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TRANSFER OF TECHNOLOGY IN SPACE: CAN THE UN CONVENTION ON THE LAW OF THE SEA SERVE AS A TRAILBLAZER?

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ABSTRACT

Transfer of Technology is significant in exploration ventures therefore calls for systematic way of governing it. Space fairing nations, organisations and institutions are keen to develop mechanisms within which technology can be effectively transferred. In most cases, there exists a legal framework governing the Transfer of Technology at national and institutional levels. At the international platform, the 1967 Outer Space Treaty *inter alia* treaties and conventions governing Space Law, posses' provisions addressing Transfer of Technology in space exploration. However, the provisions, apart from being vague and fragmented, are not comprehensive enough to conclusively govern the Transfer of Technology hence considered as a hindrance to the smooth operation of Transfer of Technology in space affairs. The Law of the Sea, which shares substantial similarities with Space Law, is fairly advanced in Transfer of Technology issues in terms of the international legal framework. Part XIV 1982 UN Convention on the Law of the Sea lays down an explicit comprehensive legal regime governing Transfer of Marine of Technology that could set as a leading example, if not a starting point for the space law equivalent, aside from challenges faced by the former Convention's implementation. In lieu of the foregoing, this paper seeks to expose inhibitions to effective Transfer of Technology in space exploration caused by the scattered nature of the provisions pertaining to Transfer of Technology in the Principle Space law legal instruments. It will also highlight the benefits of establishing a harmonised, all-inclusive legal regime in this regard. The paper will borrow a leaf from the successes of systematic norms of the Law the Sea Convention in the sphere of Transfer of Technology, lessons to be learned from the failures of the Law of the Sea Convention, and problematic areas to be evaded. The final output will be a way-ahead proposal for a legal instrument and/or provisions with a comparable effect of Part XIV of the Law of the Sea Convention, specifically tailored to the peculiarities of the Transfer of Technology in International Space Law and Policy.

This paper will not focus on transfer of space technology in the exploitation of natural resources on the Moon and other celestial bodies. This is attributed to the fact that unlike mining under the Law of the Sea, there has not been any ongoing mining on the Moon and celestial bodies despite the existing prospects. In deed the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (herein Moon Agreement)[1] provides for the future establishment of regime that shall govern the natural resource exploitation of the Moon.[2]

Introduction

For many years, the transfer of technological know how to developing countries from industrial countries has been an area of controversy. The developing countries have felt that one of the reasons for their economic redundancy is attributed to the lack of adequate technology which developed countries enjoy.[3] Hence without the transfer of technology, their economies will not adequately develop. During 1970s, aware of the technological disparities, developing countries called for a New

[1] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Adopted on 5 December 1979, Opened for signature on 18 December 1979 and entered into force on 11 July 1984)

[2] Article 11 Paragraph 5, Moon Agreement states, "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible."

[3] Yuwen Li, *Transfer of Technology for Deep Sea-Bed Mining, The 1982 Law of the Sea Convention and Beyond* (Martinus Nijhoff Publishers Dordrecht Netherlands 1994). 102

International Economic Order (NIEO) which among others was centred around the debate on transfer of technology. In response to this wave the United Nations passed resolutions leading to calls and negotiations to establish an International Code of Conduct for the Transfer of Technology under the aegis of the United Nations Conference on Trade and Development (UNICTAD).[4] However, with the shift of global economic philosophy, the calls for NIEO dwindled thus the proposed International Code of Conduct for the Transfer of technology did not materialise.[5]

The developed countries, in order to protect their right of inventions have embraced intellectual property rights which, as sometimes been perceived a constraint to the smooth transfer of technology. With respect to the divergent views of both developing and developed nations, efforts have been geared towards achieving a win-win situation for both the parties. The United Nations though its agencies, like United Nations Institute for Training and Research (UNITAR),[6] United Nations Industrial Development Organisation (UNIDO), United Nations Institute for Disarmament Research (UNIDIR), the World Intellectual Property Organization (WIPO) among others have initiated mechanisms through which transfer of technology can be channelled. Both developed and developing countries have been encouraged to cooperate through bilateral and multilateral agreements in order to pursue the transfer of technology.

The above described state of affairs is not in any way different in the transfer of space technology. Proliferation of private and commercial activities in space, the shift to dual use of space and increased focus on civilian application has definitely enhanced the development of technology and therefore the question regarding effective transfer of technology still remains. Entrepreneurial space companies are changing the entire focus of commercial space exploitation: industries that were once limited to satellite telecommunications are advancing into investing into space transportation, personal (tourism) spaceflight, earth-orbit logistics, and resource recovery.

Nevertheless, cessation of the NIEO debates neither discouraged the drafters of Law of the Sea from incorporating clauses relating to transfer of marine technology into United Nations Law of the Sea Convention (herein UNCLOS),[7] nor deterred the international community from pursuing their goals of transfer of technology. Indeed the Law of the Sea has emerged as an exemplary the branch of international law with a well streamlined regime governing transfer of marine technology.

Legal Framework Governing Transfer of Marine Technology under the United Nations Law of the Sea Convention Part XIV et al

UNCLOS deals with transfer of marine technology in four different parts. The first part governs the Sea Bed regime in Section 5 of the Annex to the Agreement relating to the implementation of Part XI. The section exhaustively deals with transfer of marine technology for mining in the international sea bed area. It provides that anyone engaging in mining the international sea bed area has the obligation to help facilitate the acquisition of seabed mining technology by the enterprise and/or developing countries. The Sea Bed Authority (herein SBA) is required[8] to train nationals of developing countries, avail technical documentation on sea bed mining to developing countries and assist the latter in acquisition of sea bed mining technology.

Secondly, pursuant to the UNCLOS, a State may impose conditions for transfer of technology on vessels of other States wishing to fish within its Exclusive Economic Zone (EEZ).[9] Such conditions, normally contained in bilateral agreements,

[4] UNGA Res 3201 (S VI) and 3202 (S VI) (1 May 1974).

[5] R.R. Churchill and A.V. Lowe, *The Law of the Sea* (3rd Ed. Juris Publishing Manchester 1999) 417.

[6] In 1984 UNITAR report to the UN Secretary General recommended two main strategies to reach the objective that all States especially developing countries benefit from modern science and technology. UN. Doc A/39/504/Add.1, 1984, p86.

[7] United Nations Convention on Law of the Sea (Opened for signature on 10 December 1982 and entered into force on 16 November 1994).

[8] Article 144 and 274 UNCLOS.

[9] Article 62 UNCLOS.

may include the requirement to train personnel and transfer the fishing technology.[10]

Thirdly, in order to promote transfer of technology under UNCLOS, States are required directly or through international organisations, to promote programmes of scientific, educational, technical and other assistance to developing States for the protection and preservation of marine environment and the prevention of marine pollution.[11] This may include, training of scientific and technical personnel, supply of equipment and facilities, enhancing the capacity of developing States to manufacture the said equipment and the development of research, monitoring and education programmes.

Finally, UNCLOS in Part XIV provides for an in-depth of the general parameters of the development and transfer of marine technology[12] as hereunder detailed:

Part XIV UNCLOS - Development and Transfer of Marine Technology

Key Issues

Sections 1 of the Chapter provides for the general provisions of the transfer of technology including:

a. Promotion of the development and transfer of marine technology.[13]
b. Protection of legitimate interests[14] with due regard for all the rights and duties of holders, suppliers and recipients of marine technology.
c. Basic objectives and the measures to achieve the latter objectives.[15] For example promotion of the acquisition, evaluation and dissemination of marine technological knowledge, development of human resources through training and education of nationals of developing international cooperation at all levels. The measures provided for achievement of goals include; establishing programmes of technical cooperation for the effective transfer of all kinds of marine technology to State; promote favourable conditions for the conclusion of agreements, contracts and other similar arrangements, under equitable and reasonable conditions among others.

Section 2 explicitly deals with international cooperation where upon it sets explicit parameters under which the international cooperation shall be carried out to achieve transfer of marine technology. The issues addressed under this docket are:

Ways and means of international cooperation.[16] UNCLOS stipulates that transfer of marine technology shall be carried out through existing bilateral, regional, multilateral programmes, expanded and new programmes.

a. *Guidelines, criteria and standards*[17] for transfer of marine technology to established directly through States or through competent international organizations on a bilateral basis or within the framework of international organizations and other fora.
b. *Coordination of international programmes.*[18] According to UNCLOS, it is the responsibility of the States to ensure that competent international organizations coordinate their activities, including any regional or global programmes.
c. *Cooperation with international organizations and the SBA*[19] to encourage and facilitate the transfer of skills and marine technology to developing States, their nationals and the enterprise with regard to activities in the Area.
d. *Objectives of the SBA*[20] in addition to cooperation are laid down by the UNCLOS. The SBA, with regard to activities in the Area, on principle of equitable distribution, taking into account the needs of the developing countries developing States shall among other objectives:
   - Ensure that nationals of developing States shall be taken for training as members of the managerial, research and

[10] For Instance the Fisheries Agreements with Senegal (1979) and Guinea –Bissau (1980).
See J.E Carroz and M.J. Savini, 'The new International Law of Fisheries emerging from bilateral agreements' 3 Marine policy 79 (1979) 88-91.
[11] Article 202 UNCLOS.
[12] Part XIV UNCLOS.
[13] Article 266 UNCLOS.
[14] Article 267 UNCLOS.
[15] Articles 268 and 269 UNCLOS.
[16] Article 270 UNCLOS.
[17] Ibid., Article 271.
[18] Ibid., Article 272.
[19] Ibid., Article 273.
[20] Ibid., Article 274.

technical staff constituted for its undertakings.

- Ensure that the technical documentation on the relevant equipment, machinery, devices and processes is made available to all States.
- Facilitate the acquisition of technical assistance in the field of marine technology, necessary skills and know-how by States which may need and request through any financial arrangements provided for by the UNCLOS.

Section 3 concerns mainly the implementation aspects and provides for establishment[21] and strengthening of existing national and regional marine scientific and technological centres particularly in developing coastal States through competent international organizations and the SBA. The primary goal of establishing national and regional technological centres is to stimulate and advance the conduct of marine scientific research by developing and enhancing their national capabilities to utilize and preserve their marine resources for their economic benefit.[22] It also includes giving adequate support so as to provide advanced training facilities and necessary equipment, skills and know-how as well as technical experts to such States which may need and request such assistance.

The UNCLOS Convention stipulates that all States of a region shall cooperate with the regional centres therein to ensure the more effective achievement of their objectives.[23] Functions of the regional centres include[24] training and educational programmes on aspects of marine scientific and technological research, management studies, protection and preservation of the marine environment. The regional centres are have a task of organising regional conferences, seminars and symposia, acquisition and processing of marine scientific and technological data and information. They are required to disseminate of results of marine scientific and technological research. Besides that, they have a duty to conduct and create awareness programmes on national policies with regard to the transfer of marine technology and systematic comparative study of those policies, compile and systematize information on the marketing of technology on contracts. Other responsibilities include arrangements concerning patents and technical cooperation with other States of the region.

Section 4 focuses on the cooperation among international organizations.[25] Its provisions charge the international organizations referred in the UNCLOS[26] with the obligation of taking all appropriate measures to ensure, either directly or in close cooperation among themselves and effective discharge of their functions and responsibilities.

Although the UNCLOS is quite comprehensive, there still remain controversial issues that pose as hiccups in its implementation that the next part addresses in greater detail.

Constraints of Transfer of Marine Technology Regime UNCLOS

1. Lack of Concrete Legal Obligations

Part XIV details the transfer of marine technology and provides for the channels to be followed to effect the transfer. Nonetheless, a deeper analysis reveals lack of concrete legal obligations. It has been said to take the form of a number of *pacta de contrahendo* obligations largely explained by the novelty of the subject and the opposition of developed States to precise commitment.[27] The provisions only establish guidelines and standards of conduct.[28]Effectiveness of the provisions depends on the action taken by international organisations as envisioned by UNCLOS.[29] Even so, international organisations such as Food and Agriculture Organisation (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO) and

[21] Article 275 UNCLOS.
[22] Article 275 (1) and 276 (1) UNCLOS.
[23] Article 276 (2) UNCLOS.
[24] Article 277 UNCLOS.
[25] Ibid., Article 278.
[26] Part XIII and Part XIV UNCLOS.
[27] M.H. Nordquist (Ed), *United Nations Convention on the Law of the Sea. A Commentary* (Dordrecht Nijhoff), Vol. 1 IV, 1991, p. 669.
[28] Boleslaw A. Boczek, *The transfer of marine technology to developing nations in international law* (University of Hawaii 1982) 11-12.
[29] Ibid., Churchill 418.

International Maritime Organisation (IMO) have been involved for decades in the transfer of marine technology to developing countries in aspects of fisheries technology, technical assistance in shipping and assisting of training maritime personnel respectively.[30]

2. Lack of Commitment by Trans-National Corporations (TNCs)

The commercial channels of transfer of marine technology involve bilateral agreements for scientific and technological corporation or by TNCs through investment in foreign subsidiaries, joint ventures, technical assistance agreements and licensing arrangements. The activities of TNCs have been viewed as controversial because of their control of patents, methods of manufacture and the elusive nature of package transfers which increases the cost of technology.[31] In many circumstances, they have taken advantage of the weak positions of purchasers of marine technology (mostly developing countries) during negotiations.[32]

3. Other ambiguities

There exist ambiguities that need to be subject to further interpretation. One example is the use of the word 'State' in some of the provisions of UNCLOS. For example Article 144 UNCLOS, the SBA and State Parties should cooperate in promoting the transfer of marine technology. This raises the question as to whether it can be construed to mean States that are not party to the UNCLOS or should it be automatically be interpreted mean States Parties to the Convention.[33] The legal connotation and implications of ubiquitous phrases such '...legitimate interest including *inter alia,* the rights and duties of holders, suppliers and recipients of technology' needs to be re-examined. Albeit the clarity of the phrase, it still raises serious legal questions such as the definition of legitimate interests or of the criteria determine the former.

[30] Ibid. Churchill.

[31] To curb the elusive practice of TNCs some developing countries enact laws and policies directly regulating transfer of technology contracts. Some incorporate special transfer of technology provisions into their industrial property laws and/or general investment policies of the government.

[32] Ibid., Yuwen Li, 122.

[33] Ibid., Yuwen Li. 162.

Transfer of Space Technology

During the early years of space exploration, the players in space sphere were the world super powers: the United States of America and the former Soviet Union. Nonetheless, involvement of more States and the use of space for the benefit for all had already been envisioned by the international community through the adoption of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Herein the Outer Space Treaty).[34] Its Article XIII states:

"*...the provisions of this Treaty shall apply to the activities of State Parties to the Treaty in the exploration and use of outer space ... carried out by a single State Party to the Treaty or jointly with other States, including cases where they are carried out within the framework of international intergovernmental organizations.*"

Not only have the space faring nations increased but other entities have joined. Furthermore, there is a paradigm shift from the classical involvement of States to participation of private companies, commercial institutions, intergovernmental organisations and agencies. This dynamism has been demonstrated through joint ventures like the "Sea-Launch Project,"[35] which involved four States (Norway, the Russian Federation, Ukraine, and the United States of America) international organisations such as the former International Telecommunication Satellite Organization (INTELSAT currently ITSO); the former International Mobile Satellite Organization (INMARSAT currently IMSO); the European Telecommunication Satellite Organization (EUTELSAT).[36]

[34] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (adopted on 19 December 1966,opened for signature on 27 January 1967, entered into force on 10 October 1967).

[35] Sea Launch Project http://www.boeing.com/special/sea-launch/ last accessed 23 August 2007

[36] Álvaro Fabricio dos Santos 'Space Law and Technological Cooperation' United Nations/ Brazil Workshop on Space Law: Dissemination and developing international and national space law the Latin American and Caribbean perspective. (June 2005).

Cooperative agreements in joint ventures between States have also become increasingly significant in space activities. Moreover, States that had been classified as developing nations, like China, Brazil, and India, have emerged as active space faring nations with great capabilities to engage in domestic, bilateral, multilateral and regional agreements. The changing aspects in the space arena have definitely led to the development of space technology. It has become imperative to assess the relevance and effectiveness of the existing legal structure on transfer of space technology.

Legal Provisions Dealing on the Transfer of Space Technology under the Current International Space Law

While UNCLOS deals with a domain where many activities have taken place for centuries, at the time of adoption of the Outer Space Treaty, a few activities had taken place in space exploration. The drafters of UNCLOS were mainly codifying norms that had been practiced over a period of time while the drafters of the Outer Space Treaty, in the words of Kerrest,[37] '...had to propose rules *de lege ferenda*, having few possibilities to refer to current practice.' He adds that '...proposed rules need a strong base, space law is very much oriented and based on ethical and moral principles.'[38] Since the rules were not customary norms, in order to gain acceptance, the drafters of the outer space treaty wrote many provisions on international cooperation giving rights to non-space faring and developing countries which still apply and influence the way in which space activities should be conducted in addition to transfer of space technology.[39]

Relevant Legal Provisions

As mentioned earlier, unlike UNCLOS that dedicates a whole part on transfer of marine technology, transfer of space technology is not directly addressed by the Magna Carta of Space, the Outer Space Treaty. There is seldom an express provision that provides for space technology in the Outer Space Treaty. Nevertheless, provisions although scattered can be mapped out in the space law treaties.

Article I the Outer Space Treaty states that '....the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development.'"[40] The reference to the "degree of economic or scientific development" of the countries indicates not only non space faring countries but also developing countries.[41]

The 'Non-Appropriation' principle[42] guarantees all States access to space by prohibiting space faring States to appropriate outer space and celestial bodies by any means.[43] Although not directly related to transfer of technology it provides a base through which all States can use space for their interest and benefit within which transfer of space technology stems.

'International Cooperation' embedded in UN Charter,[44] which today is considered a legal obligation,[45] forms the bedrock and one of the channels of space technology transfer. This principle is ubiquitous in most of the space treaties. It stresses the obligation to enter into cooperation in order to achieve the goals envisaged in the treaties. Article I the Outer Space Treaty affirms that "States shall facilitate and encourage international co-operation in such [scientific] investigation." Article IX sets important obligations in favour of all States, providing that activities "...shall be guided by the principle of co-operation and mutual assistance" and "with due regard to the corresponding interests of all other States

[37] Comment by Armel Kerrest on Álvaro Fabricio dos Santos 'Space Law and Technological Cooperation' United Nations/Brazil Workshop on Space Law: Dissemination and developing international and national space law the Latin American and Caribbean perspective. (June 2005).

[38] Ibid. Kerrest.

[39] Ibid Kerrest.

[40] Article I, Outer Space Treaty.

[41] Ibid., Kerrest.

[42] Article II Outer Space Treaty.

[43] Article II Outer Space Treaty.

[44] Articles 1-3 United Nations Charter 1945 'to achieve international cooperation in solving international problems of an economic social, cultural or humanitarian character...'

[45] Dra Marta Gaggero Montaner, 'Law and Ethics of Space Activities in the New Millennium' Proceedings of the Forty-third Colloquium on the Law of Outer Space. International Institute of Space Law of the International Astronomical Federation (2-6 October 2000) Rio De Janeiro, Brazil IAAA 108.

Parties to the Treaty." Articles X and XI also recognize the right to observe the flight of space objects and to be informed about these activities.

In other legal instruments, for example the Principles Relating to Remote Sensing of the Earth from Outer Space (herein Principles on Remote Sensing),[46] international cooperation is synonym to most State obligations on remote sensing in space. Pursuant to the Principles V, VI, VII and XII, sensed States enjoy the access to primary and processed data "on a non discriminatory basis and on reasonable cost terms." Principle XIII considers the obligation of States carrying out remote sensing to enter into consultations with sensed States especially developing countries, "...in order to make available opportunities for participation and enhance the mutual benefits to be derived there from'.

However, the principles having been adopted by way of a General Assembly Resolution do not carry the weight of a binding treaty. This has been seen as legal lacuna on enforcing the obligation to cooperate.[47] In words of Kerrest, "it brings in the distinction between *pactum de contrahendo*, namely the obligation to conclude agreements, and *pactum de negotiando*, which is the obligation to negotiate future agreements."

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 (the Declaration on International Cooperation), also a General Assembly Resolution,[48] reflects the current aspirations of States with respect to international cooperation, in particular when fostering the development of relevant and appropriate space capacities.

The Declaration refers to joint action of both the developed and developing States for the benefit and interests of all States whatever their degree of economic, social scientific or technical development, for the concern of mankind. The phrase, '...for the Benefit and in the Interest of all States, taking into particular account the Needs of Developing Countries' also embedded in many provisions of the space law treaties, is significant for the transfer of technology.

This Declaration seeks to ensure that developing States can benefit from the development of space technology. However, the Declaration on International Cooperation only sets general parameters which can be applicable transfer of space technology. It neither deals with transfer of space technology comprehensively nor sets concrete legal obligations appertaining to such process. It still faces the constraints long experienced in other international instruments that govern transfer of technology. It addresses intellectual property rights, but fails to mention new legal issues surrounding transfer of technology.[49]

Paragraph 5 of the Declaration on International Cooperation States:

'*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. 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.*'

Although the content is clearly understood, the deliberate use of words, like 'mutual acceptable basis', leaves it with vague and hollow meaning. The provision is drafted in away that States can cooperate without necessarily committing themselves to the transfer of space technology. It also increases the vulnerability of countries with low negotiating powers to restrictions of TNCs and other commercial purchasers of space technology.

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[46] United Nations Principles Relating to Remote Sensing of the Earth from Outer Space (Adopted 3 December 1986).

[47] Ibid., Kerrest

[48] 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 on 13 December 1996).

[49] Tulio Ortiz Cetra 'Reflections on Technology, Globalisation and International Space Law' Proceedings of the Forty-third Colloquium on the Law of Outer Space. International Institute of Space Law of the International Astronomical Federation (2-6 October 2000) Rio De Janeiro, Brazil IAAA 69.

In practice however, despite that lack of a comprehensive legal framework on transfer of space technology, transfer of space technology has been affected through the aforesaid provisions and other channels. States, especially developing countries, have been able to benefit from the fruits of space technology under the recommendations of United Nations Conferences on the Exploration and Peaceful Uses of Outer Space (UNISPACE). As an example, the UNISPACE 82[50] recommended that the United Nations Office of Outer Space Affairs' Space Applications should focus its attention, *inter alia,* on the development of indigenous capabilities in space science and technology at the local level. That recommendation was endorsed by the United Nations General Assembly in its resolution 37/90 of 10 December 1982.[51] This culminated into the establishment of five Regional Centres for Space Science and Technology Education institutions in each region covered by the United Nations Economic Commissions: Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia.[52] These institutions have been instrumental in the transfer of space technology especially through training of personnel from developing countries.

Non-commercial channel of transfer of technology, particularly training, research assistance and information dissemination is considered most beneficial for developing countries. In space technology,[53] the commercial of transfer of technology is equally important. This is for the reason that space exploration unlike the sea, is a relatively young field and therefore thrives on innovation advanced by the proliferation of private and commercial entities which are more likely to transfer the technology in commercial ways. Thus if the developing nations would like to bridge the discrepancies it is vital that they then to embrace the transfer of technology in both commercial and non commercial ways.

Selected Legal Problems Facing Transfer of Space Technology

1. Fragmented nature and inadequacy of the relevant legal provisions

Drawing from the above discussion, it is apparent the there is no express provision addressing transfer of space technology. The Outer Space Treaty does not exhaustively capture transfer of space technology. Relevant provisions have to be subjected to critical interpretation in order derive a legal effect of transfer of space technology. There is no harmony whatsoever in the provisions. It takes criss-crossing of the entire treaty and other legal documents to identify the provisions since they are scattered in all the space law instruments.

2. Vagueness of the legal provisions on transfer of space technology

The few provisions in the space law legal instruments make it difficult for countries to decide if they can be interpreted in the context of transfer of technology or just cooperation. For instance, Principle V of the Principles on Remote Sensing dealing with international cooperation and participation of the sensed State in remote sensing activities is restricted by the words "such participation shall be based in each case on equitable and mutually accepted terms". This implies that cooperation will be dependent on the will of the countries carrying out the activity. In addition, it has been observed[54] that the obligation of international cooperation in Principles V and VII of the Principles on Remote Sensing is not easy to interpret and in practice it amounts to an

[50] The second United Nations Conference on the Exploration and Peaceful Uses of Outer.
Space (UNISPACE 82), held in Vienna, Austria in 1982.

[51] The General Assembly (GA), in its resolution 45/72 (December 1990), endorsed the recommendation of the Working Group of the whole of the Scientific and Technical Subcommittee, as approved by the Committee on the Peaceful Uses of Outer Space (COPUOS), that: "...the United Nations should lead, with the active support of its specialized agencies and other international organizations, an international effort to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries."

[52] United Nations Office for Outer Space Affairs (UNOOSA)http://www.unoosa.org/oosa/en/SAP/centres/index.html last accessed 30 August 2007.

[53] Ibid., Yuwen Li. 122.

[54] Ibid., Álvaro Fabricio dos Santos.

obligation to negotiate but not necessarily to reach agreement.

Another outstanding significant question is the meaning of the term "reasonable costs" entrenched in Principle XII Principles on Remote Sensing. The provision is not explicit thus left for the interpretation with the ensuing uncertainties involved. This attracts questions for instance '...does the "reasonable cost" requirement refer to the market value? Should the term "reasonable" be applied having in mind the possibilities of developing countries?"[55] If not, the advantages recognized by sensing States to developing countries would be meaningless. The expression "taking due account of the needs and interests of developing countries" in that same Principle would be useful - albeit rather vague - to argue in favour of the developing world.[56]

3. Ambiguity in legal provisions on transfer of space technology

Most of the provisions on transfer of space technology as indicated earlier, are open to wider interpretation hence not easy to enforce. For example Principle XII of the Principles on Remote Sensing talks about '...non-discriminatory basis and on reasonable cost...' These terms are open ended and lack the criteria for determining the degree of reasonableness and deciding whether an act or omission is discriminatory or not or if the cost place is reasonable or not.

4. Lack of enforcement mechanisms in international law

Even though the lack of enforcement mechanism is a general constraint of international law, it greatly affects the transfer of space technology which sometimes relies on the willingness of the owners of technology. There is no mechanism to verify compliance with international treaties. It falls back to the question of ethics which are known to have declined today.

5. Legal problems arising from international cooperation.

Whereas under space law, every State can participate in space activities through cooperation, some countries have been reluctant to enter cooperative agreements because of the legal implications that may ensue. For instance, a State my through cooperation be subjected to the jurisdiction of another State and may become responsible for a "national activity" pursuant to Article VI of the Outer Space Treaty. Unless otherwise agreed upon, the said provision may permit the former State to continually supervise this activity of the latter State. As Article VI clearly declares, this responsibility exists if the State conducts the activity through its governmental agency, but also if it's private entities do so.[57]

6. Problems associated with export control of Space technologies.

The current international political climate in regard to export of space technology does not favour liberalisation and transfer of space technology and other exports. Major defence companies of industrialized countries are merging to sustain their competitiveness. For the latter reason, fear of issues of terrorism and use of the technology *mala fides* for other purpose like development of Weapons of Mass Destruction (WMD), countries and institutions have often placed export control mechanisms on transfer of space technology. This has sometimes influenced the decisions and resolutions of the United Nations leading to passing of sanctions that could be detrimental to effective transfer of space technology.[58] Other existing export control regimes continue to slow the transfer of space technology. The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (herein referred as Wassenaar Arrangement)[59] designed to

[55] Ibid. Kerrest.

[56] Ibid.

[57] Ibid. Kerrest.

[58] Amal Rakibi, 'Export Control and dual use of Space technologies' Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space. International Institute of Space Law of the International Astronomical Federation (17-21 October 2005) Fukuoka, Japan IAAA.

[59] The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods Technologies (established on 19 December 1995, came into force 1996) The Hague - Netherlands, (Wassenaar Arrangement).

promote transparency, exchange of views and information and greater responsibility arms and dual-use goods and technologies with an aim of preventing destabilising accumulation. It should however be cautiously applied to ensure that transfer of space technology is not impeded. Great caution should be exercised when placing restriction to countries that have demonstrated a good intention for the requested technology. The Missile Technology Control Regime[60] though informal and voluntary without legal enforce has great implication for transfer of space technology. The International Traffic in Arms Regulations (ITAR), a set of United States's government regulations that control the export and import of defence-related articles and services, not only serves as a barrier to US trade, science ability to compete but has substantial negative effects to transfer of technology.[61]

7. Budgetary limitations, lack of the political will and prioritisation.

Transfer of space technology especially through commercial channels often requires large financial sums. On the one hand, most developing countries, the main purchasers of technology, do not have exclusive budgetary allocations from their national budgets therefore rely on external revenue to finance the purchase technology. In addition, some developing countries due to low economic status have other priorities than transfer of space technology. On the other hand, the owners of space technology unwilling to compromise their profits may be reluctant to enter into transfer of space technology agreements. Since developing countries are susceptible to low negotiation powers, the owners may rise their stakes hence discourage the purchasers.

Way Forward

Having examined the two regimes, the transfer of marine and technology transfer of space technology, it goes with no say that the regime in UNCLOS is advanced compared to the regime under the Outer Space Treaty and the related space law instruments. Finding a feasible and effective solution is to transfer of space technology key as hereunder recommended.

1. New Comprehensive Space Treaty encompassing transfer of space technology exhaustively.

The principal Space Treaty - the Outer Space Treaty - has been facing a lot of criticism for lacking capacity to deal with the new emerging trends owing to its enactment at a time when the players were few in sphere of space. Observed, is the question of the legal value of the Outer Space Treaty because it was adopted at the time when national security and maintenance of peace were the ultimate desire of most countries. Today however, the use of space has taken additional dimensions. In light of this, it has been suggested by many scholars that a new comprehensive legal frame work should be developed to encompass the current state of affairs. Transfer of space technology will greatly benefit in the event the international community considers this approach. A new Treaty could offer a chance to draw concrete legal regime governing space technology. This approach is however prone to be the longest drawing from the practice of the international space community in space law making process.

2. Amend the current Outer Space Treaty to include concrete provisions transfer on space technology exhaustively.

If the international Community considers that transfer of space technology is a matter of priority, a possible solution would be to amend the Outer Space Treaty to incorporate solid provisions governing the transfer of space technology. This might however face opposition as there are many other issues surrounding transfer of technology that might need to be resolved. Keeping in mind that the participation of private entities in space activities is constantly growing, it seems opportune to have a fresh discussion on the international cooperation in relation to transfer of Space technology with a view of identifying gaps

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[60] The Missile Technology Control Regime http://www.mtcr.info/english/index.html last accessed 30 Aug 2007

[61] US Department of State, Directorate of Defense Trade Controls, International Traffic in Arms Regulations(ITAR)http://www.pmddtc.state.gov/reference.htm last accessed 30 August 2007.

and providing interpretation criteria that affects transfer of space technology.

3. Protocol to the Outer Space Treaty relating to transfer of space technology

This sounds to be the most feasible and most effective way of dealing with transfer of space technology. There are precedents on the use of Protocols to either fill gaps where an important legal issue had not been addressed in the main treaty extend the mandate of a Treaty.[62] The proposed protocol should be able to clarify, detail and develop the existing provisions and elaborate new ones, if necessary. This is in order to create a contemporary and effective legal instrument regulating the international use of the most advanced space technology and its transfer for the benefit of all nations and, thereby, harmonizing the legitimate rights and interests of the proprietor and recipients of space technology.

4. Repeal the Declaration on International Cooperation and accord it treaty status

The Declaration on International Cooperation passed by resolution could be repealed and fleshed up with express legal provisions dealing with transfer of space technology. It would also help to encourage the international space community to improve is legal weight by passing it as treaty with enforceable legal provisions on transfer of space technology. However, it is apparent that current trend demonstrates that the international space community prefers to pass non-binding instruments to treaties. So far, the last proper space law treaty was passed by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPOUS) in 1979 (the Moon Agreement). Since then, most of the space related instruments passed have been through Resolutions of the General Assembly which are by nature non-binding legal documents.[63] Taking this into consideration, convincing States to pass the Declaration on international Cooperation as a treaty might be certainly be an arduous task but nonetheless possible through proper lobbying.

5. International Code of Conduct for the transfer of space technology

Although this idea might sound like reviving an extinct volcano, decades after the calls for a code of conduct were abandoned, not much progress has changed in the behaviour of States towards the transfer of technology. For space technology it is prudent to initiate a debate that would encourage or develop a strong ethical relationship that embraces international cooperation and guarantees the transfer of space technology. There also a need to place an incentive to encourage the countries to pursue such a code of conduct.

Conclusion

It is a fact that transfer of space technology is ongoing under existing legal framework. Conversely, vital space technology is increasingly invented every day. Times have changed and space has become a part of our daily lives. As States, private and commercial entities continue to develop technology the quest for its transfer is also growing. To embrace these developments, even the legal regime governing space technology needs to be updated. In the words of Dra Marta GaggeroMontaner '...scientific technological activities cannot continue developing without legal rules."[64] These words are an attestation to the utterance of former Judge Manfred Lachs who stated that "pacific Cooperation is possible only if States submit themselves to the rule in all its dimensions." That should be the case in the transfer of space technology. There is truly a need for establishing a comprehensive, harmonised, all-inclusive legal regime to govern transfer of the growing space technology. The Law of the Sea regime on the transfer of marine technology indeed offers a precedent to be used by the space law equivalent.

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[62] When the 1951 United Nations Convention Relating to the Status of Refugees exhausted its mandate 1967 Protocol Relating to the Status of Refugees was passed to extend its mandate to date.

[63] Even the most recent IADC Space Debris Mitigation Guidelines were endorsed UNCOPOUS the plenary session June 2007 shall be non binding in nature, in fact voluntary if passed by the General Assembly in December 2007. Report of the Committee on the Peaceful Uses of Outer Space, Sixty-second session (Supplement No. 20 A/62/20) http://www.unoosa.org/pdf/gadocs/A_62_20E.pdf last accessed 24 August 2007.

[64] Ibid., Dra Marta Gaggero Montaner 108.