

Economic Governance and Space Law: Emerging Foundations for Development of “Common Pool Resources” in Outer Space

Valnora Leister¹

ABSTRACT

As commercial space faring capabilities spread, a need is growing for new approaches to safeguard the common interests of humanity in space. The 1967 Outer Space Treaty declares in its opening article that, “exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of Mankind”. However, to date, little has been done to develop outer space for the benefit of humanity. So far, space has been explored mainly by developed nations, acting to foster their economic and military interests in the new frontier. Based upon their interests, these countries at present restrict access to and transfer of space technologies, despite moves backed by emerging economies to liberalize trade barriers. This article examines the concept of “province of mankind” in view of recent developments in environmental law, and seeks to apply to outer space the keys to successful development of “common pool” resources, as proposed by Nobel Laureate Elinor Ostrom in her book “Governing the Commons: The Evolution of Institutions for the Collective Action”.

¹ Valnora Leister holds a Master of Laws (LLM) and Doctor of Civil Law (DCL) degrees from the McGill University Institute of Air and Space Law, as well as a Bachelor, Master and Doctoral degrees in Law from University of Sao Paulo, Brazil. She is Senior Fellow of Openworld, an international development research group, where she specializes in policy reforms and technology development initiatives. A former Guggenheim Fellow of the Smithsonian Institution and Project Attorney with the Inter-American Development Bank (IDB), Dr. Leister is an international lawyer and a legal scholar based in Dayton, VA, USA. She is a member of the International Institute of Space law (IISL), the International Law Association (ILA), Brazilian Society of Space Law, Forum of Air and Space Law of the American Bar Association (ABA). E-mail: valnoral@openworld.com.

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I. INTRODUCTION

In recent years, the world has seen a shift in political and economic power, creating tensions in the international system. One major concern is over the future of outer space: should access to this realm be shaped by national military considerations?

This article explores opportunities for the traditional legal foundations of international space law to evolve in ways that lead to greater accountability in the management of common resources for the benefit of humanity. First, the article considers the evolution of the concept of “the commons” under international law as areas not subject to the national jurisdiction of states and the guidelines established to govern Antarctica, the high-seas, the seabed and outer space. Secondly, it examines the major national security constraints preventing the use of outer space for the benefit of mankind. A look at the principles regarding environment and the role of non-governmental organizations (NGOs) reveals the introduction of new tools for governance, requiring transparency and accountability from states in the management of “the global environment”. Lastly, this article will explore practical innovations for economic governance, as developed by Nobel Laureate Elinor Ostrom,

for management of “Common Pool Resources (CPR)” in outer space. Her theories may open paths for realization of the ideal that outer space activities should be carried out for the benefit of Humanity.

II. THE GLOBAL COMMONS: ANTARCTICA, HIGH-SEAS, SEABED AND OUTER SPACE

In the present legal system, the state is the primary subject and object of public international law. In order for the state to have legal personality, it must meet four simple tests – it must hold a territory, have a population, include a political structure for government and have the capacity to enter into relations with other states.² According to traditional positivist doctrine, only states have rights and obligations under public international law. The validity and authority of international law depends upon the voluntary participation of states in its formulation, observance, and enforcement.

Areas that are not part of a state’s territory and jurisdiction are defined as “*res communis*” also known as “Commons,” “Common Heritage of Mankind,”³ or “Province of Mankind”.⁴ The principle of the common heritage of humankind (CHM) envisages that all human beings have a stake in resources outside the sovereign territory of states. Such areas are subject to treaties negotiated between nation states. These agreements reflect a shared aim of holding the resources in trust for future generations, and a corresponding desire to prevent monopolization by individual nation states or corporations.⁵

² The territory is the geographical area subject to the sovereign entity (its soil, subsoil, interior waters, territorial sea and aerial space). According to art. 1 of Montevideo Convention on the Rights and Duties of States, Dec. 26, 1934, (1936) 165 L.N.T.S. 19, “[t]he state as a person of international law should possess the following qualifications: (a) permanent population; (b) a defined territory; (c) government; and (d) capacity to enter into relations with other states”. This Convention is the best-known formula for setting out the basic characteristics of statehood. The United States and fifteen Latin American states are parties to it. Despite the small number, it is seen as reflecting the classical conditions under customary international law that a prospective state must satisfy.

³ The spaces that were considered *res nullius* in traditional International law, are now considered “common heritage of mankind” in the post- modern International law: PAULO BORBA CASELLA, DIREITO INTERNACIONAL DOS ESPACOS 564 (2009).

⁴ The Law of the Sea Convention and the Moon Treaty refer to the areas considered “Common Heritage of Mankind” whereas the Outer Space Treaty refers to outer space as “Province of Mankind.”

⁵ KERNEL BASLAR, THE CONCEPT OF COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW 13 (1998).

A look at how international law has attempted to politically manage these domains – Antarctica, the high-seas, the seabed and outer space – provides a context for evaluating parallel attempts to govern the “commons” of outer space for the benefit of humankind.

A. Antarctica

The 1959 Antarctica Treaty recognizes a common interest of humanity in maintaining Antarctica as a peaceful area. The treaty established the continent as being beyond national jurisdiction and sovereignty and prohibited military activities, including basing of nuclear weapons.⁶ According to its Article 1, “Antarctic shall be used for peaceful uses only,”⁷ but scientific research and logistical problems led to a high degree of involvement of armed forces, raising fears of military activities. The 1959 Treaty was complemented by the Wellington Protocol of 1988, which proposed international regulation of mineral resources in Antarctica. After opposition from developed countries blocked this proposal, the Madrid Protocol of 1991 to protect biodiversity was passed,⁸ with backing by leading nations including China, the U.K. and the U.S.

B. High Seas

In November of 1967, Malta proposed that the new law of the sea should be based no longer on the notion of “freedom of the seas” but on a new concept, the CHM.⁹ The CHM concept was thereafter given legal status in the 1982

⁶ The centerpiece of this regime is the Antarctic Treaty, which functions legally and politically as the authoritative nucleus for overseeing Antarctic activities. Since its entry into force in 1961, the Antarctic Treaty has expanded in membership from twelve original parties to thirty-nine in early 1989. Of these parties, the designated group of decision makers – the Antarctic Treaty Consultative Parties (ATCPs) – has increased from the original twelve to twenty-two today. Seven of these states – Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom – assert claims to pie-shaped portions of territory on the continent. All ATCP states meet biennially to recommend policy for the Antarctic.

⁷ See GILLIAN D TRIGGS, *THE ANTARCTIC TREATY REGIME, LAW, ENVIRONMENT AND RESOURCES* (2009).

⁸ It came into force in 1998, with the effect of protecting Antarctica for 50 years from commercial exploitation of its mineral wealth.

⁹ E.M. Borgese, *Expanding the Common Heritage of Mankind*, in *GLOBAL PLANNING AND RESOURCE MANAGEMENT* (A. Dolman ed., 1980).

Law of the Sea Convention (LOSC), which entered into force November 1994, after being signed by 159 countries (the U.S. signed but has not yet ratified this convention). Under the law of the sea, the high seas are defined as, “all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic state” (art.86).¹⁰ In general, the high seas are open to all states. The flag state has the exclusive right to exercise jurisdiction over its vessels on the high seas. Like outer space, the high seas and sea-bed are to “be reserved for peaceful purposes” (art.88). The term “peaceful purposes” has been interpreted as “non-aggressive” purposes and therefore national military uses of the high seas, like in outer space, have been allowed. The major maritime nations have claimed the right to use areas of the high seas for military activities such as the testing of missiles and nuclear weapons. When these activities occur, a ‘warning’ zone is typically declared and mariners are advised to stay clear. Sometimes ‘safety’ or ‘exclusion’ zones are established, and other vessels are explicitly barred from entry.¹¹

C. Seabed

In 1970, the UN General Assembly adopted Resolution 2749 declaring the CHM as the prime principle governing the exploitation of the international seabed. The international seabed area is defined as an area consisting of the “seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction.” The LOSC recognizes the seabed as a “commons” with rich minerals, which include baseball-size nodules lying on the seabed floor formed by processes of accretion and containing cobalt, copper, iron, manganese and nickel. Developing countries moved that exploration of the sea-bed should be managed by a Seabed Authority. Participating private entities would be taxed and the profits distributed to all states. Moreover, the Seabed Authority, an inter-governmental body, itself would engage in mining through the establishment of a new entity, called the “Enterprise”. A 1994 agreement on Part XI of the Convention agreed on a modified Seabed Authority. The Enterprise was to begin operations only upon a decision from the Seabed

¹⁰ THOMAS BUERGENTHAL & SEAN D. MURPHY, *PUBLIC INTERNATIONAL LAW IN A NUTSHELL* 283 (4th ed., 2007).

¹¹ See Jon M. Van Dyke, *Military Exclusion and Warning Zones on the High Seas* 15(3) *MARINE POL'Y* 147 (1991).

Authority and it would be required to conduct its initial mining operations through joint ventures rather than operate independently.¹² This system has not yet been fully implemented, since the consensus has been that economic mining of the ocean depths might be decades away. Moreover, the United States, with some of the most advanced ocean technology in the world, has not yet ratified the LOSC and is thus not a member of the Authority.¹³

D. Outer Space

The body of international space law comprises five treaties and five declarations of legal principles applying to outer space.¹⁴ International legal principles in the treaties cover non-appropriation of outer space by any one

¹² *Report of the ISBA*, April 14, 2008, Doc ISBA/14/2. In recent years, interest in deep-sea mining, especially with regard to ferromanganese crusts and polymetallic sulphides, has picked up among several firms now operating in waters within the national zones of Papua New Guinea, Fiji and Tonga. Papua New Guinea was the first country in the world to grant commercial exploration licenses for seafloor massive sulfide deposits when it granted the initial license to Nautilus Minerals in 1997. Japan's new ocean policy emphasizes the need to develop methane hydrate and hydrothermal deposits within Japan's exclusive economic zone and calls for the commercialization of these resources within the next 10 years. Reporting on these developments in his annual report to the Authority in April 2008, Secretary-General Nandan referred also to the upward trend in demand and prices for cobalt, copper, nickel and manganese, the main metals that would be derived from seabed mining, and he noted that technologies being developed for offshore extraction could be adapted for deep sea mining.

¹³ E.M. BORGESE, *OCEAN MINING AND THE FUTURE OF WORLD ORDER* (1990).

¹⁴ The Five Treaties are:

Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", *adopted by the General Assembly in its Resolution 2222 (XXI), opened for signature on 27 January 1967, entered into force on 10 October 1967, with 98 ratifications and 27 signatures as of 1 January 2008).*

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the "Rescue Agreement", adopted by the General Assembly in its resolution 2345 (XXII)), opened for signature on 22 April 1968, entered into force on 3 December 1968, 90 ratifications, 24 signatures, and one acceptance of rights and obligations (as of 1 January 2008).

The Convention on International Liability for Damage Caused by Space Objects (the "Liability Convention", adopted by the General Assembly in its resolution 2777 (XXVI)), opened for signature on 29 March 1972, entered into force on 1 September 1972, 86 ratifications, 24 signatures, and three acceptances of rights and obligations (as of 1 January 2008).

The Convention on Registration of Objects Launched into Outer Space (the "Registration Convention", adopted by the General Assembly in its resolution 3235 (XXIX)), opened for signature on 14 January 1975, entered into force on 15 September 1976, 51 ratifications, 4 signatures, and 2 acceptances of rights and obligations (as of 1 January 2008).

country, arms control, the freedom of exploration, liability for damage caused by space objects, the safety and rescue of spacecraft and astronauts, the prevention of harmful interference with space activities and the environment, the notification and registration of space activities, scientific investigation, the exploitation of natural resources in outer space and the settlement of disputes. Each of the treaties recognizes that the domain of outer space - including the activities carried out there, and whatever benefits might accrue from them - should be devoted to enhancing the well-being of all countries and humankind. Each agreement seeks to promote international cooperation in outer space activities.

Article 1 of the 1967 Space Treaty defines outer space as “the province of Mankind”, whereas the Moon Treaty in its article 11 declares that the Moon and its natural resources are CHM, undertaking to establish and international regime to govern the exploitation of its natural resources, which to date has not been created.

As with other CHM areas such as the high-seas, military activities are also taking place in outer space. In interpreting the guidelines and principles applied to outer space, leading space powers during and after the Cold War have concluded that outer space can be used for “non-aggressive” military purposes.¹⁵

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the “Moon Agreement”, adopted by the General Assembly in its resolution 34/68), opened for signature on 18 December 1979, entered into force on 11 July 1984, 13 ratifications and four signatures (as of 1 January 2008).

The Five Declarations on Legal Principles are:

The Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (General Assembly resolution 1962 (XVIII) of 13 December 1963); The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (resolution 37/92 of 10 December 1982); The Principles Relating to Remote Sensing of the Earth from Outer Space (resolution 41/65 of 3 December 1986);

The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (resolution 47/68 of 14 December 1992);

The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (resolution 51/122 of 13 December 1996).

¹⁵ Many studies have been written on this topic, see e.g. ISABELLA DIEDERIKS-VERSCHOOR & VLADIMIR KOPAL, AN INTRODUCTION TO SPACE LAW 139 (2008).

Citing the validity of military uses of space so long as they are not aggressive, the U.S., Russia and China have deployed a range of remote sensing, communications and other secret space-based systems. The impact of such “non-aggressive” secret uses are beginning to be more widely felt. Anti-satellite missile tests by China in 2007 and by the U.S. in 2008 have raised concerns as such use of space can generate large amount of debris and also destroy communications systems dependent on satellites.¹⁶

The U.N. has recognized an arms race in outer space as an ongoing risk. A draft treaty on the Prevention of an Arms Race in Outer Space proposed by Russia and China was rejected by the U.S. on the ground that an effective and verifiable ban on space-based weapons or earth-based anti-satellite systems (ASAT) would be impossible. The European Union has proposed bilateral consultations towards amending the project and developing a text that would be acceptable by the greatest number of countries possible. Yet the prospects for such measures apparently remain checked by superpower consideration of national interests.¹⁷

For decades, the prospect of opening space for the benefit of mankind has fired imaginations of people around the world. As a new global commons, it has generated innovative legal thinking on how to foster transnational exploration and development of the frontier. Yet such CMH frameworks have yet to prevail. Access to and uses of outer space have been controlled by few space faring nations, seeking to advance their own military and economic interests.

A key reason for the gap between declared principles and practice consists of technology export controls put in place during the Cold War. Under this framework, the U.S. and the former Soviet Union – joined by their respective political allies, the NATO alliance and the Warsaw Pact – put in place treaties

¹⁶ Valnora Leister & Lalin Kovudhikulrungsri, *Outer Space: Of the People, by the People and for the People*, Presented at the IISL Symposium in Korea (2009).

¹⁷ *Experts Urge Reformulation of U.S. Space Policy: American Academy Issues Three White Papers*, EUREKALERT! (July 30, 2009), http://www.eurekalert.org/pub_releases/2009-07/aaoa-eur072909.php. The Reconsidering the Rules of Space project is supported by a generous grant from the Carnegie Corporation of New York.

and national policies to prevent the transfer of space technologies to non-aligned countries.¹⁸

In 1989, with the fall of the Berlin Wall, the East-West confrontation abated. Yet the Cold War restrictions on transfer of space technologies remained in place. In consequence, the North-South gap persisted with regard to access to space technologies. After the 9/11 terrorist attack on the U.S., export controls became stricter, making it even more difficult for developing countries to obtain technologies for access to space. The State Department by its Directorate of Defense Trade Controls (DDTC) is in charge of enforcing the International Traffic in Arms Regulations (ITAR) and the Export Control Act. Although the Munitions List is subject to change as well as the list of countries whose access to technologies is limited or restricted, the ITAR system as a whole has kept global aerospace companies from responding to partnerships opportunities in emerging economies.¹⁹ A new released U.S. National Policy calls for government to government agreements for sensitive or advanced spacecraft related exports.²⁰ Another factor limiting emergence of peaceful economic outer space activities for the benefit of mankind has been a lack of transparency. Key aspects of national space programs have been cloaked to avoid scrutiny and citizen participation.

The European Community's (EU) Draft Code of Conduct for Outer Space Activities (December, 2008), has proposed transparency and confidence building measures for civilian, military and commercial uses of space aimed at preventing space from becoming an area of conflict. Yet even these voluntary measures have encountered opposition by powerful space faring countries, such as the U.S.

Regardless of the principles that declare space to be the province of mankind and the Moon and other celestial bodies as CHM, it is clear that unilateral national actions are a key obstacle to realizing this vision. Issues

¹⁸ *Supra* note 15, at 138.

¹⁹ The U.S. Government views the sale, export, and re-transfer of defense articles and defense services as an integral part of safeguarding U.S. national security and furthering U.S. foreign policy objectives. The Directorate of Defense Trade Controls (DDTC), in accordance with 22 U.S.C. 2778-2780 of the Arms Export Control Act (AECA) and the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120-130), is charged with controlling the export and temporary import of defense articles and defense services covered by the United States Munitions List (USML).

²⁰ *US National Space Policy*, June 28, 2010 (White House Press).

such as growing militarization, restrictions on technology transfer, increased space debris and lack of transparency stem from decisions taken to advance national military and economic interests. So far there have been no measures to limit the sphere of state actions in areas outside state sovereignty.

III. A BRIDGE TO NEW GOVERNANCE OF THE COMMONS: ENVIRONMENTAL LAW AND NGOS

International environmental law, a recent branch of international law specializes in the preservation and enhancement of the global ecosystems. It addresses problems such as ozone depletion, climate change, and loss of biological diversity. Countries have developed a network of environmental law treaties as well as organizations, and established legal principles and operational guidelines applying to global environment.²¹ The environment, like outer space, transcends national boundaries and environmental law is giving legal standing to the rights and obligations of people directly – rather than exclusively through nation states – in issues relating to the CHM area.

In 1972, at the U.N. Conference for the Human Environment in Stockholm, a total of one hundred and thirteen states attended, as well as dozens of Non-Governmental Organizations (NGOs). Twenty years later, the Conference on Environment and Development in Rio de Janeiro was attended by representatives of one hundred and seventy two countries. At this conference, environmental protection gained recognition as a critical aspect of sustainable development. The principle of citizen participation was endorsed there as a preferred way for countries to deal with environmental issues. Citizen participation was defined to include direct access by individuals and NGOs to global judicial and administrative proceedings affecting the environment. Such citizen engagement has become standard procedure for the environmental projects financed by leading international organizations. In Europe, EU authorities have to place at the disposal of requesting private citizens of member countries any environmental information that they require.²² The environment and its protection are recognized as a core interest

²¹ *Supra* note 10, at 301.

²² E. WEISS, IN FAIRNESS TO FUTURE GENERATION: INTERNATIONAL LAW, COMMON PATRIMONY AND INTER-GENERATIONAL EQUITY (1989).

of every individual, resulting in legal standing for direct access in international proceedings that relate to environmental law.

Globalization of other kinds of technology, such as cyberspace, during this period has given people around the world access to information and the ability to mobilize on issues of common concern. Some of the most vibrant areas of global debate and action have been in the area of environment. In response to these new international conditions, non-governmental actors are linking and self-organizing on a global basis. Individuals, enterprises and organized civil society groups are today more directly influencing international relationships, and are being recognized as new actors in international law.²³ Non-Governmental Organizations (NGOs) have been at the forefront of increasing consciousness of global issues, researching the extent of transnational problems and crises, and mobilizing consensus and action. They have the ability to represent shared interests in ways that transcend the agendas of nation-states²⁴ and are now active participants in the norms and procedures of global economics as well as dispute resolution.

Nonpolitical organizations such as the International Arbitration Association and ICANN, the global body responsible for Internet domain name registration and dispute resolution are active globally. These organizations have been researching the extent of transnational problems and crises and mobilizing global consensus and action. They have the capacity to represent shared interests in ways that transcends the exclusive interests of nation states.²⁵

²³ U.N. Resolution 96/31 reaffirms the consultative status of the Non-governmental organizations, (NGOs) which are considered nor public, nor private. The New Humanitarian International Order recognizes NGOs as subjects of the Public International order, even if they do not have legal personality.

²⁴ Among such initiatives are the U.N Conference on Disarmament for Security and the 62nd Annual Public Information Gathering of NGOs, which took place in Mexico in September 2009. Nobel Peace Prize Winner Jody Williams, one of the speakers, pointed out opportunities to apply future savings from a reduction in military spending to benefit Humanity in areas such as education, health and natural disaster prevention. The objective of the gathering that was attended by more than one thousand NGOs was to enforce disarmament and the non-proliferation agenda and expand transparency about the costs of weapons.

²⁵ U.N. Resolution 96/31 reaffirms the consultative status of NGOs in accordance with the New Humanitarian International Order.

As a result of these trends, opportunities are growing for future generations to work together on CHM areas on a peaceful and mutually beneficial basis. Foundations for global governance are emerging in which individuals and public or private institutions create or use systems as a dynamic and complex process for reaching decision in global issues.²⁶ With these new actors to monitor the management of the “commons”, Ostrom’s theory may be instrumental in bringing access to outer space in conformity with the CHM concept.

IV. OSTROM’S THEORY FOR SUCCESSFUL MANAGEMENT OF THE COMMONS: A NEW PATH FOR ECONOMIC GOVERNANCE IN OUTER SPACE?

A far-reaching alternative approach to handling the commons has been developed by Elinor Ostrom, the recipient of the 2009 Nobel Prize in Economics.²⁷ Her book, “Governing the Commons: The Evolution of Institutions for Collective Action”,²⁸ presents historically grounded ideas. Her approach to the management of “Common Pool Resources” (CPR) may be relevant to the development of outer space resources for the benefit of all humanity.

An influential 1968 article by economist Garret Hardin, “The Tragedy of the Commons”, noted that reliance on national governments to use and dispose of the common property of humanity would produce unfortunate consequences. In his view, “they would manage natural resources to satisfy their electors, without being accountable to future generations”. Hardin stated as well that, “freedom in a commons brings ruin to all”.²⁹ Hardin’s “tragedy of the commons” theory focused the attention of economists and policymakers on the “commons dilemma”, in which people’s short-term selfish interests

²⁶ PATRICIA BIRNE AND ALAN BOYLE, *INTERNATIONAL LAW AND ENVIRONMENT* 34 (2nd ed. 2007).

²⁷ Scientific background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel compiled by the Economic Sciences Prize Committee of the Royal Swedish Academy of Sciences, 12 October 2009.

²⁸ OSTROM ELINOR, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* (1990). She was the recipient of the 2009 Nobel Prize in Economic Sciences of the Royal Swedish Academy of Sciences.

²⁹ Garrett Hardin, *The Tragedy of the Commons* 162 *SCIENCE* 1243, 1244 (1968).

are at odds with long term group interests and the common good. In academia, the article prompted research into common pool resources such as the ozone layer, global fish populations, orbital resources and radio frequency.

Ostrom re-examined the problem of resource depletion in “Governing the Commons: The Evolution of Institutions for Collective Action”. In her book, she objected to the presumption that common property governance necessarily leads to a “tragedy”. She explored how real world communities manage communal resources such as fisheries and found that a number of factors produce successful resource management. Ostrom found that resource users themselves envisage rules and enforcement mechanisms that enable them to sustain tolerable outcomes. She pointed out that government imposed restrictions are often counterproductive, because central authorities lack knowledge about local conditions and have insufficient legitimacy. Moreover, the expectation of governmental imposed restrictions can discourage users from organizing themselves to manage resources. Ostrom noted a tendency in authors such as E.S. Rolph²⁹ to downplay the self-organizing capabilities of users and to assume their dependency upon an amorphous, fictitious and omni-competent entity called “the government”. The users, says Ostrom, are viewed by such authors as turning to the government for a “program”, rather than themselves struggling to find workable and equitable solutions to difficult problems within arenas demarcated by courts, by legislative bodies and by local authorities. She points out that,

[T]he models that social scientists tend to use for analyzing CPR problems have the perverse effect of supporting increased centralization of political authority. First, the individuals using CPR’s are viewed as if they are capable of short term maximization, but not long-term reflection about joint strategies to improve joint outcomes. Second, these individuals are viewed as if they are in a trap and cannot get out without some external authority imposing a solution. Third the institutions that individuals may have established are ignored or rejected as inefficient, without examining how these institutions may help them acquire information, reduce monitoring and enforcement costs, and equitable allocate appropriation rights and provision duties. Fourth, the solutions

³⁰ E.S. Rolph, *Government Allocation of Property Rights: Who Gets What?* 3(1) J. POL’Y ANALYSIS & MGMT. 45, 61 (1983).

presented for “the government” to impose are themselves based on models of idealized markets or idealized states.³¹

Ostrom’s research found that the motivation to conserve common resources increased when people identified with a user group. In such relationships, individuals tended to abide by agreed restraints in using the common resource. Thus, conditions that foster a “user group” identity may promote long term management of these resources and increase social interdependencies. In fisheries, for example, each individual prefers to maximize their profits by fishing without limits. As a member of a user group, however, individuals recognize the need to avoid over fishing, so that there will be enough fish next year. In her findings, she stresses eight design principles associated with the success of user groups in sustainably managing CPRs and gaining compliance over generations to the rules in use.³²

Could her principles be applied to future cooperative system for use of CPR in outer space introducing a new economic governance system? Ostrom has earned acclaim for showing that CPR can be managed by associations of users, in place of governments or private corporations. She has outlined a “design” process through which transparent, accountable systems of rules can emerge from communities that organize nonprofit systems to manage CPR areas. We have not seen yet communities based on her principles starting their own space initiatives. Would it be possible? Can economic governance as envisaged by Ostrom apply to outer space?

Ostrom’s eight principles can apply to outer space activities as follows:

1. *Clearly defined boundaries*

Ostrom notes that boundaries of the CPR as well as the eligibility criteria for individuals to use the resources must be defined. Otherwise, the user group faces the risk that “any benefits they produce by their efforts will be reaped by others who have not contributed to these efforts”.³³ Applied to outer space,³⁴

³¹ ELINOR, *supra* note 28, at 216.

³² ELINOR, *supra* note 28, at 90.

³³ ELINOR, *supra* note 28, at 91.

³⁴ A working definition accepted by many legal experts assumes that outer space generally begins at the lowest altitude above sea level at which objects can orbit the Earth, approximately 100 kilometers or 62 miles. STEPHEN GROVE, *THE GEOSTATIONARY ORBIT*, ISSUES OF LAW AND POLICY (1979).

this principle of economic governance presents a challenge. If space is the province of all humanity, it would seem that any principle of CPR management that results in enclosing parts of the domain to “outsiders” is necessarily at odds with the basic precept of space as being open to use by all.

This barrier could be overcome only if the space frontier is seen as a “metacommons”³⁵ containing a potentially infinite number of defined CPR areas in space, in which Ostrom’s principles can apply. If approached on this basis, all members of humanity can have equal standing in terms of their rights to form (non-overlapping) space CPR associations, and to set membership criteria for the use of the CPR as they deem appropriate. From these associations can arise “associations of associations”, generating norms and contract based systems for dispute resolution.

2. Sensitivity of rules governing the use of the CPR to local needs and conditions of the users.

Successful CPR associations, Ostrom found, set rules regarding member inputs of labor, material and/or money based on their assessments of local conditions. Thus, members leave if they cannot respect the rules and the decisions on technology and financial resources required to undertake the project. This principle seems to be perfectly applicable to associations engaged in outer space activities.

3. Collective-choice arrangements

Ostrom found that effective CPR associations provided internal means for individuals affected by operational rules to participate in modifying such rules, in case where modifications are required. Applying this principle to space, it follows that successful development of communities benefiting from space resources, will require making provision, at the outset, for such arrangements. For instance, people affected by a launching facility should have means to work together on the environmental issues that might affect the area. In Brazil, for example, a launch center was being developed in a way

³⁵ Metacommons was first defined as Commons-based peer production (or CBPP) in a phrase first used by Yale law professor Yochai Benkler to describe decentralized, Internet-based collaborative projects, <http://planetmath.org>.

that impinged upon communities with historical ties to the site. After a legal battle, the launch site – which cost hundreds of millions to build – had to be relocated to a different part of Brazil.³⁶ The costs and delays might have been minimized if a framework for community inputs had been in place prior to the final process of deciding the location for the original site.

4. *Monitoring*

Ostrom found that successful CPR groups also created neutral means of monitoring member compliance with the association rules. For space, user groups (launch organizations, satellite operators, etc.) could appoint external monitors to actively audit CPR operational conditions and member behavior and accountability. Such monitoring would help to bring transparency to activities taking place in outer space.

5. *Graduated sanctions*

Ostrom's research discovered that user group members who violate operational rules are likely to be assessed graduated sanctions, depending on the context and seriousness of the offense, by other appropriators, by the officials accountable to these appropriators, or by both. In the case of space, for example, an association of satellite operators and launch organizations might be established to work out graduate sanctions for debris in outer space and for holding parties responsible for damages.

6. *Conflict resolution mechanisms*

Ostrom further found that successful CPR user associations created systems for rapid low-cost resolution of conflicts among members, or between members and the officials in their associations. Regarding space, the Permanent Court of Arbitration established in December, 2009 a space law arbitration advisory group to develop arbitration and settlement rules for disputes related to outer space and map out their possible implementation.³⁷

³⁶ *Space Invaders: Brazilian Villagers Launch Protesters of Rocket Base*, THE WALL STREET JOURNAL, Oct. 9, 2008.

³⁷ *Gabrynowicz appointed to Space Law Arbitration Advisory Group for the Hague*, <http://rescommunis.wordpress.com/2010/01/06>.

Their recommendations were submitted to the Court's Administrative Council, which consists of one hundred and ten member states. Eventually the group's work will become part of the official body of optional arbitration rules used by the Permanent Court of Arbitration.

While there are currently no specific and detailed arbitration or settlement rules for space-related disputes, the need for them has become more pronounced with the accumulation of space debris. As space activities continue to expand, disputes will inevitably arise.³⁸ A key challenge will be to let user association develop their own conflict resolution systems, rather than impose top-down solutions.

7. *Minimal recognition of rights to organize*

Another finding of Ostrom's research is that the right of resource users to devise their own institutions should not be challenged by external governmental authorities. This is a very important design principle to extend to space, since the resource users otherwise would be faced with entanglements in non-transparent regulations and requirements to win licenses from Earth bound authorities. As Ostrom points out, "if external governmental officials presume that only they have the authority to set rules, then it will be very difficult for local CPR users to sustain a rule-governed CPR over the long run".³⁹

8. *"Nested enterprises" that connect CPR groups to larger systems*

Ostrom found that the functions of appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are best organized in multiple layers, as CPR groups multiply. Over time, networks of "nested enterprises" emerge, in which local associations delegate to trusted solution providers the responsibilities for agreed services.⁴⁰ Applying this principle to space, it is likely that networks of CPR area associations will grow as specializations and trust relationships emerge.

³⁸ *Ram Jakhu named to outer space group in The Hague*, Dec. 3, 2009, <http://www.mcgill.ca/channels/announcements/item>.

³⁹ ELINOR, *supra* note 28, at 101.

⁴⁰ ELINOR, *supra* note 28, at 214-15.

At present, it is clear that states are a primary force in outer space. Most of the programs are carried by governmental space agencies. Different legal instruments are used to implement governmental international cooperation in outer space. Treaties are used to define principles and set guidelines and bilateral and multilateral agreements are used between countries working in joint programs. The use of space technologies also requires the agreement of the interested governments liable for these activities, of the nationally-regulated industries that have developed the required technology.⁴¹

Although national space programs have been expanding, commercial approaches to space development have also been growing. Arianespace S.A., the company operating Europe's spaceport in French Guiana,⁴² is a leading example of cooperation through a shareholding agreement. Arianespace is a for profit launch company, with twenty-four private and public sector shareholders⁴³ from ten European countries.⁴⁴ Since its creation in 1980, Arianespace has signed over two hundred and ninety launch contracts with sixty-five international operators, and has launched nearly two-thirds of the satellites in orbit today. Arianespace has generated sales of 919 million Euros in 2007, in its fifth successive profitable year.⁴⁵

Purely private space initiatives are also flourishing.⁴⁶ Non-governmental space initiatives include Google's O3B Network Ltd. with Liberty Media,

⁴¹ In emerging economies, governmental space programs are advancing. India's space agency has been focusing its efforts in space on practical applications, involving schools in remote areas, teaching students about space exploration and advanced technologies. It has announced plans to open its first astronaut training center in Bangalore. India's space agency is training young scientists, and is planning its first manned space mission in 2015. Brazil has entered into bilateral agreements with China and Ukraine to develop its national space program.

⁴² See <http://www.arianespace.com>.

⁴³ Astrium, Aerospace. Alcatel Alennia Space, SABCA, Techspace aero SA, Christian Rovsing; Crisa, EADS CASA, Sner Grupo de Ingenieria SA, Astrium SAS, Clemessy SA, CNES, Comapnie Deutsch SAS, EADS France, L'Air Liquide, SAFRAN, Alcatel Space Italia, Avio Spa, Konsberg Defence, Dutch Space, SAAB Space, Volvo Aero Co., Oerlikon Space Ag, Rua Aerospace. Source: <http://www.arianespace.com>.

⁴⁴ Belgium (3.15%), Denmark, France (60.12%), Germany (18.6%), Italy (9.3%), Netherlands (1.8%), Norway (0.1%), Spain (2.01%), Sweden (2.30%) and Switzerland (2.51%). Source: <http://www.arianespace.com>.

⁴⁵ Maggie McKee, *Russian Rockets to Launch from the South American Base*, NEW SCIENTIST, (Apr. 12, 2005), <http://www.newscientist.com/article/dn7257-russian-rockets-to-launch-from-south-american-base.html>.

⁴⁶ On legal aspects of corporations activities in outer space see Jose Monserrat, *Corporations and Space Law*, PROC. FORTY EIGHTH COLLOQUIUM ON L. OUTER SPACE 17 (2005).

which plans to launch 16 low earth orbiting satellites in late 2010 to bring affordable Internet access to less affluent regions of the world. Hughes, IPStar and other leading technology companies are also bringing space-based services directly to underserved people across the planet. Bigelow Aerospace has started developing next-generation crewed space complexes to revolutionize space commerce, with an expressed aim of opening the final frontier to all of humanity. In anticipation of this opening, several nonprofit associations have been formed to promote the space tourism industry, including the Space Tourism Society, and others.⁴⁷ Under current US law, however, any company proposing to launch paying passengers from American soil on a suborbital rocket must receive a license from the Federal Aviation Administration (FAA/AST).⁴⁸

In keeping with moves by NGOs to take a more direct part in opening space, the Space Data Association Ltd. (SDA) was formed in 2009 as a nonprofit international organization with the announced aim of promoting safe satellite operations, including measures to minimize risks of collisions in space, and to improve satellite communications.⁴⁹ SDA was established in the Isle of Man initially by Inmarsat, Intelsat and SES, and it is open to all satellite operators and other participants. Its database will assemble information on satellite location, broadcast frequencies and power, signal polarization and coverage areas. Its intent is to reduce the time between when a customer notifies a satellite operator of interference and when that interference is located.

All these initiatives suggest an evolution beyond the premises of the Cold War era, when space exploration was treated as an arena for national rivalries. Today, people around the world are experiencing direct benefits from expanded information flows made possible through direct broadcast satellites and

⁴⁷ More information about the future of Space Tourism can be found at Space Tourism Lecture, which is a free online Space Tourism Lecture handout collection. Since 2003 Dr. Robert A. Goehlich and Pierluigi Polignano teaches the world's first and only Space Tourism class at Keio University, Yokohama, Japan. UniGalactic Space Travel Magazine is a bi-monthly educational publication covering space tourism and space exploration developments in companies like Space X, Orbital Sciences, Virgin Galactic and organizations like NASA.

⁴⁸ The licensing process focuses on public safety and safety of property, and the details can be found in the Code of Federal Regulations, Title 14, Chapter III. This is in accordance with the Commercial Space Launch Amendments Act passed by Congress in 2004.

⁴⁹ See <http://www.space-data.org/sda/>.

increasingly affordable two-way satellite Internet links. In a time of global transitions, opportunities are emerging for nonprofit, civil society organizations to take a leading role in the design of transnational rules capable of opening space on a basis that can benefit all.

As Ostrom notes in her research into CPR groups' success hinges on whether the user communities opt to supply their own institutions – or whether they instead look to external authorities to solve their problems. Once responsibility is ceded to states for solving CPR problems, users who do not have local institutions in place will tend to “wait for the government to handle their problems.”⁵⁰

So far, global civil society has been leaving to governments the decisions on development of the frontier *because governmental authorities indicate that they consider it their responsibility to solve space-related CPR problems*. However, the growing participation of individuals and NGOs in the international scene may create opportunities to bring Ostrom's design principles to realization. Such enlightened partnerships offer an opportunity for Ostrom's insights to influence the course of civilization in space, by helping humanity's frontier avoid a sterile future of national state rivalries or of capture by corporate monopolies.

⁵⁰ ELINOR, *supra* note 28, at 213.