations might only develop a treaty with broad and general guidance, leaving it to an international technical body to establish standards and recommended practices for States to follow."<sup>188</sup>

The process begins with political consensus in multilateral fora, leading to the formation of soft-law obligations. The constellation of political interests are then accommodated in a framework convention that expresses the commitment of signatory states to cooperate in knowledge sharing in a setting in which binding normativity can emerge. Subsequent protocols would supplement and elucidate the content of the fundamental norms in the framework convention.<sup>189</sup> Protocols represent the real operational part of such a regime, and are undoubtedly the cornerstone of the proposed Space Environment Framework Convention. By ratifying the SEFC, states would express their commitment to the protection and preservation of the space environment as the "province of all mankind." These declarations would reflect political commitments toward a common interest that may at some later stage, through the development of specific protocols, acquire the full force of law.

The current configuration of space treaties does not contemplate such a regime-building approach in relation to the protection of the space environment from pollution. The regime-building approach as understood in international relations theory is most conducive to furnishing the fundamental building blocks for the ultimate grand architecture of a more specific holistic

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186. Compare Montreal Protocol, *supra* note 182 (ratified by over 70 countries), with London Amendments, *supra* note 184 (ratified by only 10 countries).

187. "States may very well consent to explicit formulations of rules that they do not intend to observe in practice. The plethora of environmental and human rights standards set out in innumerable conventions, many of which are breached on a daily basis, is sad testimony to this truth." Brunnée & Toope, *supra* note 166, at 31.

188. Jasentuliyana, *supra* note 171, at 225.

189. Such an approach to international environmental law-making has the support of CHAYES & CHAYES, *supra* note 39, at 225-27; Lang, *supra* note 94, at 117-22; Palmer, *supra* note 97, at 273-78; and Donald Rothwell, *International Law and the Protection of the Arctic Environment*, 44 INT'L & COMP. L.Q. 280, 308 (1995).

regime with binding legal obligations.<sup>190</sup> To facilitate the drafting of the Protocols—the next point in the regime-building continuum after establishing the framework convention—scientific and technical issues relating to the threats posed by space debris and nuclear power sources must be worked out over time by an International Space Agency comprising experts from both spacefaring and non-spacefaring nations. Indeed, this approach allows a framework embodying general aspirations and principles to come into force in a cooperative regime where the consensus necessary for a more detailed agreement is immediately lacking. However, it requires repeated negotiation and identification of protocols, and can only succeed with centralized active management.

The method of treaty-making employed by the Ozone Layer Convention secures widespread ratification and may be applauded for its innovation, but the sad truth is that the entire regime is open to subversion. If the suggested Space Environment Framework Convention were to follow the format of the Ozone Layer Convention, it might well suffer a similar fate as the London Amendments,<sup>191</sup> unless the task of constant review and updating of the original framework convention is undertaken by a new specialized institutional agency. The role of a U.N. International Space Agency will be discussed in depth in Section B.

## 2. *A Framework Convention on the Protection of the Space Environment*

The SEFC must be grounded in a cooperative paradigm where the focus is on sharing the exploration and use of the “province of all mankind.” The SEFC must aim to secure a dynamic universal cooperation and must resist the allure of succumbing to any attempts to impose a normative code of conduct from the outset. In this regime-building approach, in order to acknowledge the unique nature of the outer-space environment, the SEFC must first encompass all states whose activities can affect or be affected by, in the present or future, the exploration and use of outer space. It should also emphasize the “common interest” of all states in the protection and preservation of the space environment for the “common benefit,” rather than their competing sovereign interests. It must also speak the new rhetoric of “compliance” and avoid the offensive language of “breach” and “dispute settlement.”

In order for the regime to be effective, the SEFC must be able to grow in both the substantive and the procedural sense. At the bare minimum, states

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190. See, e.g., Keohane, *supra* note 185, at 334 (“[A] major function of international regimes is to facilitate the making of specific agreements on matters of substantive significance within the issue-area covered by the regime. International regimes help to make governments’ expectations consistent with one another. Regimes are developed in part because actors in world politics believe that with such arrangements they will be able to make mutually beneficial agreements that would otherwise be difficult or impossible to attain.”).

191. See *supra* note 186.



should also undertake, in accordance with the means at their disposal and their capabilities, to

- (1) cooperate by means of systematic observations, research, and information exchange in order better to understand and assess the short-term and long-term effects of human activities on the outer-space environment through epistemic communities coordinated by a central agency;<sup>192</sup>
- (2) be guided by the emerging principles of sustainable development, intergenerational equity, equitable allocation, and the precautionary principle in their dialogues and in the formulation of agreed measures, procedures, and standards for more precise implementation of the SEFC through the adoption of future protocols;<sup>193</sup> and
- (3) identify and develop implementation, compliance, and dispute-avoidance mechanisms.<sup>194</sup>

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192. See, e.g., Alan E. Boyle, *Saving the World? Implementation and Enforcement of International Environmental Law Through International Institutions*, 3 J. ENVTL. L. 229, 231 (1991); Katharina Kummer, *Providing Incentives To Comply with Multilateral Environmental Agreements: An Alternative to Sanctions?*, 3 EUR. ENVTL. L. REV. 256, 257 (1994); see also BIRNIE & BOYLE, *supra* note 162, at 234–40 (1992) (suggesting that information exchange, notification, and consultation regarding planned activities will assist signatory states in complying with substantive provisions). One of the more pressing tasks is to develop a common database for space debris that could serve as a clearing house of information for the international community for research and further advancement of knowledge about the incorporation of debris mitigation measures into vehicle design. Presently, the United States Space Surveillance Network (USSSN) and the Russian Space Surveillance System (RSSS) monitor the LEO environment to warn the U.S. space shuttle and the Russian Mir space station if an object is projected to come within a few kilometers. Russian specialists have compiled a catalogue of several million incidents in which space objects have approached the space station, and have developed an algorithm for determining when to proceed with avoidance maneuvers. The European Space Agency (ESA) and the Centre National d'Etudes Spatiales (CNES) of France are using two-line element catalogue data and orbit determinations of their LEO spacecraft to forecast conjunction events and to initiate evasive maneuvers if certain fly-by range limits or estimated collision risk levels are violated. As more spacecraft are launched into the GEO, coordinated station-keeping is increasingly becoming necessary. A sharing of knowledge and expertise amongst the USSSN, RSSS, ESA, CNES, and other agencies is important in the proposed contextual framework. See *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Fifth Session*, *supra* note 38, paras. 21–24.

193. See, e.g., UNCLOS, *supra* note 10, art. 192, 21 I.L.M. at 1308, 1315 (“States have the obligation to protect and preserve the marine environment.”); *id.* art. 235(1) (“States are responsible for the fulfillment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law.”); see also Elizabeth P. Barratt-Brown, *Building a Monitoring and Compliance Regime Under the Montreal Protocol*, 16 YALE J. INT’L L. 519, 544–70 (1991) (comparing human rights regime approaches in the recommendation of a monitoring and compliance regime under the Montreal Protocol); Brunnée & Toope, *supra* note 166, at 65–75 (discussing the regime formation and elaboration approach in ecosystem protection); Catherine Redgwell, *Environmental Protection in Antarctica: The 1991 Protocol*, 43 INT’L & COMP. L.Q. 599, 633 (1994) (discussing the relative strengths and weaknesses of the Protocol provisions in the context of framework environmental agreements).

194. The trend is to use “compliance,” “implementation,” and “dispute avoidance” as alternative terminology for “breach,” “dispute settlement,” and “compulsory jurisdiction” to convey a less adversarial and confrontational atmosphere. In this proposed regime-building approach, the goal is to secure compliance through the use of neutral language, like “implementation,” that implies

As the emphasis shifts from state interests to common environmental interests in the sharing of knowledge and identification of problems by the epistemic communities,<sup>195</sup> the resulting depoliticization can lead to important substantive evolution of the regime into normative frameworks of law.<sup>196</sup> In the formulation of more concrete binding obligations in future protocols, it is possible to involve different parties in issues of especial concern to them. As protocols are usually focused on relatively narrow issues, each has the capacity to flesh out the broad principles embodied in the SEFC and can crystallize into custom. The main strength of this framework-protocols regime lies in its intrinsic ability to involve both contextual and normative aspects in a creative synergy from formation to maturation at all points in its dynamic

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cooperating for the common benefit, rather than simply identifying noncompliance or a breach of an obligation. Various dispute-avoidance and implementation techniques are predicated on continuing dialogue and moving the regime across the continuum. *See, e.g.,* Andronico Adede, *Management of Environmental Disputes: Avoidance Versus Settlement*, in SUSTAINABLE DEVELOPMENT AND INTERNATIONAL LAW, *supra* note 162, at 115 (distinguishing between “dispute avoidance” and “dispute settlement”); Martti Koskenniemi, *Breach of Treaty or Non-Compliance? Reflections on the Enforcement of the Montreal Protocol*, 3 Y.B. INT’L ENVTL. L. 123, 150–55 (1992) (assessing the effectiveness of the Meeting of the Parties under the Montreal Protocol); Diana Ponce-Nava, *Capacity-Building in Environmental Law and Sustainable Development*, in SUSTAINABLE DEVELOPMENT AND INTERNATIONAL LAW, *supra* note 162, at 131 (detailing the main aspects of capacity building); Kamen Sachariew, *Promoting Compliance with International Environmental Legal Standards: Reflections on Monitoring and Reporting Mechanisms*, 2 Y.B. INT’L ENVTL. L. 31, 32–34 (1991) (focusing on monitoring and reporting systems, and the role of NGOs); Patrick Széll, *The Development of Multilateral Mechanisms for Monitoring Compliance*, in SUSTAINABLE DEVELOPMENT AND INTERNATIONAL LAW, *supra* note 162, at 97 (scrutinizing the new non-compliance regimes of the Montreal Protocol and the Convention on Long-Range Transboundary Air Pollution). Chayes and Chayes provide further discussion:

These disparate elements—transparency, dispute settlement, capacity building—all of which are to be found in some regimes, can be considered to be parts of a management strategy. They merge into a broader process of “jaw-boning”—the effort to *persuade* the miscreant to change its ways—that is the characteristic method by which international regimes seek to induce compliance. . . . Our experience as well as our research indicates that, on the contrary, the fundamental instrument for maintaining compliance with treaties at an acceptable level is an iterative process of discourse among the parties, the treaty organization, and the wider public.

CHAYES & CHAYES, *supra* note 39, at 25; *see also* Brunnée & Toope, *supra* note 166, at 44–45, (describing the success of the “two-track” approach established in the Montreal Protocol and the 1991 Convention on Environmental Impact Assessment in a Transboundary Context of the Economic Commission for Europe (the “Espoo Convention”).

While the entry into force of UNCLOS in 1994 has been hailed as one of the most important developments in the settlement of disputes since the adoption of the U.N. Charter and the Statute of the ICJ, some commentators have expressed concern on “how far competition between different international tribunals will promote the settlement of disputes, or whether it will fragment either the substantive law of the sea or international law in general.” Alan E. Boyle, *Dispute Settlement and the Law of the Sea Convention: Problems of Fragmentation and Jurisdiction*, 46 INT’L & COMP. L.Q. 37, 54. In any event, the existing dispute-settlement mechanisms of the space treaties regime are inadequate for the purposes of the protection of the space environment. *See* I.H.Ph. Diederiks-Verschoor, *The Settlements of Disputes in Space: New Developments*, 26 J. SPACE L. 41, 42 (1998).

195. *See infra* note 210 and accompanying text.

196. This effect was observed by the Intergovernmental Panel on Climate Change. *See* ORAN R. YOUNG, INTERNATIONAL GOVERNANCE: PROTECTING THE ENVIRONMENT IN A STATELESS SOCIETY 41–42 (1994); Daniel B. Bodansky, *The Emerging Climate Change Regime*, 20 ANN. REV. ENERGY & ENV’T 425, 443–44 (1995); Brunnée & Toope, *supra* note 166, at 43 n.102.

continuum.<sup>197</sup> The three broad working principles proposed above provide a wide ambit for procedural cooperation and ample room for epistemic communities to interact and flourish.

Experience may be gleaned from the regime-building approach to climate change, which began with the 1992 U.N. Framework Convention on Climate Change (FCCC).<sup>198</sup> Further elaboration of rules and guidelines through intergovernmental cooperation moved the regime along the continuum that adequately addresses the problem of global climate change, resulting in the adoption of the Kyoto Protocol by over 160 parties to the FCCC in December 1997.<sup>199</sup> The FCCC was designed as a first step in dealing with the threat of anthropogenic climate change, explicitly recognizing that countries have “common but differentiated responsibilities.”<sup>200</sup> In the same manner, both spacefaring and non-spacefaring nations have the common responsibility of conserving, protecting, and restoring the integrity of the outer-space environment. The policies that each state adopts—for example, reporting, communication, research, and mitigation measures—will vary depending on their individual space capabilities. In a decision known in environmental parlance as the Berlin Mandate,<sup>201</sup> a process was established to

197. At the 66th Conference of the International Law Association in Buenos Aires, Aug. 14–20, 1994, the Buenos Aires International Instrument on the Protection of the Environment from Damage Caused by Space Debris was adopted by consensus. *See* Williams, *supra* note 4, at 77. The text of the ILA Resolution and the adopted Instrument is reprinted in *id.* at 112. This ambitious new instrument was conceived to tackle the issue of pollution and debris originating from activities in outer space and is couched in the traditional language of fault imputation—“state responsibility,” “liability,” and “dispute settlement”—which does not accord with the rhetoric of the proposed regime-building approach. Chayes and Chayes, however, suggest another approach:

In the environmental field, the “framework-protocol” format has often been used. . . . This kind of evolving treaty is one response to the need for adaptation and flexibility in a regulatory regime. It permits a treaty embodying general principles to come into force and a cooperative regime to get under way where the consensus necessary for a more detailed agreement is lacking. . . . The treaty and the regime in which it is embedded are best seen not as a set of prohibitory norms, but as institutions for the management of an issue over time.

CHAYES & CHAYES, *supra* note 39, at 225–28.

198. United Nations Framework Convention on Climate Change, *opened for signature* June 4, 1992, S. TREATY DOC. NO. 102-38 (1992), 31 I.L.M. 849 (1992) (entered into force Mar. 21, 1994) [hereinafter FCCC].

199. Kyoto Protocol to the FCCC, Conference of the Parties, 3d Sess., U.N. Doc. FCCC/CP/1997/L.7/Add.1 (1998), reprinted in 37 I.L.M. 22 (1998) [hereinafter Kyoto Protocol].

200. FCCC, *supra* note 198, art. 3(1), 31 I.L.M. 854. This concept is also recognized in Principle 7 of the Rio Declaration, which reads as follows:

States shall cooperate 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 sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Rio Declaration, *supra* note 157, 31 I.L.M. at 877.

201. FCCC Conference of the Parties, 1st Sess., at 4–6, U.N. Doc. FCCC/CP/1995/7/Add.1, Decision 1/CP.1 (1995).

fortify the FCCC's commitments through a protocol with the goal of setting quantified emissions limitation and reduction objectives, and of elaborating policies and measures relating to emissions reductions. A new body, the Ad Hoc Group on the Berlin Mandate, was tasked to commence negotiation of the protocol. "[T]his group met eight times from 1995 through 1997 to discuss and develop the overall framework and specific obligations" of the new protocol.<sup>202</sup> Protocols to the proposed Space Environment Framework Convention are likely to develop in a similar manner, but research, report consolidation, and negotiations would be coordinated by a permanent International Space Agency. Finally, the "compliance" elements of the Kyoto Protocol merit particular attention: The termination by the non-breaching party of related obligations under the Protocol is not available.<sup>203</sup> If a non-breaching party is permitted to stop performing a related obligation as a reciprocal countermeasure, the problem the agreement seeks to remedy—whether it is climate change or protection of the outer-space environment—may well be exacerbated even further than it was by the initial breach.

Critics of the Kyoto Protocol may argue that it has no effective compliance regime because it affords member states too much flexibility with respect to how it implements its obligations, at both the national and international levels. Indeed, one of the hallmarks of the regime-building approach—and its ultimate success in securing "compliance"—is this very flexibility. An authoritarian uniform treaty rule that fails to recognize the uniqueness of each member state is destined only for obsolescence. When the framework convention and its subsequent protocols are all driven by a single vision—in the case of the SEFC, the protection of the outer-space environment as the "province of all mankind"—each state party can still comply with its obligations when each designs its own approach in light of its unique economic, technological, social, and political situation. The Antarctic Treaty system is another unusual international regime that has experienced great success in maintaining a balance between international interests and national interests in Antarctica. While once believed to be impossible, the Protocol on Environmental Protection to the Antarctic Treaty is now a reality.<sup>204</sup>

Like the FCCC and the 1992 Convention on Biological Diversity,<sup>205</sup> the SEFC should also contain provisions for funds to finance capacity-building

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202. Clare Breidenich et al., *Current Developments: The Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 92 AM. J. INT'L L. 315, 318 (1998).

203. See Kyoto Protocol, *supra* note 199, arts. 3(1), 5, 7, 8, 18.

204. See Rodney R. McColloch, *Protocol on Environmental Protection to the Antarctic Treaty—The Antarctic Treaty—Antarctic Minerals Convention—Wellington Convention—Convention on the Regulations of Antarctic Mineral Resource Activities*, 22 GA. J. INT'L & COMP. L. 211, 231 (1992). We have much to learn from these protocols as we formulate the principles that would underpin the SEFC.

205. The Biodiversity Convention, June 5, 1992, 31 I.L.M. 818 (1992) [hereinafter Biodiversity Convention], signed at the U.N. Conference on Environment and Development (UNCED) by 153 states and the European Community, is aimed at conserving and protecting ecosystems and biodiversity.

and “compliance.”<sup>206</sup> It should specifically require that the commitments of states parties developing space capabilities are contingent on the provision of resources by present spacefaring nations to meet the full agreed incremental costs of compliance. At the same time, in order to secure regime transparency, verification and monitoring functions should be actively managed by a central organization like the International Space Agency.

The aim of the SEFC will be to protect and preserve the outer-space environment as the “province of all mankind,” and all subsequent protocols should build upon the structural and institutional components of the SEFC, beginning with reporting and review requirements and potentially culminating in binding implementation norms. While one would not expect substantive obligations to be present in the SEFC, nevertheless the Preamble should begin with a firm commitment by signatory states:

While we recognize our freedom of the use and exploration of outer space as stated in Article I of the Outer Space Treaty, we also acknowledge our responsibility for conserving the outer-space environment and for using its resources in a sustainable manner for the benefit of present and future generations. . . .

Coercive enforcement of a hegemony of norms is as misguided as it is costly, as we are faced with varying degrees of capability and priority. At the most fundamental level, the new regime assumes a primary managerial role at its genesis and a secondary regulatory role as it matures. The management of this new regime must:

- (1) ensure transparency in the generation and dissemination of information about the requirements of the SEFC and the parties’ performance under it;
- (2) coordinate the scientific research and data reporting of epistemic communities, national governments, and international organizations;
- (3) assist in capacity-building by coordinating technical assistance for enabling countries; and
- (4) establish a multilateral consultative process and dispute-resolution procedure that focuses more on fulfilling the spirit of the SEFC (through mediation, negotiation, or compulsory conciliation) than on sanctions and fault attribution.

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Notions of sustainable development and intergenerational equity have been incorporated into the Convention. The Preamble, for example, proclaims that “States are responsible for conserving their biodiversity and for using their biological resources in a sustainable manner” and that the signatories are “[d]etermined to conserve and sustainably use biological diversity for the benefit of present and future generations.” *Id.*, pmbl., 31 I.L.M. at 822–23.

206. See FCCC, *supra* note 198, art. 11, 31 I.L.M. at 864–65; Biodiversity Convention, *supra* note 205, arts. 20–21, 31 I.L.M. at 830–32.

These guiding principles are by no means exhaustive, but could provide a fertile ground for further debate and action in the new millennium. The success of this regime-building approach will depend much on the level of collective political will, and the efforts of bureaucratic alliances and interdisciplinary cooperation.

### B. *The Need for an International Space Agency*

At present, regional and interregional coordination of space science and technical assistance for developing countries is coordinated by the U.N. Programme on Space Applications, through its Office for Outer Space Affairs.<sup>207</sup> However, the Programme's main focus is in making the benefits of space technology available to all countries by such cooperative activities as sharing payloads, ensuring compatibility of space systems, educating in remote sensing, and providing access to launch capabilities.<sup>208</sup> The Programme pays scant attention to the conservation of the space environment.

In spite of the establishment of the U.N. Conference on Environment and Development (UNCED) and the U.N. Environment Program (UNEP), the United Nations still lacks any coherent institutional mechanism for dealing effectively with environmental issues. At present, environmental responsibilities are divided among numerous international organizations, but the existing institutions suffer from poor coordination and the lack of real power and authority. In order to offer any credible protection to the outer-space environment, a U.N. International Space Agency (UNISA) should be established, and should be managed by COPUOS. NASA (United States), CNES (France), BNSC (United Kingdom), NASDA (Japan), ASI (Italy), DARA (Germany), RKA (Russia), the International Telecommunication Union (ITU), the International Astronomical Federation (IAF), and other international space organizations should be brought under UNISA's umbrella.<sup>209</sup> The presence of one single international agency to coordinate international negotiations on the regulation of space activities is crucial to the

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207. See *Report of the Scientific and Technical Subcommittee on the Work of Its Thirty-Sixth Session*, *supra* note 33, paras. 65-76.

208. See *id.*

209. Extending the activities of the International Atomic Energy Agency (IAEA) to safeguarding the use of NPS in outer space has also been suggested. See *Report of the Legal Subcommittee on the Work of Its Twenty-Third Session (19 March-6 April 1984)*, U.N. GAOR, COPUOS, at 26, U.N. Doc. A/AC.105/337 (1984); see also Hilary F. French, *Reforming the United Nations To Ensure Environmentally Sustainable Development*, 4 *TRANSNAT'L L. & CONTEMP. PROBS.* 559, 586 (1994) (making a similar proposal for a new global environmental organization that could provide "some overarching structure and coordination to the current scattered process of international environmental governance, functioning as something of an umbrella for the myriad of existing bodies"). See generally Michel Bourély, *The Institutional Framework of Space Activities in Outer Space*, 26 *J. SPACE L.* 1 (1998) (arguing that the diversity of autonomous institutional arrangements for space activities is unfortunately not complemented by the existence of an overarching international framework).

success of any program that has the goal of the protection and preservation of the space environment as the "province of all mankind."

A truly inter-disciplinary approach must be undertaken under the auspices of the proposed UNISA. The role of UNISA would be to coordinate the Scientific and Technical Subcommittee and the Legal Subcommittee of COPUOS, and the participation of experts from the areas of science, technology, economics, health, national security, law, and other fields. The contribution of these "communities of shared knowledge" or "epistemic communities"<sup>210</sup> plays a crucial role in influencing the space regime formation, particularly in identifying and developing policy options. Epistemic communities, according to Peter Haas, are "networks of knowledge-based experts" or "professionals with recognized expertise and competence in a particular domain . . . or issue-area."<sup>211</sup> Epistemic communities are distinguished from ordinary interest groups, non-governmental organizations, and other bureaucracies along four dimensions: shared principles, causal beliefs, validity tests, and policy orientation.<sup>212</sup> Epistemic communities are transnational in scope. "Political infiltration into governing institutions" may eventually lead to the implementation of an epistemic community's shared beliefs and policy orientation.<sup>213</sup> Scientific data and research, for example, on the effect of space debris on space activities and the hazards of NPS, may be assembled and tested by an international coalition of experts who are working together with government officials and legal scholars. The cost-benefit analyses may be conducted in a uniform manner, but still take into account the different perspectives of developed and developing nations. The proposed

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210. See, e.g., ORAN R. YOUNG & GAIL OSHERENKO, *POLAR POLITICS: CREATING INTERNATIONAL ENVIRONMENTAL REGIMES* 245 (1993); Peter M. Haas, *Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control*, 43 INT'L ORG. 377, 380, 384 (1989). Government officials and politicians will not necessarily heed the proposals of scientific experts and policy elites, partly due to a lack of understanding, and partly out of a desire to retain control. In any event, given the intricate complexities of the issues relating to the space environment, some reliance on these epistemic communities for policy development and normative evolution is unavoidable. See Brunnée & Toope, *supra* note 166, at 35; see also LYNTON KEITH CALDWELL, *BETWEEN TWO WORLDS: SCIENCE, THE ENVIRONMENTAL MOVEMENT, AND POLICY CHOICE* 23 (1990) (arguing that changes in environmental policy have resulted from organized public pressure from the scientific community); Harold K. Jacobsen & Edith Brown Weiss, *Strengthening Compliance with International Environmental Accords: Preliminary Observations from a Collaborative Project*, 1 GLOBAL GOVERNANCE 119, 126 (1995) (arguing that international organizations are needed to make available the information necessary to compel compliance with environmental standards).

211. Peter M. Haas, *Introduction: Epistemic Communities and International Policy Coordination*, 46 INT'L ORG. 1, 2-3 (1992).

212. See *id.* at 18-20.

213. *Id.* at 15-16. The power of epistemic communities cannot be underestimated and should be harnessed by the proposed UNISA. Haas's understanding of the mechanics of the epistemic community is a valuable contribution to the building of a new framework treaty regime for the protection of the space environment: "A transnational community's ideas may take root in an international organization or in various state bodies, after which they are diffused to other states via the decision makers who have been influenced by the ideas. As a result, the community can have a systemic impact. Because of its larger diffusion network, a transnational community's influence is likely to be much more sustained and intense than that of a national community." *Id.* at 17.

UNISA would also be the international agency in charge of making recommendations to the United Nations to adopt internationally binding norms and enforceable regulations in appropriate international agreements, in the form of protocols to the proposed Space Environment Framework Convention. In order to promote the protection of the space environment and the associated earth environment, states parties should be obliged to arrange for members of UNISA to have access to all parts of stations, installations, equipment, and spacecraft for the purpose of inspection to ensure effective implementation of the Space Environment Framework Convention and its subsequent protocols.

The proposed UNISA is crucial to the success of the regime-building approach to be adopted in the formation of the Space Environment Framework Convention. The following guidelines are instrumental to the effectiveness and success of UNISA as a strategic manager:

- (1) the formulation of a clear mission, agreed to by the signatories to the SEFC;
- (2) the acceptance of the role of UNISA in an organizational structure that reflects the interest, power, and capabilities of member states;
- (3) the minimization of bureaucratic inefficiency through the establishment of an able and professional Secretariat within UNISA to coordinate transnational scientific, technical, technological, and legal matters, maintaining at all times an apolitical agenda;
- (4) the authority to engage in research on the effects of all space activities on both the outer-space environment and the Earth's environment;
- (5) the authority to recommend, from time to time and without the need to achieve consensus, relevant principles to be included in a protocol to the Space Environment Framework Convention; and
- (6) the guarantee of funding from the United Nations.

We have to recognize that UNISA, like all international organizations, will ultimately be a political institution. Like all politics, there will be a fair share of political bargaining and power-brokering. But as long as we have an active management strategy in place—which is as much a part of the bargaining process—commitments will eventuate and performance will ensue. Efforts are already underway to establish regional centers for space science and technology education, led by the U.N. Programme on Space Applications.<sup>214</sup> As mentioned earlier, the establishment of UNISA would

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214. See *supra* note 207 and accompanying text.



harmonize the myriad initiatives and programs undertaken by the spectrum of organizations and agencies involved in the exploration and use of outer space.<sup>215</sup> It will be in a better position to coordinate uniform policies among the many states to implement SEFC rules for the protection of the “province of all mankind.” UNISA will draw together COPUOS, its Legal as well as its Scientific and Technical Subcommittees, and the administrators of the U.N. Programme on Space Applications, to work more closely with the governments of member states at the policy-making level. The above criteria may seem like a millennial wish list, but the fact is they have been surfacing as agenda items at numerous meetings, colloquia, conferences, and symposia.

### C. *Conclusions*

Any attempt to establish a new space order can only be successful if it is based on a realistic assessment of the existing power structures within the international community.<sup>216</sup> Experience indicates that, when the developing countries that lack spacefaring capabilities but possess numerical superiority in the General Assembly attempt to control the process of hard-law formation, the result is a farrago of impractical propositions and vague obligations in multilateral conventions. For example, the CHM regime declared in article XI of the Moon Agreement finds few supporters, particularly amongst the developed nations, and appears condemned to a philosophical existence.<sup>217</sup> The ephemeral notions of “equitable access” and “equitable distribution” require a delicate balance of the special needs of developing nations with the largely commercial and military interests of the spacefaring states. On the other hand, the protection of the outer-space environment as the “province of

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215. Similar principles, but in relation to the equitable sharing of benefits from the exploitation of outer space, have been highlighted in CHRISTOL, *supra* note 72, at 440–42. The Soviets also proposed the establishment of a World Space Organization and an international space center. See Gennady Danilenko, *The Progressive Development of Space Law: New Opportunities and Restraints*, in VIEWS OF THE FUTURE, *supra* note 47, at 99, 106–07.

216. Without the support of the spacefaring nations, in particular the United States, it is impossible to envisage success for the Space Environment Framework Convention. For a discussion of the importance of the U.S. commitment to protect the global environment, see Suzanne C. Massey, *Global Warming—International Environmental Agreements—The 1992 United Nations Conference on the Environment and Development Most Likely Will Not Culminate in a Successfully Preventive Global Warming Treaty Without the United States’ Support*, 22 GA. J. INT’L & COMP. L. 175, 208 (1992).

217. See Douglas Barritt, *A “Reasonable” Approach to Resource Development in Outer Space*, 12 LOY. L.A. INT’L & COMP. L.J. 615, 627–35 (1990); Barbara Ellen Heim, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space and Antarctica*, 23 VAND. J. TRANSNAT’L L. 819, 834–35 (1990); see also Carl Q. Christol, *The 1979 Moon Agreement: Where Is It Today?*, 27 J. SPACE L. 1 (highlighting problems with the CHM principle and the political intricacies over the last two decades); Carl Q. Christol, *The Moon Treaty and the Allocation of Resources*, 22 ANNALS AIR & SP. L. 31, 37 (1997) (noting that the specific reference to the exploitation of relevant resources and the provisions dealing with the sharing of benefits derived from such exploitation have resulted in limited ratification of the Moon Agreement).

all mankind" transcends the politics of technological and economic asymmetry—it affects all individuals, present and future.

As discussed in Part V, the current space treaties regime fails to offer satisfactory protection to the space environment. Customary international law can hardly be said to possess adequate content or scope to prevent damage and furnish sufficient sanctions to be directed against the perpetrators when damage to the outer-space environment occurs. It is "not a regulatory system and cannot be turned into one."<sup>218</sup> A unique Space Environment Framework Convention, created within a regime-building approach, will recognize the prohibition on damage or harm to the outer-space environment and overcome "the tyranny of realism"<sup>219</sup> to protect the "province of all mankind." The desirability of this recommendation is supported by the principle of sustainable development as recognized by the international community in the Stockholm Declaration, the Rio Declaration, and various multilateral international fora; it is also grounded in the jurisprudential notions of intergenerational equity and responsibility. The proposals on the possibility of negotiating the Framework Convention on the Protection of the Outer Space Environment and the establishment of an U.N. International Space Agency should be considered seriously. Commitments made within an organizational framework regime as such, no matter how insignificant the skeptics may lead one to believe they are, are visible to the participants and part of the kaleidoscope of favors, promises, and patronage exchanged over time.<sup>220</sup> It has been said that the notion of the outer-space environment as the "province of all mankind" was adopted as a result of "concrete political interests and social or economic requirements involved in the struggle and cooperation of states in pursuit of solutions to compelling problems of the moment."<sup>221</sup> The compelling problems of space debris and the increasing use of nuclear power sources must be addressed immediately. The protection of the space environment in the new millennium is in the interest of all states, developing and developed, and it is in the interest of all human beings, present and future.

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218. Palmer, *supra* note 97, at 266.

219. DON E. KASH, *THE POLITICS OF SPACE COOPERATION* 126, 130–31 (1967) ("Given the weight of evidence put forward by our present reality one could hardly expect the government generally or a government agency to accept the innovative approach."). In the new millennium, a different reality of international cooperation faces us. See, e.g., Aldo Armando Cocca, *Prospective Space Law*, 26 J. SPACE L. 51 (1998) (summarizing the efforts of the international community in the recognition of new legal subjects and considering a system that would make international cooperation an obligation in space activities). Note also the recent scholarship on the globalization-versus-sovereignty debate, which may have some bearing on the identification of common interests that transcend statehood. See William R. Moomaw, *International Environmental Policy and the Softening of Sovereignty*, 21 FLETCHER F. WORLD AFF. 7, 8 (1997); Christyne J. Vachon, *Sovereignty Versus Globalization: The International Court of Justice's Advisory Opinion on the Threat or Use of Nuclear Weapons*, 26 DENV. J. INT'L L. & POL'Y 691, 717–20 (1998).

220. See Lisa L. Martin, *Credibility, Costs and Institutions: Cooperation on Economic Sanctions*, 45 WORLD POL. 406, 418 (1993).

221. Merlin M. Magallona, *The Concept of Jus Cogens in the Vienna Convention on the Law of the Treaties*, 51 PHIL. L.J. 521, 526 (1976).