Law and the Extension of the Human Presence with Moon 2.0

– Update to Global Compact 2.0?

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Abstract / Résumé

In 1969, humans set foot on the lunar surface for the first time. The space race of the cold war era was at its peak with *Moon 1.0*. Almost four decades later, there is renewed interest in returning to the Moon and going beyond. This time, the extension of the human presence into outer space is meant to be permanent and sustainable. Space exploration is to be brought into the economic sphere with *Moon 2.0*.

The activities of the public sector mainly represented in the *Global Exploration Strategy* and those of the private sector, which have been highlighted by the *Google Lunar X PRIZE* are surveyed and contrasted against the core international legal framework. Arguing that the private sector can play a unique role in reconciling inclusive social interests for the benefit of mankind with their current exclusive economic priorities, the *United Nations Global Compact* is offered as a suitable gateway.

C'est en 1969 que l'homme a mis pieds sur la lune pour la première fois. La course vers l'espace à l'époque de la guerre froide était a son apogée avec *Lune 1.0*. Près de quatre décades plus tard, l'intérêt de retourner vers la lune et d'aller même encore plus loin est de nouveau réveillé. Cette fois-ci, on a l'intention d'assurer l'extension de la présence humaine dans l'espace de façon permanente et durable. L'exploration spatiale doit gagner une dimension économique avec *Lune 2.0*.

Les activités du secteur public représentées surtout par la *Stratégie mondiale d'exploration* et celles secteur privé qui ont été mises en évidence par le concours *Google Lunar X PRIZE*, sont examinées et comparées au principes fondamentales du droit international. Invoquant l'argument que le secteur privé peut jouer un rôle unique en conciliant les intérêts sociaux pour le bienfait de l'humanité et les priorités économiques actuelles excluantes, le *Pacte Mondial des Nations Unies* est proposé comme moyen d'accès approprié.

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Table of Acronyms and Abbreviations

Air & Space L.	Air & Space Law
ASI	Agenzia Spaziale Italiana
BMBF	Bundesministerium für Bildung und Forschung
BNSC	British National Space Centre
CEOS	Committee on Earth Observation Satellites
CERN	European Organization for Nuclear Research
Chi. J. Int'l L.	Chicago Journal of International Law
CLEP	Chinese Lunar Exploration Network
CNES	Centre National d'Etudes Spatiales
CNSA	China National Space Administration
COSPAR	Committee on Space Research
CSA	Canadian Space Agency
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DLR	Deutsches Zentrum für Luft- und Raumfahrt
EC	European Community
ESA	European Space Agency
EU	European Union
FAA	Federal Aviation Administration
FDI	Foreign Direct Investment
GA	General Assembly
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GC	Global Compact
GEO	Geostationary Orbit; Group on Earth Observation
GES	Global Exploration Strategy
GLXP	Google Lunar X PRIZE
GNSS	Global Navigation Satellite System
IAA	International Academy of Astronautics
IADC	Inter-Agency Space Debris Coordination Committee
IAF	International Astronautical Federation

ICEUM	Int. Conference on Exploration and Utilisation of the Moon
ICG	International Committee on Global Navigation Satellite Systems
I.C.J. Reports	International Court of Justice Reports
IGF	Internet Governance Forum
IISL	International Institute of Space Law
ILA	International Law Association
ILEWG	International Lunar Exploration Working Group
IMARS	International Mars Architecture for Return of Samples
IMEWG	International Mars Exploration Working Group
Int'l L. & Mgmt. Rev.	International Law & Management Review
IOAG	Interagency Operations Advisory Group
IPEWG	International Primitive Body Exploration Group
ISECG	International Space Exploration Coordination Group
ISRO	Indian Space Research Organisation
ITAR	International Traffic in Arms Regulations
ITU	International Telecommunication Union
JAXA	Japan Aerospace Exploration Agency
J. Air Law & Com.	Journal of Air Law and Commerce
J. Corp. Citizen.	Journal of Corporate Citizenship
J. Space L.	Journal of Space Law
KARI	Korea Aerospace Research Institute
LC	Liability Convention
LHC	Large Hadron Collider
MA	Moon Agreement
NASA	National Aeronautics and Space Administration
NASAct	National Aeronautics and Space Act
NEO	Near Earth Object
NGO	Non-Governmental Organization
NSAU	National Space Agency of Ukraine
Nw. J. Int'l L. & Bus	Northwestern Journal of International Law & Business
OECD	Organisation for Economic Co-operation and Development

OST	Outer Space Treaty
RA	Rescue Agreement
Regent J. Int'l L	Regent Journal of International Law
Res.	Resolution
Roscosmos	Russian Federal Space Agency
SIPRI	Stockholm International Peace Research Institute
TNC	Transnational Corporation
UNCLOS	United Nations Convention on the Law of the Sea
UNCOPUOS	United Nations Committee on the Peaceful Uses of Outer Space
UNCOSA	United Nations Coordination of Outer Space Activities
UNCTAD	United Nations Conference on Trade and Development
UNOOSA	United Nations Office for Outer Space Affairs
U.N.T.S.	United Nations Treaty Series
WMO	World Meteorological Organization
W. St. U. L. Rev.	Western State University Law Review
WTO	World Trade Organization
XPF	X PRIZE Foundation

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A. Introduction

At the beginning of the space age, although the projection of the future was more than difficult, States undertook to formulate principles within the UN organisational framework that should guide the space activities of mankind and most of which eventually evolved into the 1967 Outer Space Treaty.[1] Mankind, represented by the United Nations General Assembly, expressed early in Resolution 1348 (XIII) its wish "to avoid the extension of present national rivalries into this new field".[2] To that end, international cooperation was deemed crucial. However, plans to place certain space activities such as sounding rocket launching under the sponsorship of the United Nations were abandoned in favour of national space endeavours dominated by the two superpowers of the cold war era. The space race of that time culminated in the manned Moon landing of 1969 – "Moon 1.0". Recently, the Moon has experienced a renewed interest with major exploration projects underway or being planned. The two distinct features of this second wave of exploration are: firstly, the objective to establish a permanent presence of human beings in outer space, and secondly, the active involvement of the private sector – named "Moon 2.0" by the X PRIZE Foundation.[3]

Therefore, this thesis first explores whether the extension of the human presence to the Moon and beyond involves space activities of such a new quality that they require further development of the regulatory framework based on global acceptance and legitimacy, and second, whether the active involvement of the private sector contributes favourable characteristics to space exploration that could soften national rivalries and make space exploration a peaceful endeavour of all mankind.

Part B provides the context of space exploration from Moon 1.0 to 2.0. In order to assess the significance of current and future undertakings in manned space exploration, this thesis discerns similarities and differences between early space activities, the status

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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*, 27 January 1967, 610 U.N.T.S. 205 (entered into force 10 October 1967), online: UNOOSA <http://www.unoosa.org/oosa/en/SpaceLaw/treaties.html> accessed 29 July 2008 [*Outer Space Treaty*].

[2] *Question of the Peaceful use of outer space*, adopted without vote on 13 December 1958, GA Res. 1348 (XIII), online: UNOOSA <http://www.unoosa.org/oosa/en/SpaceLaw/gares/html/gares_13_1348.html> accessed 29 July 2008.

[3] See *infra* note 7.

quo and expected future activities. The comparative criteria used include: the development stage of the international system, the number and kind of actors, the kind of activity and applications, economics and the geopolitical situation, the organisational setup of undertakings and the development of the legal framework as well as the ethical dimension of space activities.

Part C focuses on the public sector's current space exploration activities. The analysis of national initiatives and policies is limited to the fourteen major space-faring nations whose space agencies agreed on the Global Exploration Strategy (GES). On 31 May 2007, these agencies revealed "The Global Exploration Strategy: The Framework for Coordination", which is arguably the most ambitious attempt to guide space exploration on a global level.[4] Particular attention is focused on the coordination mechanism within GES, called the International Space Exploration Coordination Group (ISECG), which is scrutinized with respect to its objectives, scope, membership and possible output. The discussion of the existing core international legal framework which sets major parameters for space exploration is framed along an inclusive vs. exclusive dichotomy of exploration and use.

Part D begins with the analysis of the Google Lunar X PRIZE. The challenge of a privately funded mission to the Moon gave the second wave of lunar exploration its name "Moon 2.0". It is also a showcase for the characteristics the private sector could contribute to space exploration. Arguing that a business-friendly, stable regulatory regime is a necessary precondition for significant private involvement, a national approach is contrasted against a global approach as well as exclusive interests against common interests: striking a balance is legally required but is also in the self-interest of space business. To that end, it is analyzed what role the United Nations Global Compact[5] could play to reconcile the economic element of outer space activities with the social element for the benefit of all mankind.

Part E concludes the thesis.

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[4] ASI, BNSC, CNES et al., *The Global Exploration Strategy: The Framework for Cooperation*, 31 May 2007, online: NASA <http://www.nasa.gov/pdf/178109main_ges_framework.pdf> accessed 29 July 2008 [*GES Framework*].

[5] *The United Nations Global Compact*, online: <http://www.unglobalcompact.org/> accessed 29 July 2008.

B. Evolution of Space Activities – From Moon 1.0 to 2.0

Space Activities have come a long way since Neil Alden Armstrong became the first human being in known history to set foot on a celestial body during the Apollo 11 mission to the Moon on July 20th, 1969 – Moon 1.0.[6] With multiple public and private initiatives en-route to the Moon, mankind seeks to expand its presence into outer space on a permanent basis – Moon 2.0.[7] Part B takes stock of the context of these human endeavours by assessing the current situation as well as by looking back and ahead.

I. Historical Evolution: From Independent States to Global Community

While the existence of relatively independent entities and of international law can be traced back to Antiquity,[8] the modern State system emerged in the 17th century. States became the dominant form of political organization primarily because of, first, their credibility on the international plane i.e. their centralised authority through which States could claim to represent the people of a certain territory and ensure compliance with undertakings vis-à-vis other States; second, their desire to make independent choices and "define themselves in the way that they chose"; and third, their social, economic, and military efficiency.[9] By recognizing each other as separate, independent and sovereign entities, States had to succumb to the idea that they were embedded in a system nonetheless; a system which had to be governed by common rules if they wanted to avoid

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[6] For a detailed visualisation of the Apollo program see *Google Moon*, online: Google Inc. <http://www.google.com/moon/> accessed 29 July 2008.

[7] Term pair coined for Google Lunar X PRIZE, see e.g. X PRIZE Foundation, "Google Lunar X PRIZE: Introductory Video", online: <http://www.googlelunarxprize.org/lunar/about-the-prize/introductory-video> accessed 29 July 2008.

[8] Wilhelm G. Grewe, *The Epochs of International Law* (Berlin/New York: Walter de Gruyter, 2000) at 7 ff. "The question of whether a law of nations existed in Antiquity and the Middles Ages can only reasonably be answered by departing from the conventional thinking and established categories of modern international law and considering the structural characteristics of an international legal order to be the essential criteria for examination." Grewe distinguishes Ius gentium (the structure of the Law of the Nations during the Middle Ages), Ius inter gentes (Spanish Age 1494-1648), droit public de l'Europe (French Age 1648-1815), International Law (British Age 1815-1919), International Law and the League of Nations (Inter-War period 1919-1944), United Nations (American-Soviet Rivalry and Rise of the Third World 1945-1989). See also Malcolm N. Shaw, *International Law*, 5th ed. (Cambridge: Cambridge University Press, 2003) at 14 ff.

[9] Colin Warbrick, "States and Recognition in International Law" in Malcolm D. Evans, ed., *International Law*, 2d ed. (Oxford/New York: Oxford University Press, 2006) 217 at 221 ff.

it being entirely anarchic and solely based upon power. The necessity of assuring co-existence and the need to facilitate transactions prompted the adoption of basic rules, at the core of which however lay the protection of unlimited domestic jurisdiction through the principle of non-intervention.[10]

However, economic interests in trade, progress in transportation and communications, advances into spaces beyond state territory, a desire to maintain peace and security as well as social and ethical developments have all contributed to the emergence of the International Community and eventually to the Global Community as such. The term 'International Community' may narrowly be understood as the community of States, whereas 'Global Community' reflects an expanded view that takes into account the role of non-state actors on the international plane.

The increase in international interaction gave rise to novel forms of governance beyond traditional diplomatic channels. The Central Commission of the Rhine was set up in conjunction with the Congress of Vienna as early as 1815 to regulate the use of this important waterway. The International Telegraph Union and the Universal Postal Union were established in 1865 and 1874 respectively. Advances into the airspace and the aftermath of World War I facilitated the conclusion of the first multilateral framework with respect to airspace, known as the Paris Convention, and led to the establishment of the first comprehensive international organisation, the League of Nations, in 1919-1920. After the "scourge of war" that brought "untold sorrow to mankind" for the second time within half a century, the United Nations were founded in 1945 with the aspiration that the organisation would deliver on its broad all-encompassing mandate.[11]

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[10] *Ibid.* at 222 "…these separate units needed means for making contacts and completing transactions between themselves. Accordingly, principles of non-intervention feature prominently among these basic rules for protecting domestic jurisdiction, as do those on diplomatic representation for establishing and furthering State relations *inter se*."

[11] Preamble of the UN Charter reads: "We the Peoples of the United Nations, determined to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind, and to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations large and small, and to establish conditions under which justice and respect for the obligations arising from treaties and other sources of international law can be maintained, and to promote social progress and better standards of life in larger freedom…"
Article 1 of the UN Charter reads: "The Purposes of the United Nations are: 1. To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law,

The heated conflict of World War II however made way to the cold war rivalry between the two superpowers of that time. It happened to be during this on-going power struggle between the two ends of the duo-pole that agreements were sought on spaces such as Antarctica in 1959 and Outer Space in 1967.[12] The Apollo Mission was consequently primarily designed "to beat the Russians"[13] in order to regain the ideological leadership role in promoting individual freedom after the Soviet lead in the space race had demonstrated the technological viability of a contrary economic concept.[14] Moon 1.0 was a public state-backed endeavour undertaken by a single nation mainly for strategic prestige purposes amidst a state-based international system. It did not encompass a broader vision for sustained space exploration. While public excitement soon faded away, space activities in general continued, of course, and meanwhile the International Community moved on.

The United Nations became, after an era of decolonization, the first truly global and universal organisation. It currently has 192 Member States, as well as an active Secretariat and a host of programs, funds and specialized agencies, known as the UN family.[15] While worldwide interaction takes place in various fields and at multiple levels, its economic dimension can be rather objectively assessed. Trade in merchandise

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adjustment or settlement of international disputes or situations which might lead to a breach of the peace; 2. To develop friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples, and to take other appropriate measures to strengthen universal peace; 3. To achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion; and 4. To be a centre for harmonizing the actions of nations in the attainment of these common ends."

[12] *The Antarctic Treaty*, 1959, 402 U.N.T.S. 72 (entered into force in 1961), online: Antarctic Treaty Secretariat <http://www.ats.aq/documents/ats/treaty_original.pdf> accessed 29 July 2008, is at the core of the broader Antarctic Treaty System; *Outer Space Treaty, supra* note 1; although Arvid Pardo, Malta's Ambassador to the UN, called for an international regime with respect to the Sea as early as 1967, it was only in 1973 that the conference mechanism was commenced and to be concluded in 1982 with the adoption of the *Convention on the Law of the Sea*, online: UN <http://www.un.org/Depts/los/convention_agreements/convention_historical_perspective.htm> accessed 29 July 2008 [*UNCLOS*].

[13] See X PRIZE Foundation, "Google Lunar X PRIZE Q & A", Question no. 6, online: <http://www.googlelunarxprize.org/lunar/media-center/faq> accessed 10 January 2008 [X PRIZE Foundation, "GLXP Q&A"], "What should kids know about the importance of going back to the Moon? Kids in the 1960's could tell you the reason for the Apollo program in four short words: 'to beat the Russians.'…".

[14] The USSR successfully landed and orbited unmanned space objects and was ahead in the space race of the 50s and 60s; see David Baker, ed., *Jane's Space Directory 2003-2004* (Coulsdon, Surrey, UK: Jane's Information Group, 2003) on lunar exploration; see also compilation of Soviet "Firsts" online: Wikipedia, "Soviet Space Program" <http://en.wikipedia.org/wiki/Soviet_space_program> accessed 29 July 2008.

[15] See the *Official WEB Site Locator for the United Nations System of Organizations*, online: UN <http://www.unsystem.org> accessed 29 July 2008.

increased from 277 billion US$ in 1969 to over 13.8 trillion in 2007.[16] Trade in services, not even envisaged in 1969, increased from 391 billion in 1980 to 3.3 trillion in 2007.[17] Foreign direct investments (FDI) leapfrogged from roughly 14 billion in 1970 to 1.3 trillion in 2006 plus an additional 12 trillion in stock with international mergers and acquisitions amounting to 880 billion US$.[18] This dramatic increase in quantity signifies a no less dramatic qualitative change towards a global economy with global actors and supply chains. By rough estimates, there are 78,000 transnational corporations (TNCs) with 780,000 foreign affiliates; the latter accounting for 73 million employees and $51 trillion in assets.[19] A rather recent development – the internationalization of R&D beyond local product adaptation, which is nothing less than the global distribution of a competence of core strategic value – is evidence of a process of full scale global economic integration.[20] Although the legal framework of free trade in the modern era dates back to GATT 1948, it reached a new quality in 1995 with the establishment of the WTO and Member States' acceptance of a mandatory dispute resolution mechanism. Foreign investments have been protected through a worldwide web of several multilateral and over 2,500 bilateral treaties.[21]

A wholly different web has been spun throughout the International Community since the 1980s. What began as a "resilient communication facility designed to survive a

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[16] UNCTAD, *Handbook of Statistics 2008*, table 1.1 Value and shares of merchandise exports and imports, US Dollars at current prices in millions, online: UNCTAD GlobStat Database <http://stats.unctad.org/Handbook/TableViewer/tableView.aspx?ReportId=1902> accessed 3 August 2008.

[17] *Ibid*. table 5.1 Value and shares of total exports and imports of services, online: <http://stats.unctad.org/Handbook/TableViewer/tableView.aspx?ReportId=1913> accessed 3 August 2008.

[18] UNCTAD, *FDIstat*, online: <http://stats.unctad.org/fdi/>; see also UNCTAD, *World Investment Report 2007*, online: <http://www.unctad.org/en/docs/wir2007_en.pdf>; for definitions of FDI see online: UNCTAD <http://www.unctad.org/Templates/Page.asp?intItemID=3145&lang=1> accessed 3 August 2008.

[19] UNCTAD*, Development and Globalization: Fact and Figures 2008* at 30, online: <http://www.unctad.org/en/docs/gdscsir20071_en.pdf>; for a definition of TNC see online: UNCTAD <http://www.unctad.org/Templates/Page.asp?intItemID=3145&lang=1> all accessed 3 August 2008.

[20] UNCTAD, *World Investment Report 2005: Transnational Corporations and the Internationalization of R&D* at 131ff., online: <http://www.unctad.org/en/docs/wir2005_en.pdf> accessed 3 August 2008; Secretary-General of UNCTAD speaks of a "'second generation' of globalization" with economic multipolarity being its distinctive characteristic, UNCTAD, *Development and Globalization: Fact and Figures 2008, supra* note 19 at iii.

[21] See further Charles Leben, "La Théorie du contrat d'État et l'évolution du droit international des investissements", (2003) 302 Recueil des cours de l'Académie de droit international de La Haye 201; UNCTAD's database *Investment Instruments Online* alone contains over 1,800 BITs, online: <http://www.unctadxi.org/templates/Page____1006.aspx> accessed 3 August 2008.

nuclear attack" [22] connects currently over 1.4 billion individual end-to-end-users worldwide via a decentralised network architecture. [23] The Internet facilitates global collaboration and exchange to such an extent that it created a new, and in its quality still vague, domain – the cyberspace.[24] Collaboration within open network communities will be taken to the next level when the Large Hadron Collider (LHC), the world's largest scientific instrument at the CERN in Geneva, which is designed to simulate the conditions of the universe just after the Big Bang, will start operation in 2008, pouring petabytes of research data into the worldwide LHC computing grid.[25]

Figure B.I.1 World city-to-city connections; Source: Chris Harrison, online: <http://www.chrisharrison.net/projects/InternetMap/index.html> accessed 29 July 2008.

A new global dimension was added when the environmental movement and the notion of sustainable development set in at the national level in the 1960s, reaching the international plane by 1972 with the Stockholm Declaration on the Human Environment, and gaining full momentum with the 1992 Rio Declaration on Environment and

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[22] Eduardo Gelbstein & Jovan Kurbalija, *Internet Governance: Issues, actors and divides* (Geneva/ Kuala Lumpur: DiploFoundation/Global Knowledge Partnership, 2005) at 8, online: <http://www.diplomacy.edu/isl/ig/> accessed 29 July 2008; the Internet originates from 1960s US government project called DARPANet.

[23] As of June 2008 the Internet had 1,463,632,361 users according to Miniwatts Marketing Group, *Internet Usage Statistics: The Internet Big Picture*, online: <http://www.internetworldstats.com/stats.htm> accessed 3 August 2008; as regards the issue of digital divide see UN, *Measuring ICT website*, online: UNCTAD <http://new.unctad.org/default____575.aspx> accessed 29 July 2008, and Gelbstein & Kurbalija, *supra* note 22 at 115.

[24] John Perry Barlow, *Declaration of the Independence of Cyberspace*, online: <http://homes.eff.org/~barlow/Declaration-Final.html> accessed 29 July 2008, sent to all governments in 1996; Gelbstein & Kurbalija, *supra* note 22 at 18.

[25] CERN, *Worldwide LHC Computing Grid*, online: CERN <http://lcg.web.cern.ch/lcg/overview.html> accessed 29 July 2008.

Development, Agenda 21, and the Conventions on Climate Change and Conservation of Biological Diversity.[26] Above all, mankind regained a sense that we all are part of our natural environment and share this blue planet called Earth.

The common threat of becoming victims of natural disasters has given rise to profound international cooperation e.g. by means of the 2000 International Charter on Space and Major Disasters.[27] While internationally organized humanitarian aid dates back to the 1863 International Committee of the Red Cross, the world witnessed unprecedented dimensions of global aid and solidarity in the wake of the Tsunami in the Indian Ocean that inflicted so much pain on that region in 2004.[28] These days the world's attention and assistance is focused on the earthquake-struck region of Sichuan, China.[29]

Our impaired world vision was further healed and elevated to a global level through the Fall of the Berlin Wall in 1989, which symbolizes the end of a stalemate that cut the world in pieces. Taking this development as Flattening Force #1, Friedman argues in his book "The World is Flat" that globalisation can be divided in three phases: Globalisation 1.0 from 1492 until around 1800, an era in which countries and governments "led the way in breaking down walls and knitting the world together"; Globalisation 2.0 from 1800 to 2000, where the driving force was multinational companies; and finally Globalisation 3.0, where empowered individuals collaborate and compete globally.[30]

At the beginning of the third millennium, one has to attest that the international system has undergone immense structural changes and remains in constant transition. States, omnipotent entities four centuries earlier, have accepted the existence of *jus*

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[26] See Catherine Redgwell, "International Environmental Law" in Evans, *supra* note 9, 657-687 at 659.
[27] *The Charter On Cooperation To Achieve The Coordinated Use Of Space Facilities In The Event Of Natural Or Technological Disasters*, 20 October 2000, Rev.3 (25/4/2000).2, online: <http://www.disasterscharter.org/charter_e.html> accessed 29 July 2008.
[28] "UN launches unprecedented multiple effort to aid victims of Asia's devastating tsunami" *UN News Centre* (27 December 2004), online: <http://www.un.org/apps/news/story.asp?NewsID=12914&Cr=tsunami&Cr1=&Kw1=tsunami&Kw2=&Kw3=> accessed 29 July 2008; "2004 Indian Ocean earthquake" *Wikipedia*, online: <http://en.wikipedia.org/wiki/2004_Indian_Ocean_earthquake> accessed 13 July 2008.
[29] As regards Chinas acceptance of international humanitarian aid related to the devastating earthquake in Sichuan, China on 12 May 2008 see "In Departure, China invites Outside Help" *New York Times* (16 May 2008), online: <http://www.nytimes.com/2008/05/16/world/asia/16china.html?ref=world> accessed 13 July 2008.
[30] Thomas L. Friedman, *The World is Flat: a Brief History of the Twenty-First Century,* Version 3.0 (Vancouver/Toronto: Douglas & McIntyre, 2007) at 9 ff., describing the ten forces that flattened the world at 51.

cogens and the notion of *erga omnes* obligations vis-à-vis the International Community.[31] States find themselves confronted with an array of global challenges which demand a global solution and to which ends human dignity as well as the unity of the human family are stressed as guiding principles of the noble UN mission.[32] The concepts of *actio popularis* [33] and universal jurisdiction [34] are gaining ground and the International Community finds it increasingly unacceptable if national borders remain closed for its humanitarian aid efforts.[35]

Non-state actors have made their debut on the international plane primarily with increasingly active and influential Non-Governmental Organisations (NGOs) and Transnational Corporations (TNCs). TNCs have an inherent ability to challenge national regulatory power through their structural set up and have, in instances, accumulated greater economic power than some individual States. One of those TNCs has further empowered the Individual to search or 'google' the internet and to adopt a global world vision more easily than ever before, through Google Earth, a powerful visualisation tool.[36] The term 'International Community' generates 12.800.000 hits vs. 1.860.000 for

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[31] Art. 53, 64 *Vienna Convention on the Law of the Treaties,* 1969, 1155 U.N.T.S. 331 (entered into force in 1980) [*VCLT*]; Art. 33(1) *Draft articles on the Responsibility of States for International Wrongful Acts*, 2001, International Law Commission, online: <http://untreaty.un.org/ilc/texts/instruments/english/draft%20 articles/9_6_2001.pdf> accessed 29 July 2008 [*ILC on State Responsibility*]; Art. 218 *UNCLOS*, *supra* note 12; Principle 21 of *the Declaration of the UN Conference on the Human Development*, 1972, Stockholm, online: < http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=97&ArticleID=1503> accessed 29 July 2008; Paul Tavernier, "L'identification des règles fondamentales un problème résolu?" in C. Tomuschat & J.-M. Thouvenin, eds., *The Fundamental Rules of the International Legal Order* (Leiden, Boston: Brill, 2006) at 1, attests universal consensus on the existence (but not on the identification) of *jus cogens* norms with the exception of France; for the categorization of fundamental rules see Stefan Kadelbach, "The Identification of Fundamental Norms" in Tomuschat & Thouvenin, *ibid*. at 26.

[32] See e.g. "Addressing General Assembly, Pope stresses major UN role on raft of issues" *UN News Centre* (18 April 2008), online: UN <http://www.un.org/apps/news/story.asp?NewsID=26377&Cr=pope&Cr1=>; Pope Benedikt XVI*., Address to the General Assembly of the United Nations*, 18 April 2008, Holy See Press Office, online: UN <http://www.un.org/webcast/pdfs/Pope_speech.pdf> accessed 13 July 2008.

[33] Art. 42, 48 *ILC on State Responsibility*, *supra* note 31.

[34] Vaughan Lowe, "Jurisdiction" in Evans, ed., *International Law*, *supra* note 9, 335, at 348, arguing that the universal principle is made up of two strands: heinous crimes as genocide, crimes against humanity, serious war crimes; as well as serious crimes which otherwise would go unpunished. Moreover, "one might argue that the principle could be extended to justify assertions of jurisdiction over others who commit serious crimes in places beyond the territorial jurisdiction of the State."

[35] See the UN Secretary-General Ban Ki-Moon on the humanitarian crisis in Myanmar, "Opening remarks at press conference on Myanmar" *UN News Centre* (12 May 2008), online: <http://www.un.org/apps/news /infocus/sgspeeches/search_full.asp?statID=239> accessed 13 July 2008.

[36] For an explanation of the deeper sense of 'search' see John Battelle, *The Search: how Google and its rivals rewrote the rules of business and transformed our culture* (New York: Portfolio/Penguin Group, 2005); *Google Earth*, online: Google Inc. <http://earth.google.com/> accessed 29 July 2008.

'independent States' on the Google Search Engine.[37] The broader concepts of a Global Community, which generates 3.250.000 hits, as well as global governance are taking shape, with the latter being defined by the Commission on Global Governance as follows: "Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interest … At the global level, governance has been viewed primarily as intergovernmental relationships, but it must now be understood as also involving non-governmental organizations (NGOs), citizens' movements, multinational corporations, and the global capital market. Interacting with these are global mass media of dramatically enlarged influence."[38] In this context, it cannot be stressed enough that the Outer Space Treaty consciously makes outer space an endeavour of all mankind and avoids any reference to nationality in favour of the concept of jurisdiction and control.[39] It is against this background of progressing denationalization[40] that Moon 2.0 is approaching.

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[37] Internet search using *Google* on 3 August 2008, online: Google Inc. <http://www.google.com>.
[38] Commission on Global Governance, *Our Global Neighbourhood* (Oxford: Oxford University Press, 1995), online: <http://www-old.itcilo.org/actrav/actrav-english/telearn/global/ilo/globe/gove.htm#The%20Concept%20of%20Global%20Governance> accessed 29 July 2008.
[39] Art. I(1) "province of all mankind", Art. II "not subject to national appropriation", Art. V "envoy of mankind", Art. VIII "jurisdiction and control" of the 1967 *Outer Space Treaty*, *supra* note 1.
[40] As regards the term 'denationalization', see Stephan Hobe, "Individuals and Groups as Global Actors: The Denationalization of International Transactions" in Rainer Hofmann, ed., *Non-State Actors as New Subjects of International Law* (Berlin: Duncker & Humblot, 1999) 115-135.

II. Main Actors – Who?

1. From Public Duo-Pole to Public-Private Space Economy

The early space age was dominated entirely by the two superpowers. From 1958 to 1984, solar system exploration was undertaken only by the USA and USSR, with the exception of participation of the FRG in Helios 1 and 2 in 1974/1976.[41] In the age of Moon 1.0, space activities were public state undertakings. In the case of the US, private participation was mostly limited to the role of contractors manufacturing the necessary hardware. With respect to NASA's Apollo program this meant manufacture of the spacecraft by Boeing, Chrysler, Grumman, IBM, North American Rockwell and McDonnell Douglas.[42] As the Soviet economic system did not favour private undertakings, development for the space program in general and the manned lunar program N1/L3 in particular, was handled by design bureaus working for different ministries.[43]

Commercial space applications were, however, already being exploited, predominantly via satellite telecommunication. With the exception of COMSAT, a private but closely publicly controlled enterprise established in 1962 by the COMSAT Act, that was part of INTELSAT with conclusion of the Interim Arrangements in 1964 and that eventually became the signatory on behalf of the USA to the definite INTELSAT Operating Agreement of 1971,[44] the telecommunication sector largely remained in the public domain prior to a wave of liberalization and privatization in the 90s.[45] Although

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[41] Baker, Jane's Space Directory 2003-2004, *supra* note 14 at 760 ff., table 3: solar system exploration chronology.

[42] Richard W. Ortloff, *Apollo by the Numbers: A Statistical Reference* (NASA History Series SP-2000-4029, 2000, revised 2004) at "Launch Vehicle/Spacecraft Key Facts 1st - 3rd Table", online: <http://history.nasa.gov/SP-4029/SP-4029.htm>; *ibid.* at "Apollo Program Budget Appropriation", online: <http://history.nasa.gov/SP-4029/Apollo_18-16_Apollo_Program_Budget_ Appropriations.htm> accessed 29 July 2008.

[43] Marcus Lindroos, ed., *The Soviet Manned Lunar Program*, online: Federation of American Scientists <http://www.fas.org/spp/eprint/lindroos_moon1.htm> accessed 29 July 2008.

[44] *Operating Agreement relating to the International Telecommunications Satellite Organization "INTELSAT"*, 20 August 1971, 1220 U.N.T.S. 149, Reg. No. 19678; Francis Lyall, "On the Privatisation of INTELSAT" (2000) 28 J. Space L. 101-119, at 103 ff.

[45] *General Agreement on Trade in Services* including Telecommunication annex, 1992 (entered into force in 1995), online: WTO <http://www.wto.org/english/docs_e/legal_e/26-gats.pdf> accessed 29 July 2008 [*GATS*]; *Fourth Protocol to the GATS* on basic telecommunications, 1997, online: WTO

international satellite telecommunication is inherently an international undertaking and multilaterally organized, the initial space infrastructure was nonetheless provided solemnly by the two superpowers to INTELSAT and INTERSPUTNIK respectively.

At the brink of Moon 2.0 the club of States providing space launch services has significantly grown beyond USA and Russia, and now includes Europe, China, Japan, India and Israel as well as the multinational consortium Sea Launch.[46] The number of space-faring nations is even greater.[47] 32 States and 2 organizations (ESA and EUMETSAT) have registered space objects with the UN, either according to the Registration Convention or GA Res. 1721 B (XVI).[48] According to OECD statistics, more than thirty States have dedicated space programmes and even more than fifty have procured satellites in orbit.[49] Space activities gain global reach if one considers the direct and indirect use of space applications by the United Nations family[50] and by public and private entities all over the world.[51]

Commercialization of space activities and the growing importance of the role of private actors[52] have given rise to a complex $250 billion[53] space economy, defined by the OECD Global Forum on Space Economics as "all public and private actors involved in developing and providing space-enabled products and services. It comprises a long value-added chain, starting with research and development actors and manufacturers of

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<http://www.wto.org/english/docs_e/legal_e/4prote_sl20_e.pdf> accessed 29 July 2008; INTELSAT's privatization was effected in 2001.

[46] Federal Aviation Administration (USA), *Commercial Space Transportation: 2007 Year in Review* (2008) at 6, online: <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2007_Year_In_Review_Jan_2008.pdf> accessed 29 July 2008.

[47] See reports on national activities to UNCOPUOS, online: UNOOSA <http://www.unoosa.org/oosa/en/natact/natact/index.html> accessed 29 July 2008, for 2007 see UN doc. A/AC.105/907 and addenda.

[48] UNOOSA, *Notifications from States & Organizations (Launch Year 1976 – present)*, online: <http://www.unoosa.org/oosa/en/SORegister/docsstatidx.html> accessed 21 May 2008; *Convention on Registration of Objects Launched into Outer Space*, 12 November 1974, 1023 U.N.T.S. 15. [*Registration Convention*]; *International cooperation in the peaceful uses of outer space*, 20 December 1961, GA Res. 1721(XVI).

[49] OECD, *The Space Economy at a Glance 2007* (Paris, OECD Publications, 2007) at 34, online: <http://213.253.134.43/oecd/pdfs/browseit/0307021E.PDF> accessed 29 July 2008.

[50] United Nations Coordination of Outer Space Activities, online: <http://www.uncosa.unvienna.org>.

[51] E.g. satellite telecommunication, remote sensing data, and global navigation satellite services.

[52] See Karl-Heinz Böckstiegel, Susanne Reif & Bernhard Schmidt-Tedd, eds., *Project 2001: Legal Framework for the Commercial Use of Outer Space*, *Vol. II Legal Framework for Privatising Space Activities* (Cologne: DLR, 1999); Stephan Hobe, Kai-Uwe, Schrogl & Bernhard Schmidt-Tedd, eds., *Proceedings of Project 2001 Plus: Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Berlin, Cologne et. al., 2004).

[53] Frank Morring Jr., "Worldwide Space Economy Passes $250 billion" *Aviation Week* (7 April 2008).

space hardware (e.g. launch vehicles, satellites, ground stations) and ending with the providers of space-enabled products (e.g. navigation equipment, satellite phones) and services (e.g. satellite-based meteorological services or direct-to-home video services) to final users."[54] While commercialization and privatization of space activities has become a common theme of space development, especially with the adoption of free market systems in wider parts of the world after the end of the cold war period, analysis of the space economy indicates that public actors, i.e. governments, still play a dominant and therefore critical role in sustaining the space economy and dealing with its strategic implications as investors, owners, operators, regulators and customers for much space infrastructure as well as sponsor of research and development.[55] Public space budgets[56] of over 100 million US$ are listed in figure B.II.1, whereas the value chains of major commercial applications on which private involvement has mainly focused on so far – telecommunications, earth observation or remote sensing and navigation – are visualized in figure B.II.2 below.

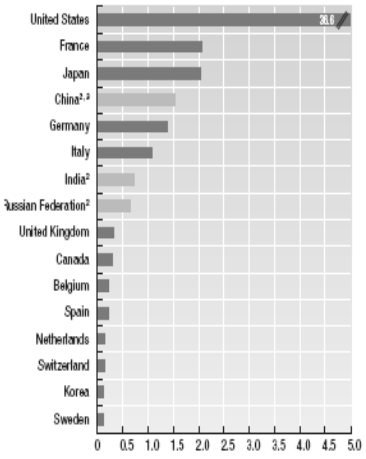

Fig. B.II.1 Space budgets of selected OECD and non-OECD Countries, 2005, billions of current US$. Source: OECD 2007 Space Economy at a Glance, at 37.

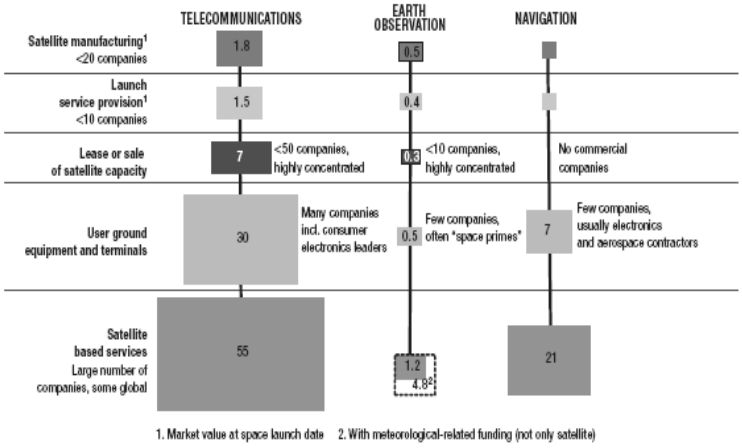

Fig. B.II.2 The three value chains in commercial satellite applications in 2005, revenues in billions of US$. Source: R. Bierett (2007), Presentation for Telecom Info Days 2007, ESA, ESTEC (data from Euroconsult, 2006) in: OECD 2007 The Space Economy at a Glance, at 52.

[54] OECD, The Space Economy at a Glance, *supra* note 49 at 17.
[55] *Ibid*. at 18.
[56] *Ibid.* at 34, as defined by the OECD, space budgets refer to "Space budgets refer to the amounts that governments have indicated they will provide to public sector agencies or organisations to achieve space-related goals (e.g. space exploration, better communications, security). For OECD countries examined here, the space budgets may serve both civilian and military objectives. However, significant portions of military-related space budgets may not be revealed in published figures. Data for non-OECD countries Brazil, Russia and India refer to civilian and/or dual-use programmes. Chinese figures are only estimates and not official data. Other estimates of China's space budget (from diverse Western and Asian sources) range from USD 1.2 to more than USD 2 billion.

Space exploration[57] has long been a sphere reserved for public actors. In contrast to the US-Soviet duet of Moon 1.0, space exploration under Moon 2.0 promises to resemble an ensemble at least with respect to the number of actors, if not with respect to a harmonic tune. China, Europe, India and Japan have also laid out exploration initiatives. Although private involvement in commercial space launch and transportation services dates back to Arianespace in 1980, the private sector is becoming increasingly active in human spaceflight in the form of space tourism. Moon 2.0 can be considered as another watershed development since the private sector is now in business with space exploration and exploitation beyond the Geostationary Orbit.

2. Status of Non-State Actors

The diversity of active participants in Moon 2.0 necessitates taking a closer look at non-state actors within the international legal system. Traditionally, the international legal system is constructed as a state-based system in which the individual was entirely mediatized, i.e. the individual was made an object of this system rather than a subject thereof. The concept of 'individual' can be understood in this context to include a single human being or groups thereof, as well as separate organisations formed to pursue common interests, such as non-governmental organisations (NGOs) or corporations.[58] Rather than being static, the international legal system dynamically evolves. Subjects of law, their nature and the extent of their rights depend on the "needs of the community" and the "requirements of international life" as highlighted by the ICJ when it acknowledged the international personality and capacity of the UN due to the "progressive increase in the collective activities of States".[59]

While the subject quality of individuals remains controversial, efforts have been directed towards conceptualizing the international legal system as one of 'participation'.[60]

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[57] *Ibid.* at 62, defined by the OECD as "the physical exploration of outer-Earth objects, via robotic probes and human missions. More broadly, it also includes the scientific disciplines (e.g. astronomy, solar physics, astrophysics, planetary sciences), technologies and policies applied to space endeavours."
[58] Robert McCorquodale, "The Individual and The International Legal System" in Evans, *supra* note 9, 307-332 at 308.
[59] *Ibid.* at 309*; Reparations for Injuries Suffered in the Service of the United Nations,* Advisory Opinion, 11 April 1949, I.C.J. Reports 1949, 174.
[60] Rosalyn Higgins, *Problems and Process: International Law and How We Use It* (Oxford: Oxford University Press, 1994) at 49; McCorquodale, *supra* note 58 at 310.

Accordingly, an entity has been defined to have international legal personality "if it has direct international rights and responsibilities, can bring international claims, and is able to participate in the creation, development, and enforcement of international law."[61] Another matter of debate is, whether the individual derives its role solely from the State as international (governmental) organisations do, or whether the individual has an independent role in the system. The status of individuals has progressed foremost in the fields of international human rights, humanitarian, criminal, environmental and economic law. This is not irrelevant for space activities, as an eventual broad development in general international law is also effective for exploration and use of outer space pursuant to Article III OST.

Article VI OST and Article 14 of the Moon Agreement[62] references space activities carried out by "non-governmental entities", but addressees of the norm are the State Parties. As States bear direct international responsibility even for "national activities" carried on by non-governmental entities, and considering the growing role of the private sector, attribution is to become an issue. Although individuals might be the beneficiaries of Article V OST and the Rescue Agreement,[63] the obligations are owed to other Contracting Parties. Article V OST and Article 4 RA might nonetheless be construed to grant personnel of a spacecraft the right to land in foreign territory in case of accident, distress, emergency or unintended landing. Article VIII of the Liability Convention[64] expressly sets the regime up on a state-to-state level with no *jus standi* of individuals. International intergovernmental organizations are, however, provided for in Article 6 RA, Article XXII LC, Article VII Registration Convention[65] and Article 16 MA. Even though private sector space activities are recognized in international space law, the system is constructed around public sector actors, whether it be States or international (governmental) organizations.

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[61] McCorquodale, *supra* note 58 at 309.
[62] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 18 December 1979, 1363 U.N.T.S. (entered into force in 1984), online: UNOOSA <http://www.unoosa.org/oosa/en/SpaceLaw/treaties.html> accessed 29 July 2008 [*Moon Agreement*].
[63] *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 U.N.T.S. 119 (entered into force in 1968) [*Rescue Agreement*].
[64] *Convention on the International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 U.N.T.S. 187 (entered into force in 1972) [*Liability Convention*].
[65] *Registration Convention*, *supra* note 48.

De facto, the role of private entities is increasing and includes active participation in law-making and enforcement. Aside from lobbying activities at the national level, private entities can seek sector or associate membership at the ITU.[66] By contributing their funds and expertise through preparatory work and participation in the discourse, sector and associate members can shape policy and law-making in ITU fora. As certain sectors of the space economy fall within the domain of GATS and subsequently the WTO, the mandatory dispute settlement system is applicable. Even though it was set up as an inter-state system, private entities are often recognized as the true driving force of their procedures.[67]

A trend is set for greater participation of non-state actors in the international legal system. Where vital interests of individuals are touched, one can argue that they will claim a role of independence.

III. Main Activities and Applications – What?

As is true for all human activity, space activities undertaken by mankind also produce waste or space debris. Since the inception of the space age with the launch of Sputnik in 1957, a population of artificial man-made space objects has been building up in earth orbit – active and non-active objects. In 2007 alone a total of 68 orbital launches took place worldwide, 23 of which were of a commercial nature.[68] For the last five years 61 orbital launches were carried out annually on average.[69] Compared to the 110 orbital launches in 1969[70], these figures are not really impressive. However, although a "decline in launch activities, a concurrent peak in solar activity, and a parallel reduction of on-orbit explosion rates due to post-mission passivation measures has resulted in an almost constant on-orbit catalog population close to 9,000 since 1994",[71] the steadily increasing

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[66] See Ram Jakhu, "International Telecommunication Union and Regulation of Use of Radio Frequencies and Orbital Positions" in Ram Jakhu, ed., *Law of Space Applications: Documents and Materials Volume I* (Montreal: McGill, 2004) 88 at 99; *ITU Membership Division,* online: ITU <http://www.itu.int/members/index.html> accessed 29 July 2008.
[67] McCorquodale, *supra* note 58 at 320.
[68] Federal Aviation Administration (USA), *supra* note 46 at 6 table 3.
[69] *Ibid.* at 13 figure 9.
[70] Baker, Jane's Space Dictionary 2003-2004, *supra* note 14 at 817 table 23: world launch log 1957-2005.
[71] Heiner Klinkrad, *Space Debris: Models and Risk Analysis* (Berlin/Chichester: Springer/Praxis, 2006) at 6.

amount of payloads suggests an increased intensity in use of outer space. Payloads occupying the GEO were up to 485 in 2002 from roughly 60 in 1969.[72] According to OECD estimates, around 940 active satellites are currently operating in orbit, with a replacement value of between170 – 230 billion US$.[73]

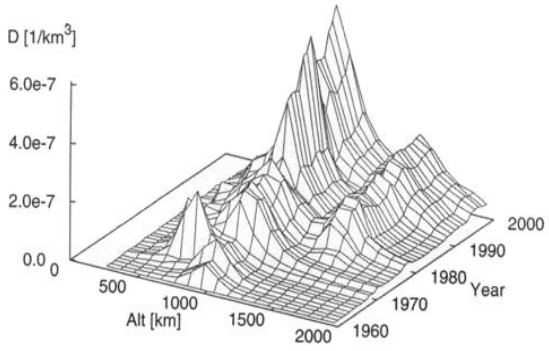

Figure B.III.1 Spatial object density versus altitude and year for objects of $d > 1$ cm according to the MASTER-2001 model. Source: Heiner Klinkrad, Space Debris (2005) at 93.

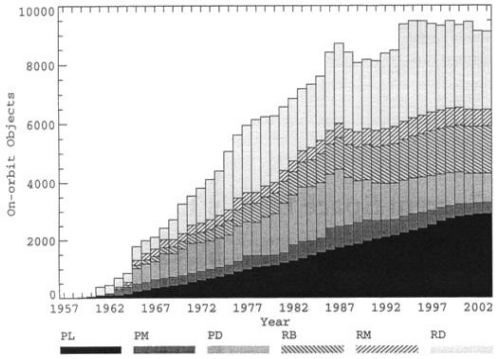

Figure B.III.2 Historic evolution of the number of trackable on orbit catalog objects and their share between different source categories (PL = payloads, RB = rocket bodies, PM = PL mission-related objects, PD = PL debris, RM = RB mission-related objects, RD = RB debris). Source: Klinkrad, at 6.

As regards the type of use, one distinguishes military[74], civil (non-profit) and commercial (for-profit)[75] uses of outer space. In the early space age, amidst the cold war, space was developed for national security and prestige purposes. Military applications were therefore of paramount importance. As space launch systems are derived from missile technology, the capability to access outer space is intrinsically of a dual-use nature. Nonetheless, the space launch industry has become part of the private sector in key regions of the world since the 1980s and offers its services now also on a basis that is commercial, i.e. competitively or privately financed.[76] Even commercial spaceports

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[72] *Ibid.* at 9 figure 2.4.
[73] OECD, The Space Economy at a Glance 2007, *supra* note 49 at 42.
[74] Baker, Jane's Space Dictionary 2003-2004, *supra* note 14 at 575 lists the following military use satellites: ASAT, ballistic missile defence, communications, data relay, early warning, Elint, fractional orbital bombardment systems, geodetic, meteorological, minor military, navigation, nuclear surveillance, ocean surveillance, photo reconnaissance, radar calibration, radar imaging, science and engineering test.
[75] *Ibid.* at 345 lists the following civil and commercial satellites: communications, data relay, earth observation and meteorological, engineering test, geodetic, microgravity and materials science, scientific, search and rescue.
[76] See the definition of a commercial launch adopted by the Federal Aviation Administration (USA), *supra* note 46 at 2.

mushroom in the USA.[77] Satellite enabled reconnaissance, communication and navigation for military purposes, have all found their civil and commercial equivalent, termed 'remote sensing and earth observation', 'satellite telecommunication' and 'GNSS systems'.

The era of manned spaceflight commenced with Yuri Gagarin in 1961 and thus far three States, Russia/SU, USA and China, have demonstrated their capability to put a human in space, China doing so as recently as 2003. As of the end of 2006, 451 persons from 37 States have flown in earth's orbit.[78] Construction of manned space structures began with the Salyut program in 1971, culminating in the assembly of the International Space Station, which is currently underway. Commercialization has left its mark on human spaceflight with Denis Tito's $20,000,000 ride to the ISS on a Russian ticket in 2001. Since then, three other 'space tourists' or 'independent researchers' or 'private space explorers' undertook orbital flights. Commercial sub-orbital flights are soon to be offered to the general public and expandable space habitats are undergoing on-orbit testing.

Meanwhile, Voyager I and II demonstrate in an incredible way how space exploration has continuously expanded the knowledge and vision of mankind. Both robotic probes were launched in 1977 and have reached the outer rim of our solar system traversing the termination shock after travelling through outer space for thirty years.

The return to the Moon – this time with private participation and a commercial agenda right from the beginning – is envisioned to lead to human settlements in the form of permanent outposts, resource utilization and removal as well as construction of larger scientific and commercial equipment, such as telescopes or solar energy panels. The Moon might possibly serve as a stepping stone for both robotic and human exploration to Mars and beyond, extending the human presence even farther. The use of outer space is to increase in quantitative and qualitative intensity. The role and influence of the private sector in outer space activities is continuously on the rise.

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[77] Federal Aviation Administration (USA), *U.S. Spaceports*, online: <http://www.faa.gov/about/office_org/headquarters_offices/ast/industry/media/spaceports.gif> accessed 29 July 2008.
[78] OECD, The Space Economy at a Glance 2007, *supra* note 49 at 63 table 3.6b.

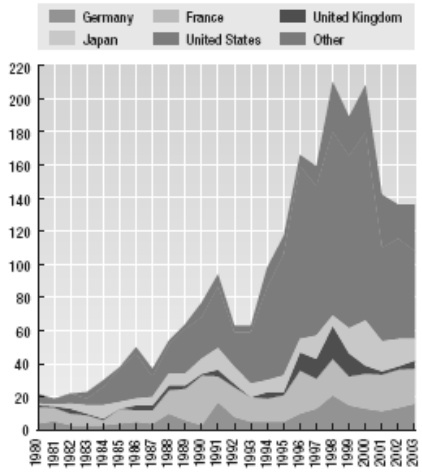

Fig. B.III.3 Breakdown of space-related patents at EPO, 1980-2003, number of patents granted or pending by country of applicant. Source: OECD, Space Economy at a Glance (2007) at 57.

The commercial viability and potential of the final frontier is out of the question, indicated by statistics on space-related patents. The sharp decline in patent applications from the US at the European Patent Office can arguably be explained by national security considerations, which highlight the fragile balance between freedom of commercial exploitation and restrictive national security and foreign policy requirements. Taking into account the growing dependence on space assets, Damocles' sword of weaponization is permanently hanging above global space development.

IV. Organisational Setup – How?

The midwives of space development believed that the UN "should provide for a focal point of international cooperation", established UNCOPUOS and particularly stressed the role of specialized agencies like the WMO for worldwide meteorology and ITU for universal non-discriminatory access to telecommunications.[79] The placement under UN sponsorship of "creation and use of sounding rocket launching" on the geomagnetic equator was even considered.[80] UN sponsorship was, however, quickly abandoned in favour of further emphasis on national space programs.

With the creation of international satellite organisations, namely INTELSAT in 1971, INTERSPUTNIK in 1972, ARABSAT in 1976, INMARSAT in 1979, EUTELSAT in 1985, EUMETSAT in 1986, States opted for cooperation as enshrined in the 1967 Outer

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[79] *International co-operation in the peaceful uses of outer space*, 20 December 1961, UN GA Res. 1721 B (XVI), *supra* note 48; *International cooperation in the peaceful uses of outer space*, 12 December 1959, GA Res. 1472(XIV), online: UNOOSA <http://www.unoosa.org/oosa/en/SpaceLaw/gares/html/gares_14_1472.html> accessed 29 July 2008; GA Res. 1348 (XIII), *supra* note 2.

[80] *International co-operation in the peaceful uses of outer space*, 14 December 1962, UN GA Res. 1802 (XVII), online: UNOOSA <http://www.unoosa.org/oosa/en/SpaceLaw/gares/html/gares_17_1802.html> accessed 29 July 2008.

Space Treaty and the 1972 Friendly Relations Declaration.[81] In the case of INTELSAT, cooperation rested on the pillars of universal non-discriminatory access to public international telecommunication, provision of service on a commercial basis and based on worldwide uniform charges as well as distribution of investment shares according to utilization. [82] While an international rump organisation called ITSO is to ensure compliance of Intelsat Ltd. with its core principles after privatization in 2001 until at least 2013, [83] Intelsat's commitment to public service obligations has been repeatedly questioned.[84]

In 1992 the UN GA's Benefit Declaration made it clear that "States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis".[85] International cooperation was destined to be negotiated bilaterally and multilaterally on a project-by-project basis. Institutionalized on a global scale is predominantly coordination as in the case of administrating orbital slots and the frequency spectrum through ITU fora. It is therefore not surprising that the Global Exploration Strategy stresses it should not be mistaken for a joint program, but constitutes merely a coordination mechanism.[86] States' reluctance to institutionalize cooperation[87] has to be seen against the background of national security and foreign policy considerations in a competitive geopolitical and

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[81] Preamble, Article I, III, X, XI *Outer Space Treaty, supra* note 1; *Declaration On Principles Of International Law Friendly Relations And Co-Operation Among States In Accordance With The Charter Of The United Nations*, 24 October 1970, UN Doc. A/RES/2625(XXV).

[82] Art. III(a), V(b), V(d) *Agreement relating to the International Telecommunications Satellite Organisation "INTELSAT"*, 20 August 1971, 1220 U.N.T.S. 22, No. 19677 (entered into force on 12 February 1973).

[83] *Agreement relating to the International Telecommunications Satellite Organisation "ITSO",* as amended by Assembly of Parties in 2000, online: ITSO <http://67.228.58.85/dyn4000/itso/tpl1_itso.cfm?location=&id=5&link_src=HPL&lang=English> accessed 29 July 2008, Article III on core principles, Article VII(a) limited duration of ITSO; see also Francis Lyall, *supra* note 44.

[84] Peter B. de Selding, "ITSO Questions Intelsat's Commitment to Public Service" *Space News* (24 April 2006), online: <http://www.space.com/spacenews/archive06/Intelside_042406.html> accessed 29 July 2008.

[85] Principle 2, 3 and 5 of 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*, adopted without vote on 13 December 1996, UN GA Res. A/RES/51/122, online: <http://www.unoosa.org/oosa/en/SpaceLaw/gares/html/gares_51_0122.html> accessed 29 July 2008 [*Space Benefits Declaration*].

[86] GES Framework, *supra* note 4 at 2, "This Framework does not propose a single global programme. Rather, it recommends a voluntary, non-binding forum, the international Coordination Mechanism, through which nations can collaborate to strengthen both individual projects and the collective effort."

[87] Reporting on national programs and international cooperation to the United Nations through UNCOPUOS is still limited, *supra* note 47; and the work within UNCOPUOS is a slow-moving process with a recurrent agenda.

economic environment. So far, the UN Program on Space Applications focuses on education and capacity building and has done so since its creation in 1971.[88] Only the high level of integration in Europe has enabled this region to go forward and create the European Space Agency, which consists of 17 Member States as well as 5 Cooperating States. Proposals to establish a World Space Organization or any other 'international regime' have not come to fruition yet.[89]

Amidst globalisation and ideological dominance of a free market system, even non- and for-profit private collaboration and business relationships are hampered as restrictions on scientific exchange and export controls apply. For instance, exchange of know-how and accident investigation within the Sea Launch consortium, a multinational space launch service provider comprising enterprises from the USA, Norway, Russia and Ukraine, is a regulatory nightmare. Arianespace, a consortium of entities from 10 different European countries, faces fewer hurdles due to its establishment in an integrated region. Interestingly, private entities challenge those regulatory hurdles as soon as they impair their access to markets for their products and services.[90]

Renewed impetus for cooperation at the state-level stems from the insight that sustainable development on Earth and space technologies go hand in hand. The United Nations system and Member States of UNCOPUOS have responded to the specific recommendations of the 2002 World Summit on Sustainable Development.[91]

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[88] UNOOSA, *United Nations Programme on Space Applications*, online: <http://www.unoosa.org/oosa/en/sapidx.html> accessed 29 July 2008.

[89] On proposals by France and Soviet Union/Russian Federation in 1980s, see Report of the Secretary-General, *International Cooperation in Space Activities for Enhancing Security in the Post-Cold War Era* (1999) UNISPACE III, online: <http://www.un.org/events/unispace3/docs/sgrep.htm> accessed 29 July 2008; Article 11(5), 18 *Moon Agreement*, *supra* note 52 .

[90] See OECD, *Space 2030: Tackling Society's Challenges* (Paris: OECD Publications, 2005) at 254 OECD recommendation 5.2., online: <http://213.253.134.43/oecd/pdfs/browseit/0305011E.PDF> accessed 29 July 2008.

[91] UNCOSA, *Space Technology and Sustainable Development:* List of space-related initiatives and programmes carried out by member States of the Committee on the Peaceful Uses of Outer Space and within the United Nations system that respond to specific recommendations contained in the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (WSSD), online: UNCOSA <http://www.uncosa.unvienna.org/uncosa/en/wssd/index.html> accessed 29 July 2008.

V. Geocentric Activities vs. Leaving the Cradle of Mankind – Why?

Of course, one could ask whether mankind should explore and develop the final frontier of outer space. Without going into detail, the presumed answer, however, is "yes". Mankind has been reluctant throughout history to accept "final" barriers and limitations, thriving to challenge truths, doubting and asking fundamental questions. If one looks into the sky and takes a look around oneself, one probably cannot help but come to realize that life is most likely the most exciting thing in the universe. It might at least be worth the journey to find out, and spread the presence of mankind on the way.

Equally true is that space applications already "have the potential to provide significant contributions to society's responses to 21st century challenges, such as environmental monitoring, management of natural resources, security and safety. Key activities in everyday life – weather forecasting, global communications and broadcasting, disaster prevention and relief – depend increasingly on the unobtrusive utilisation of space technologies. Over coming decades, space-related applications, such as distance education, telemedicine, precision farming, land use management, and monitoring of various international treaties, will continue to hold great socio-economic promise."[92] Space exploration may indeed provide mankind with the tools 'to save the Earth' as promised by the X Prize Foundation for Moon 2.0, in contrast to being just an opportunity 'to beat the Russians', as was the case with Moon 1.0.[93]

The emphasis on private involvement in Moon 2.0 is significant. Hence, it is fair to say that business opportunities are a major factor driving exploration and development of the final frontier.[94] Building a space economy around space exploration is viewed as a

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[92] OECD, The Space Economy at a Glance 2007, *supra* note 49 at 13.
[93] See X PRIZE Foundation, GLXP Q&A, *supra* note 13, question no. 6, "What should kids know about the importance of going back to the Moon? Kids in the 1960's could tell you the reason for the Apollo program in four short words: 'to beat the Russians.' Kids of the 21st century should know that the four-word purpose of going to the Moon is 'to save the Earth.'…".
[94] See the detailed account of private sector influence on what is termed "hyper-privatization" of outer space by Edythe Weeks, *The politics of space law in a post cold war era: understanding regime change* (Dissertation at Northern Arizona University: ProQuest Database, 2007) at 136 ff.

"pragmatic" approach in order to sustain the development and to make it a real "journey" instead of only a "race".[95]

The motives with respect to security are three-fold: first, space can be viewed as logical extension of the battleground, and second, with power and influence on the globe increasingly depending on technological leadership and scientific infrastructure, the impetus of space development for innovation, imagination and vitalization of the workforce cannot be overestimated. Third, rallying and unifying the nation behind a fascinating goal and promoting national pride could be perceived as means to counter-balance the centrifugal forces of globalization.

The reasons for undertaking the journey of space exploration are intrinsically connected to the question of whether we go as mankind, as a nation, as an organisation, as a company or as a human being, in a cooperative or competitive manner, whether we think these are exclusive identities and exploration patterns or inclusive phenomena of a multilayered global society. The UN General Assembly spoke its mind in 1958[96] when it recognized the common interest of "mankind" while bearing in mind the concept of "sovereign equality". The GA was also conscious that outer space development has added a new dimension to "man's" existence. Article VI OST later explicitly acknowledged "non-governmental entities" as undertakers of space activities. From the very beginning of the space age, these different levels of identity were therefore not regarded as exclusive at all. The efforts of the UN were guided by the GA's wish to "avoid the extension of present national rivalries into this new field", recognizing "the great importance of international cooperation in the study and utilization of outer space for peaceful purpose". From this, one could derive that the UN did not envision a competitive space environment, but saw the space endeavour as a cooperative effort. Read against the historic background of two recent world wars and heightened tensions during the cold war, it becomes apparent that competition was not to be outlawed in general, but that international cooperation was to be strengthened. Rivalries between nations were to be kept out of

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[95] *Report of the President's Commission on Implementation of United States Space Exploration Policy,* June 2004, at 11 ff., online: <http://govinfo.library.unt.edu/moontomars/docs/M2MReportScreenFinal.pdf> accessed 29 July 2008 [*President's Commission*].

[96] *Question of the Peaceful use of outer space*, GA Res. 1348(XIII), adopted without vote on 13 December 1958, *supra* note 2.

outer space, but an element of competition would remain in the space exploration system. Rather, the UN desired to "promote energetically the fullest exploration and exploitation of outer space for the benefit of mankind" and was conscious that space development opens "new possibilities for the increase of his [man's] knowledge and the improvement of his life". It would be congruent with the spirit of space exploration stemming from the "International Geophysical Year" of 1957 to construct long-term space exploration as an endeavour for the benefit of mankind based on international cooperation and transnational competition, to which end global governance, i.e. the "framework of the United Nations" can make "an important contribution".

Caveat! Wouldn't it be naïve to believe that space exploration puts an end to national rivalries, if those are not solved on Earth? Wouldn't space rather be the logical extension of earthly conflicts? A realist would agree and argue for international cooperation only if it is in the State's self-interest; an idealist would think that the unification of mankind in space and on Earth should be at least what we are aiming for; and the institutionalist would call for a collaboration pattern that facilitates the process and changes people's perceptions. So far, space activities, especially commercial applications, have focused largely on the Earth's orbit, retrieving data about the Earth and providing signals to the Earth. That these mostly robotic geocentric activities follow the same distribution conflicts on Earth seems understandable. The moment where we set out to leave the cradle of mankind and extent the human presence permanently throughout outer space, we are likely to become increasingly aware of this new quality of exploration and our common denominator – the human race. Simultaneously, mankind faces overwhelming global challenges, such as climate change and preservation of biodiversity. Rallying the necessary global support for global measures to tackle global problems seems unlikely if there is no equitable distribution of benefits and opportunities on Earth and in outer space. The "common interest of all mankind" in space exploration and use[97] is inseparably linked with the "common concern of mankind" to sustain life on Earth[98].

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[97] Preamble, Art. I(1) *Outer Space Treaty*, *supra* note 1.

[98] *Protection of global climate for present and future generations of mankind*, 3 December 1988, UN GA Res. 43/53, online: <http://www.un.org/documents/ga/res/43/a43r053.htm> accessed 29 July 2008; *UN Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 320 (entered into force in 1994), online: <http://unfccc.int/resource/docs/convkp/conveng.pdf> accessed 29 July 2008; *Convention on*

VI. Forms, Levels and Timing of Regulation – Freedoms or Limits?

The development of international space law can be divided in three distinct phases: a first hard law phase from 1956 to 1979, a second soft law phase from 1980 to 1992, and a current phase of reinterpretation since 1992.[99]

The first phase gave birth to the Outer Space Treaty in 1967. The treaty is rooted in a declaration unanimously adopted by the UN General Assembly in 1963[100] and was later ratified by 98 State Parties. This universally accepted treaty, which became known as the "Magna Charta" of outer space, laid the basic regulatory tenet for space exploration and use. At the core of the Outer Space Treaty lies the tripartite correlation of the 'province of mankind principle', the 'freedom principle' and the 'non-appropriation principle'.[101] While there is general freedom to explore and use outer space, any national appropriation is prohibited. Currently underlying all space activities is the obligation to carry them out "for the benefit and interest of all countries". These principles are inseparable and need to be balanced.[102] Together with the other components of the treaty, they form the overarching common or "global public interest" in outer space.[103] The Rescue Agreement of 1968, the Liability Convention of 1972 and the Registration convention of 1975, each elaborate further on principles of the Outer Space Treaty. While the former two enjoy roughly the same support as the Outer Space Treaty in terms of number of Parties, the latter gained only 52 Parties.[104] Merely 13 States have become Parties to the Moon Agreement of 1979, which would subject-wise be pertinent to the legal analysis of space

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Biological Diversity, 5 June 1992, 1769 U.N.T.S. 142, online: <http://www.cbd.int/convention/convention.shtml> accessed 29 July 2008.

[99] Stephan Hobe, "International Space Law in its First Half Century" in: Gennady P. Zhukov, ed., *The Contemporary Problems of International Space Law* (People's Friendship University of Russia, Moscow 2008) 131-144.

[100] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, adopted without vote on 13 December 1962, UN GA Res. 1962 (XVIII), online: UNOOSA <http://www.unoosa.org/oosa/SpaceLaw/lpos.html> accessed 29 July 2008.

[101] Article I(1), I(2), II *Outer Space Treaty*, *supra* note 1.

[102] XIN Chongyang & CAO Wenjuan, "对私人与外空不得据为己有原则关系的思考" in *International Forum on Air and Space Law: Papers Collection* (Beijing: China University of Political Science and Law, 2007) 379-389 at 381: "《外空条约》的共同利益原则、外空自由原则与不得据为己有原则缺一不可".

[103] Ram Jakhu, "Legal Issues Relating to the Global Public Interest in Outer Space" (2006) 32 J. Space L. 31-110.

[104] See UNOOSA, *Searchable Online Treaty Status*, online: <http://www.unoosa.org/oosatdb/showTreatySignatures.do> accessed 29 July 2008.

exploration initiatives to the Moon and other celestial bodies. Almost none of the current protagonists in Moon 2.0 are party to the treaty, with the exception of Australia and Belgium (the latter through EU/ESA). Although the Moon Agreement has gathered renewed support from all corners of the Earth in recent times through the ratification by Kazakhstan in 2001, Belgium in 2004, Peru in 2005, and Lebanon in 2006, it marks the endpoint of the hard law phase in international space law.

Subsequently, the common ground was not solid enough to move forward with treaty law. Instead, UN GA resolutions were adopted, sometimes not even unanimously, on specific issues such as direct television broadcasting in 1982, remote sensing of the Earth in 1986, and nuclear power sources in 1992.[105] While international space law has lost some of its innovative energy of *a priori* law-making during the second phase, the focus gradually shifted towards national legislation to deal with specifics as deemed necessary.

This trend continues into the third phase with the UNOOSA database currently containing information on 20 countries with more or less sophisticated national space legislation.[106] Additionally, the third phase is characterized by "a re-definition of major notions of international space law" as exemplified through the Space Benefits Declaration of 1996.[107]

The political will or at least the political consensus within the International Community is decreasing, whereas the intensity of use of outer space is simultaneously increasing. Use of outer space is closing in on the non-appropriation threshold and efforts to create incentives for private ventures in the form of exclusive rights in the outer space have added new urgency to the matter.

It is suggested that binding regulation has two perceived characteristics: it is limiting and enabling. It has limiting effects in the sense that States and potentially other

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[105] *Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting*, 10 December 1982, UN GA Res. 37/92, vote: 107-13-13; *Principles Relating to Remote Sensing of the Earth from Outer Space*, 3 December 1986, GA Res. 41/65; *Principles Relevant to the Use of Nuclear Power Sources in Outer Space,* 14 December 1992, GA Res. 47/68; see online: UNOOSA <http://www.unoosa.org/oosa/SpaceLaw/gares/index.html> accessed 29 July 2008.

[106] UNOOSA, *National Space Law Database*, online: <http://www.unoosa.org/oosaddb/index.html> accessed 7 May 2008.

[107] *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*, adopted without vote on 13 December 1996, GA Res. 51/122, *supra* note 85; Hobe, International Space Law in its First Half Century, *supra* note 99 at 138.

participants in the international system sign away some of their otherwise unrestricted sovereignty and exercisable freedom in absolute terms. It has enabling effects if a regulatory framework is the precondition for activity or the exercise of freedom in the first place. The trend towards technical guidelines as exemplified by the Debris Mitigation Guidelines[108] is arguably an attempt to minimize the limiting effect without compromising the enabling effect by avoiding binding rules and creating rules which are recommended to be implemented nationally in order to preserve space activities in the long-term. The conceptual problem gains even more complexity with respect to property or other exclusive rights as incentives for private actors. The enabling character of legal certainty, especially with regard to the high investment and long planning horizon involved, goes without saying. Yet an actor could be inclined to subscribe to the benefits of a globally coherent and specific space law framework based on binding international law only under the assumption that the actor intends to stay committed to the limitations already put in place, instead of turning back the clock.

[108] IADC, *Space Debris Mitigation Guidelines*, 2007, online: <http://www.iadc-online.org/docs_pub/IADC_Mitigation_Guidelines_Rev1_Sep07.pdf> accessed 29 July 2008; endorsed by *International cooperation in the peaceful uses of outer space*, 22 December 2007, UNGA A/RES/62/217, para. 26., online: <http://www.unoosa.org/pdf/gares/ARES_62_217E.pdf> accessed 29 July 2008.

VII. Interim Conclusion: Continuation of Major Trends and a New Chapter

On the path from Moon 1.0 to Moon 2.0 the following trends related to space activities can be discerned:

(1) *Global world vision* is shifting the focus from bilateral inter-state relations towards rules of the International Community as a whole. The law of international responsibility follows suit. The expanded concept of a Global Community and global governance reflect the growing participation of non-state actors.

(2) The *number and diversity of actors* directly and indirectly involved in space activities is increasing. In particular, the private sector assumes an ever greater role, which is also reflected in the growing *complexity* of the international legal system.

(3) Space activities grow in terms of quantity and quality. This translates into increasing *intensity of use* of outer space.

(4) Organisationally, two concepts surface in public inter-state relations: *coordination and cooperation*. While coordination facilitates the co-existence of separate national programs, cooperation entails a joint program based on equitable and mutually accepted terms. Private entities are interested in transnational competitive markets, if it is to their advantage. Their involvement is partly believed to sustain space development.

(5) It is compatible with the spirit of outer space to adopt a competitive approach for space development. *Common interest and common concern of mankind* are, however, inseparable and indispensable fundamental rules for sustainable earth and space development. Ethically, the extension of permanent human presence into outer space represents a new dimension in comparison with geocentric activities.

(6) The basic but broad tenets of international space law are universally legally binding with respect to state and non-state actors. Formulation of specific rules, if adopted, relies increasingly on instruments of *less binding* character or even *technical arrangements*. Regulation can be perceived as *limiting* and/or *enabling*.

As the world has changed, the context of Moon 2.0 is very distinct from Moon 1.0. There is a need for vision as the Commission on Global Governance concluded in 1995: "The last fifty years have radically and rapidly transformed the world and the agenda of world concern. But this is not the first generation to live on the cusp of a great transformation. The turbulence of the last decade is not unlike those that accompanied the rise of Islam in the century following the death of the Prophet, the European colonization of the Americas after 1492, the onset of the Industrial Revolution in the eighteenth century, and the creation of the contemporary international system in this century. Yet there is a distinction between the contemporary experience of change and that of earlier generations: never before has change come so rapidly – in some ways, all at once – on such a global scale, and with such global visibility. A time of change when future patterns cannot be clearly discerned is inevitably a time of uncertainty. There is need for balance and caution – and also for vision. Our common future will depend on the extent to which people and leaders around the world develop the vision of a better world and the strategies, the institutions, and the will to achieve it."[109]

[109] Commission on Global Governance, *supra* note 38.

C. Public Sector: The Global Exploration Strategy (GES)

On 31 May 2007, fourteen space agencies revealed "The Global Exploration Strategy: The Framework for Coordination" (GES).[110] The strategy was developed at NASA's initiative over several conferences from April 2006 to December 2007 and received input from over 1,000 individuals representing public space agencies, non-governmental organisations and private commercial entities.[111] As GES is arguably the most ambitious attempt to guide space exploration on a global level, it is in conjunction with the national policies pertinent for the analysis in Part C on how the public sector acts in the distinct context of Moon 2.0. An analysis of the international legal framework for space exploration concludes this part.

I. National Space Exploration Initiatives and Policies

1. ASI (Italy) [112]

Italy devotes its resources for civilian uses equally to ESA programmes and national programmes, the latter also including bi- and multilateral collaboration. For instance, Italy participates in ESA missions such as Mars Express (2003), Rosetta (2004), Venus Express (2005). Italy also takes the lead with a 40% investment in ExoMars, the first robotic exploration mission under ESA's Aurora programme. Outside ESA, Italy contributes to several NASA space exploration missions such as Cassini-Huygens (1997), Dawn (2007), Juno (2011), and Mars Reconnaissance Orbiter. Further collaboration with JAXA is envisioned through the use of the VEGA launcher for Hayabusa-2. Italy will also provide payloads for the Russian Phobos Grunt mission.

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[110] GES Framework, *supra* note 4.
[111] NASA, "Global Exploration Strategy Frequently Asked Questions", online: <http://www.nasa.gov/mission_pages/exploration/news/GES_FAQ.html> accessed 29 July 2008.
[112] Sylvie Espinasse, "International Collaboration and Global Space Exploration: an Italian/European view", 27 February 2008, *3rd Space Exploration Conference*, online: <http://www.nasa.gov/pdf/214642main_0830-Espinasse.pdf> accessed 29 July 2008; Loredana Bruca, "Italian Vision for Moon and Mars Exploration", 10-12 October 2006, *IOAG-10 Pasadena*, online: <http://www.ioag.org/IOAG-10/Day%201%20Presentations/ASI%20Organization%20Chart%20(Bruca).pdf> accessed 29 July 2008.

Approved in 2006, a national lunar exploration programme which emphasizes reliance on Italian capabilities as well as its openness for collaboration now forms part of the national space strategy. In the short-term, the focus is set on the study of the Moon and evaluation of its resources as well as on universe and earth observation from the Moon. In the medium term, the Moon is considered for resource exploitation and as a test-bed for Mars, potentially leading to a permanent base in the long term. Meanwhile, an expandable module concept called FLECS is under consideration.[113] By embracing synergies through different types of collaboration supported by an underlying vision, Italy seeks to implement its own national exploration strategy.

2. BNSC (United Kingdom)[114]

The UK is primarily engaged in space and lunar exploration through ESA, devoting 70% of its civil space expenditures to ESA.[115] However, MoonLITE, a small robotic mission to the Moon with a launch target of 2012, is undertaken under UK leadership outside of ESA programs. MoonLITE is also the key area of lunar science and space cooperation with NASA, as identified by the BNSC-NASA Joint Working Group among other fields such as lunar drilling. The MoonLITE mission concept comprises a polar orbiter and multiple instrumented penetrator vehicles, which would emplace a global network of three to four 13-kilogram science stations equipped with seismometers, heat sensors, and spectrometers. Under the bilateral cooperation, it is also envisaged to apply UK's Public-Private-Partnership experience to NASA's commercial development activities.

The UK, in "developing tomorrow's economy", focuses on the "pull-through of innovation from the science base to the stage where the private sector is willing to invest"

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[113] Sandro Mileti et al., "The Flecs expandable module concept for future space missions and an overall description on the material validation" (2006) 59 Acta Astronautica 220-229.

[114] BNSC, *UK Civil Space Strategy: 2008-2012 and beyond*, February 2008, online: BNSC <http://www.bnsc.gov.uk/assets/channels/about/UKCSS0812.pdf> accessed 29 July 2008; *Report of the UK Space Exploration Working Group*, 13 September 2007, online: <http://www.scitech.ac.uk/Resources/PDF/sewgreport.pdf> accessed 29 July 2008; *NASA-BNSC Joint Working Group Report on Lunar Cooperation*, October 2007, online: <http://www.bnsc.gov.uk/assets/channels/resources/publications/pdfs/nasabnscjwg.pdf> accessed 29 July 2008; Ian Crawford, "UK Lunar Exploration Activities", 23 October 2007, *ICEUM9*, online: <http://sci.esa.int/science-e/www/object/doc.cfm?fobjectid=41974> accessed 29 July 2008.

[115] Estimates for 1999 by BMBF, *Deutsches Raumfahrtprogramm*, Mai 2001, at 9, online: DLR <http://www.dlr.de/rd/Portaldata/28/Resources/dokumente/drp.pdf> accessed 29 July 2008.

and sees the role of the government as (1) supporting research and knowledge transfer, to help emerging technologies reach a commercially viable level of market readiness; (2) helping to create a beneficial business environment (i.e. an appropriate regulatory framework), (3) acting as early adopter for potential satellite-based services and applications. The momentum of the new age of space exploration is perceived to be so immense that the long-standing decision of 1986 not to participate in human space missions is under review and likely to be reversed based upon the recommendations of the 2007 UK Space Exploration Working Group. The short-term focus remains on robotic missions. Were the UK to reverse its decision on manned missions, it would engage in preparatory studies for human exploration.

3. CNES (France)[116]

The French position on exploration is being developed with a time horizon of 2020 / 2030. In October 2007, a national workshop was convened to analyse and evaluate several scenarios, including the ISS and human flights to LEO, human missions to Lagrange points, robotic and human missions to the Moon, robotic missions to Mars and small bodies. While the scientific interest in the Moon has been recognized, it is understood to be lesser than the one in Mars. Although the Moon is also identified as a test-bed for human missions to Mars, it is pointed out that a human presence improves science only marginally.

France clearly prefers a coordinated European approach over national initiatives, with France channelling approx. 35% [117] of its civil space resources through ESA. Complementary cooperation is to be discussed with the USA, Russia, Japan, India, China and others. This was underscored by the President's address to ESA and EU, in which he proposed "that we should work together to establish the framework for a dialogue with

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[116] D.J.P. Moura, "French Views on Moon Exploration & Utilisation", 23 October 2007, *ICEUM9*, online: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=40925&fbodylongid=1998> accessed 29 July 2008; *CNES Programme 2007*, at 27, online: <http://www.cnes-multimedia.fr/dossiers/programme2007/media/__Programme2007_livret_programme2007.pdf> accessed 29 July 2008.

[117] Estimates for 1999, see BMBF, *supra* note 115 at 9.

US and other space powers to structure our efforts", while emphasizing the global and international nature of space exploration.[118]

4. CNSA (China)

China traces its efforts in systematic and comprehensive lunar research back to the mid-1960s. After feasibility studies in the 1990s, the lunar space program was made public for the first time in the 2000 White Paper on Chinese Space Activities.[119] The robotic lunar exploration program is structured along three phases: orbiter Chang'e-1 was launched on 24 October 2007, Chang'e-2 will realize a soft landing and rover exploration in 2013, and Chang'e-3, expected for 2017/2020, will return samples from the lunar surface. Although plans for a manned landing by 2020 have been frequently reported, these have so far been denied.[120] Instead, it is emphasized that China "will not embark on any lunar probe competition in any form with any country and will share the results of its moon exploration with the whole world".[121] The assertion that the decision-making process was carried out without any exterior influences and the policy of self-reliance and independent development are major themes, as can be seen from the 2006 White Paper.[122] China encourages a "diverse, multi-channel space funding system, so as to guarantee the sustainable and stable development of the space industry" and would accept private investments.[123]

Regarding itself as a developing country, China welcomes supplementary international cooperation and has signed cooperation agreements on the peaceful use of

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[118] French President Sarkozy, Kourou, 11 February 2008.
[119] "China's Lunar Probe Chief Commander: Scientific Exploration, Not Competition" *Space Daily* (25 October 2007); 《中国的航天》白皮书(2000 年版), online: CNSA <http://www.cnsa.gov.cn/n615708/n620168/n750545/52025.html> accessed 29 July 2008, "发展空间科学，开展深空探测。建立新型的科学探测与技术试验卫星系列，加强空间微重力、空间材料科学、空间生命科学、空间环境和空间天文研究；开展以月球探测为主的深空探测的预先研究".
[120] LIN Shujuan, "China will not rush to get to moon" *China Daily* (19 March 2008); "China Has No Timetable For Manned Moon Landing" *Moon Daily* (27 November 2007).
[121] "China's Lunar Probe Chief Commander: Scientific Exploration, Not Competition" *Space Daily* (25 October 2007).
[122] China's State Council. *China's Space Activities in 2006*, online: Xinhua <http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm> accessed 29 July 2008.
[123] *Ibid.*; "China to accept private funding for lunar missions" *Space Daily* (8 November 2007).

outer space and space project cooperation agreements with Argentina, Brazil, Canada, France, Malaysia, Pakistan, Russia (Yinghuo-1 to Mars in 2009), Ukraine, ESA and the EC (Double Star and Dragon program), and has established space cooperation subcommittee or joint commission mechanisms with Brazil, France, Russia and Ukraine. China further realized commercial projects with Venezuela and Nigeria. After an MoU in 1998, the Asia-pacific Space Cooperation Organisation truly came to fruition with the Beijing Convention of 2005, which strengthened cooperation with Bangladesh, Indonesia, Iran, Mongolia, Pakistan, Peru, Thailand and Turkey (2006). China's wish for closer collaboration with the USA has been met with a "closed door policy" and opposition towards China becoming involved in the ISS. A change in US policy is addressed with "low expectations", but an "optimistic" attitude and "patience". [124]

China became the third nation with independent capabilities for manned spaceflight, as demonstrated on 15 October 2005 by Shenzhou-5. In November 2007, state media allegedly reported that China was to place a space station in Earth orbit by 2020, but that was later denied.[125]

5. CSA (Canada)[126]

Canada has strong expertise in niche areas and intends to leverage the expertise to participate in exploration programs of foreign agencies – NASA and ESA in particular. With the many Moon and Mars missions being planned, Canada sets out to "be ready to seize the opportunities" by contributing to missions and providing critical components to space exploration infrastructure. Communication/navigation, in-situ resource utilization, robotic systems, science instruments and mobility systems have been identified as potential areas of participation. In the long-term Canada intends to participate in human Moon exploration missions as well. Canada is also Partner in the ISS undertaking.

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[124] Ju Jin (Embassy of PRC), "China's Space Industry and International Collaboration", 27 February 2008, *3rd Space Exploration Conference*, online: <http://www.nasa.gov/pdf/214655main_SpeceEx08-Slides_Jin_final.pdf> accessed 29 July 2008.
[125] "China targets space station in 2020: report" *Space Daily* (7 November 2007).
[126] David Kendall (CSA) et al., "CSA Activities and Canadian Plans in Lunar Exploration", 23 October 2007, *ICEUM9*, online: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=40925&fbodylongid=1998> accessed 29 July 2008.

6. *CSIRO (Australia)*[127]

Australia secures access to benefits derived from space-related activities by participating in international cooperative arrangements and by purchasing products and services in the domestic and global market places. While acknowledging the potential for national security, economic and social impact, and encouraging commercially viable and sustainable endeavours in the sector, space is viewed not to be substantially different from any other high-tech sector and not need to be addressed by an innovation program solemnly dedicated to space. The Australian Space Office was discontinued in 1996 and instead, the Australian Government Space Forum now lies at the core of the policy framework for space engagement. Contributions to international cooperative arrangements concentrate mainly on ground segment infrastructure, an area where Australia has a competitive advantage, e.g. the Canberra Deep Space Communication Complex. Significantly, Australia is the only party to the Moon Agreement of 1979 in the group that so far numbers fourteen members.

7. *DLR (Germany)*[128]

Germany is predominantly engaged through ESA, to which it devotes approx. 70% of its civil space program expenditures, including ISS module Columbus, ATV, Rosetta, Mars Express, and Venus Express. Germany committed a 24% investment share to ESA's Horizon 2000 program as well as the follow-up COSMIC VISION 2020 and, since 2005, is an active participant in the Aurora exploration program. Apart from its ESA involvement, Germany collaborates in a range of international contexts, such as NASA's Cassini-Huygens mission, and has put forward a concrete proposal for a national lunar

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[127] *Australian Government Space Engagement: Policy Framework and Overview*, November 2006, online: <http://www.industry.gov.au/Documents/Space_Engagement_Statement_Nov_20062006122110260 6.pdf> accessed 29 July 2008.

[128] ESA share of national civil space expenditures as estimated for 1999, BMBF, *Deutsches Raumfahrtprogramm*, May 2001, *supra* note 115 at 9; DLR, *Fachprogramme Raumfahrt*, 2002/2003, at 44, online: <http://www.dlr.de/rd/Portaldata/28/Resources/dokumente/fachprogramm_2003.pdf> accessed 29 July 2008; "Germany preparing for Moon mission" *Moon Daily* (1 March 2007); Gerhard Hegmann, "Dossier: EADS Astrium übernimmt Führung bei Mondmission" *Financial Times Deutschland* (12 February 2008); "'Leo' fliegt nicht zum Mond: Bundesregierung verzichtet vorerst auf Mondmission" *Tagesschau.de* (12 July 2008); "Deutschland beteiligt sich am ESA-Programm Aurora zur Weltraum-Exploration" *DLR* (12 July 2005); *DLR Institute of Space Systems*, online: <http://www.dlr.de/irs/>.

orbiter called LEO. Yet the necessary funds for the € 350 million mission, that was supposed to be contracted out to EADS Astrium and OHB with a ready to launch date in 2012, have not been allocated in the public budget for the time being. Germany has, however, taken a significant step towards innovative space exploration in the international arena by establishing the DLR Institute of Space Systems in 2007, which is dedicated to the analysis, evaluation and development of concepts for space exploration and space applications.

8. ESA (European Space Agency)

The European space architecture rests mainly on two pillars: the EU/EC and ESA. Both entities have established formal relations through the 2004 framework agreement.[129] After the endorsement by the joint Space Council, the first European Space Policy was adopted in May 2007.[130] Provided the Treaty of Lisbon will enter into force as envisaged on 01 January 2009, the EU will be granted express space-related competencies without limiting the national competencies in this area.[131] "Having regard to the UN Outer Space Treaty framework", and highlighting the strategic value of space assets for the "independence, security and prosperity of Europe" and recognizing the potential contributions from space activities for "growth and employment", the "European knowledge society" and "European cohesion", the policy emphasizes, with respect to exploration, "the importance of a proactive ESA participation in the preparation of future international exploration programmes, with the objective of ensuring a significant targeted and coordinated European role in this endeavour".

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[129] *Framework Agreement between the European Community and the European Space Agency*, full text as attached to the decision of the Council of the EU 12858/03, 2 October 2003, online: European Commission <http://ec.europa.eu/enterprise/space/doc_pdf/agreement_en.pdf> accessed 29 July 2008, Art. 5 on joint initiatives, Art. 8 on space council.

[130] EU Council Resolution 10037/07 on the *European Space Policy*, 22 May 2007, online: <http://register.consilium.europa.eu/pdf/en/07/st10/st10037.en07.pdf> accessed 29 July 2008; *European Space Policy*, 26 April 2007, Communication from the Commission to the Council and the European Parliament, COM(2007) 212 final, online: <http://ec.europa.eu/enterprise/space/doc_pdf/esp_comm7_0212_en.pdf> accessed 24 April 2008.

[131] Art. 4(3), 13, Title XIX Art. 189 of *The Treaty on the Functioning of the European Union* (ECTreaty as amended by the Treaty of Lisbon, not in force yet), consolidated version, online: <http://www.consilium.europa.eu/uedocs/cmsUpload/st06655-re01.en08.pdf> accessed 29 July 2008.

While a comprehensive European Space Program is under development,[132] ESA already took on this challenge in 2001 as part of Europe's strategy for space, and initiated the (optional) Aurora program, a long-term plan for the robotic and human exploration of solar system bodies "to bring about a coherent European framework for exploration and to progressively develop a unified European approach."[133] The 2004 US Vision for Space Exploration was, however, considered to be a "turning point in global space policy", so that the final and revised program was approved by the ESA Council in December 2005. Aurora comprises two main elements: one is the core programme, which is to define architectures and scenarios as well as to prepare for missions and their enabling technologies, with a budget of € 73 million for 2006-2009 (mainly contributed by Belgium and Italy). The second element is the development of actual robotic missions. The first one will be ExoMars, which is slated for 2013. The main contributor of the € 650 million project is Italy. It will encompass a lander and rover, capable of drilling to a depth of 2m.

ESA carefully balances a "degree of independence alongside significant commonality with NASA's and other partners' plans" and maintains that the European contribution is "robust and sustainable, and to the maximum extent possible does not critically depend on a single partner's capabilities. Since Aurora's inception, international cooperation has always been identified as a key enabling element to achieve the long-term goals. Sound, yet flexible, international cooperation is therefore an important element for sustainability and robustness in the worldwide endeavour in which Europe and ESA intend to play a significant role."[134]

The second mission to Mars has meanwhile literally been placed under international auspices. The International Mars Sample Return mission, foreseen for launch around

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[132] See EC staff working document, *European Space Programme – Preliminary elements*, 26 April 2007, SEC(2007) 504, online: <http://ec.europa.eu/enterprise/space/doc_pdf/esp_sec2007_0504_en.pdf> accessed 29 July 2008.

[133] "Aurora's origins" *ESA* (9 January 2006), online: <http://www.esa.int/SPECIALS/Aurora/SEMZOS39ZAD_2.html>; "Green light awaited for Europe's Mars mission" *ESA* (5 March 2008), online: <http://www.esa.int/esaMI/Aurora/SEM0TQMHE8F_0.html>; "The European Space Exploration Programme Aurora" *ESA* (19 December 2007), online: <http://www.esa.int/esaMI/Aurora/ESA9LZPV16D_2.html> all accessed 29 July 2008.

[134] "The Aurora Programme: Europe's Framework for Space Exploration" *Esa bulletin* 126 (May 2006), online: <http://www.esa.int/esapub/bulletin/bulletin126/bul126b_messina.pdf> accessed 29 July 2008.

2020, is currently backed by half a dozen countries and ESA, NASA, CSA and JAXA. All space-faring nations are invited to join in this endeavour coordinated by the International Mars Architecture for Return of Samples (IMARS), a subcommittee of IMEWG.[135]

In addition to Aurora, several missions are under operation or being planned under ESA's scientific programme Cosmic Vision 2025: HST (1990/US), SOHO (1995), Newton (1999/US), Cluster2 (2000), Integral (2002), Mars Express (2003), SMART-1 (2003), Rosetta (2004), Double Star (2003/04/China), Venus Express (2005), AKARI/Astro-F (2006/Japan), Solar B (2006/Japan), Chandrayaan-1 (2007/India), Herschel-Planck (2008), Lisa PF (2009), Lisa, Gaia(2011), Bepi-Colombo (2013), MIRI/ JWST (2013/US), and Solar Orbiter (2015).[136] The two instruments that will fly onboard Chandrayaan-1 are direct "descendents" from the SMART-1 lunar orbiter, and provide a good example of synergy effects that can be achieved through cooperation.[137]

As regards human exploration, ESA is a Partner in the ISS undertaking. Concrete proposals for further engagement in human exploration have been put forward via the ATV Evolution concept, which entails upgrading the ATV with re-entry capability by 2013 and equipping it for manned spaceflight including astronaut safety systems by 2017. As the Space Shuttle fleet is scheduled to retire by 2010, and due to the limited cargo capacity of the Soyuz, demand for servicing the ISS is perceived to exist. The transport capabilities for 2-3 weeks are expected to reach beyond near-Earth orbit.[138] Meanwhile, ESA and Roscosmos are considering joint development of a manned space transportation system.[139] Major decisions on the future of exploration are expected to be taken during the ESA Council meeting at Ministerial level in November 2008, providing new impulse and direction for European programs.

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[135] "International group plans strategy for Mars sample return mission" *ESA* (19 December 2007), online: <http://www.esa.int/esaMI/Aurora/SEM9E92MDAF_0.html> accessed 29 July 2008.
[136] *European Space Programme – Preliminary elements*, *supra* note 132 at paras. 3.4.1 & 3.5.
[137] "Europe's Next Ride To The Moon: Chandrayaan-1" *Moon Daily* (14 January 2008).
[138] "Europäer planen Einstieg in bemannte Raumfahrt" *Spiegel Online* (13 May 2008).
[139] "Russian space agency chief: ESA head to discuss manned space transportation system" *Interfax* (28 May 2008); "Russland und Europäer kooperieren beim Raumschiffbau" *Financial Times Deutschland* (14 May 2008).

9. ISRO (India)[140]

Chandrayaan-1 is India's first scientific mission to the Moon. Originally targeted for launch in 2007, the polar orbiter is now scheduled for launch between October and December 2008. Chandrayaan-2 will land on the Moon and a manned mission is envisaged post-2020.[141] From the inception of ISRO, with the first Indian satellite Aryabhata launched in 1975, international cooperation has been a cornerstone of the Indian space program. So far, India has signed Memoranda of Understanding with Canada, China, ESA, France, Germany, Hungary, Indonesia, Mauritius, Norway, Russia, Sweden, Syria, the Netherlands, Ukraine and the US. In November 2007, India concluded an agreement on joint lunar research and exploration with Russia. While the first stage will be the all-Russian Luna-Glob, India will provide a spacecraft and the launch vehicle in the second stage as of 2011. A geosynchronous satellite launch vehicle with indigenous cryogenic technology is expected to be launched by March 2008. Within the timeframe of the 11th Five Year Plan period from 2007-2012 India intends to triple the number of missions in comparison to the previous period to a total of 70 missions.

10. JAXA (Japan)[142]

Japan formulated a comprehensive vision in 2005 for its aerospace activities over the next 20 years, structured along five major categories: (1) secure and prosperous society through disaster management and global environmental protection systems, (2) expansion of the human frontier, (3) independent space capabilities, i.e. in particular, autonomous

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[140] Jayati Datta & S.C. Chakravarty (ISRO), *Chandrayaan-1: India's first scientific mission to Moon* (Bangalore: ISRO, 2004), online: <http://www.isro.org/chandrayaan/resources/Chandra_book.pdf> accessed 29 July 2008; "India To Launch First Lunar By Year End" *Moon Daily* (28 May 2008); "Russia And India Sign Joint Lunar Research Deal" *Moon Daily* (13 November 2007); Spacesecurity.org, *Space Security Index 2007* (Waterlo, Ontario: Project Ploughshares, 2007) at 48, online: <http://www.spacesecurity.org/SSI2007.pdf> accessed 29 July 2008.

[141] "国际月球探测的发展历程和方向" *Chinese Lunar Exploration Network (CLEP)*, online: <http://210.82.31.82/index.asp?modelname=cegc_cegcgh_nr&titleno=cegczxdt&recno=16> accessed 26 February 2008.

[142] *JAXA Vision 2025*, 31 March 2005, online: <http://www.jaxa.jp/about/2025/pdf/jaxa_vision_e.pdf>; Junichiro Kawaguchi & Fuyuto Terui, "International Collaboration and Global Exploration", 27 February 2008, *AIAA 3rd Space Exploration Conference*, online: <http://www.nasa.gov/pdf/214654main_0830-TeruiDontuseifKawaguchishows.pdf> accessed 29 July 2008; "New law will recast Japan's space policy" *Daily Yomiuri Online* (23 May 2008).

(manned) space transportation and wireless energy transmission, (4) growth of self-sustainable space industry with world-class technological capability, and (5) growth of aviation industry and breakthroughs in future air transportation such as supersonic and hypersonic planes. While accentuating the full-scale development of independent space capabilities, Japan is strongly committed to preparing for an international human lunar base (2025) and envisages the establishment of a "Deep Space Harbour" at a Lagrangian point "as the base for humankind's activities over a broader spatial area reaching further into the solar system".

As regards concrete missions, after HITEN (MUSES-A) in 1990, which was the first dedicated Moon mission in the post-Moon 1.0 era, and the cancellation of Lunar-A in 2007, on 14 September 2007, Japan launched the KAGUYA (Selene) complex consisting of a lunar polar orbiter as well as two small satellites. Selene-2, scheduled for 2010s (2013), will include a rover, and follow-up missions (Selene-X) with continuously more advanced landers will start incorporating human related technology. The Hayabusa series focuses on sample return missions to asteroids. The first Hayabusa spacecraft launched in 2003 is to return in 2010 and will be swiftly followed by Hayabusa-2 with a launch window of 2010-2012. JAXA will cooperate with ESA on the Hayabusa MK-II / Marco Polo mission. NOZOMI and its follow-ups are heading for planetary exploration. They aim to put a Japanese astronaut on the Moon "as early as possible", embedded in the international activity leading towards a permanent outpost. Japan's ISS segment KIBO was docked in 2008.

JAXA established in April 2007 its Space Exploration Center (JSPEC), especially aimed at space exploration activities. In May 2008, Japan adopted a new space law. By means of reinterpretation of the Outer Space Treaty away from the understanding that use of outer space is limited to non-military purposes, the law expands the national scope for utilization of space.

11. KARI (Republic of Korea)[143]

South Korea adopts a two step approach as set out in its Vision 2020. Step one foresees the acquisition of independent aerospace technology by 2010, whereas industrialization of aerospace technology is the main theme of step two, which is envisaged to be taken by 2020. Step one encompasses basic research for space exploration. Step two already calls for active participation "in the moon and planet exploration project by developed countries such as the United States" as well as the creation of a domestic launch service and the launch of a magnetic-powered satellite for moon exploration. "To develop our relatively weak aerospace technology as soon as possible", KARI collaborates internationally with 12 advanced countries so far. On 8 April 2008, Yi So-yeon, onboard a Soyuz-flight to the ISS, became the first Korean in space.

12. NASA (USA)

After the cancellation of the lunar programs (Pioneer, Ranger, Surveyor, Lunar Orbiter, Explorer 35, Apollo) in the 1970s, it was not before the 1990s that exploration of the Moon resumed: a Galileo flyby in 1990, Clementine in 1994, Lunar Prospector (1998-1999), whose common objective was the search for water/ice deposits in the polar regions.

On 14 January 2004, the President set out his vision for U.S. space exploration to "extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations" and to "promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests". This meant initiating a series of robotic missions to the Moon by 2008 and conducting the "first extended human expedition to the lunar surface" between 2015 and 2020.[144]

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[143] KARI, *Vision 2020: Realization of Korea's New Values and our Aspiration towards the Sky and Space*, online: <http://www.kari.re.kr/english/02_cms/cms_view.asp?iMenu_seq=101> accessed 29 July 2008; "International Cooperation" *KARI* online: <http://www.kari.re.kr/english/02_cms/cms_view.asp?iMenu_seq=105> accessed 29 July 2008.

[144] U.S. President George W. Bush, *A renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration*, 14 January 2004, online: <http://www.whitehouse.gov/space/renewed_spirit.pdf> accessed 29 July 2008.

Duly complying, NASA responded in February 2004 with roadmaps for solar system exploration, emphasizing sustainability, affordability and flexibility as guiding principles.[145] NASA began its own organisational transformation and pledged to "rely more heavily on private sector space capabilities to support activities in Earth orbit and future exploration activities".[146] Long-term affordability is to be achieved through budget increases – initially 5 and then 1% – as well as through innovations, focussing on programs in support of the vision, and freeing up funds by the Space Shuttle retirement, in around 2010.[147] Under the heading of national benefits of space exploration, NASA makes an analogy to the Lewis and Clark expedition igniting the settlement of the American West in the 19th century to illustrate that "the very purpose of exploratory voyages and research is to understand the unknown, exact benefits defy calculation". Broad themes of expected benefits and "growth" in particular are nonetheless identified to be technological development, economy and national security, inspiration of the youth, symbolism of American democracy and a free society, international cooperation as well as human creativity and imagination.[148]

In June 2004, the President's Commission that is to provide recommendations on the implementation of the vision, had recourse to the same 'Lewis and Clark expedition' analogy to build their case that private sector participation is of paramount importance for sustainable and affordable space exploration.[149] Accordingly, the Commission believes that "commercialization of space should become a primary focus of the vision, and that the creation of a space-based industry will be one of the principle benefits of this journey".[150] Innovation and creativity, cost-effectiveness and flexibility are attributed to the private sector. The private sector is also identified as a source of significant investment.[151] NASA's organizational structure, business culture, and management processes are, by contrast, "all largely inherited from the Apollo era", but NASA's

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[145] NASA, *The Vision for Space Exploration*, February 2004, at 3 ff., online: <http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf> accessed 29 July 2008.
[146] *Ibid.* at 17.
[147] *Ibid.* at 19.
[148] *Ibid.* at 21.
[149] President's Commission, *supra* note 95 at 13, 45.
[150] *Ibid.* at 19.
[151] *Ibid.* at 15.

leadership "[f]ortunately… has itself looked deeply into the mirror following the tragic loss of the Orbiter Columbia.". [152] Consequently, NASA's necessary transformation process is nothing less than a paradigm shift within its relationship to the private sector: NASA shall allow "private industry to assume the primary role of providing services to NASA", "use its contractual authority to reach broadly into the commercial and nonprofit communities to bring the best ideas, technologies and management tools into the accomplishment of exploration goals", and "develop a plan for transition of appropriate technologies to the private sector", especially with regard to the extraction, storage and production of space resources.[153] The "government's credibility as partner" for the private sector is measured according to its "commitment to reduce market and regulatory risk and implement incentives for private sector investment", seeing the government's proper role as the one of a "tenant, rather than a landlord".[154] These incentives include monetary prizes, tax incentives, regulatory relief, and property rights in space.[155] The Commission recognizes the dual-role of regulation as a prerequisite to space activities – "government regulation of the nascent private sector space industry is ongoing and will be necessary in the future" – and as a potentially limiting force, voicing concern that the industry shall "not become overregulated". Occupational safety and environmental standards as well as the liability regime and a reasonable standard for implied consent are matters of particular concern. Against the background that "the legal status of a hypothetical private company engaged in making products from space resources is uncertain", it is considered to be absolutely crucial to assure "appropriate property rights for those who seek to develop space resources and infrastructure". As private sector activity is key to the vision, "it is imperative that these issues be recognized and addressed at an early stage in the implementation of the vision". [156] In general, space is perceived as a "competitive frontier", and international cooperation should be based on the "value that potential partners bring to the elements of the mission".[157]

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[152] *Ibid.* at 7, 23.
[153] *Ibid.* at 7, 8, 31, 7, 21.
[154] *Ibid.* at 15.
[155] *Ibid.* at 32.
[156] *Ibid.* at 34.
[157] *Ibid.* at 12, 34.

On 16 June 2004, the President saw his vision for sustainable and affordable long-term space exploration supported by the Commission's report.[158] The vision found further legislative support in the NASA Authorization Act of 2005, particularly Title I Section 101(b) and Section 503. In general, the "Administrator shall establish a program to develop a sustained human presence on the Moon, including a robust precursor program, to promote exploration, science, commerce, and United States preeminence in space, and as a stepping-stone to future exploration of Mars and other destinations. The Administrator is further authorized to develop and conduct appropriate international collaborations in pursuit of these goals."

On 31 August 2006, President Bush authorized a new national space policy, which gave further impetus to the exploration program "with the objective of extending human presence across the solar system".[159] While the US, as a matter of principle, "rejects any claims to sovereignty by any nation over outer space or celestial bodies" as well as "any limitation on the fundamental right of the United States to operate in and acquire data from space", the only reference to international law as such is that the US "will oppose the development of new legal regimes or other restriction that seek to prohibit or limit U.S. access to or use of space". Instead, with respect to the orbital debris issue and the challenge to preserve the space environment for future generations, the US "shall take a leadership role in international fora to encourage foreign nations and international organizations to adopt policies and practices". Space exploration is also identified as an area for potential international cooperation. To encourage an entrepreneurial innovative commercial space sector as industrial base, the policy makes express reference to prize competitions and sets guidelines for a supportive public-private relationship. A "timely and responsive regulatory environment for licensing commercial space activities" is to be maintained, while ruling out "the use of direct Federal subsidies". The U.S. space policy is generally supportive to the use of space nuclear power systems, where those "safely enable or significantly enhance space exploration or operational capabilities".

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[158] *President's Statement on the Commission on Implementation of United States Space Exploration Policy*, 16 June 2004, online: <http://www.whitehouse.gov/news/releases/2004/06/20040616-6.html> accessed 29 July 2008.

[159] *U.S. National Space Policy*, 31 August 2006, online: NOAA <http://www.licensing.noaa.gov/USNationalSpacePolicy_083106.pdf> accessed 29 July 2008.

The U.S. House of Representative further elaborated on the exploration program when it passed NASA Authorization Act of 2008 and asked the President to "invite America's friends and allies to participate in a long-term international initiative under the leadership of the United States to expand human and robotic presence into the solar system" (Sec. 401). Adopting a step-by-step approach, the timetable for lunar exploration is no longer fixed but shall be "determined by the availability of funding and agreement on an international cooperative framework for the conduct of the international exploration initiative" (Sec. 402). The US "portion" of the first human-tended lunar outpost shall be named after Neil A. Armstrong. It shall not require permanent occupation to maintain its viability and be capable of remote or autonomous operation. Lunar outpost activities are to be supported via commercial services to the maximum extent practicable (Sec. 403). The strategic focus on commercialization and private sector involvement is further underscored by the statement of sense of Congress in Sec. 901: "While some activities are inherently governmental in nature, there are many other activities, such as routine supply of water, fuel, and other consumables to low Earth orbit or to destinations beyond low Earth orbit, and provision of power or communications services to lunar outposts, that potentially could be carried out effectively and efficiently by the commercial sector at some point in the future." The development of private manned space transportation vehicles is incentivized through a potential "Crew Transfer and Crew Rescue Services Contract" for servicing the ISS until 2016 / 2020 (Sec. 902, 601). More extensive use is to be made of innovation prizes with the maximum amount per challenge increased from $10 m to $50 m (Sec. 1106; Sec. 314 NASAct). Under the heading of "Participatory Exploration" emphasis is placed on "a rich, multi-media experience to the public" (Sec. 407). Congress further recognizes the increasing need for an appropriate framework for space traffic management. To that end, the Administrator shall initiate discussions with "other spacefaring nations" (Sec. 1102).

The US currently undertakes a plethora of missions. The Lunar Reconnaissance Orbiter (LRO) and the Lunar Crater Observation and Sensing Satellite (LCROSS) will be launched together at the end of 2008. The twin spacecrafts of the GRAIL mission are scheduled for 2011 to orbit the Moon in tandem. Mars Odyssey (2001) and Mars Reconnaissance Orbiter (2005), as well as the rovers Spirit and Opportunity (2003), still

actively explore Mars from the orbit and the surface, respectively. Phoenix newly arrived on 25 May 2008 after a complex landing and has made already direct contact with water ice deposits. The Constellation program comprises the Orion crew transport vehicle, Ares launchers, and the Altair lunar lander. Orion is expected to make its maiden voyage to the ISS by 2014 and to the moon by 2020. The lunar outpost follows an open architecture, including pressurized rovers and moveable habitats. As regards bilateral cooperation under the exploration vision, NASA and ESA undertake a comparative architecture assessment to identify potential scenarios for collaboration. Studies of potential lunar cooperation with the UK and Germany are ongoing.[160]

13. NSAU (Ukraine)[161]

The 3rd National Space Program of Ukraine for 2003-2007 already specifically provided for the study of the Moon as one of the top priorities of scientific space research. Due to the growing interest in lunar exploration, Ukrselena has been proposed as a first step of the future Ukrainian lunar program. As polar orbiter, Ukrselena is under consideration to fill principal knowledge gaps on the evolution and geological history of the lunar surface. The Ukraine emphasizes the commercialization of space activities and wishes to attract financing from "non-budget" [i.e. private] sources. Ukraine is engaged in a range of multilateral international cooperation, such as a long-term program with Russia on ISS utilization. The conclusion of a cooperation agreement with ESA in January 2008 can be seen as a significant step in the broader context of European integration. Just recently, on 31 March 2008, a framework agreement on cooperation in the exploration and use of outer space for peaceful purposes with the USA was also reached.

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[160] Geoffrey Yoder, "Lunar Architecture update: Constellation Lunar Study Status, Partnership Flexibility", *3rd Space Exploration Conference*, 28 February 2008, online: <http://www.nasa.gov/pdf/214727main_Cook-Yoder-Coleman-Hensley_lunar-update.pdf> accessed 29 July 2008.

[161] NSAU, *Directions of Ukrainian space activities*, online: <http://www.nkau.gov.ua/nsau/catalognew.nsf/mainE/1CBACD36BC623C40C3256BF80052D398?OpenDocument&Lang=E> accessed 29 July 2008; Yu. G. Shkuratov et al., "A prospective Ukrainian Lunar Orbiter Mission 'Ukrselena'", 23 October 2007, *ICEUM9*, online: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=40925&fbodylongid=1995> accessed 29 July 2008.

14. Roscosmos (Russia)[162]

The USSR abandoned its extensive and successful lunar exploration program (Luna, Zond) after the space race of the mid 70s. Moon 1.0 was over. In response to the renewed global interest in the Moon, Russia has stepped up its lunar exploration program. Luna-Glob has been earmarked for launch in 2009, after being initially targeted for 2012. The mission comprises an orbiter and 12 penetrators to set up a seismic network to study the Moon's origin, as well as a polar station to detect water ice deposits. Luna-Glob also marks the first stage of activities under the agreement on joint lunar research and exploration with the Indian Department of Space, concluded in November 2007. The Second Stage, running as of 2011, will include a Russian Lunokhod unmanned rover, on an Indian provided spacecraft and launch vehicle. The Third and Fourth stages (2012-2015) will focus on mineral resources. Russia teamed up with China in August 2006 through a general agreement for Sino-Russian space cooperation. Based on a follow-up agreement of June 2007, China will provide several critical parts for Phobos-Grunt, a sample return mission to Mars satellite Phobos, set for launch in 2009 and return in 2012. It has been proposed to serve as a data relay station for ESA's ExoMars spacecraft. Venera-D to Venus is targeted for 2016. Russia also extensively cooperates with the USA, Europe and others in fields such as the ISS, and participates for instance in NASA's Mars Odyssey (2001), ESA's Mars Express (2003), ESA's Venus Express (2005), NASA's Lunar Reconnaissance Orbiter (2008) and NASA's Mars Science Laboratory (2009). Russia only plans robotic missions to the Moon until 2015, and might go forward with manned exploration afterwards, which is likely to lead to manned missions after 2025 and a permanent station set up in 2028-2032. A Mars expedition could be launched after 2035.[163] Russia is interested in commercial exploitation of space activities and is so far the only partner to open its ISS segments for space tourism.

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[162] Roscosmos, *Fundamental Space Studies***,** online: <http://www.federalspace.ru/science0615E.asp?Lang =ENG > accessed 29 July 2008; "No Plans to Join NASA Lunar Program says Russian Space Agency" *Moon Daily* (28 May 2007; "Moon race-2008" *RIA Novosti*, 06 December 2007; "Russia, India sign joint lunar research deal" *RIA Novosti* (12 November 2007).

[163] Andrey Kislyakov, "Outside View: China takes space race lead" *Space Daily* (29 October 2007).

II. The Global Exploration Strategy

1. Origins and Background

It is apparent from the diversity and number of space exploration initiatives that the need for international exchange exists. The first workshop on lunar exploration took place in 1994 in Switzerland and lead to the Beatenberg Declaration. The International Lunar Exploration Working Group (ILEWG) was created by the world's agencies as a public forum to support "international cooperation towards a world strategy for the exploration and utilization of the Moon – our natural satellite".[164] The analogous International Mars Exploration Working Group (IMEWG) was conceived at a meeting in Wiesbaden, Germany, in 1993.[165] In January 2008, the International Primitive Body Exploration Group (IPEWG) held its first meeting in Okinawa, Japan.[166] After a series of discussions formally initiated in 2006, the foundation for a comprehensive exploration superstructure was laid on 31 March 2007 by the above mentioned fourteen space agencies' Global Exploration Strategy (GES).[167] This framework document foresees a voluntary, non-binding international coordination mechanism which came into fruition as the International Space Exploration Coordination Group (ISECG) upon its first meeting in Berlin on 6-7 November 2007. ISRO and KARI, originally amongst the fourteen founding agencies of GES, did not participate in the ISECG meeting. The ISECG does not intend to either duplicate or govern the work of the other coordination groups, but rather to "work with" them.[168]

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[164] See ESA, *International Lunar Exploration Working Group*, online: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=34125> accessed 29 July 2008.
[165] IMEWG, *Towards Mars: International Strategy for the Exploration of Mars*, online: University of Washington <http://www.atmos.washington.edu/~mars/IMEWG_strategy.html> accessed 29 July 2008.
[166] "The First Meeting of The International Primitive Body Exploration Working Group (IPEWG)" *JAXA* (30 December 2007), online: JAXA's Space Exploration Center <http://www.jspec.jaxa.jp/okinawa_index.html> accessed 29 July 2008.
[167] GES Framework, *supra* note 4.
[168] ISECG, *Annual Report 2007*, 14 March 2008, at 2, online: <http://www.dlr.de/rd/Portaldata/28/Resources/dokumente/raumstation/ISECG_AnnualReport_2007.pdf> accessed 29 July 2008.

2. The Underlying Vision

From Part C.I. above one can see that national or regional exploration programs take various shapes as they differ in terms of scope, scale and focus and reflect national capabilities and interests. GES is built upon the assumption: that "sustainable space exploration is a challenge that no one nation can do on its own".[169] Being the first single comprehensive strategy for space exploration, the framework is not a single programme, "but recognizes that individual space exploration activities can achieve more through coordination and cooperation. Nations have varying scientific, technological and societal objectives for their space activities, and – inevitably – some can afford to do more than others".[170] Through coordination, the exploration is expected to be more effective, safe, robust and affordable. To these ends, a common vision has been outlined that gives the journey direction and a common exploration philosophy.

a) "Mapping the Space Exploration Journey" – Our Common Route…

Space exploration is seen as a natural evolution in human migration patterns. Modern humans, believed to have emerged from ancient Africa, spread throughout continents, across oceans, and reaching the frozen poles, the deep oceans, the high atmosphere and eventually Earth orbit and the lunar surface. The inexorable human expansion – so it seems – quite naturally aims for a sustained human presence in space.[171] By making "use" of local resources, human presence would be enabled with no or with little support from Earth. Multiple missions coordinated under the GES framework instead of one single space project shall take mankind on a step-by-step "journey" that involves both robotic and human missions.[172] The Moon is targeted as the starting point for human exploration, where necessary technology can be developed and tested. Scientific exploration entails science "of" the Moon (lunar and solar history), "from" the Moon (observation of the universe), and "on" the Moon (how to live and work on other celestial bodies, i.e. the "use" of lunar resources). While endeavours to further destinations are envisaged

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[169] GES Framework, *supra* note 4 at 2.
[170] *Ibid.* at 5.
[171] *Ibid.* at 2, 4.
[172] *Ibid.* at 15 ff.

("beyond"), Mars is the primary destination because of the likelihood that human life could be sustained due to the planet's similarity to Earth, especially with regard to its temperature, day-length, thin atmosphere, water ice or liquid water.[173]

b) "Space Exploration in the Service of Society" – Why We Explore…

The GES framework also addresses the justification for space exploration. It proposes five themes for how space exploration can serve society and "contribute to our common future".

(1) "New Knowledge in Science and Technology"

It is quite right to assert that space exploration can reveal fundamental truths about the history of the solar system and the universe as well as the origin and nature of life. Taking ice core samples on the Moon could provide historical records just like research undertakings at Greenland and the Antarctic.[174] "Despite the spiritual, emotional, and intellectual appeal" of this justification, it may, however, not be sufficient, and the journey should be undertaken for "pragmatic, but no less compelling reasons".[175] As both the public and private sector have come to realize that innovation and technology can set them apart from their competitors and are key to national and corporate well-being, strategic investment into areas of national priority are to increase global competitiveness.[176] The challenge of space exploration is expected to drive not only scientific, but also technological, progress and innovation. The deflection of an Earth-crossing asteroid is given as an example for technology that could ensure a common future.[177]

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[173] *Ibid.* at 20 ff.
[174] *Ibid.* at 8 ff.
[175] President's Commission, *supra* note 95 at 12.
[176] See e.g. CSIRO, *Strategic Plan for 2007–2011: Executive Summary*, at 7, online: <http://csiro.au/files/files/pfeu.pdf> accessed 29 July 2008.
[177] GES Framework, *supra* note 4 at 9.

(2) "A Sustained Presence – Extending Human Frontiers"

Human space exploration is a step in the evolution of human civilization that will redefine mankind's relationship with Earth. Although criticism has been voiced that humans are of little more value than robotic capabilities, GES assumes that humans have unique decision-making capabilities that are vital for complex operations. A sustained and self-sufficient presence in space is to enable the maintenance of off-world repositories of knowledge and history.[178]

(3) "Economic Expansion"

Probably the most "pragmatic" way to sustain space exploration is bringing space exploration into the economic sphere, just as Earth-orbit space activities such as satellite communication, remote sensing, and satellite navigation. According to GES, "far-sighted entrepreneurs" are already thinking about further commercial expansion into space. In particular, provision of crew and cargo transportation services, telecommunications and navigation systems, space-based resource extraction and processing capabilities (esp. oxygen, helium-3, titanium), as well as real and virtual commercial space tourism are identified as potential opportunities for companies. Innovation and investment capabilities are attributed to the private sector as "much of the technology for space exploration will be created by business, and business will find unexpected ways of exploiting this know-how in the wider economy". The Public sector is to nurture commercial space development, while future "large tax returns to national treasuries" are promised in return. Prize funds are pointed out as an example of an innovative way to stimulate links between the public and the private sector.[179] The suitable business investment environment requires "certainty of a long-term commitment to space exploration, the opportunity to introduce its ideas into government thinking, and the rule of law". The latter is understood as the necessity to solve "difficult issues as property rights and technology transfer", to which end the ISECG will "provide a forum to discuss these important issues". The technological development, further enhanced by private involvement, which however

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[178] *Ibid.* at 10.
[179] *Ibid.* at 10 ff.

requires a suitable investment environment that must arguably include incentives such as property rights, would then foster "spin-off opportunities in fields such as medicine, agriculture and environmental management, and help achieve sustainable development on Earth".[180]

(4) "A Global Partnership"

In short, space exploration is also about "providing a challenging, shared, and peaceful activity that unites nations in pursuit of common objectives" and indirectly enhances global security.[181] Under a global strategy, it is possible to develop a common understanding of nations' respective interests and a common language for space exploration. The GES framework emphasizes that "it is inclusive; the goal is to expand the opportunity for participation in space exploration to all nations and their citizens". Global coordination and bilateral or multilateral cooperation on specific missions does not, however, preclude national interests, and can in fact advance them. Be it for prestige and leadership, national cohesion and identity, or global competitiveness and security – global partnership is a means to an end. While participants are eager to share costs and to avoid duplication in building an overall robust space development infrastructure, they are equally interested in maintaining or achieving independent capabilities and maximising their benefits from space exploration and exploitation by making visible national contributions and maintaining visible national programs.[182]

(5) "Inspiration and Education"

New virtual reality technologies and innovative media are expected to allow for profound participation by the general public in the space exploration endeavour. The idea is to help the public take ownership of the programme, instilling a sense of (national) pride, and ultimately leading to public acceptance at the domestic and global levels.

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[180] *Ibid.* at 12.
[181] *Ibid.* at 25, 13.
[182] As regards the trend towards co-existence of cooperation and individual programs, see "合作与单干并存——国际探月新动向" *Chinese Lunar Exploration Network (CLEP)* (17 May 2007), online: <http://210.82.31.82/index.asp?modelname=cegc%5Ftygc%5Fnr&FractionNo=&titleno=cegctygc&recno=27> accessed 29 July 2008.

Another element is the hope to inspire young people to pursue careers in science and technology. Space exploration as a theme for educators and as source of new jobs with "limitless possibilities for creativity, challenge and motivation", sets out to constantly attract new generations of scientists and engineers.[183]

3. The International Coordination Mechanism: ISECG

Due to the "success of preliminary discussions" amongst the fourteen space agencies, the GES framework recommends the establishment of an international coordination mechanism to assist the implementation of the Global Exploration Strategy.[184] The mechanism is supposed to be guided by four principles: it shall be open and inclusive, flexible and evolutionary, effective, and serve mutual interests. This mechanism came into being as ISECG; its terms of reference have been developed and agreed upon by the beginning of ISECG's first meeting in November 2007, but have not so far been made publicly available.[185]

a) Purpose and Scope

ISECG's stated purpose is to serve as a forum for discussions and to promote space exploration throughout society in order to make use of all available resources, knowledge and technological capabilities; leverage each agency's individual investments; identify gaps in national programs and overlaps between them; share 'lessons learnt' from national and international missions; improve the safety of humans in space – for example, through interoperability of life support systems; and to enhance the overall robustness of global space exploration.[186] ISECG is concerned with 'coordination', although the forum might serve as a starting point for 'cooperation' on specific missions and may facilitate international cooperation beyond the traditional partners as well. Particular emphasis is put on the technical and scientific aspects of the coordination effort, which is to facilitate agreement amongst "planners and engineers" on "practical features".[187] The ISECG

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[183] GES Framework, *supra* note 4 at 13 ff.
[184] *Ibid.* at 2, 5, 22.
[185] ISECG Annual Report 2007, *supra* note 168 at 2.
[186] GES Framework, *supra* note 4 at 22.
[187] GES Framework, *supra* note 4 at 6.

workplan for 2008 accordingly sets the following initial agenda: identification of standards to promote interoperability; methods of sharing scientific data and related analysis; identification of common services, allowing for the development of shared infrastructures; mechanism(s) to allow for the provision of payload opportunities; ways and means to include broader future participation in the planning and coordination process; and development of a common international exploration coordination tool to enhance the implementation of the coordination process (INTERSECT). A very broadly framed agenda item that reads "assessment of the requirements for any relevant international legal agreements" is definitely not of a technical nature.[188] The dual nature of "standards" with technical practical and also legal repercussions is highlighted in the GES framework itself, which says that "internationally-agreed standards" allow goods to meet national "safety laws".[189] The assertion that the lunar and Martian environment are "both fragile and special; we must protect and preserve [them] even as we explore [them]", raises questions that are not merely technical. ISECG is aware that "complex issues such as protection of areas of scientific importance may arise and be discussed before they block progress".[190] Considering the envisaged types of "uses", including the construction of a lunar-based low-frequency radio telescope, as well as space-based resource extraction and processing, in addition to the declared aim of achieving sustainable space development by bringing exploration into the economic and commercial sphere, which in turn depends upon the "rule of law", ISECG has been identified by the participants as the forum to foster a "common understanding on such difficult issues as property rights and technology transfer".[191] The intent and potential of the mechanism to eventually enable resource utilization rights is further underscored by the official U.S. policy on private involvement and incentives deemed necessary to that end[192] as well as by the (unofficial) U.S. policy concerning the design of the coordination mechanism.[193]

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[188] GES Framework, *supra* note 4 at 23; ISECG Annual Report 2007, supra note 168 at 3.
[189] GES Framework, *supra* note 4 at 13.
[190] *Ibid.* at 13, 19, 21.
[191] *Ibid.* at 11, 18, 19.
[192] See *supra* C.I.12.
[193] See Audrey M. Schaffer (Space Policy Institute, Washington), "Design of a Mechanism to Organize International Collaboration on Space Exploration" (31 March 2007) at 4, "The mechanism must actively enable the United States to achieve its national objectives. Enablers could be … legal mechanisms that

b) Membership

Membership is formally limited to 'space agencies', referring to government representatives that include space agencies, science organizations and groups of space agencies that have been designated to represent their governments.[194] One of the guiding principles for ISECG, as established by the GES framework, is being "open and inclusive". Nonetheless, entry requirements and a two-tier system are established under this heading. The coordination mechanism receives "inputs" from all interested agency participants that "invest in and perform" activities related to space exploration (first tier participants), and "provides for consultations" among all interested agencies with a "vested interest" in space exploration and space agencies or national government agencies "without specific related capabilities" (second tier).[195] Membership admissibility is objectively assessed based on budgetary allocations to space exploration and a certain level of technological capabilities.[196] This somewhat resembles the threshold for appointing a representative with voting power to the Consultative Meetings under the Antarctic Treaty System, where Contracting Parties must demonstrate their interest in Antarctica by "conducting substantial scientific research activities, such as the establishment of a scientific station or the despatch of a scientific expedition".[197]

The divide amongst the founding agencies of GES between those favouring an open door policy or "everybody is welcome" principle, and those, in particular the USA, wishing to maintain control over membership application by the existing participants, has apparently been resolved in the adopted terms of reference.[198] Concerns with respect to foreign policy alignment seem to have been addressed by expressly subscribing to 'peaceful purposes'. As ISECG formulated it in its annual report 2007, it is "open to space agencies which have or are developing space exploration capabilities for peaceful purposes, and which have a vested interest to participate in the strategic coordination process for space exploration" and comes to the conclusion that "in sum it is not an

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ensure resource utilization rights…", online: Arizona State University <http://www.cspo.org/igscdocs/Audrey%20Schaffer.pdf> accessed 29 July 2008.

[194] GES Framework, *supra* note 4 at 5 fn. 3.

[195] GES Framework, *supra* note 4 at 22 – 23.

[196] See Schaffer, *supra* note 193 at 6, 17.

[197] Art. IX(2) *Antarctic Treaty* of 1959, *supra* note 12.

[198] See Schaffer, *supra* note 193 at 6, 17, 21.

exclusive club of the fourteen agencies that developed the Framework Document".[199] While openness beyond the founding members could be affirmed 'in sum', ISECG remains a forum for actual participants in space exploration, to their mutual interest and benefit (Principle 4) and the technological threshold of high-technology space activities is rather high. Though potentially unrelated to the controversial question of membership control and purpose of ISECG, one has to note, that ISRO (India) and KARI (South Korea) did not participate in the ISECG meeting of 2007.

Nigeria has already voiced concern over whether GES truly expands the opportunity for participation to all nations. To that end, "the rules of engagement would … have to drastically change to allow for genuine collaborative development and knowledge sharing".[200] Since there will be only mere coordination at the ISECG level, neither exchange of funds nor exchange of detailed technical information is likely to occur.[201]

Although other existing coordination and working groups will not necessarily receive membership, ISECG will establish appropriate relations to take advantage of information, expertise and enhanced credibility. The private sector is most likely included under the agenda item under which ISECG looks for "ways and means to include broad future participation".[202]

c) Nature / Status

It is repeatedly stated that the international coordination mechanism/ISECG is formal, but non-binding and voluntary. Accordingly, ISECG "will focus on developing non-binding findings, recommendations and other outputs as necessary for use by Participating Agencies".[203] The fourth guiding principle of 'mutual interest' makes it explicitly clear that ISECG "respects the national prerogatives of participating agencies" and "allows for optional participation based on the level of each agency's interest". The

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[199] ISECG Annual Report 2007, *supra* note 168 at 2.
[200] Adigun Ade Abiodun, "Global Exploration Strategy – The Framework for Coordination", 6 June 2007, *50th Session of COPUOS*, at 4, online: UNOOSA <http://www.unoosa.org/docs/pres/copuos2007/hi-02.doc> accessed 29 July 2008.
[201] Schaffer, *supra* note 193 at 7.
[202] GES Framework, *supra* note 4 at 23; ISECG Annual Report 2007, *supra* note 168 at 3; Schaffer, *supra* note 193 at 8.
[203] ISECG Annual Report 2007, *supra* note 168 at 3; GES Framework, *supra* note 4 at 2, 5, 22.

coordination mechanism does not, therefore, in any way diminish each agency's right of autonomous decision-making. The participating agencies are, however, "encouraged" to "accept" the role of the coordination process and "act" upon the anticipated results of the coordination mechanism pursuant to the guiding principle of 'effectiveness'.[204]

A similar and rather effective approach in terms of compliance was taken to address the space debris issue. Ten out of the fourteen GES space agencies also form the Inter-Agency Space Debris Coordination Committee, which recommended its Space Debris Mitigation Guidelines for national implementation and use.[205] The trend towards use of international coordination committees outside of UNCOPUOS with limited membership and a predominantly scientific and technical agenda that work under the catchword of 'interoperability' is further demonstrated by the Committee on Earth Observation Satellites (CEOS)[206] and the providers forum within the International Committee on GNSS (ICG).[207] The discussion of space-related key issues increasingly bypasses UNCOPUOS, hence its universal representation and consensus approach.[208]

As in the case of ISECG, the line between scientific-technical matters and legal matters is blurred at best when it comes to issues of site and environmental protection or space-resource extraction and procession as a form of utilization. Rules of the road and technical standards set by the qualified minority to undertake these activities might very well lead to a uniform practice of space-faring nations based on a common understanding and secured through bilateral or multilateral treaties.[209]

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[204] GES Framework, *supra* note 4 at 23.
[205] IADC Space Debris Mitigation Guidelines, *supra* note 108.
[206] CEOS, *Committee on Earth Observation: Terms of Reference*, online: <http://www.ceos.org/pages/ceos_terms.html> accessed 29 July 2008.
[207] UNOOSA, *ICG Provider Forum*, online: <http://www.unoosa.org/oosa/en/SAP/gnss/icg/providersforum.html> accessed 29 July 2008.
[208] See Ram Jakhu, "The Effect of Globalisation on Space Law", Notes for a brief presentation made at the *Colloquium on The Effect of Globalisation on Various Fields of International Law* held on 28 March 2008 at the University of Cologne, Germany.
[209] Larry F. Martinez, "Science in Service of Power: Space Exploration Initiatives as Catalysts for Regime Evolution" (2007) 32:6 Air & Space L. 431-456 at 451; Ulrike M. Bohlmann & Larry F. Martinez, "Fly me to the Moon: Legal and political considerations of space exploration initiatives" in *Proceedings of the 49th Colloquium on the Law of Outer Space, Valencia, 2006* (Reston, VA: AIAA, 2007) 117.

III. Core International Legal Framework for Space Exploration

1. Freedom of Exploration and Use

So far only 12 human beings have ventured further than Earth orbit – temporarily, on a round-trip ticket. The new era of space exploration envisages robotic and human missions beyond Earth orbit with the ultimate aim to permanently extend and spread the human presence into outer space. Due to the fundamental significance of this potential step one may wonder whether global agreement is necessary. From a legal perspective, Article I(2) OST stipulates that "[o]uter space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies." Whether or not to bring life as we know it to outer space might be a question that is beyond the scope of freedom granted to individual States as it concerns mankind as a whole.

The wording of Article I(2) OST – 'exploration and use' – is broad, and its ordinary meaning does not convey a limitation to temporary expeditions.[210] Read in context with Article XII OST, which sets out principles for "stations, installations, equipment and space vehicles on the Moon and other celestial bodies", long-duration if not permanent undertakings seem to have been understood. The overall objective and purpose of the OST supports the development of the final space frontier, since the beginning of the preamble prominently states that the States Parties to this Treaty are "inspired by the great prospects opening up before mankind as a result of man's entry into outer space".

However, through international, Article I(2) OST, limits the freedom that individual States enjoy. Primarily based upon the *Lotus* decision rendered by the Permanent Court of International Justice in 1927,[211] some advance the view that under international law States may do whatever is not expressly forbidden.[212] The narrow majority decision by the

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[210] See Article 31, 32 *VCLT, supra* note 31.
[211] *The Case of the S.S. "Lotus"* (France v. Turkey), Judgment No. 9, 7 September 1927, P.C.I.J. Series A, No. 10, 1927.
[212] See e.g. Alan Wasser & Douglas Jobes, "Space Settlements, Property Rights, and International Law: Could a Lunar Settlement claim the Lunar Real Estate it needs to survive?" (2008) 73 J. Air Law & Com. 37 – 78 at 47, 50.

President's vote favouring State discretion has been subject to extensive criticism in later years. While it has been contradicted by subsequent international conventions and judgments in general, its applicability, particularly with respect to outer space, has been widely negated.[213] As can be seen from the contextual analysis of Moon 1.0 and Moon 2.0 in Part B, the international legal system evolves continuously. As the International Community is taking shape, it is conceivable that the individual freedom of States is being limited by *erga omnes* obligations to the Community as a whole and that certain rights could only be exercised by the Community as a whole. Besides the connection of the freedom principle with international law (also Article III OST), the freedom to explore and use is further tied to the obligation that it shall be carried out "for the benefit and in the interest of all countries" (Article I(1) OST). General restrictions apply further where the individual freedom granted to one State overlaps with the freedom granted to another. As freedom is enjoyed by States "on the basis of equality" (Article I(2) OST) they owe "due regard to the corresponding interest of all other States Parties to the Treaty" (Article IX OST). Another threshold not to be breached is the prohibition of national appropriation of outer space (Article II OST). Article I(2) OST does not distinguish between different types of uses or purposes such as military, civil, scientific or commercial *per se*, but the freedom principle overlaps with other principles and provisions that either privilege or restrict certain purposes or types of uses.

Although one has to acknowledge the historic evolution of mankind exploring and spreading its presence on Earth as outlined in the GES framework document, one also has to be clear about the fundamental difference between exploring Earth territory and exploring outer space as the "province of mankind". While the former may be undertaken under a national identity and may lead to national territorial expansion, the latter – consciously or not – is undertaken under an at least additional mankind identity and it cannot lead to national territorial expansion. Alluding to the Lewis and Clark Expedition of the American West in the 19th century in the context of space exploration (C.I.12) might serve to explain the often unforeseeable benefits of risky undertakings, but one cannot equate space exploration to an era of national expansion.

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[213] See Jakhu, Legal Issues Relating to the Global Public Interest in Outer Space, *supra* note 103 at 39.

2. Non-appropriation

While Article I(2) OST formulates the freedom of exploration and use, Article II OST stipulates 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."

a) Scope

First, the scope of application needs to be circumscribed. Although outer space is not defined in the space treaties and, taking into consideration that so far no clear delimitation of air space and outer space has emerged, outer space includes the Moon and other celestial bodies as well as the outer void space. As regards appropriation, the only exclusion needs to be made with respect to extraterrestrial materials which reach the surface of the Earth by natural means, i.e. without any intervention (see Article 1 MA).

b) Exploration and Use v. Appropriation

Second, one has to ask whether the *prima facie* allowed activity of 'exploration and use' is substantially distinct from the prohibited activity of 'appropriation', i.e. whether these terms are mutually exclusive with respect to a certain type of activity. As Article II OST prohibits 'appropriation' by means of 'use', it is preferable to assume that they are not mutually exclusive and that identical types of 'uses' can either amount to 'appropriation' or not, depending on additional criteria.

c) Drawing the Line between Appropriation and Use

Third, one has to determine what 'use' amounts to 'appropriation' and identify the criteria on which this delineation depends. The wording, context, and purpose of Article II OST seem primarily to be concerned with *exclusivity*. Exclusivity could result from a "claim of sovereignty", i.e. the assertion to enjoy unrestricted and exclusive freedom and complete control over a certain area. However, all States enjoy freedom of exploration and use equally. Any particular separation of parts of the province of all mankind would violate the freedom of others and would undermine the obligation to undertake activities for the benefit and the interest of all countries, irrespective of their degree of economic or

scientific development (Article I(1) OST). Exclusivity could also stem from the "use" of outer space. Placing a space object in orbit or placing a station on the surface of a celestial body "occupies" an orbital slot and a surface area respectively and excludes others from this specific use. As Articles I(2), XII OST and 9(2) MA demand free access to all areas and reciprocal open access to stations, these uses do not necessarily reach a degree of exclusivity that would amount to appropriation. Using or occupying outer space in a fashion or type that is limited, such as the GEO, raises more concern of exclusivity than the use of a space resource that is readily available, abundant and infinite.

The *intensity* of use depends on the nature of changes made to outer space, whether they are reversible or not, the repeatability of the use (notion to protect late-comers, Article I(1) OST), its likelihood to cause harmful interference and contamination (Article IX OST), the duration (Article 5(1) MA) and quantity of use (Article 5(2) MA). A higher intensity, e.g. the extraction of minerals from a celestial body, raises more concern of exclusivity than a lower intensity, e.g. solar power generation.

Another factor that influences the level of exclusivity is the *scope of beneficiaries*. Any exploration and use of outer space "shall be carried out for the benefit and interest of all countries" (Article I(1) OST) and "in the interest of maintaining international peace and security" (Article III OST). International cooperation is promoted throughout the treaty (Article I(3), III, IX, X, XI OST; Article 4(2) MA "international cooperation … should be as wide as possible") as such cooperation is believed to "contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples" (Preamble). Transparency (Article IX-XI OST; 5 MA), sharing, and contributing to a broad base of beneficiaries consequently decrease the concern of exclusivity. In this context, one has to keep in mind that Article II OST only prohibits "national" appropriation.

The *purpose* of exploration and use also has a significant impact in this regard. Everything that serves the common interest is privileged over everything that advances exclusive interests. By doing so, space activities are geared towards the overarching theme of pursuing peaceful purposes (Preamble, Article IV(2) OST). Scientific investigation is assumed to be in the common interest per se and therefore ranks on the privileged side of the scale (Article I(3) OST). For instance, Article 6(2) MA elaborates

that a relatively intense type of use – the collection and removal of substances of a celestial body or its use for mission support – is allowed for scientific purposes. The overall intensity must be kept low by taking only small "appropriate" quantities or "samples". The samples, even then, merely remain at the "disposal" of the collector who has to consider making "portions of it available" to other parties. A similar concept of *proportionality* of use and intensity is introduced by Article 9(1) MA, which contains the obligation only to use the area which is required for the needs of the station. As equally privileged as scientific investigation is activity that addresses life threatening situations of distress (Article V OST, 10 MA). Military objectives, by contrast, are restricted and discouraged (Preamble, Article III, IV OST; Article 3 MA including the prohibition of "use of force"). Civil objectives accordingly range somewhere in between, while commercial activities bear the predisposition that financial profits are steered towards a limited group of beneficiaries.

For the purpose of a legal analysis, one can assume that any 'use' has an element of exclusivity to it as it takes place at a specific location at a certain time. High intensity 'use', exclusive interests, and a narrow scope of beneficiaries heighten the *level of exclusivity*, whereas lower intensity, pursuing common or *global public interests*, and a broad scope of beneficiaries lowers the level of exclusivity.[214] These factors determine whether a certain 'use' breaches the threshold of exclusivity that is required to amount to 'appropriation'. The inclusion in Article II OST of the broad prohibition of national appropriation "by any other means" suggests an emphasis on the absolute abstract level of exclusivity as to how this level is achieved by concrete means.

As the legal effect of the Moon Agreement is controversial,[215] it must be emphasized that these principles are already anchored in the Outer Space Treaty and are only further

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[214] For an exhaustive study of the elements that make up the 'Global Public Interest' in outer space see Jakhu, Legal Issues Relating to the Global Public Interest in Outer Space, *supra* note 103 at 38 ff; as regards the legal necessity to spread ownership widely in order to create broad stakeholder participation in outer space solar power systems, see Paul B. Larsen, "Current Legal Issues Pertaining to Space Solar Power Systems" (2000) 16 Space Policy 139-144.

[215] The limited number of ratifications is sometimes advanced to point out the insignificance of the Moon Agreement for international space law (see e.g. Wasser & Jobes, *supra* note 212 at 42 ff.), but recently ratifications have picked up (*supra* B.VI.) and even non-Parties suggest legal effects due to the lack of objections; see President's Commission, *supra* note 95 at 33, "Property Rights in Space. The United States is signatory to many international treaties, some of which address aspects of property ownership in space.

elaborated and affirmed in the Moon Agreement,[216] whose scope of application includes all other celestial bodies within the solar system (Article 1(1) MA).

The new era of space exploration will increasingly involve crew and cargo transportation to and beyond Earth orbit as well as on the surface of celestial bodies, telecommunications and navigation satellites services, habitats in orbit and on the surface of celestial bodies, and other construction such as telescopes, the placing of space objects at Lagrangian points, as well as mining, space-based resource extraction and utilisation. A whole infrastructure needs to be put in place in order to sustain increasingly autonomous human settlements in outer space. As space exploration intends to live increasingly "off the land", the intensity of use of outer space will increase dramatically.[217] Commercialization and private involvement is a key factor in exploration strategies, to which end property or utilization rights are of crucial necessity. 'Rules of the road', technical arrangements and common understandings might effectuate equivalents to these rights. Additional concern with respect to Article II OST is provoked by the limited membership of the ISECG or other fora where these arrangements are facilitated or brokered. In the sense of Article II OST, ISECG is exclusive as it does not represent the common interest of all countries and of all mankind.

d) "National" Appropriation

The fourth step of the analysis therefore focuses on the question of how to distinguish or define a "national" appropriation. Special emphasis is attributed to 'national' where the 'use' reaches levels of exclusivity that arguably amount to appropriation. One could take the view that 'national' is to be understood as relating only to the public sphere.[218] Article II OST makes no express reference to the private sphere as Article VI OST or Article 11(3) MA do. On the other hand, the formulation in Article VI OST is seen to define

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The most relevant treaty is the 1967 UN Treaty on the Peaceful Uses of Outer Space (the "Space Treaty"), which prohibits claims of national sovereignty on any extraterrestrial body. Additionally, the so-called "Moon Treaty" of 1979 prohibits any private ownership of the Moon or any parts of it. The United States is a signatory to the 1967 Space Treaty; it has not ratified the 1979 Moon Treaty, but at the same time, has not challenged its basic premises or assumptions."

[216] See Frans G. von der Dunk, "The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources" (2007) XXXII Annals of Air & Space L. 91 at 100; Xin & Cao, *supra* note 102 at 389.

[217] See *supra* B.III.

[218] See e.g. recently Wasser & Jobes, *supra* note 212 at 43 ff. with additional references.

'national' to include the private sphere as well,[219] and Article 11(3) MA is interpreted as not changing or adding to Article II OST but only clarifying this point. In any case, it is hard to imagine a legal construction that sustains private rights in a legal environment that lacks public authority to grant them.[220]

The term could rather distinguish between 'national' and 'international'. However, Article XIII(1) OST extends the scope of application to joint activities of States Parties and international intergovernmental organizations. The provision focuses on the (national) activities of States Parties though, and intends to foreclose any circumvention of obligations through the pooling of activities. Genuinely international-global appropriation is not prohibited by Article II OST.

As noted above, Article II OST prohibits unacceptable levels of exclusivity that contradict its status as global commons. A single nation, a single company or a single person could arguably stake a claim and mine half the Moon, if that solved all of mankind's energy problems, making us live in peace and harmony, raise the standards of living in every corner of the Earth and simultaneously deflected a NEO that would have otherwise wiped out our very existence. 'National' does not refer to a specific entity, but to exclusive interests and beneficiaries. At the time of the drafting and today still, the national identity and the State as actor were and are the main vehicle to define an interest as opposed to the common or global public interest. 'National' could be read as "not enough in the common interest of all mankind".

e) Property Rights: Possible, Desirable, and Obtainable?

Fifth, one has to answer the question whether some sorts of property rights in and of outer space are possible, desirable and if so how those could be obtained. Article II OST

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[219] IISL, "Statement by the Board of Directors Of the International Institute of Space Law (IISL) On Claims to Property Rights Regarding The Moon and Other Celestial Bodies", online: IISL <http://www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf> accessed 29 July 2008; see also Ulrike M. Bohlmann, "Legal Aspects of the 'Space Exploration Initiatives'" in M. Benkö & K.-U. Schrogl, eds., *Space Law: Current Problems and Perspective for Future Regulation* (Utrecht: Eleven International Publishing, 2005) 215 at 222, with additional references.

[220] See Virgiliu Pop, Appropriation in outer space: the relationship between land ownership and sovereignty on the celestial bodies, (2000) 16 Space Policy 275 – 282; however, Wasser & Jobes, *supra* note 212 at 47, 54, 62, distinguish between an illegal *de jure* sovereign who grants or *confers* property rights and a *de facto* sovereign who "legally" *recognizes* private property of space settlers, see *infra* D.II.2.

(no "appropriation") and Article 11(3) MA (no "property") seem to give a straight forward answer. Article 11(5) of the MA itself, however, calls for the establishment of an "international regime" that shall include "appropriate procedures, to govern the exploitation of the natural resources of the Moon". Traditional concepts, whether on grounds of natural or positive law, construct property rights as a comprehensive bundle of rights comprising the rights to control and use, to benefit, to transfer and to exclude others. In any case, property *potentially* puts the owner in a legal position of exclusive use to advance exclusive interests, to the benefit of a limited scope of beneficiaries. A notion of property that grants the right of unrestricted use, for an indefinite time and, for the advancement of any purpose the entity wishes to an individual entity is clearly not compatible with the status of outer space and Article II OST. For example, in German law, private property is always tied to a social obligation towards the public or common interest.[221] In this sense, 'property' is not banned provided the level of exclusivity does not breach the threshold of 'national appropriation'. To distinguish 'property' that is underneath the relevant threshold level of exclusivity from a comprehensive absolute understanding, the terms 'utilization' or 'usage' rights might be more suitable.

The difficulty is to determine what usage rights (intensity of use, i.e. duration, quantity, repeatability, reversibility, risk in terms of contamination and interference) correspond to which level of contribution to the common good and the benefit of mankind. The Moon Agreement reflects the complexity of this question by delegating the answer to a future international regime.

The Moon Agreement also deals with the desirability of the existence of some sort of property or utilization rights or "procedures" would be desirable. It responds in the affirmative for an "orderly and safe development", for "rational management", for the "expansion of opportunities", for "equitable sharing" (Article 11(7) MA), and for a sustainable space development that pays due regard to "the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the

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[221] Article 14(2) *Basic Law for the Federal Republic of Germany* (Grundgesetz), official English translation reads: "Property entails obligations. Its use shall also serve the public good." online: Bundestag <http://www.bundestag.de/htdocs_e/parliament/function/legal/germanbasiclaw.pdf> accessed 29 July 2008.

United Nations" (Article 4(1) MA). As incentives not only for private actors but for the development of space in general, structuring the use of outer space along utilization rights is indispensable in a situation where the intensity of use is on the rise. Efforts to coordinate the exploration activities among the group of active participants in ISECG on the basis of common understandings signify the preoccupation with a potentially chaotic situation. Stability and predictability are necessary preconditions for devoting significant investment. Intensive uses approach the threshold of national appropriation and legally require greater alignment with the common interests and contributions to the benefit of mankind. Utilization rights achieve all of the above: preventing a chaotic development, introducing stability and predictability into space development, and creating the necessary balance between exclusive and inclusive interests through concrete obligations towards the common good.

Although the notion of an "international regime" and the obligation of "equitable sharing" as advanced by the Moon Agreement are sometimes depicted as inadequate in the 21st century world, one has to stress that these general ideas are already anchored in the Outer Space Treaty and that the details of application are not even worked out in the Moon Agreement, but left for further clarification in the future. The Moon Agreement does not require the international regime to be an inflexible dinosaur of public administration,[222] nor does it necessarily require the exchange of funds as a means of equitable sharing. Article 11(7)(d) MA does, however, confirm the social obligation towards the global public good which manifests itself by reaching a compromise between the global stakeholders, in particular between the "developing countries" and "those countries which have contributed either directly or indirectly to the exploration of the Moon". The international regime does not have to be designed like the International Seabed Authority through which access to natural resources is channelled and administered.[223] However, it is equally inconceivable that mere international registration

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[222] As the proposed clarifications to Article 11(5) MA by Special Rapporteur Frans von der Dunk illustrate, which intend to establish a national licensing and international registration regime, *ILA Conference Report New Delhi 2002*, International Law Association – Space Law Committee, New Delhi Conference, 2002, at 9, online: ILA <http://www.ila-hq.org/download.cfm/docid/0B9D27C7-8E20-4604-AF1A6D888ACA60F1> accessed 29 July 2008.

[223] See further A. A. Kovalev & W.E. Butler (translator and editor), *Contemporary Issues of the Law of the Sea: Modern Russian Approaches* (Utrecht: eleven international publishing, 2004) at 293 – 296.

by a national entity or an exclusive forum like ISECG could manage to accurately and legitimately determine the necessary bargains that have to be made.

3. Benefit and Interest of Mankind

Article I(1) OST demands that space activities are conducted "for the benefit and interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind". Article 11(1) MA adopts the formulation that the "Moon and its natural resources are the common heritage of mankind". The exact meaning and legal consequences of the common interest principle and the common heritage principle, and whether they mean basically the same thing, are disputed. Whether outer space property rights exist or not is a particularly hotly contested question. From the above, one can see that the answer depends on the specific characteristics of the asserted right, whether the level of exclusivity of use, interest and benefit is appropriatory in the sense of Article II OST. As uses that are highly exclusive become feasible, the focus needs to shift towards defining common interests and fair distribution of benefits and risks.

When "incessant attacks on the 'common heritage of mankind' (CHM) regime by those States willing and able to exert property claims on the Moon and other celestial bodies"[224] are deplored by thinkers of developing states, it is not the structured and incentivized, orderly and safe development of space that could flow from 'property' rights which is deplored – it is the concern that large parts of mankind are left behind and excluded from current and future opportunities while leading space-faring nations expand. Nigeria has highlighted the critical element of global knowledge-transfer as key to global space exploration, while emphasizing its intent to attract foreign private investment in this regard.[225] The shift from the New World Order clashes of the 1970s towards a climate of cooperation is also demonstrated by the Space Benefits Declaration of 1996. It involves no strict corset of coercive transfer, but the freedom to "determine all aspects of their participation in international cooperation in the exploration and use of outer space on an

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[224] Gbenga Oduntan, "The Generational-Technological Gap in Air and Space Law – A Commentary" (2003) 29 J. Space L. 185 – 204 at 198.
[225] Abiodun, *supra* note 200 at 4 para. 10(d).

equitable and mutually acceptable basis" coupled with the reminder that "contractual terms in such cooperative ventures should be fair and reasonable and they should be in full compliance with the legitimate rights and interests of the parties concerned as, for example, with intellectual property rights".[226] Flexibility and effectiveness, instead of bulky administration, is treasured, as "international cooperation should be conducted in the modes that are considered most effective and appropriate by the countries concerned, including, inter alia, governmental and non-governmental; commercial and non-commercial; global, multilateral, regional or bilateral; and international cooperation among countries in all levels of development".[227] The declaration makes no reference to direct money transfers, but focuses on the exchange of expertise and technology in the light of the limited technical and financial resources of developing countries.[228]

The UN Programme on Space Applications,[229] contributions to which are expressly encouraged in paragraph 8 of the declaration, as well as the UN-SPIDER programme[230] both create concrete results in 'equitable sharing'. Through the lens of 'sustainable Earth development', the relevance of (geocentric) space technology in addressing the earthly problems of the 21st century is assessed.[231] The GES framework follows a similar approach. Space exploration sets out to "gain new knowledge and skills that become part of our collective ability to solve human problems and support commercial activities"[232] – commercial activity and common interest are not mutually exclusive, if undertaken in service and for the benefit of all mankind. The practical application of this concept of for-profit philanthropy has to stand the test of global acceptance and requires a global forum of stakeholders.

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[226] *Space Benefits Declaration*, *supra* note 85 at para. 2.
[227] *Ibid.* para. 4.
[228] *Ibid.* para. 5.
[229] UNOOSA, *United Nations Programme on Space Applications*, *supra* note 88.
[230] UNOOSA, *United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER)*, online: <http://www.unoosa.org/oosa/en/unspider/index.html> accessed 29 July 2008.
[231] UNCOPUOS, *Report of the 50th Session* (2007), GA doc. A/62/20, at 33 – 40, online: <http://www.unoosa.org/pdf/gadocs/A_62_20E.pdf> accessed 29 July 2008; OECD, Space 2030: Tackling Society's Challenges, *supra* note 90 at 53 ff.
[232] GES Framework, *supra* note 4 at 7 para. 3.

The priority given to sustainable Earth development is common sense in view of horrific inequalities highlighted by the Millennium Goals.[233] This should not detract from the need for sustainable space development as such. Space exploration may not be exclusive from a legal and moral point of view, but making it an inclusive endeavour of all mankind is further mandated as a matter of self-preservation. Globally unacceptable prerogatives in space exploration would arguably erode the foundation of nascent global cohesion and consensus which is crucial in addressing issues of a global scale.[234] Convincing stakeholders of their individual responsibility with respect to common concerns such as climate change would likely be problematic if they felt excluded from the new era of human expansion. Common concerns and interests of mankind are two sides of the same medal.

4. Mere Technicalities or Legal Issues at Stake?

The question could also be rephrased as follows: which issues legitimately belong in the forum of active space exploration participants and which require a broader global forum? One of the key elements for coordinating individual programmes under a global strategy is certainly interoperability. Setting international standards for infrastructure is indispensable and requires expertise that only active participants can offer. Unless standards are designed to exclude other potential participants, they are of a pragmatic nature and suitable for an international coordination mechanism such as ISECG.[235] On the other end of the scale are issues that touch upon the core of the exclusive vs. inclusive dichotomy of outer space as a global commons – matching exclusive uses and rights with an adequate social obligation towards the common interest. Common understandings of property rights inherently need to be facilitated on a global level and not within ISECG. Preservation of outer space, environmental protection, use of nuclear power sources and space traffic management are of a hybrid nature. While requiring technical arrangements

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[233] *UN Millennium Development Goals*, online: <http://www.un.org/millenniumgoals> accessed 29 July 2008.
[234] See *supra* B.I.
[235] Drawing an analogy to Internet Governance, one has to beware of the alleged neutrality of technical solutions; see Gelbstein & Kurbalija, *supra* note 22 at 15, "Technical solutions are not neutral. Ultimately, each technical solution/option promotes certain interests, empowers certain groups, and, to a certain extent, impacts social, political, and economic life".

which appropriately have been recognized under the GES framework, they clearly transcend into the common interest sphere.

"Rules of the road" that might properly address the need for orientation and flexibility in working relationships have to be distinguished from the "rule of law" that has to reflect globally accepted norms in the common interest. For the latter, the centre of gravity has to be the UN framework as the representative of the International / Global Community and the only legitimate guardian of the common interest. UNCOPUOS, currently in a state of self-reflection on its future role, attempts to strengthen its link with coordination bodies.[236] Even within COPUOS itself, one finds a significant imbalance between the issues seen ripe for work in the Scientific and Technical Subcommittee and the Legal Subcommittee.[237] A creative role for COPUOS in the legal dimension of space exploration has been demanded, but has yet to materialize.[238] The expansion of human presence into outer space is such an extraordinary step that it goes way beyond scientific, technical and legal matters into cultural,[239] social, ethical, and philosophical dimensions. A global debate is barely enough.

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[236] UNCOPUOS, *Working Paper submitted by the chairman: Future role and activities of the Committee on the Peaceful Uses of Outer Space*, 50th Session (2007), A/AC.105/L.268, online: <http://www.unoosa.org/pdf/limited/l/AC105_L268E.pdf> accessed 29 July 2008, proposal to strengthen exchange with ICG, GEO, ITU, COSPAR, IAF, IAA, IISL; UNCOPUOS Report of the 50th Session (2007), *supra* note 231 at paras. 291 ff.

[237] UNCOPUOS Report of the 50th Session (2007), *supra* note 231 at para. 294: "Some delegations expressed the view that there was a need to strike a balance between the future role of the Scientific and Technical Subcommittee and that of the Legal Subcommittee. Those delegations were of the view that a number of the initiatives presented in the working paper would benefit from the closer involvement of the Legal Subcommittee."

[238] *Ibid.* at para. 298, "The view was expressed that a possible future working group of the Scientific and Technical Subcommittee to address the concept of rules of the road for future space operations should also establish cooperative links with the Legal Subcommittee."; para. 323 "The Committee noted with appreciation that the High-level Panel had offered insights into ongoing national and global space exploration initiatives, which would be useful during the discussion on the future role and activities of the Committee. One particular question concerned a possible link between the Committee and the Global Exploration Strategy."

[239] GES Framework, supra note 4 at 2 para. 6 "…we are entering a new era of historic significance, in which we will extend human presence beyond Earth's orbit, physically and culturally."

IV. Interim Conclusion

When taking stock of the public sector in space exploration one can highlight the following points:

(1) Efforts in space exploration have been stepped up considerably. National programmes focus on *national interests* as a matter of priority and principally aim to increase their global competitiveness in terms of technology, economy, security and ideology.

(2) Fourteen national space agencies have teamed up to *coordinate* their space exploration activities, based on the underlying vision of the Global Exploration Strategy, to take advantage of synergy effects and to make space development sustainable. The ISECG might serve as starting point for *cooperation* on specific missions.

(3) The creation of a space infrastructure that ultimately enables a self-sufficient human presence in space involves uses of *high intensity*. When coupled with pursuing primarily national (or exclusive) interests to the tangible benefit of only national (or a limited group of) beneficiaries, the activity and assertion of rights reaches unacceptable levels of exclusivity that amount to outlawed *national appropriation*.

(4) The legal framework *does not categorically prohibit exclusive uses and (property) rights*. Neither does it prescribe financial aspects of equitable sharing, nor does it provide a detailed administrative system. The concept of for-profit philanthropy is compatible with the trend in international cooperation foreshadowed by the 1996 Space Benefits Declaration. Exclusivity of use and rights needs to be *balanced with common interest and benefits for all mankind*.

(5) ISECG is limited to a membership of active participants in space exploration with a relatively high technology threshold. While the coordination mechanism is a *practical, efficient and valuable effort to deal with scientific and technical issues* and to facilitate international cooperation, it lacks legitimacy with respect to safeguarding the common interest.

(6) Legal certainty and sustainable space development would eventually require *improvement in international law*, although attempts are made to garner the enabling effects through common understandings among active participants while avoiding

limitations of binding commitments. It will be necessary to use an appropriate forum to define what uses and rights, in conjunction with the extent to which they further the common interest and bring benefits to mankind, are *globally acceptable* and not regarded as national appropriation.

D. Private Sector: The Google Lunar X PRIZE – Moon 2.0

The private sector has already gained a stronghold in geocentric space applications. Every national space policy acknowledges the significance of the private sector in space exploration. As a source of funding, innovation, motivation and passion, active private participation will only make space exploration more robust and independent from moody public support. Tapping into as many human, financial and infrastructure resources as possible will contribute to sustainable space development. Multiple schemes have emerged in order to nurture a nascent space exploration economy: public procurement from private contractors, research grants and subsidies, public-private knowledge transfer and partnerships, tax incentives, monetary prizes, regulatory relief and (intellectual and real) property rights. In Part D, prizes will be singled out for further analysis due to their outstanding characteristics and their ability to catch the public's attention. A business-friendly and stable regulatory regime, both on the domestic and international plane, is by far the most important precondition for investment in this high risk sector and therefore deserves special attention.

I. Google Lunar X PRIZE

1. History and Theory of Prizes

Prizes are not a novel development although some have gained worldwide publicity only in recent years. As early as 1714, the British parliament established a prize of £20,000 for precise determination of longitude, which was eventually awarded to John Harrison for engineering seaworthy clocks.[240] Having been widely used to foster technical innovation between the 18th and early 20th centuries, prize competitions have enjoyed a renaissance in recent years.[241] The Ansari X PRIZE for suborbital spaceflight, established in 1996 by Peter Diamandis, sees itself in a direct line of heritage with the prize offered

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[240] Stephen Maurer & Suzanne Scotchmer, "Procuring knowledge" (2003) National Bureau of Economic Research Working Paper Servies: working paper 9903, at 10, online: <http://www.nber.org/papers/w9903.pdf> accessed 29 July 2008.
[241] Thomas Kalil, "The Hamilton Project: Prizes for technological innovation" (2006) at 5, online: Brookings Institute <http://www.brookings.edu/views/papers/200612kalil.pdf> accessed 29 July 2008.

by Raymond Orteig in 1919 for the first non-stop flight between New York City and Paris. Both were successfully claimed, by Charles Lindbergh in 1927 and Mojave Aerospace Ventures in 2004 respectively.[242] The use of monetary prizes by NASA was further enhanced in the Authorization Act of 2008, compared to the 2005 position (C.I.12). Their use was also recognized in the Global Exploration Strategy framework (C.II.2.b.3).

Two main types of prizes can be distinguished: targeted prizes and blue-sky prizes.[243] Targeted prizes reward solutions to 'needs' identified and specified by the sponsor through performance standards. As these prizes are offered from an *ex ante* perspective to stimulate efforts directed at a certain goal, they are also labelled 'inducement prizes'.[244] The degree of sophistication of performance standards may differ, of course. InnoCentive, a company that created a marketplace in the cyberspace for 'Seekers' and 'Solvers', for example, distinguishes between the idea, theoretical design, prototype and final product.[245]

Blue-sky prizes or recognition prizes reward innovators for past achievements from an *ex post* perspective without stating a concrete need in advance. The award may either be fixed or variable with respect to the *ex post* value of the innovation.[246] A classical example of a fixed recognition awards it the Nobel Prize. The Prince Sultan Bin Adulaziz International Prize for Water, whose third nomination period was announced at the 50th Session of UNCOPUOS, is also of an appreciative character for special achievements and scientific innovations in the area of water resources management.[247]

Competition Prizes have several key characteristics that set them apart from more traditional means to stimulate innovation.[248] First, the degree of detail in which the challenge is formulated is flexible. Especially with regard to targeted prizes, the sponsor can accord maximum freedom to the solver on how to approach the problem, by limiting

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[242] X PRIZE Foundation, "Media Backgrounder Google Lunar X PRIZE", online: <http://www.googlelunarxprize.org/lunar/media-center/media-backgrounder> accessed 10 January 2008.
[243] Maurer & Scotchmer, *supra* note 240 at 8.
[244] Kalil, *supra* note 241 at 5.
[245] InnoCentive Inc., "From the Big Idea to the Final Product: The complete innovation solution", online: <http://www.innocentive.com/_assets/pdfs/Product%20Sheet%2002.08.pdf> accessed 29 July 2008.
[246] Maurer & Scotchmer, *supra* note 240 at 8.
[247] UNCOPUOS Report of the 50th Session (2007), *supra* note 231 at para. 263; UNCOPUOS, *Transcripts of the 576th Meeting*, COPUOS/T.576, at 11.
[248] See Kalil, *supra* note 241 at 6 ff.

himself to the problem or need description. Second, the sponsor does not necessarily have to establish who will be suitable for addressing the need and can post the challenge to a potentially worldwide and interdisciplinary audience. The sponsor, e.g. a government, can tap into resources and independent ideas that might otherwise have been beyond its scope. Third, only successful innovation that meets the performance standards is rewarded. Fourth, prizes are a vehicle that could attract and divert financial resources from the private sector for philanthropic reasons, publicity or brand enhancement. Enter Google Lunar X PRIZE.

2. The Challenge: A privately funded Moon 2.0?

In short, "The Google Lunar X PRIZE is a $30 million competition for the first privately funded team to send a robot to the moon, travel 500 meters and transmit video, images and data back to the Earth."[249] The Grand Prize of $20 million for the first team to fully complete all requirements is available until end of 2012, and at a reduced value of $15 million until 2014. The Second Place Prize of $5 million awards the second team to fully accomplish the challenge or the first team that stops short of full completion before the Grand Prize is taken. Bonus Prizes of a total of $5 million incentivize imagery and video of historical artifacts, water discovery,[250] surface mobility beyond 5 km, survival of two lunar days, and diversity of team membership and participation.[251]

The technological specifications of the challenge, including a payload requirement in the range of 250 – 500g, are not of a ground-braking nature and definitely not a world's first if one reflects on the wide use of lander and rover technology in some even more challenging locations like Mars. The distinct feature of the prize is the intention "to create a new private race to the Moon" that engages and excites the global public, enables commercial exploration of space, and reduces its cost.[252] A 'private race' means

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[249] XPF, *Google Lunar X Prize*, online: <http://www.googlelunarxprize.org/> accessed 29 July 2008.
[250] Scientists recently proved the existence of water in lunar soil by using secondary ion mass spectrometry on samples returned to Earth during the Apollo program: Alberto E. Saal et al., "Volatile content of lunar volcanic glasses and the presence of water in the Moon's interior" (10 July 2008) 454 nature 192, online: <http://www.nature.com/nature/journal/v454/n7201/pdf/nature07047.pdf> accessed 29 July 2008.
[251] X PRIZE Foundation, *Google Lunar X PRIZE Draft Competition Guidelines*, 13 May 2008, Version 2.0, non binding draft copy, at 4 ff., online: <http://www.googlelunarxprize.org/files/downloads/lunar/GLXP_Guidelines_05-13-2008.pdf> accessed 29 July 2008 [*GLXP Draft Competition Guidelines*].
[252] *Ibid.* at 3 para. 1.1.

'privately funded' teams. To be regarded as privately funded, 90% of the funds used to compete in the prize must come from private or non-governmental sources. Purchased hardware needs to be available in large quantities or must be easily reproducible and the launch has to be secured via a commercial purchase that is fair and repeatable.[253] Since only 90%, not 100% of the funds have to come from private or non-governmental source, it is implicitly acknowledged that public sector involvement will be necessary. Indirect governmental financing is not completely excluded "in an effort to allow publicly supported universities and students to compete without direct governmental financing specific to Google Lunar X PRIZE efforts". Even the use of governmental facilities, personnel, hardware, or information previously developed by a government organization is permissible, if access is available "on a reasonably open, cooperative, nonexclusive, and reimbursable basis" to all teams. Exchange between the public and private sector is further enhanced through allowing governmental personnel to work for a team "outside of the scope of their governmental employment". Even if those conditions are not met, e.g. if the public resources are only available to some or one team, they are still permissible. They will be regarded as public funding, which is allowed up to 10%.[254] The potential reliance on the public sector is especially remarkable, as the sole novel feature of the prize is its private nature, and its attempt to demonstrate private virtues such as innovation and cost-effectiveness in comparison to the public sector whose "missions will conduct great science and will expand the scope of human knowledge – but will come with a correspondingly large price tags".[255]

3. The Foundation: Education and Outreach or Interpretative Predominance?

"The primary job for Teams competing for the Google Lunar X PRIZE is to complete a successful mission and take home prize money. The Foundation's primary goal is to educate and inspire people of all ages around the world."[256] To that end, the X PRIZE Foundation centralizes media coverage of the competition. It is not the foundation's

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[253] *Ibid.* at 7 paras. 3.2.2 and 3.2.3, at 16 para. 6.9.
[254] *Ibid.* at 7 paras. 3.2.2. and 3.2.4.
[255] *Ibid.* at 3 para. 1.1.
[256] X PRIZE Foundation, *Cover Letter for Draft Competition Guidelines*, 13 May 2008, at 2-3, online: <http://www.googlelunarxprize.org/files/downloads/lunar/GLXP_Guidelines_Cover_Letter_05-13-08.pdf> accessed 29 July 2008.

intention to take "some potential revenue streams away from the teams", as the Foundation will engage into a revenue sharing scheme with the teams. It is, however, believed that separate media deals "would not result in the best telling of the entire story".[257] This clearly distinguishes the GLXP from its "ancestor" - the first non-stop transatlantic flight. While it was enough for Lindbergh to make it to Paris in one piece, the teams that set out to accomplish the GLXP mission requirements are part of a story. The Foundation has a message. First, 'public' equals bureaucracy, 'private' equals innovation. "The X Prize Foundation focuses on areas that are "stuck" due to bureaucracy, misperception, or lack of attention...Prior to the Ansari X PRIZE, "everyone knew" that only governments could participate in human spaceflight…Now, entrepreneurial companies headed by innovators like Burt Rutan, Jeff Bezos, Sir Richard Branson, John Carmack, Elon Musk and Eric Anderson are creating a personal spaceflight revolution akin to the personal computer revolution, dramatically lowering the price and risk of space travel while increasing performance and capability."[258] Second, they wish to use the "abundant resources of the Moon".[259] Third, going to the Moon in the 1960s was "to beat the Russians", but this time it is "to save the Earth". The Moon, a natural storehouse of resources, can be used to "enhance life on Earth and explore the universe".[260] Fourth, new industries are beneficial. "The orb [kids of the 21st century] see each night in the sky is being explored for their benefit. When they grow up, they will have new opportunities to travel to the Moon and beyond… The private, competing teams are opening up new industries for them to explore the Moon, and the universe beyond."[261]

In order to deliver the Foundation's message, it requires the teams to participate in public relation efforts and to generate high quality colour near real time video from the Moon in the form of two "Mooncasts". The excitement aroused by this footage is employed to draw attention to the Foundation's interpretation of this historic event. Video message, audio track, e-mail and text message, all pre-recorded by the Foundation, will

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[257] *Ibid.* at 3; XPF, GLXP Draft Competition Guidelines, *supra* note 251 at 17 ff. para. 6.3.
[258] XPF, GLXP Q&A, *supra* note 13, question 3 and 4.
[259] *Ibid.* question 5.
[260] *Ibid.* questions 5, 6 and 7.
[261] *Ibid.* question 6.

be transmitted from the Moon. A payload of the Foundation will be deployed.[262] Instead of letting the achievements stand for themselves, the Foundation exerts interpretative predominance over the event.

4. The Sponsor: Brand, Profit and Philanthropy?

The placement, display and visibility of GLXP logos are an important element of the prize. The Foundation reserves broadly the right to put logos on all spacecrafts, launch facilities, launch vehicles, secondary vehicles, and other relevant equipment. The teams "shall not enter into sponsorship agreements with any entity that interferes with Google or XPF".[263] The brand enhancing effect of the worldwide media attention related to this historic event is likely one of the motives for Google sponsoring the prize, but Google also pursues philanthropic aims. The Google founders adhere to the concept of for-profit philanthropy, a concept that seeks to combine brand-enhancing, profit-making and tax-paying philanthropy.[264] In addition to the more traditional model of a non-profit Google Foundation, Google.org was set up as a for-profit entity for charitable investment. Its for-profit status gives it greater leeway in determining how to achieve the highest philanthropic impact. It allows for investments into for-profit endeavours that strive for breakthrough technologies as well as lobbying and traditional targeted grants. 1% of Google's equity, profits in some form, employee time and use of Google's technology, are pledged. As profits do not flow back to Google, profits could lead the way towards sustainable philanthropy.[265] Larry Page, one of the founders, took great interest in the fate of Nicola Tesla, who was a genius inventor but struggled to support his research as he never managed to properly commercialize his inventions, earning neither fortune nor fame. For Page, it is as important to invent things as it is to "get them out there, get them into people's hands so they can use them, because that's what really matters".[266] A for-profit approach and philanthropy might not be so much contradictory as complementary. Google's core mission and business to "organize the world's information and make it

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[262] XPF, GLXP Draft Competition Guidelines, *supra* note 251 at 9 ff. paras. 4.3, 5.3.
[263] *Ibid.* at 9 para. 4.3.2, at 15 paras. 5.5 and 5.6.
[264] David Haskell, "For-Profit Philanthropy" *New York Times* (10 December 2006).
[265] Google.org, *Google.org: About Us*, online: <http://www.google.org/about.html> accessed 17 January 2008.
[266] See Batelle, *supra* note 36 at 66.

universally accessible and useful" is offered to the general public free of charge and has a tremendous impact on the life of internet users in creating a world vision and satisfying the fundamental need for successful 'search'. Even the profit-generating services do not interfere with organic search results, as pledged in a cloud of corporate "don't be evil-philosophy".[267] Encouraging and enabling people to take risks with high potential payoffs is seen as key for stimulating breakthroughs that "change the world",[268] just as sustainable space development would.

5. The Teams: Globalization in Practice?

The Google Lunar X PRIZE subscribes to the "Any Team, Any Nation" principle, i.e. teams "from all countries and with any background are eligible to compete".[269] Due to the fact that the X PRIZE Foundation spends private funds, it has greater freedom with respect to eligibility than a public institution where public funds are involved, such as NASA, whose price authority is tied to nationality requirements.[270] However, the GLXP is subject to US law and has to respect U.S. sanctions. Moreover, any team is required to register and to engage into a contractual relationship with the XPF, which reserves the right to reject and remove any team or individual person for any reason without recourse. Even the judging panel's members are named by the XPF at its sole discretion. While the teams consent to a stringent corset of rules on centralized media coverage, they retain all intellectual property rights.[271]

As of July 2008, 13 teams were registered for the GLXP. One team around space pioneer Harold Rosen has already withdrawn due to fact that it had intended to compete in a "simple contest", but did not share the "unrealistic version of space commercialisation" promoted by the XPF as the "real purpose".[272] By far the most teams

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[267] *Ibid.* at 137 ff., 164, 185; despite the 'don't be evil'-philosophy, Google's technological capabilities raise privacy, legal and ethical concerns, *ibid.* at 189 ff.
[268] Andy Serwer, "Larry Page on how to change the world" *Fortune Magazine* (30 April 2008), online: <http://money.cnn.com/2008/04/29/magazines/fortune/larry_page_change_the_world.fortune/index.htm> accessed 29 July 2008.
[269] XPF, GLXP Draft Competition Guidelines, *supra* note 251 at 7 para. 3.2.1.
[270] Sec. 314(e)(3) *National Aeronautics and Space Act* of 1958 as amended.
[271] XPF, GLXP Draft Competition Guidelines, *supra* note 251 at 17 para 6.2., 21 para. 7.2., 22 para. 8.2.
[272] Deborah Castleman (Associate Team Leader of SCSG), "A Farewell from the Southern California Selene Group" *GLXP blog* (24 May 2008), online: <http://www.googlelunarxprize.org/lunar/teams/scsg/bl

are from the USA (8-10); one is under UK jurisdiction with a Canadian prime contractor; one originates from Romania; one is from Malaysia and one is from Italy. Teams differ in size and scope, ranging from large corporations with expertise in space technology, universities, over small niche businesses to individuals. The teams' distinct focus covers an equally broad range: from the idea "that landing on the Moon for the first time in more than 35 years should be an American led venture" in order to continue "America's tradition of innovation and leadership in space exploration"[273] on the one side, to the intention to harvest the strengths of multinational open source collaboration on the other side.[274] The Team FREDNET, whose leader is based in California, was set up as a non-profit organisation and claims to be the "first and only 100% open source competitor" of the GLXP. Through open decentralized collaboration, it hopes to harness the collective talents of an expanding network to produce equally robust results such as Wikipedia[275] or the Linux and Apache software. Open source software development, i.e. the global availability of the software code and the individual option to discuss and make improvements, proved to be so highly competitive with proprietary software that even players like IBM and Sun eventually switched sides and refocused on profitable auxiliary services.[276] The hybrids of open source development and revenue generation represent a form of sustainable and symbiotic for-profit philanthropy. However, the open network approach has its regulatory limitations, as members already avoid talking about certain issues in the open forum, due to real or only imagined application of ITAR restrictions.[277]

The prize reflects the characteristics of the private sector very well. On the one hand, one can imagine the ingenuity, innovation and driving forces for space development

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og/a-farewell-from-the-southern-california-selene-group> accessed 29 July 2008; Deborah Castleman, "Some serious thinking at the Southern California Selene Group", *GLXP blog* (24 May 2008), online: <http://www.googlelunarxprize.org/lunar/teams/scsg/blog/some-serious-thinking-at-the-southern-california-selene-group> accessed 29 July 2008.

[273] XPF, "Quantum3", online: <http://www.googlelunarxprize.org/lunar/teams/quantum3/about> accessed 1 July 2008.

[274] XPF, "Team FREDNET", online: <http://www.teamfrednet.org/> accessed 1 July 2008.

[275] Wikimedia Foundation, Inc., *Wikipedia: The Free Encyclopedia*, online: <http://www.wikipedia.org> accessed 29 July 2008; Ori Brafman,& Rod A. Beckstrom, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations* (New York: Portfolio/Penguin Group, 2006) at 72.

[276] Brafman & Beckstrom, *supra* note 275 at 172 ff.; see also SourceForge, Inc., *SourceForge.net*, the world's largest repository for open source projects, hosting 181,619 projects as of 10 July 2008, online: <http://www.sourceforge.net> accessed 29 July 2008.

[277] Entry posted on 12 February 2008 by root in *Team FREDNET: The Lunar X Prize Open Source Forum*, online: <http://forum.xprize.frednet.com/viewtopic.php?t=98> accessed 29 July 2008.

unleashed and stirred by diverse and powerful motives such as profit and philanthropy. On the other hand, the prize is also an example of private actors struggling for interpretative predominance on an issue of global significance and common interest.

II. Towards a Business-Friendly Stable Regulatory Framework

1. Definition

Of fundamental importance for the operation of modern economies is the existence of a business-friendly stable regulatory framework. The 'regulatory framework' includes domestic and international laws and regulations, of both a general and space specific nature, as well as substantive and procedural norms, from law-making to dispute resolution and enforcement. 'Stable' is to be understood as predictable and reliable, making it possible for actors to better assess and weigh risks against benefits. Stability needs to be balanced against flexibility by providing room and the mechanisms for evolutionary change. Although stability and predictability of the rules of the game form the characteristics that make almost any regulatory framework already very 'business-friendly', the framework should also reward private sector participation and innovation, protect rights and legal positions, and ensure market entry and wide use of space applications, while at the same time keeping regulatory restrictions to a minimum.[278]

2. National Approach

The OECD recommends a supportive legal and regulatory environment for commercial space activities. On the national plane, this means (1) developing national space laws, (2) making existing space laws and regulations more business-friendly, and (3) reviewing the impact of the application of general laws on the development of space activities.[279] With the basic tenets of the space regulatory regime set out in international treaties, space-faring nations increasingly turn to national legislation in order to implement their international obligations and specify details for national space activities.

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[278] OECD, Space 2030: Tackling Society's Challenges, *supra* note 90 at 250 ff.
[279] *Ibid.* at 252 ff. OECD recommendations 5.1 – 5.3 [sic: 5.1, 5.2, 5.4].

The primary starting point for this approach is Article VI OST, according to which States Parties bear international responsibility for national activities in outer space and have to provide for authorization and continuing supervision of non-governmental entities. Besides establishing and domestically passing clear responsibilities for non-State actors, national legislation creates more transparency with regard to how the international legal framework is interpreted by a State Party. National space laws can clarify a broad range of issues for actors under their jurisdiction.[280] Although it is recognized that legitimate security concerns should override commercial interests, the OECD recommends with respect to existing space laws that those be subjected to frequent impact assessments whether security concerns still justify constraints on the business community. Barriers for transnational and international collaboration could be kept to a minimum.[281] A review of general law is particularly concerned with liability, intellectual property, competition law and equitable access.[282]

While a national approach can provide necessary clarifications, transparency and detail, and might also be easier to develop, it instantly bears the real danger of fragmentation and conflicting interpretations of the international legal framework which might translate into disturbed or even impossible international and transnational operations of the private sector as well as international conflicts on the public sector level. The OECD acknowledges this by simultaneously calling for better coordination of national space laws.[283]

With respect to the crucial issue of real property rights in outer space, some authors advocate, however, unilateral action either in the form of setting a "positive precedent" in a domestic law suit,[284] claiming "functional sovereignty",[285] or merely "recognizing"

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[280] *Ibid.* at 252 OECD recommendation 5.1 "By implementing national laws that cover a number of items of particular importance to the business community: the authorisation and supervision of space activities, the registration of space objects, indemnification regulations, additional regulations (e.g. regulations related to insurance and liability, the environment, financing, patent law and other intellectual property rights, export controls, transport law, dispute settlement) as well as procedures for implementing the regulations."
[281] *Ibid.* at 254 OECD recommendation 5.2.
[282] *Ibid.* at 257 OECD recommendation 5.4.
[283] *Ibid.* at 253 para. 3.
[284] Michael J. Listner, "The Ownership and Exploitation of Outer Space: A Look at Foundational Law and Future Legal Challenges to Current Claims" (2003) 1 Regent J. Int'l L 75 at 92; Wayne White, "'Nemitz v. U.S.' The First Real Property Case in United States Courts" in *Proceedings of the 47th Colloquium on the Law of Outer Space, Vancouver, 2004* (Reston, VA: AIAA, 2005).

private property claims and exercising "de facto sovereignty".[286] Even a private claim of ownership to the "public in general" is envisaged.[287] The most radical proposal is the suggestion to either collectively "abandon" the Outer Space Treaty, invoke a "change of circumstances" pursuant to Article 62 VCLT as the cold war is over, or simply unilaterally appropriate extraterrestrial lands even if that meant violating international law.[288] The destabilizing effects such advances would undoubtedly have on the international (legal) system would arguably be even counterproductive to the business interests that are sought to be protected.[289] The statement that it would suffice as an inducement to world's diplomats "if it even looked like there was a serious possibility" for the U.S. Congress to pass land claims recognition legislation reveals that at least some of the proposals are not meant to be serious but are mere scare tactics.[290] Wasser and Jobes do raise a valid point when they distinguish between "good faith claims made by genuine private enterprise settlements", which are potentially open to "stockholders from many different countries" and subject to "appropriate conditions" on the one hand, and prohibited national appropriation on the other.[291] As noted above (C.III.2.e), the discussion about the existence of property rights needs to shift towards a discussion of content and definition of 'property' or better 'utilization rights', and clarify which rights correspond to which duties or "appropriate conditions", if you will. Wasser and Jobes seem to envision comprehensive property rights in perpetuity and understand 'appropriate conditions' as a requirement of openness to all paying passengers regardless of nationality of both an Earth-Moon space line as well as the settlement itself, "as long as they abide by the rules".[292] While the details of an adequate balance between exclusivity and

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[285] Wayne White, "Interpreting Article II of the Outer Space Treaty" in *Proceedings of the 46th Colloquium on the Law of Outer Space, Bremen, 2003* (Reston, Va: AIAA, 2004) 171 at 174.
[286] Wasser & Jobes, *supra* note 212 at 62.
[287] Lawrence L. Risley, "An Examination of the Need to Amend Space Law to Protect the Private Explorer in Outer Space" (1999) 26 W.St.U.L.Rev. 47 at 69.
[288] Jonathan Thomas, "Privatization of Space Ventures: Proposing a Proven Regulatory Theory for Future Extraterrestrial Appropriation" (2005) 1 Int'l L. & Mgmt. Rev. 191 at 213 ff.
[289] See Leslie I. Tennen, "Article II of the Outer Space Treaty, the Status of the Moon and Resulting Issues", *IISL/ECSL Space Law Symposium: New Developments and the Legal Framework Covering the Exploitation of the Resources of the Moon, Vienna, 29 March 2004*, in *Proceedings of the 47th Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 2005) 520 at 523 ff.
[290] Wasser & Jobes, *supra* note 212 at 77.
[291] *Ibid.* at 52 ff., 40, 64, 67.
[292] *Ibid.* at 40, 50, 67.

inclusive common interests are up for discussion and still to be established, it is important to note that this balance, the "appropriate conditions" or the "rules" settlers of an open settlement have to abide by cannot be unilaterally imposed – not legally and by no means legitimately.

However, national legislation has its advantages in flexibility, detail and clarity. Indeed, the prospect of resorting to national legislation, if faced by excessive demands on the international plane, could also be a valuable inducement to find a coherent international regime.[293]

3. Global Approach: International & Transnational

International space law has developed under the auspices of the United Nations. The institutional centerpiece has been the Committee on the Peaceful Uses of Outer Space and particularly its Legal Subcommittee. However, since the 1970s, no international hard law has emerged (B.VI.) and an ongoing trend towards coordination committees of active participants outside the UN is clearly visible (C.II.3.c). Meanwhile COPUOS attempts to redefine its role and establish closer links with other fora (C.III.4.). In the domain of space exploration, the Global Exploration Strategy, in conjunction with ISECG, has been the latest forum created with a limited membership (C.II.). The OECD set up the Global Forum on Space Economics in 2005. Its membership at least in the steering group is largely limited to public sector participants from OECD countries, due to the intergovernmental nature of OECD fora. The OECD, which accommodates mainly economic and business interests, also gives voice to non-State actors at the working group level.[294] National and transnational actors of the private sector are not only increasingly engaged in space related decision-making processes (B.II.), but focus also on producing public consent by changing perceptions of space exploration in general and the role of the private sector in particular.[295] The Google Lunar X PRIZE is just one prominent example (D.I.3.).

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[293] Ezra J. Reinstein, "Owning Outer Space" (1999) 20 Nw. J. Int'l L. & Bus. 59 at 80.
[294] *OECD Global Forum on Space Economics: Descriptive Overview* (2007), online: <http://www.oecd.org/dataoecd/4/17/38433992.pdf> accessed 29 July 2008.
[295] Weeks, *supra* note 94 at 29, 228 ff.

While technical matters might practicably and legitimately be reserved to expert discussions amongst active participants in space exploration (ISECG) and business interests be advanced by the ones concerned (OECD, X PRIZE), questions concerning the international legal framework ultimately need to be addressed by the International/Global Community as a whole within the UN framework (COPUOS). In order to provide a business-friendly stable regulatory framework, the OECD basically acknowledges the need to develop international space law, although the primary focus seems to be set on international coordination of national space law.[296] A legitimate and acceptable global law-making process, dispute resolution and enforcement, in short the rule of law serves political, economic, scientific and security interests in outer space best.[297]

Global multi-stakeholder regulation of space exploration is also politically feasible.[298] First, keeping in mind the trend towards an increasingly intertwined world in which mankind faces global challenges as well as global aspirations (B.I.), a long-term perspective for sustainable space development would be a wiser choice than a short-sighted and conflict-prone unilateral approach. Even the attempt to avoid binding and universally agreed agreements and at the same time prevent a chaotic situation by establishing a regime of *de facto* compliance among active participants in space exploration must be short-lived in such an environment. Second, the debate on the crucial issue of property rights is in fact one of balancing exclusive uses and incentives with the inclusive common interest in space exploration and use (C.III.2.e). International law has developed in a direction that is likely to overcome the obstacles that formerly led to a lack of broad support for the Moon Agreement. Most notably, expansion of human presence into outer space is recognized by developed States and private entrepreneurs to be one especially driven by economic expansion concerned with profits and not with comprehensive property rights as an end in themselves.[299] Developing States, on the other

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[296] OECD, Space 2030: Tackling Society's Challenges, *supra* note 90 at 255 ff., Recommendation 5.3.
[297] Gérardine Meishan Goh, *Dispute Settlement in International Law: A Multi-Door Courthouse for Outer Space* (Leiden: Martinus Nijhoff Pulishers, 2007) at 356 ff.
[298] Jakub Ryzenko & Anna Burzykowska, "Between Concord and Rivalry: Requirements for and Political Feasibility of Modifications of Planetary Operations Legal Regime" in *Proceedings of the 48th Colloquium on the Law of Outer Space, Fukuoka, 2005* (Reston, VA: AIAA, 2006) 105 at 107 ff.
[299] See Henry R. Hertzfeld & Frans G. von der Dunk, "Bringing Space Law into the Commercial World: Property Rights without Sovereignty" (2005) 6 Chi. J. Int'l L. 81 at 91 ff.; Patricia M. Sterns & Leslie I.

hand, have abandoned the notion of forced cooperation, technology and monetary transfers in favour of promotion of equal opportunity and the rule of law.[300] The ambiguities surrounding the Common Heritage of Mankind principle in the Moon Agreement and its implications for 'equitable sharing' could now be clarified either by deleting them altogether[301] or preferably through a separate legally binding instrument that outlines the international regime and the notion of equitable sharing in detail. In contrast to the UNCLOS which stipulates the mechanisms for resource exploitation in detail,[302] the Moon Agreement does not do so and deliberately leaves room to develop the details of a future international regime. Consequently, there is no need for the Moon Agreement to be amended like the UNCLOS was in 1994.[303]

No matter which path the development of the regulatory framework will follow, sustainable and business-friendly space exploration and development has to rest on a comfortable cushion of global acceptance and legitimacy.

III. Towards Global Acceptance and Legitimacy

1. Why bother?

The extension of human presence beyond Earth into outer space is extraordinary. The most fundamental question of our times is whether this also entails the extension of present national rivalries and earthly conflicts into outer space. The basic groundwork was laid with aspirations to avoid such a development in the 1950s and 60s.[304] This signifies a magnificent leap forward in contrast to earlier patterns of human expansion and the popular but misplaced New World analogy. Moon 1.0, the first human endeavour beyond low Earth orbit in 1969, was still shaped by national rivalries of the cold war, but

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Tennen, "Private Enterprise and the Resources of Outer Space" in *Proceedings of the 48th Colloquium on the Law of Outer Space, Fukuoka, 2005* (Reston, VA: AIAA, 2006) 240 at 242 ff.

[300] Sterns & Tennen, *supra* note 299 at 251 ff.

[301] See Dunk, *supra* note 216 at 109 ff.; ILA Conference Report New Delhi 2002, *supra* note 222 at 7 ff.

[302] *UNCLOS*, *supra* note 12, Part XI.

[303] *Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, 1994, UN doc. A/RES/48/263, online: <http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindxAgree.htm> accessed 29 July 2008.

[304] See *supra* B.V.; *Question of the Peaceful use of outer space*, GA Res. 1348(XIII), adopted without vote on 13 December 1958, *supra* note 2.

did not perpetuate national exclusivity thanks to an accepted regulatory framework that was in place prior to the undertaking. It most likely prevented the worst.

Moon 2.0 will mark the return to the Moon with robotic probes and manned missions. It is the starting point for a sustainable long-term expansion into outer space, eventually enabling a permanent human presence. After first attempts at walking in the cradle's near vicinity and toying with geocentric space activities, mankind now gathers strength to leave its cradle for good. It is therefore of paramount importance and the right time to ensure that space development is on tracks that will avoid the projection of earthly conflicts into outer space for all eternity.

The context in which Moon 2.0 takes place is in fact favourable and conducive to strengthening international cooperation – pacifying international competition while shifting towards transnational competition (Part B). Space activities are no longer the exclusive domain of two nations; the field of actors has significantly increased and gained in diversity. Space activities have increased in intensity, hence making them prone to chaos. A structured, regulated development is more desirable and beneficial for all.[305] The potent forces of economic and commercial interests are deliberately made part of this new era of space exploration by building a sustained space economy around it. The endless hunger for market entry and growth has perforated and torn down many different barriers, moving the world ever closer to an integrated economy.

In an, at first sight unusual alliance of Pulitzer Prize-winning "flat world" advocate Friedman with Marx and Engels, the fathers of communism, both stand in awe before the free market forces giving rise to a universal civilization and global business that renders national one-sidedness and narrow-mindedness more and more impossible. The latter predict a social 'race to the bottom' causing the workers of the world to unite in a global revolution, whereas the former concludes a 'race to the top' in which States, corporations and the individual seek efficiency and frictionless operations through self-improvement, imagination, innovation and trusting collaboration.[306] While business motives are

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[305] See Jonathan F. Galloway, "Cooperation, Conflict and Competition in Space Law" in *Proceedings of the 46th Colloquium on the Law of Outer Space, Bremen, 2003* (Reston, VA: AIAA, 2004) 2 at 2 ff., 6, on non-zero sum games as well as on "positive change and progressive evolution" in terms of "increasing cooperation and in the promise of commerce in space".
[306] Friedman, *supra* note 30 at 233 ff.

certainly a powerful force that needs to be and will be harnessed for space development, Huntington cautions that the concepts of 'universal civilization' and 'world community' are euphemisms to give legitimacy to actions in the Western interest and to integrate "the economies of non-Western societies into a global economic system which it dominates".[307] What the "non-Wests see as Western, the West sees as universal" and "[w]hat Westerners herald as benign global integration … non-Westerners denounce as nefarious Western imperialism".[308] In the common interest, to avoid that the clashes of the future do indeed stem from Huntington's overgeneralizing formula of "Western arrogance, Islamic intolerance, and Sinic assertiveness"[309], true global acceptance and legitimacy are indispensable.

2. The Individual and National Interest Objection

Putting an end to the projection of earthly conflicts into outer space through global trustful collaboration might be nothing more than wishful thinking, especially in light of rising military expenditures worldwide – 45% over the last decade.[310] National security is a valid objective and not necessarily an antipode to global collaboration. Whereas the Global Exploration Strategy identifies space exploration as a peaceful endeavour that can unite nations (C.II.2.b.4). Trust-building measures and transparency further increase security. Business forces can keep artificial barriers to collaboration to a minimum, as constraints need to be justified frequently (D.II.2.). Broadening the base of stakeholders that link into the global supply chain supporting the space economy and/or derive benefits therefrom can also serve global and thus national security.[311]

Binding international law might not preserve national sovereignty best. The greatest room for manoeuvre might be found in non-binding agreements between actors that

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[307] Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order* (New York: Simon & Schuster Paperbacks, 2003) at 66, 184.
[308] *Ibid.* at 66.
[309] *Ibid.* at 183.
[310] Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2008: Armaments, Disarmament and International Security* (Stockholm: Oxford University Press, 2008) at 10, online: SIPRI <http://yearbook2008.sipri.org/files/SIPRIYB08summary.pdf> accessed 28 July 2008.
[311] Friedman, *supra* note 30 at 580 ff., at 586, Friedman offers his 'Dell Theory of Conflict Prevention' arguing that just-in-time global supply chains are "an even greater restraint on geopolitical adventurism than the more general rising standard of living".

combine to achieve a 'critical mass' to prevent a chaotic situation for space development (D.II.3). International relations in general, and space development in particular, are long-term undertakings embedded in an increasingly complex international system whose participants increase in number and diversity. Participants also enjoy varying degrees of influence on the international plane over time (B.I-III.). Solid legal foundations can create the environment for sustainable long-term development. In a world where the free flow of goods, services, capital, persons and ideas is increasingly facilitated, global collaboration is also an adequate response to regain public guidance and control over the private sector.

Equally, as a matter of sovereignty, some States have asserted their right to individually determine how to share benefits and results of their space activities.[312] This objection could be extended to individuals of the private sector who are unwilling to share benefits of their risky space investments. Conflicts concerning benefits and sharing have been smoothed over by the 1996 Benefit Declaration, which is in favour of national sovereignty (C.III.3). The fundamental correlation between freedom, non-appropriation as well as the benefit and interest of mankind is enshrined in the Outer Space Treaty and was left untouched by the declaration. The establishment of an 'international regime' is a legal, moral and practical necessity to facilitate space development. Instead of being perceived as a limiting factor, it should be viewed as enabling full use of the freedom of space exploration.

Tossed by the waves of globalization, national governments might seek to exploit space endeavours in order to strengthen national identity and cohesion, especially when the speed with which changes occur puts pressure on society. National and cultural identities that provide bearings need not be confrontational though. The emerging sense of a global community may simply add another palpable layer of identity by making everyone part of mankind (B.V.). This is a long and bumpy but also promising road, as the experiment called 'European Union' may demonstrate.[313]

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[312] See e.g. U.S. Congress, Senate, *Treaty on Outer Space: Hearings Before the Committee on Foreign Relations, United States Senate, Ninetieth Congress, First Session* (Washington: U.S. Government Printing Office, 1967) at 74.

[313] On intertwined countries and mixed loyalties in international sport events such as the European Soccer Championship 2008, see Nicholas Kulish, "Germany, Turkey and Jumbled Loyalities" *New York Times* (25 June 2008).

3. The Common Interest Objection

A 'business-friendly' regulatory framework could be met with apprehension as this might be considered to be at odds with the status of outer space as a global commons. Private interests and their protection are by their very nature 'exclusive'. The warnings given by U.S. President Eisenhower show that there is a real danger that private interests do not align with or even supersede public or common interests.[314] Furthermore, purely national interests and influence could be asserted in disguise of private interests and commercial competition. Such a development might put the national public interest in the place of the common or global public interest.[315]

Broad stakeholder participation in the law-making process and enforcement would address such concerns. Besides guaranteeing stability and clarity, a globally coherent regulatory framework can assure control of, responsibility and accountability for business activities. The key question for gaining global support for a business-friendly framework that entails rewards and incentives, legal protection, market expansion and access, is how to reconcile exclusive interests with inclusive community interests.

To that end, both the public and the private sector emphasize that space activities generate benefits for all mankind. The Global Exploration Strategy places space exploration "in the service of society" whereas contestants of the Google Lunar X PRIZE set out "to save the Earth".[316] With an increasing level of exclusivity due to the intensity of use of outer space, the concern over whose interest and for whose benefit these activities are undertaken are increasingly important. Concretization of interests and benefits is necessary to specify (lunar) utilization rights to incentivize and facilitate an efficient and orderly development. Where exclusivity would otherwise reach unacceptable levels amounting to national appropriation, it is important to establish the

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[314] Dwight D. Eisenhower, "Military-Industrial Complex Speech" in *Public Papers of the Presidents of the United States* (Office of the Federal Register, 1960) 1035, online: Michigan State University <http://courses a.matrix.msu.edu/~hst306/documents/indust.html> accessed 28 July 2008, "In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the militaryindustrial complex. The potential for the disastrous rise of misplaced power exists and will persist".
[315] See Patrick A. Salin, "Privatization and militarization in the space business environment" (2001) 17 Space Policy 19-26.
[316] See *supra* C.II.2.b and D.I.3.

case that the interest transcends national boundaries and to substantiate the scope of beneficiaries and the kind of benefits.

In particular, the private sector is capable of de-nationalizing space activities by focussing on global business interests and challenging the barriers that constrain the integration process towards a truly global economy. The usual give and take of negotiation rounds within the WTO framework, from which a distribution system that is able to balance the global inequalities has yet to emerge, cannot be transposed to outer space one-to-one. While States may restrict or open the flow of goods and services to and from territory subject to their sovereignty solely according to national interests, space activities are *a priori* bound to the common or global public interest.

Given that the private sector is in a good position to demonstrate that their activities go beyond the confines of national boundaries, one has to assess to what extent business organization and objectives serve the common interest and benefit mankind. Who owns the business? To what extent is it open for investment? To what extent are products and services accessible, on a discriminatory or non-discriminatory basis? What impact do the space activities have on mankind? Does it operate as a for-profit or non-profit venture?

Business and philanthropy are far from being mutually exclusive.[317] Nobel Peace Prize winner Yunus sees 'social entrepreneurship' as a "very broad idea" that is generally defined as "any innovative initiative to help people".[318] He acknowledges the possibility of business hybrids that combine (exclusive) personal-benefit objectives with (inclusive) social-benefit objectives.[319] The weight given to the distinct objectives may vary in limitless ways, ranging from purely profit maximizing businesses for personal gain, over ones that seek company management in a socially responsible fashion, to cooperatives and non-profit enterprises, to purely social businesses.[320] Being sceptical about multiple business objectives that in his view are likely to lead to a confusion of priorities, Yunus advocates social businesses as an additional actor in the marketplace. Social businesses resemble traditional profit-maximizing businesses in organization and management. Only

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[317] See also *supra* C.III.3 and D.I.4-5.
[318] Muhammad Yunus, *Creating a World Without Poverty: Social Business and the Future of Capitalism* (New York: Public Affairs, 2007) at 32.
[319] *Ibid.* at 33.
[320] *Ibid.* at 33-37.

the underlying objective and hence the criterion by which it is evaluated differs. "The company is to create social benefits for those whose lives it touches. The company itself may earn a profit, but the investors who support it do not take any profits out of the company except recouping an amount equivalent to their original investment over a period of time." Social businesses are self-sustaining, leave room for reinvestment of initial funds and preserve the ownership-management relation as their driving force.[321]

Google.org was set up as a for-profit enterprise with the sole objective to achieve certain social impacts.[322] While Google.org is not engaged in business activities directly, the set up comes closer to social business than to traditional charity foundations. Intelsat, formerly an international organization, is now a profit-maximizing business with only some inherited public service obligations. The essence is that business organization and objectives as well as their social impact on and benefit to the marketplace can indeed differ in limitless ways. The more intense the use of outer space, the more weight has to be placed on common interests and benefits. In order to gather global support, it will be crucial to substantiate business organization, objectives and practices as well as the concrete social impacts and benefits in a transparent way.

IV. Putting Things on Tracks: Global Compact 2.0

1. Multiple Fora: Matching Mandate and Legitimacy

Space exploration needs a forum for discussion and development. The plethora of aspects related to space exploration and the extension of human presence into outer space, let it be scientific, technical, legal, political, economical, social, cultural or ethical, arguably mandate not just one, but multiple fora. As outer space is, *per se,* an area of global concern and interest, scope and membership needs to be chosen carefully. The legitimacy of the process will influence the stability and sustainability of space development.

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[321] *Ibid.* at 22, 25.
[322] See *supra* D.I.4.

Practical considerations may force the International Space Exploration Coordination Group to adopt a scientific and technical perspective within a forum of limited membership.[323] The OECD Global Forum on Space Economics may view space exploration predominantly through the economic lens of its members. Private sector actors may try to engage the public in a greater debate on space exploration and attempt to produce consent to massive private involvement. Ultimately, all the potential implications of this new era of space exploration demand a global forum for the multitude of stakeholders concerned.

Global legitimacy and acceptance are particularly important when further developing the regulatory framework for space exploration, whether by means of soft or hard law. Although common understandings and consensus among the few ISECG members is a valuable step towards a business-friendly stable regulatory framework, non-binding guidelines among active participants in space exploration are not in a position to replace or clarify universally accepted international law. The development of a regulatory framework, preferably consisting of international hard law, should be conducted under a United Nations framework.

2. The United Nations Global Compact

"You do not need to wait for governments to pass new laws. You can and should act now, in your own self-interest. The sustainability of globalization is at stake". Former Secretary-General of the United Nations Kofi Annan addressed business groups with these words in the quest to promote corporate social responsibility.[324] Unequal distribution of benefits, an imbalance in global rule-making, where social objectives dramatically lag behind economic ones and a global identity crisis are considered major forces prone to trigger a backlash against globalization. Where global markets rest upon a fragmented piecemeal of national social bargains, the fabric of the Global Community is in need of reinforcement.[325]

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[323] See *supra* C.III.4.
[324] Quoted by John Gerard Ruggie, "The Theory and Practice of Learning Networks: Corporate Social Responsibility and the Global Compact" (2002) 5 J. Corp. Citizen. 27 at 28, online: <http://www.greenleaf-publishing.com/content/pdfs/jcc05rugg.pdf> accessed 30 July 2008.
[325] *Ibid.* at 29-30.

The world is equally divided with respect to space activities: between space-faring nations and non-space-faring nations and users of space applications and non-users. Benefits of space activities are unequally distributed. The focus on creating a business-friendly regulatory regime for space exploration could easily overlook the necessity to strike a real balance with social benefits for mankind. And 'mankind' could need an identity boost in times where it is faced with an array of global challenges but public policy is widely concerned with national identity and cohesion.

The Global Compact (GC), which started operations in 2000, was initiated by Kofi Annan to alleviate the social shortcomings of globalization. Recognizing the growing importance of non-state actors, particularly of the business community, in the pursuit of UN goals, the United Nations sought a closer cooperation and partnerships.[326] In order to "exhibit and build the social legitimacy of business and markets", the GC adopted a multi-stakeholder approach to induce socially responsible global corporate citizenship based upon ten principles – a set of universal core values in the areas of human rights, labour standards, the environment and anti-corruption. "The Global Compact involves all the relevant social actors: governments, who defined the principles on which the initiative is based; companies, whose actions it seeks to influence; labour, in whose hands the concrete process of global production takes place; civil society organizations, representing the wider community of stakeholders; and The United Nations, the world's only truly global political forum, as an authoritative convener and facilitator." As of April 2008, the GC has 4,000 business participants from 120 countries, as well as 1,300 non-business participants.[327]

When committing themselves to the GC principles, corporate leaders are expected to bring about changes in business operations, to report annually on the progress made and to publicly advocate the GC and its principles.[328] The GC started out as an experimental

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[326] See UN Secretary-General Kofi Annan*, Guidelines on Cooperation between the United Nations and the Business Community*, 17 July 2000, online: <http://www.un.org/partners/business/otherpages/guide.htm> accessed 30 July 2008.

[327] UN Global Compact, "What is the Global Compact?", online: <http://www.unglobalcompact.org/AboutTheGC/index.html> accessed 29 July 2008; UN GC, "The Ten Principles", online: <http://www.unglobalcompact.org/AboutTheGC/TheTenPrinciples/index.html> accessed 30 July 2008; UN GC, *After the Signature: A Guide to Engagement in the United Nations Global Compact* (2008) at 7, 13 ff., online: <http://www.unglobalcompact.org/docs/news_events/8.1/after_the_signature.pdf> accessed 30 July 2008.

[328] *Ibid.*, Guide to Engagement in the UN GC, *supra* note 327 at 13.

learning network which underwent a major overhaul in 2005 that formalized and restructured its functioning mechanisms. While maintaining its character as a voluntary, legally non-binding and not compliance-based initiative that relies on public accountability, transparency and enlightened self-interest instead, the GC introduced several key integrity measures such as sanctions for failure to communicate progress, as well as a complaints procedure in cases of systematic and egregious abuses of the GC's overall aims and principles.[329] As of January 2008, approximately 850 companies had been delisted from the initiative.[330] The "parliamentarization" of the GC governance structure involves the Global Compact Board and the Leaders Summit, whereas "federalization" is underway through the strengthening of Local Networks and the formal establishment of the Local Networks Forum.[331] The GC Board consists of 20 senior representatives including the UN Secretary-General, the Head of the GC Office and the Chair of the GC Foundation *ex officio*, as well as 11 business, 4 civil society and 2 labour representatives who are elected by their respective constituency for a 3-years term. The GC Board gives strategic and policy advice through recommendations for the initiative as a whole. Central functions, proving overall direction for the GC, are vested in the triennially GC Leaders Summit that broadly brings together all stakeholders. The transformation process of the GC governance structure has prompted the Global Compact to be characterized as a "normatively relevant transnational regulatory regime for the promotion and protection of global public goods".[332]

The private sector plays an important role in space activities and intends to play an ever greater one in space exploration. The exploration and use of outer space, an undertaking that is bound to the common interest and benefit of mankind, is a field of human activity that needs to be guided *a fortiori* by the universal principles promoted by the Global Compact. Even though the legal regime for space exploration remains largely

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[329] UN Global Compact, *The Global Compact's New Phase* (6 September 2005), online: <http://www.unglobalcompact.org/docs/about_the_gc/2.3/gc_gov_framework.pdf> accessed 30 July 2008.
[330] Georg Kell, "Letter to the Global Compact Stakeholders", 16 January 2008, online: <http://www.unglobalcompact.org/docs/how_to_participate_doc/Stakeholder_english_2008_final.pdf> accessed 30 July 2008.
[331] Karsten Nowrot, "The New Governance Structure of the Global Compact: Transforming a 'Learning Network' into a Federalized and Parliamentarized Transnational Regulatory Regime" (2005) 47 Beiträge zum Transnationalen Wirtschaftsrecht 1, at 18 ff., online: <http://www.telc.uni-halle.de/Heft47.pdf> accessed 30 July 2008.
[332] *Ibid.* at 5, 17.

in the hands of the public sector, i.e. in the hands of States as the main actors in the international legal system, the multi-stakeholder approach of the Global Compact reflects the changing realities of global governance where non-state actors assert greater influence. Alternatively, one can draw a parallel with the emerging regulatory framework for cyberspace, with which a multi-stakeholder policy dialogue approach is pursued in the form of the Internet Governance Forum within the United Nations.[333] According to the ICJ, the international legal system is not static but evolves dynamically according to the needs of the community.[334] The multi-stakeholder approach can also reflect the multi-dimensional nature of a new era of space exploration that aims at permanently extending the human presence into outer space and touches upon mankind as a whole.

The 'common interest and benefit' principle should be added as the eleventh GC principle. It is as broad as the other principles and enjoys universal acceptance, as it can be derived mainly from Article I(1) of the Outer Space Treaty. This principle is also the social core value in the area of outer space exploration and use. As space-related applications play an ever increasing role in daily business operations, the principle would not be confined to a small niche of participants. Moreover, the set of principles is not exhaustive, as the tenth principle related to anti-corruption was also added later.[335]

Participation in the Global Compact may increase the legitimacy, accountability and transparency of space business operations, facilitating global collaboration and partnerships, and enhancing a corporation's reputation and brand image, raising employee morale and attracting highly qualified employees. Young people may be especially attracted to pursuing careers related to outer space.[336] These objectives are completely consistent with the Global Exploration Strategy and the Google Lunar X PRIZE. The GC could furthermore assist the development of a globally coherent business-friendly and stable regulatory regime for space exploration by facilitating the social bargain related to

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[333] Secretariat of the *Internet Governance Forum*, online: <http://www.intgovforum.org/> accessed 30 August 2008; IGF, *Second Meeting of the Internet Governance Forum (IGF) Rio de Janeiro, 12-15 November 2007: Chairman's Summary* (2007), online: <http://www.intgovforum.org/Rio_Meeting/Chairman%20Summary.FINAL.16.11.2007.pdf> accessed 29 July 2008, compare parallel issues such as 'access', 'diversity', 'openness', and 'security'.

[334] See *supra* B.I.

[335] Compare *The Global Compact's Nine Principles* (1999) in UN SG Kofi Annan, Guidelines on Cooperation between the United Nations and the Business Community, *supra* note 326, annex 1.

[336] See UN Global Compact, Guide to Engagement in the UN GC, *supra* note 327 at 8.

space activities. The multitude of stakeholders and global transparency could help identify a modern approach to 'equitable sharing'.

It is in the best self-interest of the business sector to cooperate more closely with the United Nations to lay the groundwork for a transnational competitive space economy. The Global Compact is the suitable gateway to the United Nations and other stakeholders. Only the convening power of the UN can cope with the complexity of the world community. The context of Moon 2.0 and the immense task at stake call for a Global Compact 2.0.

3. UN Sponsorship and Symbolism

The United Nations are in a unique position when it comes to promoting a sense of common identity for all of mankind. Endorsement of certain activities by the United Nations contributes considerably to their legitimacy, as noted above. Visible affiliation with the United Nations is already possible through the authorized use of the name and the logo of the UN Global Compact by GC stakeholders.[337] A private contestant that lands on the lunar surface and transmits "Mooncasts" back to Earth which feature not only the Google Lunar X PRIZE logos very prominently but at least equally prominently the UN GC logo, adds significantly more credibility to the X PRIZE Foundations message that the return to the Moon is "to save the Earth". The path for the X PRIZE Foundation from a 'payload' to something that is perceived as mere 'debris' is short.[338] The path to making everybody feel part of this grand endeavour leads through the United Nations.

When private corporations join the Global Compact, they accept and undertake to promote the principles of the Global Compact and help to achieve the broader goals of the United Nations, such as the Millennium Development Goals, in exchange for some degree of United Nations endorsement. This bargain, made at a very basic stage of global governance, might be the beginning of a development towards incorporation, under the

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[337] See UN Global Compact, *Policy On the Use of the Global Compact Name and Logos*, online: <http://www.unglobalcompact.org/AboutTheGC/gc_logo_policy.html> accessed 30 July 2008.
[338] As regards a private venture that claims to send a payload of business cards to the lunar surface and "allow anyone to send their own scrap of paper to be deposited on the Moon", see Tennen, *supra* note 289 at 521.

auspices of the United Nations, for entities engaged in space exploration – a modern version of launching facilities under the auspices of the UN, envisaged as early as 1962.[339]

4. UN Global Compact Foundation & Prizes

One of the priorities of the Global Compact is working towards financial independence in order to guarantee the sustainability of its operations. The Global Compact Foundation was created for that purpose in 2006 and especially encourages contributions from companies participating in the GC.[340] The United Nations Global Compact, an outstanding representative of the Global Community, is in an equally outstanding position as a legitimate recipient of monetary funds derived from global business to support the global social fabric – fostering a global identity and cohesion.

Private sector actors such as the X PRIZE Foundation already contemplate the use of inducement prizes to stimulate global entrepreneurship.[341] The GC Foundation could employ the potent tool of inducement prizes to advance its own objectives. This might lead to global public UN sponsorship of knowledge that can be put in the public domain for the benefit of all mankind. Maurer and Scotchmer demonstrate that knowledge which is destined for the public domain is preferably publicly procured, e.g. through prizes, rather than inducing its disclosure through intellectual property rights. It avoids "the inefficient exclusion of users whose willingness to pay is smaller than the proprietary price, but larger than the marginal cost of supply", or simply "deadweight loss".[342] As the deadweight loss of innovations with a high social value could be rather high on the global scale, public procurement of innovation through the UN Global Compact Foundation would be a reasonable alternative to national intellectual property regimes. Although not limited to space activities, public procurement of knowledge for the public domain could

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[339] See *International co-operation in the peaceful uses of outer space*, UN GA Res. 1802 (XVII), 1962, *supra* note 80.
[340] UN, *Global Compact Foundation*, online: <http://www.globalcompactfoundation.org/> accessed 30 July 2008; UN Global Compact Foundation, *Certificate of Incorporation*, 5 April 2006, online: <http://www.globalcompactfoundation.org/about/images/inc_cert.pdf> accessed 29 July 2008.
[341] See X PRIZE Foundation, "Future PRIZEs: Global Entrepreneurship", online: <http://www.xprize.org/future-x-prizes/global-entrepreneurship> accessed 30 July 2008.
[342] Maurer & Scotchmer, *supra* note 240 at 8 ff., 33 ff.

have a significant impact in a field where mankind sets out to leave its cradle. Non-space faring nations and non-users of socially valuable space applications could be enabled to become space-faring nations and users, while increasing the global space economy market and guaranteeing rewards for entrepreneurial innovation. If the technological know-how is too sensitive to be put in the public domain at this point in the development of the Global Community, the same results might be achieved by assuring public access and use.

V. Interim Conclusion

As regards the role of the private sector in space exploration, the following points can be made:

(1) The technological challenge of the Google Lunar X PRIZE is not ground-braking. The way in which the *private virtues* of innovation and cost-effectiveness are conveyed by the XPF is at odds with the continued dependence on public sector support in space exploration.
(2) Powerful *motives* such as profit and philanthropy can drive space exploration and make it more sustainable. Private involvement in building a space economy around space exploration is essential.
(3) Significant private involvement requires a *business-friendly stable regulatory framework* that can rely on global acceptance and legitimacy.
(4) International space law mandates the striking of a balance between individual freedom and common interests. To complement the *economic element* of space exploration with a substantiated *social element* is in the private sector's self-interest.
(5) Avoiding the projection of earthly conflicts into outer space for all eternity is one of the major tasks of our and future times. The private sector is in a unique position to *de-nationalize* space activities and push towards a transnational space economy on the basis of international cooperation.
(6) The *United Nations Global Compact* would be a suitable gateway for the private sector to participate in the global governance process and assist in the development of binding international law within the United Nations framework.

E. Conclusion

The emerging Global Community has reached a remarkable level of world vision and sense for global challenges. The inseparability of sustainable Earth and space development is as essential as the Global Community's acknowledgement of the existence of common concerns and interests of mankind.

The new era of space exploration ultimately envisages the permanent extension of the human presence beyond low-Earth orbit. In contrast to geocentric activities which form the overwhelming majority of space activities, the objective of leaving the cradle of mankind and spreading human civilization into outer space explores a whole new ethical dimension of human development. The use of outer space, growing in quantity and quality, will reach unprecedented levels of intensity.

International space law respects the freedom of exploration and use of outer space bound to the common interest and benefit of mankind. Exclusivity that amounts to national appropriation is prohibited. The intensity of use (i.e. duration, quantity, repeatability, reversibility, risk in terms of contamination and interference), exclusive interests, and a narrow scope of beneficiaries heighten the level of exclusivity, whereas lower intensity, pursuing common or global public interests, and a broad scope of beneficiaries, lower the level of exclusivity. The creation of a space infrastructure that ultimately enables a self-sufficient human presence in space involves uses of high intensity. Property or utilization rights which are deemed to be essential as rewards and incentives for private involvement, as well as for safeguarding an orderly and structured development of space also raise the level of exclusivity. Thus, transcending purely national interests and broadening the scope of beneficiaries by aligning space exploration with the common interest for the benefit of mankind gains in importance if unacceptable levels of exclusivity and national appropriation are to be avoided.

The active participants in space exploration of the public sector opted for mere coordination of their national activities when mapping out the Global Exploration Strategy. Implementation is delegated to the International Space Exploration Coordination Group. The forum's scope includes foremost technical but also legal issues. While the neutrality of technical standards could at least be disputed, legal issues, such as property or utilization rights and the preservation of the space environment, touch upon

the common interest in space exploration and use. Although ISECG only generates legally non-binding output, rules of the road and technical standards set by the qualified minority could lead to a uniform practice of space-faring nations based on a common understanding and secured through bilateral or multilateral treaties. ISECG is a practical approach to streamlining discussions on technical matters. As the membership of ISECG is limited to active participants in space exploration, it lacks, however, legitimacy to address the universally accepted regulatory framework of a complex field that is of common interest and concern for the Global Community.

One crucial element of the Global Exploration Strategy is to build a space economy around space exploration, in order to make it a sustainable long-term undertaking. It is therefore consistent with this strategy that the private sector promotes space exploration and attempts to produce public consent to greater involvement of private non-state actors. From the Google Lunar X PRIZE one can study the attributes of the private sector: powerful motives such as profit and philanthropy can drive innovation, cost-effectiveness and impact. As individual private actors struggle for interpretative predominance on an issue of global significance and common interest, the need for a regulatory framework becomes also apparent.

At least initially, space exploration will depend on the devotion of the public sector. The development of a business-friendly, stable regulatory framework for space exploration is another precondition for a thriving space economy, which in turn necessitates a globally accepted and legitimate process within the United Nations. Predictability may already be the most important factor in terms of business-friendliness, but further rewards and incentives make it more likely that the full potential of the private sector can be harnessed for space exploration. Private actors are in an advantageous position to avoid the strings attached to national appropriation and receive approval on a globally accepted and legitimate basis if they can substantiate to what extent their undertakings reflect the common interest for the benefit of mankind. Advocating the reconciliation of economic and social benefits is in their self-interest.

The situation can be analogized to the phenomenon of globalization that lead to global markets while social deals remained largely limited to the national sphere. The United Nations Global Compact addresses this pitfall to make globalization more

sustainable. International space law in fact requires a simultaneous development of social and economic, common and exclusive interests. The Global Compact is also a suitable gateway to consider the complex issues of space exploration under a multi-stakeholder approach. A business model that adopts the notion of for-profit philanthropy can choose from the broad range of social entrepreneurship.

To live up to the aspirations of the midwives of international space law who wished "to avoid the extension of present national rivalries into this new field", the potential of the private sector to create a transnational competitive space economy based on international cooperation should be harnessed: best for business and best for mankind.

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