enacted the Framework Act on Low Carbon, Green Growth in 2009, which became effective in January 2010.[86]

Salient points of the Act are:

- Establish National Strategy for Low Carbon, Green Growth (Art. 9)
- Set-up Presidential Committee on Green Growth under the control of the President to deliberate on the basic direction for policies (Art. 14 & 15)
- Establish and support companies for investment in green industries (Art. 29)
- Establish and implement basic plan for coping with the climate change (Art. 40) and for energy (Art. 41)
- Medium and long-term target to cut GHG (Art. 42)
- Each entity emitting GHG or consuming energy above certain level to report annually to government (Art. 44)
- Establish information management system for GHG (Art. 45)
- Cap and trade system to be provided by another forthcoming act (Art. 46)
- Management of GHG in traffic sector (Art. 47)[87]

2. Enforcement Decree of the Framework Act

The Enforcement Decree is designed to address matters delegated by the Act and matters necessary for enforcement, including establishing a central and local action plans. The Decree, effective April 2010, prescribes the implementation date from April 2011 to allow preparation time for the concerned entities. Its major points are:

- Set up mid-term target for GHG reduction at the level of 30% below the business-as-usual projection by 2020 (Art. 25)
- GHG management system under overall control of Ministry of Environment in coordination with national and business GHG inventory (Art. 26 through 36)

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[86] Framework Act on Low Carbon, Green Growth, *supra* note 41.

[87] *Id.*

- Entities emitting GHG or consuming energy above certain level designated as controlled entities (Art. 29) to be made public in September 2010 with wider application from January 2012 and January 2014 respectively
- Controlled when entity emits 125,000 (87.5K from 1 Jan. 2012, 50K from 1 Jan. 2014) tons of CO_2 equivalent[88] or over or the entity consumes 500 (350 from Jan. 2012, 200 from Jan. 2014) terajoules[89] or over for last three years until 2011
- Place of business designated controlled entity emitting annually 25K (20K from Jan. 2012, 15K from Jan. 2014) tons of CO_2 equivalent or over or when consumes 100 (90 from Jan. 2112, 80 from Jan. 2014) terajoules or over until the end of 2011[90]

With the above measures to be taken through the final year, 2014, 70% of the national emissions and 90% of the emissions produced by the industries are expected to be covered. As either the source of GHG emissions or as entities consuming energy, airlines are covered either way as controlled entities. When applying the criteria specified in the Decree, major airlines in Korea, i.e. the Korean Air and the Asiana Airlines, are to be designated controlled entities while the low cost carriers, all four of them (Air Busan, Jeju Air, Jin Air, Eastar Jet), are to be excluded.

3. Voluntary measures to reduce GHG in industries not targeted

The Traffic sector, which includes automobiles, trains, airplanes, and vessels, is to be regulated some time in the future by the Minister of Land, Transport, and Maritime Affairs (MLTM).[91] However, without foreseen schedules, aviation, rail,

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[88] Twenty-five tons of CO_2 equivalent emissions require the burning of twenty-two tons of fuel oil every day.

[89] 100 terajoules' consumption is equal to about 2,400 tons of oil equivalent.

[90] Enforcement Decree of the Framework Act on Low Carbon, Green Growth, *supra* note 42.

[91] Framework Act on Low Carbon, Green Growth, *supra* note 41, at art. 53(1); Enforcement Decree of the Framework Act on Low Carbon, Green Growth, *supra* note 42, at art. 41.

and sea transport are certain industries not specifically targeted by the above laws unless they are emitting or consuming significantly. The only industry-specific target in the traffic sector is car manufacturing which is regulated either by fuel efficiency or allowable exhaust emissions or both.[92]

Another relevant law is the Sustainable Transport and Logistics Act.[93] It aims to reduce emissions from different platforms of transportation (Art. 34) in accordance with the UNFCCC and thereby establishes a balanced and efficient liaison system between different means of transportation (Art. 16). As another means of reducing GHG, it purports to increase maximum use of the public transportation (Art. 23) and develop environmentally friendly transportation and energy-saving systems (Arts. 26 to 33).

In order to encourage voluntary GHG reduction in the airlines industry, in January 2010, MLTM provided a Directive to Manage Voluntary Memorandum of Understanding between his Ministry and airline operators to facilitate CO_2 reduction in the aviation sector. Based upon the Directive, each of the two major airlines in Korea is expected to sign the MOU sometime in July 2010. Consequently, the two airlines are subject to two different regimes in reducing GHGs: one regime is obligatory according to the Enforcement Decree to be implemented in April 2011, and another one is voluntary with an expected conclusion of MOU thereto in July.

Although the obligatory one is to be borne together with other GHG emitters or energy consumers regardless of type of industry, the voluntary one is unique in that it applies only to the airline industry. The only plausible explanation of such measures is none other than the forthcoming implementation of the EU Directive 2008/101/EC. In fact, the Korean government is encouraging its airlines to adapt to the EU Directive, rather than dealing with the case from the point of protecting its airlines, if not to assist them.

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[92] Enforcement Decree, *supra* note 42, at art. 37.

[93] Sustainable Transport and Logistics Act, enacted June 2009 with Legislative Act No. 9777.

Consequently, the EU, after awakening the Korean leaders to the importance of environmentally friendly policies, justified, with its Directive, the Korean aviation authorities to deal with the emissions reduction issues unopposed by the national airlines. The ripple effect of the EU on the Korean policies and measures played to the advantage of the Korean government at the burden of the private airlines industry.

Korean Air and Asiana Airlines have already set up their plans against climate change. Plans of Korean Air include purchase of high efficiency airplanes, development of alternative fuels, short ground waiting time, improvement of ground facility, etc., while those of Asiana Airlines includes maintaining high efficiency airplane engines, proactive recycling, low carbon offset program, clear cabin, environmental training, etc.. Notwithstanding, there are many overlapping measures in both airlines.

Fortunately there is more than one national flag carrier so that MLTM can put up incentives for airlines that will faithfully observe the MOU to be introduced in July. The incentives are awarding citation, which in itself is not attractive, but is effective when applied with the credit attached to the award that will be taken into account in allocating new air routes, applying reduced landing and take-off charges for highly efficient airplanes, and lastly tax and financial incentives to be considered in consultation with the relevant ministries.

Policy measures are also envisaged to reduce GHG applicable to each and different aviation industry. They include constructing green airport[94] and aviation transport infrastructure, air traffic management (ATM) like procedure of continuous descent approach (CDA), development of short airway, and market based measures of emissions trading system (ETS) to be introduced by another critical Act in the second half of 2010. Cap and

[94] In Korea there are 15 airports, half of them serving as international airports. The biggest one, the Incheon International Airport, entry gate to Seoul and selected recently as the best airport in the world by the Airports Council International (ACI) for the fifth consecutive year, is managed separately. One big airport to be located in the south-eastern part of South Korea is in the pipeline.

trade system is not expected however to cover the air industry at the initial phase.

Unless the ETS is introduced and applied to the airlines industry, the voluntary measures to reduce GHG have limitations, which may be less critical because of culture differences in Asia from that of the Western world. Normally, Directives, though not in the form of legislation but a convenient and efficient form of policy undertaking of the relevant authorities, have been attended well by the concerned businesses. But the limitation lies where there is no comprehensive and consistent regulation because the Directives may be at the whim of the ruling elite of the government at the time, which is likely to be prone to change for no serious reasons.

VI. CONCLUSIONS

As is often said, noise abatement is of the local concern, while the emissions of greenhouse gases are of the global concern. This global matter has been successfully dealt with so far despite the boycott of the USA, the biggest player of the world. Now that the EU plans to expand the existing GHG cap and trade system to the emissions of aircraft operating to or from the area of the European Union from 1 January 2012 many countries outside EU are concerned with the impact of the EU regulation on their airline industries.

One recent figure suggests that the GHG from international aviation and shipping fuels account for nearly 10% of the climate problem, and are growing so rapidly that they could double or triple by 2050.[95] In dealing with the serious global issues, the relevant international inter-governmental organization, ICAO, did not fulfill its mandate entrusted to it by the Kyoto Protocol. This is in contrast with the role of the IMO, which is expected to introduce the binding rules to limit and reduce GHG from international shipping probably within two years. When

[95] European Federation for Transport and Environment, *supra*, note 63; European Federation for Transport and Environment, *Industry and NGOs say ICAO has lost control*, June 15, 2009, http://www.transportenvironment.org/News/2009/6/Industry-and-NGOs-say-Icao-has-lost-control/.

the representatives of fifteen governments comprising the Group of International Aviation and Climate Change (GIACC) agreed to a "program of action" that recommended in June 2009, ahead of the Copenhagen Conference on Climate Change held in December 2009, a "global aspirational goal" of cutting 2% per year in fuel consumption from international aircraft, NGOs said it was effectively a decision to do nothing.[96]

Here, European Union is fulfilling a role to contribute to rein in the fast growing industry in terms of GHG emissions. However, for all its good intentions, Directive 2008/101/EC has certain legal problems. Two principal points are that: one, its domestic air operation being subject to the Kyoto Protocol for obligatory reduction of GHG until 2012 is integrated in the EU scheme of cap and trade together with all other extra-EU airlines, mostly not bound by the Kyoto Protocol but operating to and from the EU, from the year 2012. This results in the unexpected premium for the European airlines, because their unilateral burden is not any more for the year of 2012, are given that much advantage compared with the four years (2008 to 2011) out of five years' implementation period (2008 to 2012) under the Kyoto Protocol. However minimal the advantage may be, this is against provisions of the Kyoto Protocol. Two, as is the critical issue in the litigation pending in the European Union, can "aviation activities" as defined in the Annex I[97] to the Directive include aviation activities in the airspace of the third countries and over the high seas or not.

The initiatives of the European Union were both taken seriously and lightly by the new government in Korea. Certainly, overall Korean reaction to the EU initiatives is positive thanks to the vision of President Lee Myung-bak, a former CEO in Korea unlike former Presidents who were mostly politicians or military leaders, for seriously recognizing the importance of the Kyoto Protocol that is best applied in Europe and its impact on

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[96] *Industry and NGOs say ICAO has lost control*, *supra* note 95.

[97] Annex I to the Directive 2008/101/EC says in its 1.(b) that "From 1 January 2012 all flights which arrive at or depart from an aerodrome situated in the territory of a Member State to which the Treaty applies shall be included." Council Directive 2008/101/EC, *supra* note 29, at Annex I, art. 1(b).

the world economy, but also, lightly though, because the concrete measures to include aviation emissions are excluded in the national regulatory scheme, unlike the EU Directive 2008/101/EC.

As seen in the above, emissions from aircraft operation will be governed on the voluntary basis with certain incentives of the government. Other than that, no meaningful guidance or assistance programs have been suggested to the Korean airliners that have to deal with the impending enforcement of EU. In this regard, Korean airliners have to fend for themselves, in an environment where their annual growth of emissions since 2005 is between 5% to 6%, implying their emissions in 2012 will be about 40% more than that of 2005, considered to be median year of the years of historical aviation emissions 2004 to 2006 on which basis the free annual allowances will be allocated at the level of 97% in 2012, and 95% each year afterwards, taking into account the actual share of emissions of total emissions in Europe in the reference year 2010 as stipulated in the EU Directive.

A sure fact is that most airlines registered in and outside the EU will have to buy emissions rights in the market, but no more than 15% of the number of allowances the aircraft operator is required to surrender can be bought in the first year 2012 while the percentage for the subsequent years shall be decided later.[98]

It is onerous for aircraft operators compared to ship operators in reducing GHG emissions when it comes to a planned reduction regime in regional scale with international application like we saw in the EU. Similarly, inside Korea only the aircraft operators are expected to observe the so-called voluntary reduction regime. Is this discrimination against the aviation industry whose emissions of GHG are less than those of the shipping industry?[99] On the other hand, the international shipping industry is likely to be subject to the emissions reduction regime in the

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[98] Council Directive 2003/87/EC, *supra*, note 52, at art. 11a.

[99] In 2000, CO_2 emissions of maritime shipping accounted for an estimated 1.8% to 3.5% of global emissions, with all aviation including international (1.5%) and domestic (1.4%) for 2.9%. JASPER FABER ET AL., *supra* note 26, at 5.

near future thanks to the continuous cooperative works undertaken in the IMO with enormous ripple effect on the regional and national planes. It looks like although the air industry is flying high with visibility on a regional scale at most, maritime industry is catching up in a wider scale for emissions reduction.

In narrowing down the scope of application to emissions reduction of airlines registered in Korea, two issues arise.

First, how effective will the voluntary measures be? Would it be more beneficial for one or both aircraft operators in Korea to be subject to an MOU for voluntary emissions reduction with the aviation authorities sometime in July 2010? Are incentives that the Korean government envisages to put up, including citation awards attractive enough to entice the airlines to bind themselves voluntarily to the MOU?

Second, will there not be any discrimination against the Korean airliners by the Korean government to take measures to reduce GHG while foreign airlines operating to Korea are not bound by any local measures to the advantage of the latter? This is more so when these foreign airlines are not operating to and from the EU.

Since the best effective measure for the airliners to reduce emissions is modernizing the fleet by substituting new aircraft for the existing ones, the critical element is for the airliners to have easy access to low cost financing. In this regard, there is not much room for the government to get involved as the purchase or lease transactions of the aircraft are undertaken by pure business considerations in the world market. The only effective incentive or penalty the Korean government can exercise is to give favorable consideration to the obedient airliner when establishing new air routes.

As regards the second issue, the Korean government seems to regard it as an inevitable but advantageous challenge for the Korean airliners ahead of the EU implementation of the emissions reduction of the aircraft from 2012. Taking into account of the eventuality that such reduction regime in EU might expand worldwide, the aircraft operators that are well prepared will certainly have the edge over others. In short, the EU measures provided for the Korean government to follow suit in a passive way. The aggressive way for the Korean government with vi-

sion, in line with the philosophy of the new government, would have been to introduce obligatory measures for aircraft operators like the one of the EU.[100] Such measures would have shown the leadership of Korea in the universal issue of environment that it is at least morally indebted to from the time it joined the OECD.

[100] While the data on the emissions of each airliner in the world is not made public, it seems that the two Korean airliners seem to be in the first group of efficiency on the list.

THE MOON AGREEMENT IN THE 21ST CENTURY: ADDRESSING ITS POTENTIAL ROLE IN THE ERA OF COMMERCIAL EXPLOITATION OF THE NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES

*Fabio Tronchetti**

I. INTRODUCTION

The beginning of the 21st century has been characterized by a renewed interest of States and private operators in the exploration of the Moon and, possibly, in the exploitation of its natural resources. In recent years, the major space powers, including the United States,[1] China,[2] India,[3] and Japan[4] have

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[1] On June 18, 2009, the United States launched the Lunar Reconnaissance Orbiter (LRO) mission, the main purpose of which is to study the physical composition of the Moon by focusing particular attention on the Polar Regions. *See Lunar Reconnaissance Orbiter*, http://lunar.gsfc.nasa.gov/mission.html (last visited Oct. 27, 2010). The LRO mission would have represented the first step in the realization of the Vision for Future Space Exploration, which was proposed by former US President George W. Bush in 2004. NAT'L AERONAUTICS & SPACE ADMIN., NP-2004-01-334-HQ, THE VISION FOR SPACE EXPLORATION iii-iv (2004), *available at* http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf. The Vision foresaw the return of astronauts on the Moon by 2020, the establishment of a permanent manned basis on the lunar surface and the use of the Moon as a basis for future space exploration. *Id*. In order to pursue the goals laid down in the Vision for Space Exploration, the United States developed the Constellation Program, which is aimed, inter alia, to build new spacecraft and booster vehicles to replace the Space Shuttle and to send astronauts back to the Moon and possibly to Mars. *See* Benjamin D. Hatch, *Dividing the Pie in the Sky: The Need for a New Lunar Resources Regime*, 24 EMORY INT'L L. REV. 229, 237-38 (2010). *See generally NASA – Constellation Main*, http://www.nasa.gov/mission_pages/constellation/main/index.html (last visited Nov. 1, 2010). Currently, however, the United States seems to have renounced these objectives. The fiscal budget allocated to NASA for the year 2011, indeed, reveals that the Obama's administration has decided to cancel the Constellation program. *See* The White House, Office of Management and Budget, National Aeronautics and Space Administration, *The Federal Budget Fiscal Year 2011*, http://www.whitehouse.gov/omb/factsheet_department_nasa/ (last visited Feb. 4, 2011),

launched robotic missions with the purpose of mapping the mineral composition of the Moon and locating the most suitable landing site for a potential return of men on the lunar surface.

Returning to the Moon is, thus, no longer a priority for the United States; instead, sending astronauts to an asteroid and then to Mars appears to be the new goals of the American space exploration program. *See* Tariq Malik, *Obama Aims to Send Astronauts to an Asteroid, Then to Mars*, Apr. 15, 2010, http://www.space.com/8222-obama-aims-send-astronauts-asteroid-mars.html.

[2] China is also very active in the field of the research and analysis of lunar resources. China's Moon exploration program consists of the following objectives: 1) analysis of the Moon's composition by satellite, Luan Enjie, *The Chang'e-1 -- Project China's Lunar Exploration Program (II)*, THE LEADING GROUP OF LUNAR ORBITING EXPLORATION PROJECT, http://www.clep.org.cn/index.asp?modelname=eng\en-news_nr&FractionNo=&titleno=News&recno=6 (last visited Oct. 27, 2010); 2) deployment of two moon rovers for surface exploration in a limited area by 2013; 3) a sample return mission by 2017, *China's Recoverable Moon Rover Expected in 2017*, CHINA DAILY, Mar. 11, 2008, http://www.chinadailycom.cn/china/2008-03/11/content_6527471.htm; 4) a manned mission by 2025-2030, SpaceDaily.com, China's Space Programme Gears Up for Missions to Moon and Mars, http://www.spacedaily.com/reports/China_Space_Programme_Gears_Up_For_Missions_To_Moon_And_Mars_999.html (last visited Nov. 1, 2010). On October 24, 2007, the first spacecraft of the programme *Chang'e*, namely *Change-1*, was launched. The purpose of *Change-1* was to study the composition and quality of the lunar resources. Change-1 mission ended in November 2009 (crashed into the Moon in March 2009, *see China's lunar probe Chang'e-1 impacts moon*, Mar. 1, 2009, http://news.xinhuanet.com/english/2009-03/01/content_10923205.htm). On October 1, 2010, China launched its second lunar robotic mission, *Chang-e 2*. *See* Paul Nash, *Lunar Dreams Inspire Tomorrow's Generation of Scientists*, GLOBAL TIMES, Oct. 11, 2010, http://opinion.globaltimes.cn/foreign-view/2010-10/580601.html.

[3] India launched its first mission to the Moon, *Chandrayaan-1*, on 22 October 2008. *Mission Sequence*, INDIAN SPACE RESEARCH ORG., http://www.isro.org/Chandrayaan/htmls/mission_sequence.htm (last visited Oct. 27, 2010). The mission was aimed at mapping the entire lunar surface, both on the near and far side, in order to get a better knowledge of the minerals contained on the Moon and to facilitate the future presence of human beings on its surface. Narendra Bhandari, *Chandrayaan-1: Science Goals*, 114 J. EARTH. SYST. SCI. 203-204 (2005), *available at* http://www.ias.ac.in/jessci/dec2005/ilc-14.pdf. The mission ended prematurely on 29 August 2009, fourteen months before its expected end, due to an abrupt malfunctioning. *ISRO's Mission Over?*, THE TIMES OF INDIA, Aug. 29, 2009, http://www.timesnow.tv/ISROs-moon-mission-over/articleshow/4325977.cms. The second Indian lunar mission, *Chandrayaan-2*, is scheduled to take place by =2013. *Chandrayaan-2 to Get Closer to Moon*, THE TIMES OF INDIA, Sept. 2, 2010, http://timesofindia.indiatimes.com/india/Chandrayaan-2-to-get-closer-to-moon/articleshow/6477808.cms. The main goal of this mission will be to land a motorized rover on the lunar surface so as to pick up samples of soils and rocks, carry out on-site chemical analysis, and send the data back to the mother spacecraft *Chandrayaan-2*, which will then transmit the data to Earth. *Id*.

[4] On 14 September 2007 Japan launched the *Selene* mission whose purpose was to analyze the Moon's history and its physical composition. *See SELenological and Engineering Explorer "KAYUGA" (SELENE)*, JAPANESE AEROSPACE EXPLORATION AGENCY, http://www.jaxa.jp/projects/sat/selene/index_e.html (last visited Nov. 3, 2010).

In this respect, China[5] and India[6] are the only two States officially pursuing the goal of sending a manned mission to the Moon in a period ranging from 2020 and 2030, while the United States seems to have renounced such a goal.[7]

This global interest in the Moon and its natural resources has opened the debate on the ability of the current space law regime to ensure the orderly and safe development of future lunar activities, particularly those aimed at exploiting the natural resources of the Moon and other celestial bodies for commercial purposes. In this respect, particular attention has to be paid to the Moon Agreement,[8] as it represents the only existing legal instrument specifically dealing with the exploration, use, and exploitation of the Moon and its natural resources.

Currently, only thirteen States, not including the spacefaring States, have ratified the Agreement.[9] While it can be reasonably argued that the very low number of ratifications is attributable to some factors external to the Agreement, such as the lack of interest of the United States and Soviet Union in carrying on with the exploration of the Moon in the 1980s and 1990s and the budgetary limits faced by State space agencies forcing them to invest resources in activities able to generate certain and immediate financial benefits (e.g., the development of telecommunication satellites), the main reason behind the failure of the Agreement is to be found in the provisions of Article 11. That Article declares the Moon and its natural resources to be the "common heritage of mankind."[10] Developed and developing States held different interpretations of this concept and

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[5] *China Considering Manned Lunar Landing in 2025-2030*, CHINA VIEW, May 24, 2009, http://news.xinhuanet.com/english/2009-05/24/content_11425131.htm.

[6] According to official statements, India intends to spend spend £1.7bn to send man to the moon. In this regard, senior official of the Indian Space Agency (ISRO) have announced that India plans to launch its first manned mission by 2015 and its first lunar manned mission by 2020. *See* Dean Nelson, *India to spend £1.7bn sending man to the moon*, Feb. 23, 2009, http://www.telegraph.co.uk/news/worldnews/asia/india/4788143/India-to-spend-1.7bn-sending-man-to-the-moon.html.

[7] *See supra* note 1.

[8] Agreement Governing the Activities of States on the Moon and other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 [hereinafter Moon Agreement].

[9] *Id.*

[10] Moon Agreement, *supra* note 8, at art. 11.

its legal consequences. Due to the hopelessness of reaching a common position on this issue, the space-faring States and the majority of developing countries decided not to become Parties to the Moon Agreement.[11]

Taking into consideration the renewed interest in the Moon and the reluctance of States to accept the Moon Agreement, two questions arise: 1) Is the Moon Agreement the proper instrument to regulate present and, in particular, future explorative and exploitative lunar activities? and 2) Do we need a new instrument? In short, is it still reasonable to insist on an Agreement which has been refused by the majority of the States or is it time to propose a new legal mechanism for governing operations on the Moon either in the form of an amendment to the Agreement or a new treaty?

The present paper supports the second hypothesis. Due to the refusal of States to ratify the Agreement, and the fact that none of the space-faring States has expressed the intention of ratification in the near future, the development of a new instrument setting forth a legal regime to regulate lunar activities, especially those aimed at exploiting the natural resources of the Moon for commercial reasons, is needed.

The need for such a legal regime also stems from the fact that, when the provisions of the Moon Agreement are inapplicable, the existing space law regime does not offer a clear set of rules regulating how this exploitation should be carried out. The only somewhat relevant instrument in this respect is the 1967 Outer Space Treaty,[12] which however, is not able to fill this gap alone. The absence of specific rules clearly discourages private operators as well as developed States from investing in the exploitation of extraterrestrial resources, because there is no legal certainty that such exploitation may generate any profit.[13]

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[11] FABIO TRONCHETTI, THE EXPLORATION OF NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES 57-61 (2009).

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

[13] In this respect, one of the main problems is the uncertainty relating to the acquisition of property rights over the extracted resources and the benefits derived from their commercial use.

After an analysis of the natural resources present in the Moon and other celestial bodies, the paper will address the legal status of the Moon by comparing the Outer Space Treaty and the Moon Agreement. The failure of the Moon Agreement and the major limitations and negative impacts of its provisions on commercial activities on the Moon will then be examined. The last part of the paper will outline the essential elements to be inserted into the new legal regime aimed at regulating the exploitation of the natural resources of the Moon and other celestial bodies.

II. THE NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES

Before analyzing the legal status of the Moon, it is important to understand why States and private companies are so interested in reaching the Moon and other celestial bodies. The main reason is the possibility of mining the natural resources located in the lunar and other celestial bodies' soil and of using them for commercial purposes.

> The Moon is rich in mineral resources
>
> distributed uniformly across its surface and subsurface. It has been demonstrated that the Moon is rich in aluminum, iron, silicon, oxygen, hydrogen, chromium, manganese, potassium, and other minerals. These minerals can be utilized in their original form or refined into structural and electrical materials. They can be either brought back to Earth or used for life support of a permanent lunar basis or as rocket propellant. For instance, oxygen and hydrogen are contained in the lunar regolith at all latitudes. Oxide minerals such as limonite or olivine can be removed as water vapor by warming up these minerals with hydrogen. The water vapor which is obtained can be condensed and electrolyzed into hydrogen,

> and the oxygen is liquefied. These components can be used as life support or propellant for rockets.[14]

Additionally, a very recent NASA mission, the Lunar Crater Observation and Sensing Satellite (LCROSS) mission, has confirmed the presence of water-ice at the south pole of the Moon.[15] It is still not well-known how vast this amount is. However, in case of presence of a large amount of water, this could have a huge positive impact, because it could support the life of astronauts on the Moon's surface.

Notably,

> [t]he most valuable resource contained on the Moon is Helium-3. Helium-3 may be considered the main reason behind the interest that States and private operators are showing with respect to the Moon and to the exploitation of its resources. Helium-3 is an isotope, scarcely present on Earth but abundant on the Moon, which combined with other materials, such as deuterium, can be used as fuel in fusion power reactors. The value of Helium-3 is that it can generate nuclear power and, as a consequence, energy in a clean way, namely through a process of nuclear fusion which does not produce toxic waste.

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[14] FABIO TRONCHETTI, *supra* note 11, at 5.

[15] The Lunar Crater Observation and Sensing Satellite (LCROSS) mission was carried out by NASA to demonstrate the existence of water at the lunar poles. Mike Wall, *Moon Crater Has More Water than Parts of Earth*, LiveScience.COM, Oct. 21, 2010, http://www.livescience.com/space/moon-cabeus-crater-water-101021.html. The mission consisted of a rocket and a probe smashing into a lunar crater, the Cabeus crater, on 9 October 2009. *Id*. This impact was supposed to generate a plume of debris visible on Earth by means of spectral analysis which could confirm the presence of water ice. *Id*. Although the debris cloud provided the evidence scientists were looking for. *Id*. In addition, the work of the probe, which followed the rocket into the lunar crater, proved to be highly successful. *Id*. It detected vast amounts of water-ice and water vapour. *Id*. The results of the LCROSS mission provided confirmation for the data obtained by the Indian's *Chandrayaan-1* and NASA's *Cassini* and Deep Impact missions, which had already indicated the presence of water on the Moon. *See It's Official: Water Found on the Moon*, NASA LUNAR SCIENCE INSTITUTE, http://lunarscience.arc.nasa.gov/articles/its-official-water-found-on-the-moon (last visited Nov. 3, 2010). Information about the *Cassini* and Deep Impact missions is available, respectively, at http://www.nasa.gov/mission_pages/cassini/main/index.html; and http:/www.nasa.gov/mission_pages/deepimpact/main/.

> Thanks to these special characteristics the extraction of Helium-3 is likely to have a huge impact on the way energy is produced and distributed on Earth. Helium-3, indeed, has the potential to replace fossil fuels and other substances as primary source of energy on Earth. It has been estimated that twenty-five tonnes of Helium-3 can provide all the power that the United States needs in a year.[16]

The celestial bodies other than the Moon are rich in natural resources too.[17] This is particularly true with regard to the estimated 1400 near Earth asteroids which cross the Earth's orbit around the Sun.[18] These asteroids, which are easily accessible from the Moon, are in many cases dead comets, containing huge amounts of iron as well as water.[19] "Also the two Martian moons, Phobos and Demos, contain significant quantities of minerals."[20]

III. THE LEGAL STATUS OF THE MOON: FROM THE OUTER SPACE TREATY TO THE MOON AGREEMENT

The legal status of the Moon is defined by the Outer Space Treaty and the Moon Agreement. The study of the Moon Agreement cannot be carried out without making appropriate references to the Outer Space Treaty,[21] as the former re-affirms and further elaborates certain provisions of the latter.

Article I and II of the Outer Space Treaty are of special importance for any legal analysis of the Moon, as they confer on

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[16] TRONCHETTI, *supra* note 14, at 5-6. *See* David Whitehouse, *Moon Map Aids Discovery*, BBC NEWS, Dec. 2, 1998, http://news.bbc.co.uk/2/hi/sci/tech/226053.stm.

[17] TRONCHETTI, *supra* note 14, at 6.

[18] *Id.*

[19] *Id.*

[20] *Id.*

[21] For a broad analysis of the provisions of the Outer Space Treaty, see CARL Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 21 (1982); BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 215 (1997); M.N. ANDEM, INTERNATIONAL LEGAL PROBLEMS IN THE PEACEFUL EXPLORATION AND USE OF OUTER SPACE 30 (1992); I.H. PH. DIEDERIKIS-VERSCHOOR & V. KOPAL, AN INTRODUCTION TO SPACE LAW 24-31 (3d rev. ed. 2008); Paul G. Dembling & Daniel M. Arons, *The Evolution of the Outer Space Treaty*, 33 J. AIR L. & COM. 419 (1967); He Qizhi, *The Outer Space Treaty in Perspective*, *in* PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE 52 (Am. Inst. of Aeronautics & Astronautics ed., 1997).

outer space, including the Moon and other celestial bodies, the status of *res communis omnium*.[22]

When space activities began in the late 1950's, the international community started debates on the legal status to be attributed to outer space. Two diverging proposals were put forward. The first suggested considering outer space a *res nullius,*[23] namely an area which is not under the sovereignty of any State and hence susceptible of being occupied and acquired by States.[24] The second proposed to define outer space as a *res communis omnium* that is an area not capable of being appropriated by any State and open for free exploration and use.[25] The second proposal gained wide support and was, thus, accepted and agreed upon by States. The renouncement of any territorial claims over outer space was considered by States as the best

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[22] The concept of *res communis omnium* is described in IAN BROWNLIE, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 105, 169 (7th ed. 2008); MALCOLM N. SHAW, INTERNATIONAL LAW 492, 544-45 (6th ed., Cambridge Univ. Press 2008); & Nagendra Singh, *Introduction to International Law of the Sea and International Space Law*, *in* INTERNATIONAL LAW: ACHIEVEMENTS AND PROSPECTS 825, 883 (M. Bedjaoui ed., 1991).

[23] *See* BROWNLIE, *supra* note 22, at 147; SHAW, *supra* note 22, at 423-26, 432-38.

[24] Among the authors who proposed to consider outer space as a *res nullius* there were, for instance, A. Haley, *Space Law – The Development of Jurisdictional Concepts*, *in* PROCEEDINGS OF THE EIGHTH INTERNATIONAL ASTRONAUTICAL CONGRESS 170 (Am. Inst. of Aeronautics & Astronautics ed., 1958).; J. Verplaetse, *Can Individual Nations Obtain Sovereignty over Celestial Bodies?*, *in* PROCEEDINGS OF THE THIRD COLLOQUIUM ON THE LAW OF OUTER SPACE 311 (Am. Inst. of Aeronautics & Astronautics ed., 1961).

[25] The *res communis omnium* character of outer space was held, for instance, by J.E. Faria, *Draft to an International Covenant for Outer Space: The Treaty of Antarctica as a Prototype*, *in* PROCEEDINGS OF THE THIRD COLLOQUIUM ON THE LAW OF OUTER SPACE 122 (Am. Inst. of Aeronautics & Astronautics ed., 1960); Kenneth B. Keating, *The Law and the Conquest of Space*, 25 J. AIR L. & COM. 182, 189 (1958); Eugene Pepin, *Introduction to Space Law*, 4 N.Y.L.F. 258, 258-62 (1958); Michel Smirnoff *Problem of Legal Status of Celestial Bodies*, 28 J. AIR L. & COM. 385 (1961-62); Y. Korovin, *Conquest of Outer Space and Some Problems of International Relations*, 5 INTERNATIONAL AFFAIRS 88, 90 (1959); *Air Sovereignty and the Legal Status of Outer Space*, 49 INT'L L. ASS'N REP. CONF. 245-46 (1960) (comments of Professor Dr. D. Goedhuis); Id. at 246-48 (Comments of Professor A. Meyer). It is also possible to confer on outer space the status of *terra communis* as distinguished by that of *terra nullius*. These two concepts specifically refer to a territory. The latter refers to a territory which belongs to no one and can be appropriated; the former indicates a territory incapable of ownership and control and freely open for exploration and use**.** Frans G. von der Dunk, *The Dark Side of the Moon. The Status of the Moon: Public Concepts and Private Enterprises*, *in* PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE (Am. Inst. of Aeronautics & Astronautics ed., 1997) [hereinafter *The Dark Side of the Moon*].

guarantee for preserving the peaceful nature of the space environment and for ensuring that the space era could represent an opportunity of development for all humankind.

Article II of the Outer Space Treaty reflects this idea by declaring that "[o]uter 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."[26] Article II, thus, clearly affirms that States cannot extend their territorial sovereignty over outer space or any of its parts. Obviously, this prohibition also applies to the Moon, being part of outer space.

The provisions of Article II must be read in conjunction with those of Article I, which establishes the principle of freedom of exploration and use of outer space, without discrimination of any kind, as well as the freedom of access to all areas of celestial bodies. To sum up, this means that States can freely explore and use the space environment as long as they do not prevent others from doing the same.[27]

A key issue, which is not directly addressed by the Treaty and which is of fundamental relevance for the present discus-

[26] For an analysis of Article II of the Outer Space Treaty, see Stephen Gorove, *Interpreting Article II of the Outer Space Treaty*, *in* PROCEEDINGS OF THE ELEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 40 (Am. Inst. of Aeronautics & Astronautics ed., 1968) [hereinafter Gorove, *Interpreting Article II*]; Wayne N. White Jr., *Interpreting Article II of the Outer Space Treaty*, *in* PROCEEDINGS OF THE FORTY-SIXTH COLLOQUIUM ON THE LAW OF OUTER SPACE 171 (Am. Inst. of Aeronautics & Astronautics ed., 2003); Fabio Tronchetti, *The Non-Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty*, 33 AIR & SPACE L. 277 (2007); MANFRED LACHS, THE LAW OF OUTER SPACE 42 (1972); STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW: ISSUES AND POLITICS 25 (1991); Virgiliu Pop, *Appropriation in Outer Space: The Relationship Between Land Ownership and Sovereignty on the Celestial Bodies*, 16 SPACE POLICY 275 (2000).

[27] For a description of Article I of the Outer Space Treaty, *see* Nandasiri Jasentuliyana, *Review of Recent Discussions Relating to Aspects of Article I of the Outer Space Treaty*, *in* PROCEEDINGS OF THE THIRTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 7 (Am. Inst. of Aeronautics & Astronautics ed., 1989); Z. Qiwu, *Reflections on the Most Important Principle of Outer Space Law: To The Common Interests of All Mankind*, *in* PROCEEDINGS OF THE THIRTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 25 (Am. Inst. of Aeronautics & Astronautics ed., 1989); GYULA GAL, SPACE LAW 139 (1969); E. Galloway, *The United States and the 1967 Treaty on Outer Space*, *in* PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE 18, 24-27 (Am. Inst. of Aeronautics & Astronautics ed., 1997); Ram Jakhu, *Developing Countries and the Fundamental Principles of International Space Law*, *in* NEW DIRECTIONS IN INTERNATIONAL LAW 360 (Rafael Gutierrez Girardot et al. eds., 1982).

sion, concerns the use of outer space resources. In this respect, the main question is whether or not the prohibition on appropriation of outer space is also applicable to its resources. No clear-cut answer can be provided based on the current legal framework. While some authors express the view that the restriction in Article II applies equally to outer space and its resources,[28] others, the majority, argue that by analogy with the rules regulating the freedom of the high seas,[29] the appropriation of space resources merely forms part of the freedom of exploration and use of outer space.[30] This paper shares the opinion of the second group of authors.

The only limit to the possibility of appropriating extraterrestrial resources is to be found in paragraph 1, Article I of the Outer Space Treaty, which 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 interest of all countries, irrespective of their degree of economic and scientific development, and shall be the province of all mankind."[31] The concept of "province of all mankind" must not be confused with that of "common heritage of mankind." These two concepts have different meanings and diverse legal implications. In general, paragraph 1 means that the exploration and use of outer space, being the province of all mankind, should not serve only the interests of those States that have the technological capability to explore and utilize outer space but of all States. The drafters of the Outer Space Treaty considered the space era as an opportu-

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[28] *See, e.g.*, Gorove, *Interpreting Article II*, *supra* note 26, at 40; A.A. Cocca, 54 INT'L L. ASS'N REP. CONF. 409, 427, 434 (1970) (discussing Professor Cocca's contention that the principle of non-appropriation extends to the Moon and other celestial bodies); *Id*. at 41012 (comments of M. Markoff).

[29] The fact that the high seas are considered *res communis omnium* does not prevent nations from fishing there. *See* Henry R. Hertzfeld & Frans G. von der Dunk, *Bringing Space Law into the Commercial World: Property Rights Without Sovereignty* , 6 CHI. J. INT'L L. 81 (2005).

[30] D. Goedhuis, *Some Recent Trends in the Interpretation and the Implementation of the Rules of International Space Law*, 19 COLUM. J. TRANSNAT'L L. 213, 219 (1981); Carl Q. Christol, *Article II of the 1967 Principles Space Treaty Revisited*, 9 ANNALS OF AIR & SPACE L. 217 (1984).

[31] Outer Space Treaty, *supra* note 12, at art. I, para 1.

nity for development for all humankind.[32] It is, however, generally understood that Article 1 of the Outer Space Treaty does not set forth any mandatory requirement to share benefits resulting from space operations.

Additionally, Article I paragraph 3 confers on States the right to freely carry out scientific investigation in outer space, including the Moon and other celestial bodies.[33]

To summarize, the Outer Space Treaty lays down certain principles which have a direct impact on the exploration, use, and exploitation of the Moon and its natural resources. These principles are 1) the prohibition of national appropriation of outer space or any celestial bodies; 2) the freedom of exploration, use of, and access to the space environment; 3) the freedom of scientific investigation in outer space; 4) the non-prohibition to appropriate outer space resources; and 5) the exploration and use of outer space, including the Moon and other celestial bodies, to be carried out for the benefit of all countries.

When the United States completed the first successful Moon landing in 1969 and samples of lunar rocks were brought to Earth, awareness of the presence of valuable resources in the lunar soil, such as minerals, and the possibility to remove and use such resources spread among the members of COPUOS. Due to the fact that the Outer Space Treaty, while laying down the foundations of the legal order of outer space by means of general principles, did not provide detailed solutions of all problems which could arise in the course of the further exploration of the Moon and the planets of the solar system, in particular to those problems related to the exploitation of the extraterrestrial natural resources, States decided to enter into negotiation for drafting a new legal instrument specifically dealing with activities on the Moon and other celestial bodies.[34] The road towards

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[32] Paul Dembling & Daniel M. Arons, *The Evolution of the Outer Space Treaty*, 33 J. AIR L. & COMM. 419 (1967).

[33] Outer Space Treaty, *supra* note 12, at art. I, para. 3.

[34] The need to set up a specific regime regulating the use of lunar resources was clearly stated in the Preamble of the "Draft Agreement on the Principles Governing Activities of States in the Use of the Natural Resources of the Moon and Other Celestial Bodies", submitted by Argentina on 3 July 1970. The text of the Argentina's proposal is available in Harold W. Bashor, *Interpretation of the Moon Treaty: Recourse to Working*

the Moon Agreement was thus open. The Moon Agreement represented an attempt to modify the legal status of the Moon by declaring the Moon and the other celestial bodies "the common heritage of mankind."

IV. THE MOON AGREEMENT: APPLYING THE COMMON HERITAGE OF MANKIND CONCEPT TO THE EXPLOITATION OF THE NATURAL RESOURCES ON THE MOON AND OTHER CELESTIAL BODIES

A. Preliminary considerations

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, better known as the Moon Agreement, was adopted on 5 December 1979 in New York, opened for signature on 18 December 1979, and entered into force on 11 July 1984, when the fifth instrument of ratification was deposited.[35] As of 1 November 2009 the Moon Agreement has 13 ratifications, with an additional four States being signatories to it.[36] This rather limited level of acceptance makes it difficult to give any binding force to the provisions of the Agreement outside the small circle of those party to it.[37]

Despite the fact that the Moon Agreement enjoys rather limited support, the analysis of the norms it provides is impor-

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Papers and Related International Documents, XXXII ANNALS OF AIR AND SPACE L. 149, 156 (2007).

[35] Moon Agreement, *supra* note 8. Unlike the Outer Space Treaty and the Rescue Agreement, that required acceptance by the United States, the Soviet Union, and the United Kingdom before they could enter into force, the Moon Agreement only required the ratification of five States to enter into force. With ratification by Chile, the Philippines, Uruguay, the Netherlands, and Austria the Moon Agreement entered into force on July 11, 1984.

[36] The thirteen States which have ratified the Moon Agreement are: Australia, Austria, Chile, Mexico, Morocco, the Netherlands, Pakistan, the Philippines, Uruguay, Kazakhstan, Belgium, Peru and Lebanon. Four additional States have only signed the Agreement: France, Guatemala, India and Romania. *See* United Nations Office for Outer Space Affairs, Status of International Agreements Relating to Activities in Outer Space, http://www.oosa.unvienna.org/oosa/en/SpaceLaw/treatystatus/index.html (last visited Jan. 17, 2011).

[37] *See* Eileen Galloway, *Guidelines for the Review and Formulation of the Outer Space Treaties*, *in* PROCEEDINGS OF THE FORTY-FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 245, 248 (Am. Inst. of Aeronautics & Astronautics ed., 1998).

tant for several reasons.[38] First of all, it is the only existing legal instrument which specifically tries to regulate the exploration, use, and exploitation of the Moon and other celestial bodies and their natural resources. Although unsuccessful, the Agreement is an important development in the field of space law. Secondly, some States are parties to it; therefore, it cannot be totally disregarded. Thirdly, the feasibility of future adhesion to the Agreement must be verified. In short, is it likely or not that States would ratify the Agreement in the future? Fourthly, understanding the causes of the failure of the Agreement is important in order to avoid the same mistakes when drafting a new legal instrument aimed at regulating the exploitation of extraterrestrial resources.

B. The Moon Agreement

According to its Preamble, one of the main reasons for the conclusion of the Moon Agreement was the possibility to exploit the natural resources of the Moon, which seemed a feasible option in the not-too-distant future. Therefore, the Agreement aims at creating conditions for the peaceful, orderly, and fair development of lunar activities, with particular attention to the interests of less developed States.

The Moon Agreement follows the provisions of the Outer Space Treaty in many respects. First of all, it echoes the Outer Space Treaty as far as the *res communis omnium* character of the Moon is concerned. According to Article 11, paragraph 2, national appropriation of the Moon or any of its parts is prohib-

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[38] For a broad analysis of the Moon Agreement see GENNADY ZHUKOV & YURI KOLOSOV, INTERNATIONAL SPACE LAW 173 (1984); CHENG, *supra* note 21, at 246; HAROLD W. BASHOR JR., THE MOON TREATY PARADOX (2004); THE MODERN INTERNATIONAL LAW OF OUTER SPACE, *supra* note 21, at 246; Per M. Wijkman & Clas G. Wihlborg, *Global Use and Regulation of Space Activities under the Common Heritage of Mankind Principle*, *in* SPACE ACTIVITIES AND IMPLICATIONS WHERE FROM AND WHERE TO AT THE THRESHOLD OF THE 80'S (Rapport du Symposium Organisé par le Centre de Recerche en Droit Aerien et Spatial McGill Inst.) 121 (Oct. 16-17 1980); L. VIKKARI, FROM MANGANESE NODULES TO LUNAR REGOLITH: A COMPARATIVE LEGAL STUDY OF THE UTILISATION OF NATURAL RESOURCES IN THE DEEP SEABED AND OUTER SPACE (2002); HENRI A. WASSENBERGH, PRINCIPLES OF OUTER SPACE LAW IN HINDSIGHT 39 (1991); Nandasiri Jasentuliyana & Roy S.K. Lee, 1 *Manual on Space Law* 253 (1979).

ited.[39] This concept is further elaborated by paragraph 3 of the same Article, which makes clear that the placement of personnel, space vehicles, facilities, stations, and installations on or below the surface or subsurface of the Moon does not create a right of ownership over the surface or subsurface of the Moon or any areas thereof.[40]

The Moon Agreement also reaffirms the first part of Article I of the Outer Space Treaty in declaring the exploration and use of the Moon to be the province of all mankind. This concept is further developed by the Agreement, in the sense that such an exploration and use must be carried out with due regard to the interests of present and future generations,[41] to the need to promote higher standards of living and conditions of economic and social progress and development,[42] and to the necessity to prevent the disruption of the lunar environment.[43]

Consequently, it can be stated that the exploration and use of the Moon shall be considered the province of all mankind, and not the common heritage of mankind, even by the States parties to the Moon Agreement.[44] As will be explained later, the concept of the common heritage of mankind is only applicable to the exploitation of natural resources of the Moon.

In addition, the Moon Agreement expands the freedom of scientific investigation laid down in Article I, paragraph 3 of the Outer Space Treaty, by providing State parties with the right to collect samples of lunar mineral and other substances and to use them for scientific purposes.[45] This provision should be read together with those allowing States parties to land space objects; to place personnel, equipment, and facilities; and to establish manned and unmanned stations on the Moon.[46]

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[39] Moon Agreement, *supra* note 8, at art. 11, para. 2.

[40] *Id.* at art. 11, para. 3.

[41] *See* Moon Agreement, *supra* note 8, at art. 4 para. 1.

[42] *Id*.

[43] *Id.* at art. 7 para. 1.

[44] *See The Dark Side of the Moon*, *supra* note 27, at 121-22 (Am. Inst. of Aeronautics & Astronautics ed., 1997).

[45] *See* Moon Agreement, *supra* note 8, at art. 6, para. 2.

[46] *Id.* at art. 8, paras. 1 and 2, art. 9, para. 1.

The most innovative, as well as controversial, provisions of the Moon Agreement are contained in its Article 11, which declares the Moon and its natural resources to be "the common heritage of mankind."[47]

C. The common heritage of mankind concept

The common heritage of mankind is a rather young concept of international law which has been developed in the 1970s[48] and early 1980s and which found application in two international legal instruments, the Moon Agreement and the 1982 Law of the Sea Convention.[49]

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[47] For an analysis of the Common Heritage of Mankind concept, see Stephen Gorove, *The Concept of "Common Heritage of Mankind": A Political, Moral or Legal Innovation?* 9 SAN DIEGO L.REV. 390 (1972); G.M. Danilenko, *The Concept of the Common Heritage of Mankind in International Law*, 13 ANNALS AIR & SPACE L. 247 (1988); R. Wolfrum, *The Principle of the Common Heritage of Mankind*, *in* 43 ZEITSCHRIFT FÜR AUSLANDISCHES OFFENTLICHES RECHT UND VOLKERRECHT 312 (1983); Kunihiko Tatsuzawa, *Political and Legal Meaning of the Common Heritage of Mankind*, *in* PROCEEDING OF THE TWENTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 84 (Am. Inst. of Aeronautics & Astronautics ed., 1986); Mary Victoria White, *The Common Heritage of Mankind: An Assessment*, 14 CASE W. RES. J. INT'L L. 509 (1982); Carl Q. Christol, *The Common Heritage of Mankind Provisions in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 14 INTERNATIONAL LAW 429 (1980); Vladimir Kopal, *Outer Space as a Global Common*, *in* PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE 108 (Am. Inst. of Aeronautics & Astronautics ed., 1997).

[48] The common heritage of mankind with regard to the ocean was proposed by United Nations Arvid Pardo of Malta in 1967. In his speech at the United Nations General Assembly he suggested to declare the seabed, the ocean floor beyond the limits of national jurisdiction, and its resources as the common heritage of mankind. *See* U.N. Doc. A/6695 (18 August 1967). With regard to outer space, the concept was put forward by Ambassador A.A. Cocca who used the expression "*res communis humanitatis*" in a proposal submitted to the Legal Subcommittee of the UN General Assembly Committee on the Peaceful Uses of Outer Space (COPUOS). *See* Aldo Armando Cocca, *The Common Heritage of Mankind: Coctrine and Principle of Space Law*, *in* PROCEEDINGS OF THE TWENTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 17 (Am. Inst. of Aeronautics & Astronautics ed., 1986).

[49] United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982, in force 16 November 1994, 21 ILM 1245 (1982) [hereinafter Convention on the Law of the Sea]. Article 136, Part XI of the Convention declares the Area and its resources to be the common heritage of mankind. For a description of the provisions of the Convention, see B.H. Heim, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica*, 23 VAND. J. TRANSNAT'L L. 819, 825-28 (1990); *The Law of the Sea: Concept of the Common Heritage of Mankind: Legislative History of Article 133 to 150 and 311 of the United*

From a legal perspective the common heritage of mankind concept is an evolution of the *res communis omnium* theory. As previously analyzed, this theory, while preventing the acquisition of sovereignty rights over an area, allows for general exploration and use of the area and the resources contain therein.

The common heritage of mankind differs from this theory in several respects. It is based on the assumption that all human beings are members of the human race irrespective of which part of the world they live and that all of them should be given the same opportunity for improving their economic and living conditions.[50] Starting from this assumption, the common heritage of mankind concept holds that all States acting together on behalf of mankind as a whole, should share in the management of certain areas that, due to the economic and scientific value of the resources contained there, are considered to be the common heritage of mankind.[51] In particular, this concept requires that all activities within the common heritage of mankind area, particularly those aimed at exploiting the area's resources, must be carried out only in accordance with the rules set forth by an international regime, whose primary purpose is the orderly management of the area and the equitable sharing by all States of the benefits generated thereof, taking into particular account the needs of developing States irrespective of their degree of involvement in those activities.[52] The common heritage of mankind incorporates some further elements, such as the preservation of the area's environment, the peaceful nature of the activi-

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Nations Convention on the Law of the Sea, DIVISION FOR OCEAN AFFAIRS AND THE LAW OF THE SEA, OFFICE OF LEGAL AFFAIRS, UNITED NATIONS 187 (1996).

[50] Christopher C. Joyner, *Legal Implications of the Concept of the Common Heritage of Mankind*, 35 INT'L & COMP. L.Q. 190 (1986); Harminderpal Singh Rana, *The Common Heritage of Mankind and the Final Frontier: A Revaluation of Values Constituting the International Legal Regime for Outer Space Activities*, 26 RUTGERS L.J. 225 (1994).

[51] G.M. Danilenko, *The Concept of the Common Heritage of Mankind in International Law*, 13 ANNALS AIR & SPACE L. 247 (1988).

[52] Kevin V. Cook, *The Discovery of Lunar Water: AN Opportunity to Develop a Workable Moon Treaty*, 11 GEO INT'L. ENVTL. L. REV. 647 (1994).

ties carried out in the area, and the freedom of scientific investigation.[53]

The problem with the common heritage of mankind concept is that developing and developed States hold opposite views about its interpretation and application.[54] The former group advances a "common property" interpretation of the common heritage of mankind concept for areas beyond national jurisdiction.[55] This common property approach requires common management of such areas and common sharing by all States of the mined resources and the benefits generated therein, regardless of the level of participation in the exploitative activities. The latter group, and in particular the United States, refuse the interpretation of the common heritage of mankind concept proposed by the developing countries.[56] In their view, the concept should be interpreted in such a way as to exclude changes in the existing conditions for access to international resources.[57] In particular, the concept should not lead to a modification of the traditional freedom of the high sea, which provides States with freedom of exploration and use. Accordingly, developed States only recognize that the common heritage of mankind may contribute to certain improvement in the distribution of financial and other benefits derived from the exploitation of the resources located in the common heritage of mankind area.[58] In this respect, the special needs of developing States should be taken into consideration. However, only the States exploiting the resources are entitled to decide how to share them and what is equitable.

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[53] Cook, *supra* note 52; L.M. Fountain, *Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine*, 35 CONN. L. REV. 1753 (2003).

[54] *See* Harminderpal Singh Rana, *supra* note 50; *see also* Mary Victoria.White, *supra* note 47.

[55] M.C.W. Pinto, Alternatives in Mining, PROCEEDINGS, LAW OF THE SEA INSTITUTE (1978).

[56] Hearings on the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Before the Subcomm. On Science, Technology, and Space of the Senate Comm. On Commerce, Science and Transportation, 96th Cong. 2nd Sess. (1980), Statement of Robert B. Owen, Legal Advisor to the United States Secretary of State [hereinafter Hearings].

[57] *Id*.

[58] F. Tronchetti, *supra* note 11, at 109.

The impossibility of reaching a common understanding of the meaning and legal effect of the common heritage of mankind concept caused the failure of both the 1982 Law of the Sea Convention and the 1979 Moon Agreement.

D. Article 11 of the Moon Agreement

The insertion of the common heritage of mankind into Article 11 of the Moon Agreement represented the most debated point of discussion during the negotiations of the Agreement.[59] For instance, the Soviet Union was particularly against it and declared that the common heritage of mankind was merely a philosophical concept with "no real and practical meaning at the present stage of activities relating to the Moon."[60] The United States, at least during the negotiating phase of the Moon Agreement, supported the application of the common heritage of mankind to the Moon and its resources.[61] These contrasts lasted until the end of the negotiations. It was only in the middle of 1979 that all States agreed to introduce the common heritage of mankind concept into the text of the Moon Agreement, particularly in its Article 11.

Article 11 paragraph 1 declares that: "The Moon and its natural resources are the common heritage of mankind."[62] It specifies that the common heritage of mankind "finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this Article."[63] This indicates that the interpreta-

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[59] The proposal to declare the natural resources of the Moon the common heritage of mankind was first put forward by Argentina in 1970. *See Argentinian Draft Agreement on the Principles Governing the Activities on the Use of Natural Resources of the Moon and Other Celestial Bodies*, Annex II, U.N. Doc. A/AC. 105/85 (1970).

[60] U.N. Doc. A/AC.105/C.2/SR.204 (April 19, 1973) (on file with author).

[61] The Working Paper 12/Revision 1, proposed by the United States on April 12, 1972, proposed, inter alia, that "[t]he natural resources of the Moon and other celestial bodies shall be the common heritage of mankind." U.N. Doc. A/AC.105/C.2 (XI) (on file with author).

[62] Moon Agreement, *supra* note 8, at art. 11, para. 1.

[63] For the analysis of the legal meaning of Article 11 of the Moon Agreement see, Stanley B. Rosenfield, *Article XI of the Draft Moon Agreement*, *in* PROCEEDINGS OF THE TWENTY-SECONDTH COLLOQUIUM ON THE LAW OF OUTER SPACE 209 (Am. Inst. of Aeronautics & Astronautics ed., 1979); Stephan Hobe, *Common Heritage of Mankind-An Outdated Concept in International Space Law?*, *in* PROCEEDINGS OF THE FORTY-FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 271 (Am. Inst. of Aeronautics & Astronautics

tion of the common heritage of mankind concept should be made by taking into consideration only the provisions of the Moon Agreement with no reference to principles and rules provided for by any other treaty, including the 1982 Law of the Sea Convention.

While the Outer Space Treaty does not make any specific reference to outer space resources, the Moon Agreement clearly indicates that the natural resources of the Moon and other celestial bodies are the common heritage of mankind. This means that the exploitation of such resources must be carried out only under that concept. This idea is further developed by paragraph 3, according to which "neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become the property of any State" or any other operator performing activities on the Moon.[64]

Paragraph 5 contains the commitment of States parties to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon, when this exploitation is about to become feasible. This legal regime should include provisions guaranteeing

> a) the orderly and safe development of the natural resources of the Moon; b) the rational management of those resources; c) the expansion of opportunities in the use of those resources; 4) an equitable sharing by all States in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon shall be given special consideration.[65]

At this point of the analysis some considerations are needed. First of all, as previously mentioned, the Moon Agree-

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ed., 1998); Ricky J. Lee, *Creating an International Regime for Property Rights Under the Moon Agreement*, *in* PROCEEDINGS OF THE FORTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 409 (Am. Inst. of Aeronautics & Astronautics ed., 1999); Keven V. Cook, *The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty*, 11 GEO.INT'L ENVTL. L. REV. 647 (1999).

[64] Moon Agreement, *supra* note 8, at art. 11, para. 3.

[65] *Id.* at art. 11, para 7.

ment makes a clear distinction between exploration, use, and scientific research, which are regulated under the *res communis omnium* concept, and exploitation, which falls under the concept of the common heritage of mankind. This signifies that while lunar resources can be freely used for scientific purposes, their commercial exploitation can only take place in accordance with the provisions and principles laid down in Article 11. Secondly, the Moon Agreement does not set out an international regime to govern the exploitation of natural resources. Indeed, unlike the 1982 Law of Sea Convention which establishes an International Seabed Authority responsible for licensing and regulating the exploitation of resources located in the seabed beyond the limits of national jurisdiction, as well as several provisions dealing with the exploitative activities,[66] the Moon Agreement only expresses the intention of States to negotiate a legal regime when the exploitation of extraterrestrial resources is about to become feasible. However, there is no mandatory value in such provision. The obligation undertaken by States under Article 11(5) is no more than a *pactum de negotiando*, which means that States shall negotiate in good faith in order to reach an agreement on such a regime, but they are not bound to reach agreement at whatever cost.[67]

V. THE LIMITS OF THE MOON AGREEMENT: EXPLAINING THE FAILURE OF THE AGREEMENT AND ITS DETRIMENTAL EFFECT ON THE COMMERCIAL EXPLOITATION OF EXTRATERRESTRIAL NATURAL RESOURCES

A. Preliminary considerations

When the Moon Agreement was opened for signature and ratification in 1979, it became clear that it had limited chances of success. The interpretation of the common heritage of mankind concept still stood as a point of major contrast between developing and developed States. In particular, the newly elected

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[66] Convention on the Law of the Sea, *supra* note 49, at Part XI.

[67] *See* Carl Q. Christol, *The 1979 Moon Agreement: Where Is It Today?*, 27 J. SPACE L. 1, 14-15 (1999).

American administration considered the common heritage of mankind concept to be detrimental to U.S. interests and to create unacceptable restraints on the intention of the United States to exploit resources beyond any national jurisdiction.[68] In addition, the majority of developed States shared the U.S. refusal to accept the interpretation of the common heritage of mankind concept as "common property," which was advanced by the developing States.[69] Due to the impossibility of reaching an agreement on the interpretation of the common heritage of mankind, both developed and developing States decided not to ratify the Moon Agreement. The situation was made worse by the unclear and vague character of the provisions of Article 11 of the Agreement, which contributed to increased uncertainty about the legal consequences deriving from the application of that concept.

Despite its limited acceptance, today it is very important to analyze the Moon Agreement once more. As described in the introduction of this paper, in recent years the major space powers have shown a vivid interest in the Moon and its natural resources. This fact raises questions related to the role that the Moon Agreement can have in the upcoming era of activities involving lunar and other celestial bodies and, in particular, whether it is likely or not that States will ratify the Agreement in the near future.

When analyzing the potential impact of the Moon Agreement there is a preliminary point to be considered: the exploitation of the natural resources of the Moon and other celestial bodies is a risky and expensive task. Primarily, carrying out activities in outer space is a hazardous business.[70] Many things can go wrong in space and the smallest mistake or unexpected event may result into the destruction of a space object and the

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[68] Hearings, *supra* note 56.

[69] Wayne White Jr., *Real Property Rights in Outer Space*, PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE 1 (Am. Inst. of Aeronautics & Astronautics ed., 1997).

[70] See in this respect Brian M. Hoffstadt, *Moving the Heavens: Lunar Mining and the "Common Heritage of Mankind" in the Moon Treaty*, 42 UCLA L. REV. 575, 580 & n.24 (1994); Richard Berkley, *Space Law Versus Space Utilization: The Inhibition of Private Industry in Outer Space*, 15 WIS. INT'L L.J. 421, (1997).

death of its occupants. Secondly, developing safe and reliable technology to exploit extraterrestrial resources and to establish, as well as maintain, a permanent manned lunar basis requires huge financial investments. These two elements create serious obstacles to the actual commencement of the exploitation of lunar resources.

A method to soften their negative impact may be the establishment of a legal regime to regulate exploitation. On one side, this legal regime may enhance the safety of space operations, by laying down strict rules to be respected by the participants of such an exploitation; on the other side, it may encourage space entrepreneurs to invest their money in the exploitation of lunar resources, by making clear that is possible to make profit from it.

The main question is, then, whether or not the Moon Agreement creates a legal environment enabling the safe, orderly, and profitable development of the exploitation of the natural resources of the Moon. Particularly, it must be ascertained whether the Agreement has a positive or negative impact on the commercial use of such resources.

The answer to both questions is negative. The Moon Agreement does not contain clear rules describing how the exploitation of extraterrestrial resources has to be carried out and what the rights and duties of the parties involved in it are. On the contrary its provisions are rather vague and leave vast room for diverging interpretations. As a result it has a detrimental effect on the commercial development of lunar resources, as it is not possible to foresee if, and to what extent, it is possible to turn the exploitation of these resources into a profitable business.

The following section will provide a detailed analysis of the main limitations of provisions of the Moon Agreement.

B. Limits of the Moon Agreement

Article 11, paragraph 7 indicates that one of the purposes of the international regime is "equitable sharing" by all States

Parties in the benefits derived from the natural resources of the Moon.[71] How should this provision be interpreted? What does "equitable" mean?[72] Does it mean "equal," as suggested by the developing States, requiring that the benefits to be equally shared among all States regardless of their involvement in the exploitative activities, or does it mean "equal" in its literal sense, as proposed by developed States, providing the States directly involved in these activities with a bigger power to decide how the benefits should be shared? The present paper agrees with the literal interpretation. If the drafters of the Agreement had wanted to give another meaning to the terms "equitable," they would have clearly done so. Nevertheless, the problem concerning the exact meaning to be attributed to the term "equitable" remains.

Another problem concerns the term "benefit": what are the benefits derived from the natural resources of the Moon? The profits resulting from the commercial use of such resources? The technologies used to mine the resources? The resources themselves? This uncertainty creates a big problem. An agreement which aims at regulating the exploitation of the natural resources of the Moon cannot leave aside the problem of the definition of the term "benefit." This term must be defined before and not after the exploitation has begun. Such lack of clarity is not beneficial to anyone and prevents space operators, particularly private ones, to invest in extraterrestrial exploitative ventures.

The Moon Agreement also leaves unanswered three questions of major importance: 1) Is it possible to acquire property rights over the lunar natural resources once they have been removed from their original location? 2) Is the exploitation of lunar and other celestial bodies' resources prohibited before the establishment of an international regime? 3) Which is the legal regime in force pending the setting up of the legal regime? These three questions are clearly strictly related.

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[71] Moon Agreement, *supra* note 8, at art. 11, para. 7.

[72] On this point, see Ram Jakhu, *Twenty years of the Moon Agreement: Space Law Challenges for Returning to the Moon*, 2005 ZLW [GERMAN J. AIR & SPACE L.] 243 (F.R.G.) [hereinafter Jakhu, *Twenty years of the Moon Agreement*].

As to the first question, the majority of legal scholars agree that once extraterrestrial natural resources have been removed from their original location, they can become the property of whoever extracted them. Such thesis is, for instance, supported by an eminent author like Christol, which stated that: "by the introduction of the term "in place" [in Article 11, paragraph 3[73]] the negotiators intended to legalize the removal of natural resources from the surface or the subsurface of the Moon thereby establishing the right of ownership and of property in the possessors of such resources."[74] Other authors argue that although the expression "in place" restricts the application of "the non-appropriation principle to natural resources as long as they are not removed from their original place," this does not automatically lead to "the conclusion that appropriation can take place at random when the natural resources are being moved."[75] In this respect Article 11 (5) constitutes a limit to the possibility of appropriating resources once removed, as it contains the commitment of States to set out an international regime to govern the exploitation of lunar recourses as soon as this exploitation is feasible. Nevertheless, the analysis of the *traveaux préparatoires* of the Agreement shows that the term "in place" was inserted with the specific purpose to allow the creation of property rights over the resources once removed from their original location.[76]

The second question concerns the presence of a moratorium on the use of lunar resources pending the establishment of an international regime. The Moon Agreement does not explicitly impose any moratorium in the pre-regime period. Hence, the space-faring States, particularly the United States,[77] and the

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[73] This is added to the original Christol's text for reasons of clarity.

[74] THE MODERN INTERNATIONAL LAW OF OUTER SPACE, at 262. A similar approach is held by Eileen Galloway, *Status of the Moon Treaty*, SPACE NEWS 3-9, 21 (1998).

[75] H.L. van Traa-Engelman, *Clearness Regarding Property Rights on the Moon and Other Celestial Bodies*, *in* PROCEEDINGS OF THE THIRTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 38 (Am. Inst. of Aeronautics & Astronautics ed., 1996).

[76] *See, e.g.*, the US position contained in working paper n. 15, 1973 presented during the negotiations of the Moon Agreement and reaffirmed in 1979, see COPUOS, U.N. Doc. A/AC.105/P.V. 203, 22 (July 16, 1979) (on file with author).

[77] In 1979 the US representative suggested to other member of COPUOS that "[t]he Agreement places no moratorium upon the exploitation of the natural resources of celes-

majority of the legal scholars[78] argue that States are allowed to use and exploit the natural resources of the Moon before such regime is set up. This interpretation is not shared by the developing States. In their view, the exploitation of lunar resources shall be carried out only in accordance with rules and procedures laid down by an international regime.

This leads to the discussion of the third question: what is the legal regime in force before the establishment of the international regime? Namely, is the common heritage of mankind applicable pending its establishment?

Before the international regime is established, the legal regime applicable to lunar and other celestial bodies' resources is not the common heritage of mankind but that provided for by the Outer Space Treaty, which enables States and private operators to freely explore and use these resources as long as this does not impede others from doing the same.

This argument is used by some authors to support the assertion that the Moon Agreement does not restrict the commercial exploitation of extraterrestrial resources but that, on the contrary, encourages it. Relying on the fact that until the regime is established there is no requirement to share the benefits generated by such exploitation, these authors claim that in the pre-regime period the Moon Agreement gives private operators several opportunities to make profits.[79] Later on, when the legal regime is under discussion, private operators will be strong enough to protect their interests. Hence, they will still be able to make large profits even after the regime is set up. These authors, therefore, conclude that all States should ratify the Moon

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tial bodies, pending the establishment of an international regime", *see* U.N. Doc. A/AC.105/P.V. 203, *supra* note 76. This statement did not receive any objection by the representative of the Soviet Union. *See id*, at 43-45.

[78] *See* Sylvia Maureen Williams, *The Law of Outer Space and Natural Resources*, 36 INT'L & COMP. L.Q. 142, 147 (1987); Patricia M. Sterns, G. Harry Stine & Leslie I. Tennen, *Preliminary Jurisprudential Observation Concerning Property Rights on the Moon and Other Celestial Bodies in the Commercial Age*, *in* PROCEEDINGS OF THE THIRTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 50 (Am. Inst. of Aeronautics & Astronautics ed., 1996); Ricky J. Lee, *supra* note 63.

[79] *See* Jakhu, *supra* note 72; Carl Q. Christol, *The Moon Treaty and the Allocation of Resources* 22, pt.2, ANNALS OF AIR & SPACE L. 31 (1997).

Agreement. Failure to ratify it would be detrimental not only to States but also to their nationals.

This argument is not acceptable. It is true that pending the setting up of the regime, there is no requirement to share benefits, as the provisions of the Outer Space Treaty are in force. However, this situation, and the advantages which it may generate, is only temporary. Indeed, as soon as the exploitation of extraterrestrial resources is feasible, an international regime, requiring the equitable sharing of the benefits, is to be established. A similar scenario is surely not encouraging but rather detrimental to the interest of private operators.[80]

An example may contribute to better explain this point. A private company of a State which has ratified the Moon Agreement intends to carry out the exploitation of the resources located in a certain lunar site. As an international regime to regulate such exploitation has not been established yet, the private company expects to be able to keep the benefits resulting from its activities and not to be requested to share them with others. After receiving authorization from its State, the company starts its exploitative activities on the Moon. However, as soon as the other Parties to the Agreement become aware of these developments, which clearly demonstrates that the exploitation of natural resources of the Moon is feasible, they decide to convene a conference to set up an international regime to govern such activities. The State of that private company, too, will obviously attend the conference. If the conference is successful, an international regime containing provisions requesting space operators to equitably share the benefits derived from the exploitation of extraterrestrial natural resources, is adopted.

Obviously, this result would have a negative impact on the interests of the private company. Such company has started its space exploitative activities with the expectation of keeping the benefits generated from those activities; then, it would find itself under the obligation to share these benefits. Surely, during the negotiations phase the State of that company would try to protect its interests. Nevertheless, it is unquestionable that the

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[80] *See* Brian M. Hoffstadt, *supra* note 70, at 590-91.

interests as well as the rights of these private companies would be damaged.

This simple example demonstrates that the Moon Agreement does not encourage but rather discourages the commercial development of the natural resources of the Moon. Without legal certainty as to the possibility to maintain the benefit, and as a result of the profits derived from the exploitation of such resources, States, and in particular private operators, will never invest in this type of activity.

This reasoning could be debated by saying that States are not obliged to establish an international agreement at all costs. If the pre-regime period is so profitable, States could decide not to establish a specific legal regime and to keep relying on the provisions of the Outer Space Treaty only. This approach is, however, very dangerous. The Outer Space Treaty does not lay down specific rules to govern the exploitation of space resources. It only establishes general principles, such as the freedom of exploration and use of outer space and the non-appropriative nature of the space environment. These principles, however, are not detailed enough to guarantee the safe and orderly development of the exploitation of the natural resources of the Moon. This exploitation raises specific legal issues which require specific answers. These answers cannot be obtained by relying on the provisions of the Outer Space Treaty alone. Those provisions need to be supplemented and extended with rules addressing all foreseeable scenarios and legal problems which may arise during these exploitative activities.

The Moon Agreement has some additional shortcomings. First of all, it does not deal with the issue of liability. Hence, it is reasonable to question the ability of the existing space law liability regime, as laid down in the Liability Convention, to cope with mining activities on the Moon, as they may result in different types of damage when compared to those addressed by the Liability Convention.

Secondly, the Moon Agreement does not clarify the meaning of "national activities," a term which refers to the activities carried out in space by private operators and for which a State can be held internationally responsible and which require authorization and supervision by the State. This uncertainty may lead

to confusion as to which State should regulate which private activities carried out on the Moon.

Before concluding this section it must be pointed out that in the last eight years, four States have ratified the Moon Agreement.[81] This development, which has been directly influenced by an effort undertaken by the COPUOS aimed at enhancing support of the existing space law treaties,[82] may lead some to think that other States are about to join the Agreement. However, this does not appear to be the case. There are no tangible indications that the major space powers are willing to adhere to the Moon Agreement. The analysis of the records of the COPUOS meeting gives no elements to support such hypothesis. Interestingly enough, this analysis reveals that in the last years, the Legal Subcommittee of COPUOS has paid particular attention to the status of the Moon Agreement. This is largely due to the initiative of some delegations, in particular the Colombian one, which at the forty-sixth session of the Legal Subcommittee in 2007 expressed the view that consideration should be given to the reasons behind the low number of ratifications of the Agreement and that efforts should be undertaken to remove obstacles to its participation.[83] This initiative was followed by the decision of the Legal Subcommittee to request the Working Group on the Status of Application of the five United Nations Treaties on Outer Space to address the issue of the lack of success of the Moon Agreement, by considering, inter alia, whether the existing international rules adequately address the activities on the Moon and other celestial bodies, also incorporating information from States already parties to it about the benefits of adherence to the Agreement. This call was answered by some of the States Parties to that Agreement which at the forty-seventh session of

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[81] These States are Kazakhstan in 2001, Belgium in 2004, Chile in 2005 and Lebanon in 2007.

[82] The four recent ratifications are, at least partly, the result of an effort initiated by a Mexican proposal in April 1997 aimed at enhancing adherence to the five space treaties. This effort led to the insertion of a new item in the agenda of the Legal Subcommittee of COPUOS entitled "Review of the status of the five international treaties governing outer space." *See* U.N. Doc. A/AC.105/C.2/L.206/Rev.1 April 4, 1997). For an analysis of the Mexican initiative, *see* Christol, *supra* note 67, at 29-30.

[83] Report of the Legal Subcommittee on its forty-sixth session, held in Vienna from 26 March to 5 April 2007, U.N. Doc. A/AC.105/891, Annex 1 (2007).

the Legal Subcommittee held in March 2008 submitted a "Joint Statement on the benefits of the adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies by States parties to the Agreement."[84] The Joint Statement, which aims at encouraging States to sign and ratify the Agreement, emphasizes a number of its positive aspects. Firstly, according to the Statement, the Moon Agreement contains some innovative provisions, such as those on the establishment of a lunar basis and on the use of lunar resources to support activities on the Moon, which clarify some concepts previously expressed in the Outer Space Treaty and enhance scientific cooperation. Secondly, the Joint Statement claims that the solution adopted in Article 11 of the Agreement, namely, the decision to postpone the setting up of a legal regime until the moment in which the exploitation of lunar resources is about to be feasible, is an intelligent and obvious one. Most importantly, the Joint Statement argues that "the Agreement does not preexclude any modality of exploitation, by public and/or private entities, nor forbids commercial treatment, as long as such exploitation is compatible with the requirements of the Common Heritage of Mankind regime."

States reacted differently to the Joint Statement. While some delegations welcomed it noting its usefulness as a basis for further discussion and expressing satisfaction with the fact that the issue of the low rate of participation of States in the Moon Agreement was finally under consideration, others stressed that non-adherence to the Agreement had not hindered current or future lunar activities and that it was premature to arrive at any conclusion on the adequacy of existing rules governing activities on the Moon.[85]

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[84] Joint statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies by States parties to the Agreement, U.N. Doc. A/AC.105/C.2/L.272. These States are Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines. *Id.*

[85] Report of the Legal Subcommittee on its forty-seventh session, held in Vienna from 31 March to 11 April 2008, U.N. Doc. A/AC.105/917, para 42, and Annex I, paras 14-25 (2008); Report of the Legal Subcommittee on its forty-eighth session, held in Vienna from 23 March to 3 April 2009, U.N. Doc. A/AC.105/935, Annex I, paras 4-18 (2009).

What is significant for the purpose of this paper is the fact that the Joint Statement does not seem to have had so far any visible impact in encouraging major space–faring States to join the Moon Agreement. Indeed, not only have none of these States ratified the Agreement in the last two years, but they also have not even expressed the intention to do so in the near future. Apart from the above, it is also relevant that a conference to revise the Moon Agreement, as foreseen by its Article 18, has never been convened.[86] In 1994, ten years after its entry into force, COPUOS considered the question of a first review of the Agreement and the prospective of an international regime at its 37th session in 1994. However, the Committee recommended to the General Assembly to take no further action during the time being.[87] Such a conference would have represented an opportunity to re-open the debate on the Moon Agreement and to possibly encourage other States to join it. The fact that this conference has not been convened shows, once more, the limited interest of States in the Moon Agreement.

This part of the paper has demonstrated that the Moon Agreement is not the proper instrument to regulate the exploitation of the natural resources of the Moon. Due to the insertion of the common heritage of mankind concept and to the vague character of its provisions, the Agreement not only fails to create a clear legal framework to govern such exploitation but also has a detrimental effect on the commercial development of the lunar and other celestial bodies' resources. For these reasons, it

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[86] Moon Agreement, *supra* note 8, at art. 18:

> Ten years after the entry into force of this Agreement, the question of the review of the Agreement shall be included in the provisional agenda of the General Assembly of the United Nations in order to consider, in the light of past application of the Agreement, whether it requires revision. However, at any time after the Agreement has been in force for five years, the Secretary-General of the United Nations, as depositary, shall, at the request of one third of the States Parties to the Agreement and with the concurrence of the majority of the States Parties, convene a conference of the States Parties to review this Agreement. A review conference shall also consider the question of the implementation of the provisions of article 11, paragraph 5, on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments.

[87] G.A. Res. A/Res/49/34 (1995).

is very unlikely that States will ever decide to ratify the Moon Agreement. Hence, the need for setting up a new legal regime to regulate the commercial exploitation of extraterrestrial natural resources arises.

The provisions of the Outer Space Treaty are also not precise enough to ensure the safe and peaceful development of such exploitation. These provisions must be supplemented and further expanded so as to define the proper legal environment for the orderly as well as profitable exploitation of the natural resources of the Moon.

VI. A LEGAL REGIME TO REGULATE THE COMMERCIAL EXPLOITATION OF THE NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES

Having understood the need for establishing a legal regime to govern the commercial exploitation of extraterrestrial natural resources, the next step is to clarify how this regime should be organized and what its components should be.[88] As a matter of clarity, it must be indicated that the detailed explanation of the features of this regime goes beyond the purposes of the present paper. This section will, thus, only explain the essential points to be inserted in such regime.[89]

The starting point of the discussion is drawn up by the assumption that when developing a legal regime to govern the exploitation of extraterrestrial natural resources, two preliminary elements must be taken into consideration. First, such exploitation will never take place without the participation of private operators as well as space-faring States. Only these sub-

[88] For the analysis of the possibility of exploiting the natural resources of the Moon and other celestial bodies, see Mahulena Hofmann, *Recent Plans to Exploit the Moon Resources under International Law*, *in* PROCEEDINGS OF THE FORTY-SEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 425 (Am. Inst. of Aeronautics & Astronautics ed., 2004); Barbara Ellen Heim, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space and Antarctica*, 23 VAND. J. TRANSNAT'L L. 819, 830-36 (1990); Armal Kerrest, *New Developments and the Legal Rramework Covering the Exploitation of the Resources of the Moon*, *in* PROCEEDINGS OF THE FORTY-SEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 530 (Am. Inst. of Aeronautics & Astronautics ed., 2004).

[89] This author has elaborated a proposal for a legal regime to regulate the exploitation of extraterrestrial natural resources in FABIO TRONCHETTI, *supra* note 11.

jects have the financial resources and technical expertise required to exploit extraterrestrial resources. Therefore, the legal regime must contain provisions which are able not only to protect the interests of these subjects but also to offer them a real chance to enjoy a return on the investments they made to carry out exploitative operations in outer space.

Secondly, the legal regime governing the exploitation of the natural resources of the Moon and other celestial bodies should be based on the principles laid down in the Outer Space Treaty, particularly the non-appropriative nature of outer space and the exploration and use of the space environment for the benefit of all mankind. These principles have contributed to more than forty years of peaceful and safe space activities. Hence, they should play a fundamental role also with regard to future activities in outer space.

A. A balance between these two elements is thus essential for the success of the proposed legal regime

The majority of lunar natural resources consist of minerals.[90] In order to be used, these minerals need to be removed from their original location.[91] Therefore, it is logical to foresee that the exploitation of these mineral resources will be organized in a three-phase process: 1) a pre-mining phase (including research, development, and exploration); 2) a mining phase; and 3) post-mining phase (including the commercial use of the extracted resources).

In order to be properly structured, the legal regime should clarify how this these three phases have to be organized, the rules applicable to all of them, and the rights and duties of the parties involved. In this way, space operators will have the certainty of the legal framework in force during the entire period in which the exploitative activities are taking place.[92]

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[90] E. Robens, et al., *Investigation of surface properties of lunar regolith Part II*, 94 J. of Thermal Analysis and Calorimetry, 627-631, 627 (2008).

[91] G. FAURE & T. MENSING, AN INTRODUCTION TO PLANETARY SCIENCE, 165 (2007).

[92] For instance, issues like the duration of mining activities in a certain lunar site, property rights over the extracted resources and the benefits derived from their com-

To contribute to the orderly and safe development of the exploitative activities it would be possible to think about establishing an international authority. In this respect, the solutions adopted by the 1994 Implementation Agreement of Part XI of the Law of the Sea Convention[93] could be used as a valuable example. The 1994 Agreement introduces a new way of interpreting the common heritage of mankind which softens its stricter economic requirements and gives industrialized States a greater power to influence the decision-making mechanism.

This paper does not propose to insert the common heritage of mankind concept into the new legal regime aimed at regulating the exploitation of the natural resources of the Moon and other celestial bodies. It only suggests to take some of the most innovative and useful elements of the 1994 Implementation Agreement, such as the application of a free-market approach to the management of a certain international area and its resources, as well as a larger voice of developed States in the adoption of decision relating to the activities in the area, and to apply them to the exploitation of extraterrestrial resources.

The proposed legal regime should also contain the following features:

- a licensing mechanism to authorize private exploitative activities, either by means of national law or by decision of the international authority;
- provisions dealing with liability for damage caused to the lunar environment in the course of the exploitation of a site;
- a reliable and transparent mechanism monitoring exploitative activities;

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mercial use, and the right to explore and exploit an area of the Moon should be addressed.

[93] Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, New York, done 28 July 1994; 1836 U.N.T.S. 3; 33 I.L.M 1309, (1994), *entered into force* on 28 July 1996. For the analysis of the 1994 Implementation Agreement *see*, *e.g.*, Annick De Marffy-Mantuano, *Current Development: The Procedural Framework of the Agreement Implementing the 1982 United Nations Convention on the Law of Sea*, 89 AM. J. INT'L L. 814 (1995); Carol B. Thompson, *International Law of the Sea/Seed: Public Domain Versus Private Commodity*, 44 NAT. RESOURCES J. 841 (2004).

- a procedure for international registration of the exploitation activities taking place on the lunar or other celestial bodies' surface;
- a mechanism to settle disputes arising from the exploitation of extraterrestrial natural resources.

The last point of the above list is of particular interest. Although the main purpose of a legal regime is to prevent the emergence of disputes, it is quite unlikely that disputes will not arise in the course of the exploitation of extraterrestrial materials. Considering the fact that international space law does not set forth any compulsory dispute settlement mechanism and that without a method to settle conflicts a legal regime becomes less effective, as its rules cannot be properly enforced, the need for establishing a mechanism to settle disputes related to the exploitation of extraterrestrial resources emerges. This paper proposes to use as a model the dispute settlement mechanism operating in the context of the World Trade Organization (WTO).[94] This mechanism, which is based on the idea that the prompt settlement of disputes is essential for the proper functioning of the WTO, introduces a strict schedule for the time a case should take to be settled, with deadlines applicable to each stage of the procedure.[95] Thanks to these characteristics, the WTO dispute settlement mechanism has received worldwide acceptance and has proven to be successful.

The legal regime to govern the commercial exploitation of lunar and other celestial bodies' natural resources should be inserted in a new legal instrument, such as a treaty, to be opened for signature and ratification by States. Many could claim that negotiating a new treaty would take too long and that a simple amendment to the Moon Agreement would be a

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[94] For an analysis of the WTO dispute settlement mechanism, see J. VAN GENT, WTO TRADE DISPUTES (2006); G. YANG, B. MERCURIO, & Y. LI, WTO DISPUTE SETTLEMENT UNDERSTANDINGS: A DETAILED INTERPRETATION (2005).

[95] Generally, if a case runs its full course, it takes about one year to arrive at a first ruling, fifteen months if the case is appealed. For more information on the WTO dispute settlement mechanism see World Trade Organization, Understanding the WTO: Settling Disputes, http://www.wto.org/english/thewto_e/whatis_e/tif_e/disp1_e.htm (last visited Feb. 4, 2011).

more feasible solution.[96] Surely amending an existing treaty is faster that drafting a new one. However, it is questionable that amending the Moon Agreement would be the best choice. First of all, the amendment should address several articles of the Agreement, as the majority of its provisions have an uncertain character. Reaching an agreement on these amendments would require time and long discussions. Secondly, it is very likely that, while indicating principles to be inserted in the regime to regulate the exploitation of extraterrestrial resources, the amended version of the Agreement would not actually contain that legal regime but rather the commitment of State Parties to establish it. This would mean that a new conference should be convened to define the text and contents of such legal regime. In this respect, it would be much more reasonable to directly negotiate a new legal instrument, specifically addressing the issue of the commercial exploitation of the natural resources of the Moon and other celestial bodies, which may have an immediate impact following its ratification by States.

This author is well aware of the fact that negotiating a new legal regime will be difficult. Nevertheless, under the current circumstances, the establishment of such a regime seems to be the most suitable option to guarantee the orderly and safe development of commercial activities on the Moon.

VII. CONCLUSION

In the light of the renewed interest of States in exploring and exploiting the Moon and its natural resources, it is worth analyzing the potential impact of the Moon Agreement on future lunar and other celestial bodies' activities. The above has demonstrated that, due to the unclear meaning of its provisions and to their negative influence on the commercial exploitation of lunar resources, it is unlikely that States would decide to ratify the Agreement in the near future. This calls for the establish-

[96] A significant proposal for amendment of the Moon Agreement has been put forward by the International Law Association (ILA). *See* INT'L L. ASS'N REP. CONF. 13-16 (2002); Frans G. von der Dunk, *The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources*, 32 ANNALS AIR & SPACE L. 91, 109-13 (2007).

ment of a legal regime aimed at regulating the commercial exploitation of the natural resources of the Moon and other celestial bodies. The setting up of such a legal regime should not be further postponed. The exploitation of extraterrestrial resources may generate significant benefits not only for those directly involved in the mining activities but also for humankind as a whole. This opportunity cannot be wasted due to the absence of a legal framework ensuring the orderly, safe, and profitable development of extraterrestrial exploitative activities.

ACCESS TO WATER ON THE MOON: LESSONS FROM WATER LAW IN HAWAI'I AND ELSEWHERE

Jon M. Van Dyke[*]

I. INTRODUCTION

The discovery during the past year of substantial amounts of water ice in the craters of the Moon's south and north poles, and in a thin layer across much of the lunar surface,[1] has opened up the possibilities of lengthy exploration of the moon by humans and future human settlements. The water ice will be accessible for drinking water, and can also be broken apart into oxygen for breathing and hydrogen for fuel.[2] Obviously, this water ice will be extremely valuable for the humans on the Moon, and conflicts over ownership seem inevitable. What rules should govern access to this very important resource?

The treaties governing moon and outer space exploration have been based on an idealistic vision of cooperation and shared resources. The 1967 Outer Space Treaty,[3] which has been ratified by 99 countries and signed by another 27 (as of 2009), contains the following key provisions:

Article I

> 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

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[1] Kenneth Chang, *Scientists See Fresh Evidence of More Water on the Moon,* N.Y. TIMES, March 9, 2010, at D3, col. 1.

[2] *Id.*

[3] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 610 U.N.T.S. 205, 18 U.S.T. 2410, T.I.A.S. No. 6347 (1967) [hereinafter Outer Space Treaty].

> of economic or scientific development, and shall be the province of all mankind.

Outer 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….

Article II

> 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.

Article IX

> In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the Treaty *shall be guided by the principle of co-operation and mutual assistance* and shall conduct all their activities in outer space, including the moon and other celestial bodies, *with due regard* to the corresponding interests of all other States Parties to the Treaty. …If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space…would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space…it *shall undertake appropriate international consultations* before proceeding with any such activity or experiment…. [Emphasis added.]

Similarly, the 1979 Moon Treaty,[4] which (as of 2009) has been ratified by 13 countries and signed by another four, contains the declaration that the Moon and its natural resources are "the common heritage of mankind" and that its resources should be exploited only pursuant to an international regime established by the contracting parties.[5]

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[4] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 21.

[5] *Id.* at art. 11.

Is it realistic to expect countries to follow these idealistic provisions when the rush for scarce resources is extended to the Moon, especially in the context of the water ice, which will be crucial for future exploration and exploitation? What rules of international law govern this question, and where can we look for appropriate analogies and models?

II. THE DUTY TO COOPERATE

The duty to cooperate is one of the central and most venerable principles of international law, and it will certainly be applicable to any exploration and exploitation of the Moon's water resources, whether such activities are conducted pursuant to the treaty regime or customary international law.[6] As Professor Boyle has explained in simple and direct terms, "States are required to co-operate with each other in controlling transboundary pollution and environmental risks."[7] Principle 24 of the Stockholm Declaration states:

> International matters concerning the protection and improvement of the environment *should be handled in a co-operative spirit by all countries*, big and small, on an equal footing. Co-operation through multilateral or bilateral arrangements or other appropriate means is essential *to effectively control, prevent, reduce and eliminate adverse environmental effects* resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States.[8]

This principle was utilized by the arbitral tribunal in the 1957 *Lac Lanoux Arbitration*[9] which held that, as a matter of customary international law, a state engaging in behavior likely

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[6] Some of the material that follows is adapted from Jon M. Van Dyke, *Liability and Compensation for Harm Caused by Nuclear Activities,* 35 DENVER J. OF INT'L L. & POL'Y 13-46 (2006).

[7] Alan E. Boyle, *Nuclear Energy and International Law: An Environmental Perspective*, 60 BRIT. Y.B. INT'L L. 257, 278 (1990).

[8] U.N. Conference on the Human Environment, June 5-16, 1972, *Declaration of Principles*, Principle 24, U.N. Doc. A/CONF.48/14 (June 16, 1972) (emphasis added).

[9] Affaire du Lac Lanoux [Lake Lanoux Arbitration] (Fr. v. Spain), 12 R.I.A.A. 281 (1957).

to impact the environment of another state significantly is obliged to involve the affected state in discussions regarding these activities. Inherent in this process is the duty to listen to the concerns expressed by the affected nations along with their ideas about how best to reduce the risks. Suggestions that are helpful and constructive should of course be accepted and acted upon. If a country rejects a suggestion, it should explain its rejection it. These consultations are designed to anticipate and reduce risks. Preparing contingency plans for emergencies can only be done after a full understanding of the dangers involved. A nation that is consulted about a project outside its borders does not have a veto power over that project, but it does have the right to understand the risks created by the project and to offer constructive advice about how best to reduce those risks.

The duty to cooperate includes the duty to notify other affected countries,[10] the duty to exchange information, the duty to listen to the concerns of affected countries, the duty to respond to these concerns, and the duty to negotiate in good faith.[11] In some situations, countries also have the duty to reach an agreement, and a duty to submit the dispute to third-party adjudication if they cannot resolve the matter.[12] The International Court of Justice recognized this duty to inform in the *Corfu Channel Case,*[13] ruling that when a State becomes aware that its activities are causing or are likely to cause damaging pollution to the marine environment, it shall immediately notify other

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[10] Rio Declaration on Environment and Development, June 14, 1992, U.N. Doc. A/CONF.151/5/Rev.1 (1992), 31 I.L.M. 874 (1992), Principle 19: "States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith." As to the obligation to notify under customary international law as an aspect of the principle of good faith, *see* Hans Lammers, *Transfrontier Pollution and International Law* 110 (Hague Academy of International Law, Centre for Studies and Research in International Law and International Relations, 1986).

[11] In the Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment of 20 April 2010, 2010 I.C.J. 1, ¶ 158, *available at* http://www.icj-cij.org/docket/files/135/15877.pdf the International Court of Justice ruled that "Uruguay breached its procedural obligations to inform, notify and negotiate…"

[12] In most cases, "an obligation to negotiate does not imply an obligation to reach an agreement." *Id.* ¶ 150 (*citing* Railway Traffic Between Lithuania & Poland Advisory Opinion, 1931 P.C.I.J., Series A/B, No. 42, at 116).

[13] Corfu Channel Case (U.K. v. Albania), 1949 I.C.J. 4, 22.

States likely to be affected by such damage. Similarly, the Convention on Early Notification of a Nuclear Accidents[14] requires notification of nuclear accidents.

The "no-harm" rule is now a central component of international environmental law, and the International Court of Justice restated this rule in its recent opinion in the *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)*:

The existence of the general obligation of States *to ensure* that activities within their jurisdiction and control respect the environment of other States or of *areas beyond national control* is now part of the corpus of international law relating to the environment.[15]

When an activity may have a significant transboundary affect on ocean and coastal waters, the Law of the Sea Convention requires the exchange of information about the proposed activity and the preparation of an environmental impact assessment to disclose the nature of the activity and the attendant risks.[16] The Espoo Convention also requires an environmental impact assessment for activities that are likely to cause a significant transboundary impact.[17] Along these same lines, a State also has a duty to provide prior notification for transboundary shipment of wastes. The Basel Convention[18] and the IAEA Code of Practice on the International Transboundary Movement of Ra-

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[14] Convention on Early Notification of a Nuclear Accident, IAEA Doc. INFCIRC/335, opened for signature at Vienna Sept. 26, 1986, *entered into force* Oct. 27, 1986, 25 I.L.M. 1370 (1986).

[15] Case Concerning Pulp Mills, *supra* note 11, ¶ 193 (*citing* Legality of Nuclear Weapons Advisory Opinion, 1996 I.C.J. 226, 241-42 ¶ 29) (emphasis added).

[16] United Nations Convention on the Law of the Sea, arts. 204-06, Dec. 10, 1982, 1833 U.N.T.S. 397.

[17] Convention on Environmental Impact Assessment in a Transboundary Context, art. 2.1, Feb. 25, 1991, 1989 U.N.T.S. 309 (requiring contracting parties to take all appropriate measures to prevent, reduce, and control significant adverse transboundary environmental impacts from proposed activities.). In the Case Concerning Pulp Mills, *supra* note 11, ¶ 204, the Court said that the requirement to undertake an environmental impact assessment "where there is a risk that the proposed industrial activity may have a significant adverse impact in a transboundary context" "may now be considered a requirement under general international law."

[18] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal art. 4, Mar. 22, 1989, 28 I.L.M. 649.

dioactive Waste[19] both require a State to notify and obtain the consent of the sending, receiving, and transit States in accordance with their respective laws and regulations.

The duty to cooperate played a central role in the judgment of the International Court of Justice in the *Case Concerning the Gabcikovo-Nagymaros Dam*,[20] which, as described by Professors Birnie and Boyle, had "[t]he effect of…requir[ing] the parties to co-operate in the joint management of the project, and to institute a continuing process of environmental protection and monitoring . . ."[21] These commentators have explained that "[t]he Court's environmental jurisprudence is not extensive but its judgments affirm the existence of a legal obligation to prevent transboundary harm, to co-operate in the management of environmental risks, to utilize shared resources equitably and, albeit less certainly, to carry out environmental impact assessment and monitoring."[22]

The International Tribunal for the Law of the Sea confirmed the importance of the duty to cooperate in two recent cases. In the *MOX Plant Case (Ireland v. U.K.)*, the Tribunal ruled on December 3, 2001, that the duty to cooperate required the two countries to exchange information concerning the risks created by the plant, to monitor the effects of the plant on the marine environment, and to work together to reduce those risks.[23] Similarly in the *Case Concerning Land Reclamation by Singapore In and Around the Straits of Johor*, the Tribunal issued a ruling on October 8, 2003, stating:

> [G]iven the possible implications of land reclamation on the marine environment, *prudence and caution require* that Malaysia and Singapore *establish mechanisms for exchanging information and assessing the risks or effects*

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[19] Int'l Atomic Energy Agency [IAEA], *Code of Practice on the International Transboundary Movement of Radioactive Waste (IAEA Code)*, IAEA Doc. INFCIRC/386 (Nov. 13, 1990).

[20] Gabcikovo Nagymaros Project (Hung. v. Slovk.), 1997 I.C.J. 7, ¶ 147 (Sept. 25).

[21] PATRICIA W. BIRNIE AND ALAN E. BOYLE, INTERNATIONAL LAW & THE ENVIRONMENT 108 (2d ed. 2002).

[22] *Id.*

[23] MOX Plant Case (No. 10) (Ireland v. U.K.), 41 I.L.M. 405 (Int'l Trib. L. of the Sea 2001).

> *of land reclamation works and devising ways to deal with them in the areas concerned.*[24]

To give teeth to this duty to cooperate, the Tribunal went on to prescribe provisional measures that the parties had to comply with:

> Malaysia and Singapore *shall cooperate* and shall, for this purpose, enter into consultations forthwith in order to:
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> (a) *establish promptly a group of independent experts* with the mandate
>
> (1) *to conduct a study*, on terms of reference to be agreed by Malaysia and Singapore, to determine, within a period not exceeding *one year* from the date of this Order, the effects of Singapore's land reclamation and to propose, as appropriate, measures to deal with any adverse effects of such land reclamation . . .
>
> (b) exchange, on a regular basis, information on, *and assess risks or effects of*, Singapore's land reclamation works . . .[25]

Finally, the Tribunal directed "Singapore not to conduct its land reclamation in ways that might cause irreparable prejudice to the rights of Malaysia or serious harm to the marine environment, taking especially into account the reports of the group of independent experts."[26]

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[24] Concerning Land Reclamation by Singapore In and Around the Straits of Johor (No. 12) (Malay. v. Sing.), 126 I.L.R. 487, ¶ 99 (Int'l Trib. L. of the Sea 2003) (emphasis added).

[25] *Id.* at ¶ 106(1) (emphasis added).

[26] *Id.* at ¶ 106(2).

III. INTERNATIONAL RIVER LAW

Although at one point, the United States promoted the "Harmon Doctrine,"[27] which argued that countries with sovereignty over the upstream portions of rivers owned "their" water and could divert all of it before it reached the next country, this view has been discredited. It is now accepted that river resources should be shared according to the principle of "equitable utilization" and that the interests of countries bordering rivers (riparian states) must be reasonably balanced. It is also widely accepted now that freshwater resources in rivers and streams should not be divided up solely to serve homocentric utilitarian purposes, and that the integrity of natural ecosystems should be protected for their own sake. Among the principles now recognized as governing international shared water resources are:

* The Right to Equitable and Reasonable Use
* The No-Significant-Harm Rule
* The Duty to Inform, Consult, and Negotiate in Good Faith
* The Duty to Prevent and Control Pollution
* The Duty to Protect and Preserve Ecosystems
* The Anticipatory Obligation to Prevent or Mitigate Harmful Conditions

The 1997 U.N. Convention on the Law of the Non-Navigational Uses of International Water Courses,[28] which has been ratified by 13 countries, contains the following important provision:

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[27] The "Harmon Doctrine" was developed by U.S. Attorney General Judson Harmon who proclaimed in 1896 that "the rules, principles and precedents of international law impose no liability or obligation on the United States," in a case involving a claim by Mexico for damages from diverting the water of the Rio Grande. This view was rejected by the Joint Commission established to evaluate this dispute, including the U.S. members, who agreed that "Mexico has been wrongfully deprived for many years of a portion of her equitable rights in the flow of one-half of the waters of the Rio Grande." In 1906, the United States formally rejected this approach when it concluded a treaty with Mexico regulating the sharing of the waters of the Rio Grande. *See* William A. Paddock,*The Rio Grande Convention of 1906: A Brief History of an International and Interstate Apportionment of the Rio Grande*, 77 DENVER U. L. REV. 287 (1999).

[28] U.N. Convention on the Law of the Non-Navigational Uses of International Water Courses, U.N.G.A. Res. 51/229 (May 21, 1997) (emphasis added).

Article 7 – Obligation not to cause significant harm

1. Watercourse States shall, in utilizing international watercourses in their territories, *take all appropriate measures to prevent the causing of significant harm* to other watercourse States.

2. Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall…take all appropriate measures . . . in consultation with the affected State, *to eliminate or mitigate such harm* and where, appropriate, to discuss the question of *compensation* . . .

IV. U.S. WATER LAW IN GENERAL

The law applicable to water disputes varies greatly in the United States, depending on the amount of water available to a community and the historical approach that has been taken regarding its allocation. Some areas, like the Northeast region of the United States, have abundant water and so disputes regarding allocation are rare. Other areas, such as most of the Western states, have limited water and disputes over water are common and extremely contentious.

In areas where water is abundant, most communities use an approach called "riparianism," whereby a landowner has the right to use water from a watercourse going through the land so long as the use is "reasonable" with respect to the rights of others to water from the same source. In water-short areas, many states use the "appropriation" or "prior appropriation" approach, whereby the first person to initiate a use of water has the first or prior right over all subsequent users, providing that the use remains beneficial, and that water can be diverted from a stream, provided again that it is put to a beneficial use.[29] Under this system, in times of shortage, or if a stream is "over appropriated," the owner of the oldest water right is entitled to maintain its claim to the beneficial use of the water before subsequent users are entitled to any water.[30] Because of the scarcity

[29] R.L. DEWSNUP & D.W. JENSEN, A SUMMARY-DIGEST OF STATE WATER LAWS 35 (1973).

[30] *See, e.g.,* Colo. Const. art. XVI, sec. 6; Colo. Rev. Stat. sec. 37-92-301(3).

of water in these communities, public agencies generally monitor the use of the water carefully, and the water right can revert to the state if the water is not being used for a beneficial purpose. Some states issue water permits for a fixed term of years, such as Florida, which now issues permits for from 20 to 50 years, and New Jersey, which issues permits for 25 years. California,[31] Oklahoma,[32] Oregon,[33] and Texas[34] recognize both the riparian and appropriation doctrines in their regulation of water rights.

V. PRINCIPLES GOVERNING WATER RIGHTS IN HAWAI'I

Water law in Hawai'i has been complicated, because water is abundant in some parts of each island and scarce in others. Before Westerners started arriving in 1778, Native Hawaiians "developed a sophisticated irrigation system . . . and allocated water according to the agricultural needs of the farmers and according to the amount of labor each farmer contributed toward building and maintaining the system of ditches or *auwai*."[35] This system of cooperative work-sharing served the community well, and a "spirit of mutual dependence and helpfulness prevailed, alike among the high and the low, with respect to the use of the water."[36]

As Westerners came to dominate the economic and political life of the islands,[37] they sought to develop sugar as a cash crop, and determined that water from the rainy and mountainous parts of the islands should be transported to the dry plains. Sugar requires an enormous amount of water, so the "Western entrepreneurs quickly acquired land in the rainy parts of the islands and constructed ditches for transporting water that

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[31] Dewsnup & Jenson, *supra* note 29, at 129-154.

[32] *Id.* at 603-618.

[33] *Id.* at 619-636.

[34] *Id.* at 699-714.

[35] Jon M. Van Dyke *et al., Water Rights in Hawai'i, in* LAND AND WATER RESOURCE MANAGEMENT IN HAWAI'I.
I 141, 143 (Hawai'i Institute for Management and Analysis in Government 1979).

[36] Antonio Perry, *Hawaiian Water Rights,* 23 YALE L.J. 437, 442 (1914).

[37] *See generally* JON M. VAN DYKE, WHO OWNS THE CROWN LANDS OF HAWAI'I? (University of Hawaii Press, 2008).

were the engineering marvels of their day."[38] The Native Hawaiians were thereby deprived of the water they needed to grow their traditional staple crop of kalo (taro), but the courts, which had become dominated by Westerners linked to the sugar planters, ruled in a series of cases that landowners owned the water linked to the land and could transport that water to distant areas.[39]

When Hawai'i once again became self-governing with statehood in 1959, its Supreme Court began reexamining decisions made during the territorial period (1898-1959) and determined that Hawai'i's law should be guided by the values established by Native Hawaiians prior to the arrival of Westerners, and that water was not a commodity that could be "owned" and freely transported, but should instead be viewed as a public good to be governed by the public for the good of all.[40] This decision led to substantial controversy, but eventually the Hawai'i Legislature enacted a Water Code and established the Commission on Water Resource Management, which has the power to determine water allocation. The Water Commission is empowered to declare "water management areas" in water-short areas, and water can be taken from streams in those areas only pursuant to permits from the Commission. These permits are issued only after an applicant establishes that the proposed use of the water:

> (1) can be accommodated with an available water source;
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> (2) is a reasonable-beneficial use as defined in section 174-5;[41]
>
> (3) will not interfere with an existing legal use of water;
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> (5) is consistent with the public interest;
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> (6) is consistent with state and county general plans and land use designations;

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[38] Van Dyke, *Water Rights, supra* note 35, at 143.

[39] *See, e.g.,* Territory v. Gay, 31 Hawai'i 376 (1930).

[40] McBryde Sugar Co. v. Robinson, 54 Hawai'i 174, 504 P.2d 1330 (1973), aff'd *on rehearing,* 55 Hawai'i 260, 517 P.2d 26 (1973), *cert denied,* 417 U.S. 962 (1974).

[41] "Reasonable-beneficial use" is "the use of water in such quantity as is necessary for economic and efficient utilization, for a purpose, and in a manner which is both reasonable and consistent with the state and land use plans and the public interest." Hawai'i Revised Statutes, § 174C-3.

> (7) is consistent with county land use plans and policies; and
> (8) will not interfere with the rights of the department of Hawaiian home lands.[42]

The Water Code gives priority to using water for "domestic uses" and "municipal uses" that serve the public interest,[43] and the Hawai'i Supreme Court has emphasized the underlying principles of the public trust doctrine that apply to all uses of water.[44] As the Court has explained, the public trust is a "title different in character from that which the State holds in lands intended for sale . . . The control of the state for purposes of the trust can never be lost."[45] The public trust doctrine requires that "any balancing between public and private purposes begin with a presumption in favor of public use, access, and enjoyment."[46] This doctrine does not "safeguard rights of exclusive use for private commercial gain."[47]

A number of controversies have reached the Hawai'i Supreme Court, and it has issued several long opinions explaining that water is indeed a public trust resource, that its allocation should be guided by the precautionary principle; that while private parties can have usufructory rights in water, they do not have vested rights; and that water can be reallocated as the public good requires. Private rights to water are only "usufructory" in nature because of the practical realities of flowing water.

> It is generally recognized that a simple private ownership model of property is conceptually incompatible with the actualities of natural watercourses. Rather, the variable and transient nature of the resource, as well as the necessity of preserving its purity and flow for others who

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[42] Hawai'i Revised Statutes, § 174C-49.

[43] *Id.* § 174C-2(c); In the Matter of the Water Use Permit Applications, Petitions for Interim Instream Flow Standard Amendments, and Petitions for Water Reservations for the Waiahole Ditch Combined Contested Case Hearing, 94 Hawaii 97, 136, 9 P.3d 409, 449 (2000) (hereinafter *Waiahole I*).

[44] *Waiahole I, supra* note 43.

[45] *Id.* at 128 (internal quotation marks and citations omitted).

[46] *Id.* at 142.

[47] *Id.* at 138.

> are entitled to its use and enjoyment have led to water rights being uniformly regarded as usufructory and correlative in nature.[48]

Under the Water Code, the distribution and sale of surface water out of its original watershed is authorized only after appropriate permits have been issued allowing such diversions as reasonable and beneficial uses of the water. Such permits remain subject to alteration by the Water Commission in light of changing future conditions, changing demands for this water, and changing evaluations of the appropriate amount of the water that should remain instream.[49]

A. Reppun v. Board of Water Supply (1982)

The status of surface water is discussed and explained most clearly in *Reppun v. Board of Water Supply*.[50] The Hawai'i Supreme Court responded to the argument that surface water could be "transformed into a freely transferable private commodity," by saying that "we do not find this to be so."[51] The Court went on to say that "the creation of an independent source of profit for the possessors of water rights was not included among [the] purposes" for permitting rights in water under Section 7-1 of the Hawai'i Revised Statutes.[52] Section 7-1 "was originally enacted in 1850 as section 7 of what has come to be known as the Kuleana Act,"[53] and it provides that:

> The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, running water, and roads shall be free to all, on all lands granted in fee simple; provided that this shall not

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[48] Robinson v. Ariyoshi, 65 Hawai'i. 641, 667, 658 P.2d 287, 305-06 (1982).

[49] "[T]he continuing *authority* of the state over its water resources . . . empowers the state to revisit prior diversions and allocations, even those made with due consideration of their effect on the public trust." *Waiahole I*, *supra* note 43, 94 Hawai'i at 141, 9 P.3d at 453.

[50] Reppun v. Board of Water Supply, 65 Hawaii 531, 656 P.2d 57 (1982).

[51] *Id.* at 539, 656 P.2d at 63.

[52] *Id.* at 550, 656 P.2d at 70.

[53] *Id.* at 549, 656 P.2d at 69.

> be applicable to wells and watercourses, which individuals have made for their own use.[54]

The Hawai'i Supreme Court also emphasized an earlier sentence of section 7-1 "referring specifically to other articulated rights" which "provides that privileges enumerated in that section were 'for their [the people's] own use, but they shall not have the right to take such articles to sell for profit.'"[55] Based on this analysis, the Court concluded that "the riparian water rights created by HRS § 7-1 were not intended to be, and cannot be, severed from the land in any fashion."[56]

B. Robinson v. Ariyoshi (1982)

Similar conclusions are found in *Robinson v. Ariyoshi.*[57] The Hawai'i Supreme Court explained that rights to water were "usufructory interests," which are "not so broad as to include any inherent enforceable right to transmit water beyond the lands to which such private interests appertained."[58] The Court provided the following explanation as to why water rights have traditionally been viewed as "usufructory" rather than absolute in nature:

> It is generally recognized that a simple private ownership model of property is conceptually incompatible with the actualities of natural watercourses. Rather, the variable and transient nature of the resource, as well as the necessity of preserving its purity and flow for others who are entitled to its use and enjoyment have led to water rights being uniformly regarded as usufructory and correlative in nature. See Maloney, Ausness & Morris, A Model Water Code, 81 (1972); Trelease, *Government*

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[54] Hawai'i Revised Statutes, § 174C-1 (2010).

[55] *Reppun v. Board of Water Supply, supra* note 50, at 550, 656 P.2d at 70.

[56] *Id.*

[57] *Robinson v. Ariyoshi*, 65 Hawaii 641, 658 P.2d 287 (1982).

[58] *Id.* at 648, 658 P.2d at 294-95 (referring to its previous decision in *McBryde Sugar Co. v. Robinson*, 54 Hawaii 174, 191, 198, 504 P.2d 1330, 1341, 1344 (1973)).

Ownership and Trusteeship of Water, 65 Cal. L. Rev. 638, 640 (1957).[59]

Because water rights are usufructory, they are subject to reevaluation in light of the public interest, and any "change in any aspect of the utilization of a private water right has always been understood as dependent upon such a change not injuriously affecting the rights of others."[60] Because the rights and interests of others may change based on changes in climatic conditions and other surrounding factors, "no transfer of water could therefore be secure. It is therefore difficult to speak of there having existed an enforceable right to transfer water from the lands to which water rights attached."[61] The Court's closing sentence in the *Robinson* opinion says that the 1973 *McBryde* opinion "made clear that underlying every private diversion and application there is, as there always has been, a superior public interest in this natural bounty."[62]

C. The Waiahole Ditch Case (2000)

The Hawai'i Supreme Court restated these basic principles in its monumental opinion in the *Waiahole Ditch Case,* which concerned the transfer of water on Oahu.[63] No permanent or unchallengeable right to divert surface water from streams exists, the Court explained, because "[t]he continuing *authority* of the state over its water resources precludes any grant or assertion of vested rights to use water to the detriment of public trust purposes."[64] "This authority empowers the state to revisit prior diversions and allocations, even those made with due consideration of their effect on the public trust."[65] Any claim by a private

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[59] *Id.* at 667, 658 P.2d at 305-06.
[60] *Id.* at 649 n. 8, 658 P.2d at 295 n.8.
[61] *Id.*
[62] *Id.* at 677, 648 P.2d at 312.
[63] *Waiahole I, supra* note 43.
[64] *Id.,* 94 Hawai'i at 141, 9 P.3d at 453 (emphasis in original*, citing Robinson v. Ariyoshi,* 65 Hawaii at 677, 658 P.2d at 312, and *quoting from Kootenai Envtl. Alliance v. Panhandle Yacht Club, Inc.,* 105 Idaho 622, 671 P.2d 1085, 1094 (1983), for the proposition that "[t]he public trust doctrine takes precedent even over vested water rights.").
[65] *Id.*

landowner for a permit must be evaluated in light of "the public interest in instream flows."[66]

The Hawai'i Supreme Court reiterated again that water rights are "usufructory" and are always subject to reevaluation:

> Consequently, depending on the situation, a landowner could be entitled to certain uses of water but not others. Even established uses could fall into disfavor. A severe shortage could foreclose use altogether. Usufructory water rights, in sum, "have always been incomplete property rights, so the expectations of [rightholders] to the enjoyment of these rights are generally weaker than the expectation of the right to exploit the full value of dry land" [A. Dan] Tarlock, [*Law of Water Rights and Resources*], §3:92, at 3-153 [(2000)].[67]

Because rights to water are only usufructory rights, landowners have no absolute or unchallengeable right to transfer, sell, or divert the waters from their lands.[68]

When it passes on water permit applications, the Water Commission has the responsibility to balance the importance of maintaining the streams as robust ecological systems with the water requirements of those residences and businesses located away from the streams. In its *Waiahole Ditch* decisions, the Hawai'i Supreme Court emphasized that interim stream standards "must still protect instream values to the extent practicable" and "must still provide meaningful protection of instream

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[66] *Id.* at 161, 9 P.3d at 473 (*referring to Shokal v. Dunn*, 109 Idaho 330, 707 P.2d 441, 450 (1985) ("[T]he burden of proof in all cases as to where the public interest lies . . . rests with the applicants")).

[67] *Id.* at 181.

[68] Language in *Robinson v. Ariyoshi,* 753 F.2d 1468 (9th Cir. 1985) that might arguably be viewed as inconsistent, as related to waters on Kauai governed by other Hawaii decisions issued during the territorial period, was explicitly vacated by the U.S. Supreme Court in *Ariyoshi v. Robinson*, 477 U.S. 902 (1986), and the underlying federal case was subsequently dismissed as unripe. *Robinson v. Ariyoshi*, 887 F.2d 215 (9th Cir. 1989). The Ninth Circuit subsequently denied attorneys' fees in that case, explaining explicitly that "[t]o win fees, plaintiffs must prevail in some significant way. That did not happen in the case at bar." *Robinson v. Ariyoshi*, 933 F.2d 781. 786 (9th Cir. 1991).

uses."[69] In *Waiahole II*, the Supreme Court criticized the Water Commission's decision to restore half the water in the stream by saying that the Commission had not established that such a restoration would be "sufficient to protect instream values," and pointing out that the assumption that half would be sufficient "appears to be arbitrary and speculative," thus indicating that it may be necessary to restore more than half of the stream water.[70]

Central to the balancing process is the examination of alternative sources of water which could be used instead of the stream water, with the burden placed squarely on the party seeking to divert water away from existing streams to show the absence of alternative sources of water. In both *Waiahole I* and *Waiahole II*, the Hawai'i Supreme Court emphasized that:

> besides advocating the social and economic utility of their proposed uses, permit applicants must also *demonstrate the absence of practicable mitigating measures, including the use of alternative water sources*. Such a requirement is intrinsic to the public trust, the statutory instream use protection scheme, and the definition of 'reasonable-beneficial' use, and is an essential part of any balancing between competing interests.[71]

In *Waiahole II,* the Supreme Court concluded that the Commission had not established that the Campbell Estate had clearly articulated the alternatives and demonstrated that they were not practicable. The Court said that the Commission "must determine whether the alternative is available and capable of being utilized after considering cost, technology, and logistics."[72]

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[69] *See* In the Matter of Water Use Permit Applications…for the Waiahole Ditch Combined Contested Case Hearing (Waiahole II), 105 Hawaii 1, 11, 93 P.3d 643, 653 (2004).

[70] *Id.*

[71] *Id.* at 15, 93 P.3d at 657 (emphasis provided in *Waiahole II, quoting from Waiahole I*, 94 Hawaii at 161, 9 P.3d at 473).

[72] *Id*. at 19, 93 P.3d at 661.

D. Na Wai Eha (The Great Waters), West Maui

On June 10, 2010, Hawai'i's Commission on Water Resource Management issued a 226-page opinion regarding the allocation of waters from four streams in the West Maui mountains that flow into central Maui.[73] These streams, which were called Na Wai Eha (The Great Waters) by Native Hawaiians because of the amount of flow they produced, have been transformed into modest trickles during the past century so that their waters can be transported into the drier central Maui plains to irrigate sugar fields. Because some of the sugar plantations have closed down, it became possible to restore much of the water to the streams, but the Water Commission has declined to do so, and much of the water will continue to be diverted to the remaining sugar fields (with some also being used for the domestic purposes of Maui residents). The one dissenting commissioner, Dr. Lawrence Miike, sharply criticized the Commission's decision saying that it had ignored its responsibilities to protect the integrity of the stream ecosystems and give the natural system a chance to recover. This decision is certain to be appealed, and so Hawai'i's appellate courts will have another opportunity to evaluate the principles that should govern the division and allocation of Hawai'i's water resources.

VI. PRECAUTIONARY PRINCIPLE

The precautionary principle (sometimes called the precautionary approach), which has evolved into a customary international law norm,[74] was confirmed in Principle 15 of the Rio Declaration, which states:

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[73] *Iao Ground Water Management Area High-Level Source Water-Use Permit Applications and Petition to Amend Interim Instream Flow Standards of Waihee River and Waiehu, Iao, & Waikapū Streams Contested Case Hearing, Commission on Water Resource Management,* State of Hawai'i, CCH-MA06-01, Findings of Fact, Conclusions of Law, and Decision and Order, June 10, 2010.

[74] *See, e.g.,* Jon M. Van Dyke, *The Evolution and International Acceptance of the Precautionary Principle, in* BRINGING NEW LAW TO OCEAN WATERS 357, 357 (David D. Caron and Harry N. Scheiber eds., 2004).

> In order to protect the environment, the precautionary approach shall be widely applied *by States* according to their capabilities. Where there are threats of serious or irreversible damage, *lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*[75]

This principle continues to develop and is presently seen as an authoritative norm recognized by governments and international organizations as a firm guide to activities affecting the environment. It flows directly from the responsibility of "due diligence" that is a component of the no-harm rule and it constitutes "an obligation of diligent prevention and control."[76] The essential components of the precautionary principle are:

- Developments and initiatives affecting the environment should be thoroughly assessed before action is taken.
- The burden is on the developer or initiator to establish that the new program is safe.
- Alternative technologies should be explored.
- The absence of full scientific certainty should not limit precautionary measures to protect the environment.
- Whenever serious or irreversible damage is anticipated, the action should be postponed or canceled.

The precautionary principle has been somewhat controversial, because some commentators view it as being too vague,[77] and others view it as unrealistic, but it is a major presence at all international negotiations now, and it appears regularly in trea-

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[75] Rio Declaration, *supra* note 10, at Princ. 15 (emphasis added).

[76] BIRNIE & BOYLE, *supra* note 21, at 115.

[77] *See, e.g.,* Daniel Bodansky, *Scientific Uncertainty and the Precautionary Principle*, 33 ENV'T 4, 8 (Sept. 1991) ("Although the precautionary principle provides a general approach to environmental issues, it is too vague to serve as a regulatory standard because it does not specify how much caution should be taken."). *But see* Daniel Bodansky, *Remarks: New Developments in International Environmental Law*, 85 AM. SOC'Y INT'L L. PROC. 401, 413 (1991) ("Indeed, so frequent is its invocation that some commentators are even beginning to suggest that the precautionary principle is ripening into a norm of customary international law."). *See generally* James E. Hickey, Jr. & Vern R. Walker, *Refining the Precautionary Principle in International Environmental Law,* 14 VA. ENVTL. L.J. 423 (1995) and Gregory D. Fullem, *The Precautionary Principle: Environmental Protection in the Face of Scientific Uncertainty*, 31 WILLAMETTE L. REV. 495 (1995).

ties and documents because it reflects the view that it is necessary to be extra vigilant in our stewardship of resources, especially in light of the many mistakes we have made in recent years.[78] Although the content of the precautionary principle is still the subject of discussion, at a minimum it serves to reverse the burden of proving that a certain activity does not or will not cause damage onto the state seeking to initiate an environmentally sensitive activity. As Judge Wolfrum expressed in his separate opinion in the *MOX Plant Case*:

> There is no general agreement as to the consequences which flow from the implementation of this principle *other than* the fact that the burden of proof concerning the possible impact of a given activity is reversed. A State interested in undertaking or continuing a particular activity has to prove that it will result in no harm, rather than the other side having to prove that it will result in harm.[79]

Certainly the inclusion of the precautionary standard in the 1996 Protocol to the London Dumping Convention[80] and in the 1995 Straddling and Migratory Fish Stocks Agreement[81] provides strong evidence that this approach is here to stay.[82] The

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[78] *See generally* Jon M. Van Dyke, *Applying the Precautionary Principle to Ocean Shipments of Radioactive Materials*, 27 OCEAN DEV. & INT'L L. 379 (1996).

[79] *MOX Plant Case (No. 10) (Ir. v. U.K.),* 41 I.L.M. 405, 428 (Int'l Trib. L. of the Sea 2001) (opinion of Judge Wolfrum) (emphasis added).

[80] 1996 Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, art. 3, Nov. 7, 1996, 36 I.L.M. 1 (reversing the presumptions established in the original convention, so that the dumping of all wastes is prohibited unless the item to be dumped is explicitly listed in Annex I).

[81] Agreement for the Implementation of the Provisions of the U. N. Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, arts. 5(c) and 6, Sept. 8, 1995, U.N. Doc. A/CONF.164/37, 34 I.L.M. 1542 (listing the "precautionary approach" among the principles that govern conservation and management of shared fish stocks and elaborating on this requirement in some detail, focusing on data collection and monitoring).

[82] *E.g.,* Western Pacific Regional Fishery Management Council, *A 20-Year Report* 26 (1998) (stating proudly that the Council has established "a precautionary management approach to fishery conservation and management" as evidenced by its establishment of a moratorium and then a limited-entry program "in response to the rapid entry of longline vessels into the Hawaii-based fleet").

principle has been so universally included in recent treaties that it now appears to have been accepted as a norm of customary international law that is formally binding on all nations.[83] Several judges on the ICJ have recognized the precautionary principle as an emerging concept in international law in cases such as the 1995 *Nuclear Tests Case*[84] and the 1996 *Nuclear Weapons Case*.[85]

The Hawai'i Supreme Court has also recognized the importance of the precautionary principle with regard to decisions affecting the allocation of water. In 2000, it explained that *"the precautionary principle simply restates the [Water] Commission's duties under the [Hawai'i] constitution and [Hawai'i's Water] Code*. Indeed, *the lack of full scientific certainty* does not extinguish the presumption in favor of public trust purposes or vitiate the Commission's affirmative duty to protect such purposes whenever feasible."[86]

> *As with any general principle, its meaning must vary according to the situation and can only develop over time.* In this case, we believe the [Water] Commission describes *the [precautionary] principle in its quintessential form*: at minimum, *the absence of firm scientific proof should not tie the Commission's hands in adopting reasonable measures designed to further the public interest.*[87]

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[83] *See generally* Van Dyke, *The Evolution and International Acceptance of the Precautionary Principle, supra* note 74.

[84] Request for Examination of Situation in Accordance with Paragraph 63 of Court's Judgment of 20 December 1974 in the Nuclear Tests (N.Z. v. Fr.), 1995 I.C.J. 288, 342, 412 (Sept. 22) (dissenting opinion of Judge Weeramantry) (stating the precautionary principle is "gaining increasing support as part of the international law of the environment"); (dissenting opinion of Judge Palmer) (stating "the norm involved in the precautionary principle has developed rapidly and may now be a principle of customary international law relating to the environment").

[85] Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, 502 (July 8) (dissenting opinion of Judge Weeramantry) (stating "principles of environmental law, which this Request enables the Court to recognize and use in reaching its conclusions, [include] the precautionary principle").

[86] *Waiahole I, supra* note 43, 94 Hawai'i at 155 (emphasis added).

[87] *Id.* (emphasis added).

CONCLUSION

How should principles that have emerged from other legal systems and in other contexts apply to the allocation of the newly-discovered water ice on the moon?[88] Although a "first-come/first-served" system has been utilized in some areas to define property rights in water, most areas see that approach as inappropriate and prefer an equitable allocation system of some sort. Water is almost always seen as a public resource that should be shared.

The first to arrive at the moon to exploit its water ice resources will be from one of earth's most developed countries, and certainly some reward should attach to those who put the investment and ingenuity together to develop this resource. But they should not be able to deprive others of access to it, because the Moon itself is part of our common heritage and its important water ice resources are part of the public trust and are central to that sense of a shared heritage. It will be important to assign the task of developing the equitable principles that will govern access to the Moon's water ice to an appropriate international organization[89] so that the process of identifying these principles can begin, and the exploration of the moon can continue under the common heritage tradition.

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[88] For a discussion of the challenging task of allocating the living resources of the high seas, *see* Jon M. Van Dyke, *Allocating Fish Across Jurisdictions, in* CONSERVATION AND MANAGEMENT OF TRANSNATIONAL TUNA FISHERIES 163-79 (Robin Allen, James Joseph & Dale Squires eds. 2010); previously published in LAW OF THE SEA, PROTECTION OF THE MARINE ENVIRONMENT AND SETTLEMENT OF DISPUTES 821-44 (Tafsir Malick Ndiaye & Rudiger Wolfrum eds. 2007).

[89] The International Seabed Authority, which has been charged with supervising the exploration and exploitation of the deep seabed minerals, might provide an appropriate model.

REGULATION OF REMOTE SENSING ACTIVITIES IN HONG KONG: PRIVACY, ACCESS, SECURITY, COPYRIGHT AND THE CASE OF GOOGLE

Yun Zhao[*]

I. INTRODUCTION

Satellite remote sensing, an important technological development in human history, has been playing an increasingly important role in modern society. Remote sensing makes it possible to collect data on dangerous or inaccessible areas; as such, it functions as a powerful tool in monitoring and assessing the resources of the Earth. In view of its multi-faceted functions and awesome potential, remote sensing has been applied to many different areas, such as weather broadcasting and oceanographic observation.

In recent years society has witnessed the importance of remote sensing on one other strategic area – environmental protection. "The acknowledgement of the necessity" of environmental protection "has led to a growing need for global observation; remote sensing activities, by offering precise geographical details, allow faster and more effective help in predicting natural disasters and use of natural resources."[1] The importance of remote sensing in this area has been further evidenced in the recent United Nations Climate Change Conference in December 2009 in Copenhagen, Denmark.[2] By providing accurate data information, remote sensing can provide early warning of environmental pollution and further offer invaluable services in

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[1] Emmanuel Nabet, *Legal Aspects of the Use and Applications of Remote Sensing in South East Asia*, 5 SINGAPORE J. INT'L & COMP. LAW , 156, 159-60 (2001).

[2] COP15: United Nations Climate Change Conference, http://www.itu.int/en/osg/activities/Pages/2009-12-cop15.aspx (last visited Jan. 25, 2011).

prompt assessment of possible damages and coordinating measures against such pollutions.

Although not a Party to the United Nations Framework Convention on Climate Change, Hong Kong joined as members of the Chinese delegation to Conferences of Parties to the Convention. "Given its limited role in global climate talks, Hong Kong had to focus on what it could achieve on its own to reduce carbon emissions."[3] One of the proposals for the emission of carbon emissions is "to strengthen the control of emissions from . . . petrol and liquefied petroleum gas (LPG) vehicles, including the use of roadside remote sensing equipment and dynamometers for emission testing."[4] The use of remote sensing is thus placed in an important position in dealing with climate changes. Hong Kong has been applying remote sensing in many other areas, for example, in slope engineering and safety system, and landslide risk management.[5] An overview of ongoing remote sensing activities in Hong Kong will be further discussed in Part 2 of this article.

The extensive use of remote sensing activities does not necessarily result in a so-called "remote sensing law" in Hong Kong. As one of the most liberalized economies in the world, Hong Kong leaves the regulation of remote sensing activities to the market. Nevertheless, Hong Kong does have an Outer Space Ordinance, which deals with the launching and operation of space objects and the carrying on of other activities in outer space. Part 3 of the paper will examine the regulatory regime for remote sensing activities in Hong Kong. Several important aspects of remote sensing activities will be covered in this part, including space licensing and intellectual property issue. Part 4 of the paper elaborates on the issues of open access (transaction of remote sensing products). When it comes to the issue of open

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[3] Chi-fai Cheung, *HK's Role Limited, Yau Says*, SOUTH CHINA MORNING POST, Dec. 11, 2009, at 9.

[4] LEGISLATIVE COUNCIL PANEL ON ENVIRONMENTAL AFFAIRS SUBCOMMITTEE ON IMPROVING AIR QUALITY, PROGRESS OF MEASURES UNDER PEARL RIVER DELTA REGIONAL AIR QUALITY MANAGEMENT PLAN TO ACHIEVE 2010 EMISSION REDUCTION TARGETS 3, CB(1)2437/08-09(1) (Jan. 2010).

[5] R.K.S. Chan & T.M.F. Lau, *Slope Safety System and Landslide Risk Management in Hong Kong*, http://150.217.73.85/wlfpdf/14_chan.pdf (last visited Mar. 1, 2010) (on file with author).

access, this paper discusses a recent event in which Google decided to move its search engine from mainland China to Hong Kong. This paper will look into relevant legal issues involved in this significant event and its implication to mainland China and Hong Kong in relation to remote sensing activities.

The present paper concludes that remote sensing activities are vital to the sustainable development of Hong Kong and that in view of the particular situation in Hong Kong, the current regulatory regime is sufficient for remote sensing activities in the region.

II. REMOTE SENSING ACTIVITIES IN HONG KONG

While lacking in indigenous launching capabilities, Hong Kong has been able to actively carry out space activities in recent years. Due to its small geographical area, Hong Kong has largely limited its space activities and focused on the information aspect of space: telecommunications services, remote sensing, data, and information. The extensive use of satellite-related space activities in Hong Kong serves the sole purpose of economic development and the improvement of people's livelihood.[6]

Two major satellite companies in Hong Kong provide important telecommunications services. Operating a fleet of five satellites comprising *APSTAR I*, *APSTAR IA*, *APSTAR IIR*, *APSTAR V* and *APSTAR VI*, the APT Satellite Holding Limited ('APT Group') has been providing high quality transponder utilization service, satellite communication service and satellite TV broadcasting service to the broadcasting and telecommunication operators in Asia-Pacific, Europe, and the United States since 1992.[7] Established in 1988, the Asia Satellite Telecommunications Company Limited (AsiaSat) has three in-orbit satellites, *AsiaSat 3S*, *AsiaSat 4* and *AsiaSat 5*, which are "monitored and controlled . . . by the state-of-the-art satellite control

[6] Industrial and Commerical Affairs, http://www.cgcc.org.hk/b5/chamber/bulletin/files/AnnualArticle_1222675178.24654_IndustrialandCommercialAffairs.pdf (last visited Jan. 25, 2011).

[7] APT Satellite Holdings Limited Company Profile, http://www.apstar.com (last visited Feb. 4, 2011).

facilities in Hong Kong including the Stanley Earth Station and the AsiaSat Tai Po Earth Station."[8]

While telecommunications services are major part of space activities, remote sensing activities have been playing an increasingly important role in various areas of social life in Hong Kong. For example, an HRPT (High Resolution Picture Transmission) station for the reception of SeaWiFS (Sea-viewing Wide Field-of-view Sensor) ocean color data was installed at the Hong Kong University of Science & Technology (HKUST) in 1994, where the Institute for the Environment/Environmental Central Facility (ENVF/ IENV) is affiliated.[9]

More importantly, the Satellite Remote Sensing Receiving Station, an important facility of the Institute of Space and Earth Information Science of the Chinese University of Hong Kong CUHK), was set up to capture and process satellite sourced remote sensing data.[10] The Station is "useful in monitoring the environment and natural disasters including landslides, subsidence, earthquakes, tsunamis, floods and typhoons, thereby reducing the risk of civilian casualties and economic loss."[11] The commercial practice of the Station is exemplary for the discussion of the present paper.

III. REGULATORY REGIME IN HONG KONG

Hong Kong has one ordinance specifically dealing with outer space matters. The Outer Space Ordinance came out from localization efforts during the transfer period when China resumed its sovereignty over Hong Kong. This Ordinance confers licensing and other relevant powers on the Chief Executive to ensure the compliance with international obligations of the Peo-

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[8] AsiaSat About Us, http://www.asiasat.com/asiasat/contentView.php?section=1&lang=0 (last visited Feb. 4, 2011).

[9] *See* The Honk Kong University of Science and Technology, Welcome to the HKUST HRPT Satellite Ground Station, http://envf.ust.hk/satop/ (last visited Feb. 3, 2011).

[10] Satellite Remote Sensing Receiving Station, The Chinese Univ. of Hong Kong, Introduction, http://www.iseis.cuhk.edu.hk/groundstation/eng-background.htm (last visited Feb. 3, 2011).

[11] *Id.*

ple's Republic of China.[12] It covers the launching or procurement of launching of a space object or any activity in Outer Space. Remote sensing activities are obviously covered by this Ordinance. There are no other relevant remote sensing laws and/or policies in Hong Kong besides this Ordinance. The Hong Kong government takes a liberal approach, leaving the regulation of remote sensing activities to the market. As such, we may need to fall back on certain general legislation for the protection of remote sensing data in Hong Kong. Furthermore, it is essential to look into general practice of remote sensing activities in Hong Kong for legal guidance.

A. Privacy and Security Concerns

The easy availability of remote sensing data leads to a possible concern over privacy and security. "As data availability will be purely driven by market considerations, . . . there are real threats to the rights to privacy [and security] due to possibilities of industrial espionage and the potential use of imagery by anti-social groups."[13]

As far as the concept of "remote sensing data" is concerned, one may immediately think of the Personal Data (Privacy) Ordinance, Cap. 486. Unfortunately, this ordinance does not apply in this case as it only refers to the collection, storage, and use of personal/individual data; "such data are those that describe an individual and attribute things to an individual so that others can identify a particular individual. It applies to Data Users in Hong Kong, whether they are individuals, private companies or public bodies."[14] At the moment, there is no comprehensive data protection law in Hong Kong.

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[12] Int'l Law Ass'n, Berlin Conference (2004), Space Law Comm., *Report on the Legal Aspects of the Privatization and Commercialization of Space Activities: Remote Sensing and National Space Legislation*, 16, *available at* http://www.ila-hq.org/en/committees/index.cfm/cid/29.

[13] KR Sridhara Murthi, *Commercial Availability of High Quality Remote Sensing Imageries: Legal Issues*, 5 SINGAPORE J. INT'L & COMP. LAW, 149, 153 (2001).

[14] Implementation of Data Alignment Measures for the Alignment of Planning, Lands and Public Works Data: Final Report, Vol. 2I, at (1-9)-(1-10) (Mar. 2004, *available at* http://www.devb.gov.hk/filemanager/en/content_384/frv2I.pdf [hereinafter Final Report].

In this regard, it might be useful to refer to general policy guidance. The Security Bureau is responsible for developing policies concerning the protection and handling of confidential government information. Four security classifications exist in Hong Kong, from highest to lowest in sensitivity: top secret, secret, confidential, and restricted documents.[15] The above security classification does not necessarily mean that such documents will be denied access.

The Code on Access to Information defines the scope of information available for the public.[16] Part 2 of the Code provides several situations when request of information may be refused: defence and security; external affairs; nationality, immigration and consular matters; law enforcement, legal proceedings and public safety; damage to the environment; management of the economy; management and operation of the public service; internal discussion and advice; public employment and public appointments; improper gain or advantage; research, statistics and analysis; third party information; privacy of the individual; business affairs; premature requests; and legal restrictions.[17]

B. Copyright Protection

While there is no specific legislation in Hong Kong on the protection of intellectual property rights in remote sensing data, we can still find support in the Copyright Ordinance (Cap. 528).[18] Copyright has been broadly defined in the Ordinance to subsist in "original literary . . . [or] artistic works; . . . broadcasts; . . . and the typographical arrangement of published editions."[19] Furthermore, the Ordinance contains provisions regarding the protection of copyright in broadcasting using satellite. "Broadcast" in the Ordinance includes a transmission of visual images which "is capable of being lawfully received by members

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[15] Federation of American Scientists, Appendix F: Equivalent Foreign Security Classifications, http://www.fas.org/irp/doddir/dod/5200-1r/appendix_f.htm (last visited Oct. 20, 2010.

[16] *See* Code on Access to Information, §§ 1.1-1.3 (effective Dec. 23, 1996) (Hong Kong), *available at* http://www.access.gov.hk/en/code.htm.

[17] *See id.* §§ 2.1-2.18.

[18] Copyright Ordinance, (2007) Cap. 528.

[19] *Id.* § 2(1).

of the public in Hong Kong or elsewhere."[20] While not expressly written down in the Copyright Ordinance, originality and creativity are two essential requirements for a work to enjoy copyright protection. Originality requires that the work is not copied from another work. Creativity further requires that at least a minimum degree of independent skill or judgment must have been introduced into the work by the author.[21]

The question is how to define remote sensing data. In this regard, we may need to go further to examine the factor of "creativity" in remote sensing data. The UN Principles relating to Remote Sensing of the Earth from Space in 1986 (UN Remote Sensing Principles) contains three terms: primary data, processed data[22] and analyzed information.[23] There is no problem in finding that processed data and analyzed information involve human creativity by processing and analyzing the primary data and, therefore, enjoy copyright protection. Plenty of scholarly works have touched on the problem of copyright barriers to open access of remote sensing data.[24] As far as Hong Kong is concerned, this will not be a big problem since remote sensing documents in Hong Kong are largely accessible in a transparent manner. This issue will be further discussed in Part 4.

The Copyright Ordinance further defines Government copyright. "Where a work is made by an officer of the Government in the course of his duties, (a) the work qualifies for copyright protection . . . (b) and the Government is the first owner of any copyright in the work."[25] As discussed below, the Hong Kong

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[20] *Id.* § 8(1)(a).

[21] STEVEN L. OBERHOLTZER, THE BASIC PRINCIPLES OF INTELLECTUAL PROPERTY LAW 35 (Brinks Hoffer Gilson & Lione, 2006).

[22] *See* Principles Relating to Remote Sensing of the Earth from Space, G.A. Res. 41/65, at Principle I (b), U.N. GAOR, 29th Sess., 95th plen. mtg., U.N. Doc. A/Res/41/65 (Dec. 3, 1986) [hereinafter Remote Sensing Principles] (defining "processed data" as "the products resulting from the processing of the primary data, needed to make such data usable.").

[23] *Id.* at Principle I (d) (defining "analyzed information" as "information resulting from the interpretation of processed data, inputs of data and knowledge from other sources.").

[24] *See, e.g.*, Lesley Jane Smith & Catherine Doldirina, *Remote Sensing: A Case for Moving Space Data Towards the Public Good*, 24 *SPACE POLICY* 22, 22-32 (2008).

[25] Copyright Ordinance of Hong Kong, (1997) § 182(1) Cap.528 (H.K.). Copyright Ordinance, Section 182 (1).

Government is one major body in producing remote sensing data, which no doubt enjoys the protection under the category of Government copyright.

When it comes to primary data, reference to the UN Remote Sensing Principles is needed for the definition: "[t]he term 'primary data' means the raw data that are acquired by remote sensors borne by a space object and that are transmitted or delivered to the ground from space by telemetry in the form of electromagnetic signals, by photographic film, magnetic tape or any other means."[26]At this stage, the primary data needs further processing to make it usable. Some scholars believe that it simply constitutes an electronically stored collection of spatial and non-spatial data and involves no human creativity.[27] As such, it does not satisfy the requirement of originality for copyright protection.

IV. OPEN ACCESS

The 1986 UN Remote Sensing Principles provides for non-discriminatory access by sensed States to remote sensing data on reasonable cost terms.[28] While copyright protection is important for the production of intellectual property work, there are concerns over the undesirable consequence of restricting the use of copyright information by allowing pricing above marginal costs.[29] It would be interesting to examine whether such concerns exist in Hong Kong.

A. Transaction of Remote Sensing Products between Private Parties

As mentioned earlier, Hong Kong government leaves private remote sensing activities to the market. There is no restric-

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[26] Remote Sensing Principles, *supra* note 22, at Principle I (b).

[27] *See* Dennis.S. Karjala, *Copyright in Electronic Maps*, 35 JURIMETRICS J., 395, 395-415 (1995).

[28] Remote Sensing Principles, *supra* note 22, at Principle XII.

[29] *See* William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 326-27 (1989).

tion on the access to remote sensing data.[30] Taking the CUHK Satellite Remote-Sensing Ground Receiving Station as an example, it has completely commercialized its products. *ENVISAT*, an advanced polar-orbiting Earth observation satellite, was launched in 2002 by the European Space Agency.[31] The ground station receives and processes data from the satellite, and provides useful information to government and private corporations in Hong Kong, South China and neighboring regions.[32] A list of product prices is reproduced below:[33]

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a. Basic Price (# a minimum order of 4 consecutive scenes for programming acquisitions)

Product Mode	Price (Archive)	Price (Programming)
Image Mode	HK$4300/scene #	HK$5800/scene #
Wide Swath Mode	HK$4300/scene	HK$5800/scene
Alternating Polarization Mode	HK$4300/scene #	HK$5800/scene #

b. Extra Programming Fee (# one programming request includes: four consecutive Image Mode images, or four consecutive Alternating Polarization Mode images, or One Wide Swath Mode image)

Programming Mode #	Extra Programming Fee
Regular: Order received 16 days in advance	No extra fee required
Priority: Order received between 9-16 days	HK$5000/per programming request #
Emergency: Order received between 4-9 days	HK$25000/per programming request #

[30] *See e.g.*, Anthony Yeh, *Development and Applications of GIS in Asia*, http://www.gisdevelopment.net/proceedings/gisdeco/2004/keynote/gar.htm (last visited Jan. 25, 2011).

[31] Satellite Remote Sensing Receiving Station, *supra* note 10.

[32] *Id.*

[33] Satellite Remote Sensing Receiving Station, The Chinese Univ. of Hong Kong, ENVISAT Data ASAR Product, http://www.iseis.cuhk.edu.hk/groundstation/eng-price.htm (last visited Oct. 20, 2010).

c. Discounts for Volume Orders

Description	Discount
Order of 10-15 scenes	5%
Order of 16-50 scenes	10%
Order of more than 50 scenes	15%

d. Non-profit Making Project conducted by Universities and Research Institutes

"To promote the applications and researches on Satellite Remote Sensing, additional discounts can be offered to Universities or Research Institutes for conducting non-profit making projects."

From the above list, it is clear that remote sensing data producers are in the sole position to decide on transaction terms with relevant customers, such terms normally being on a market basis. This rightly reflects the long-held commercial tradition in Hong Kong.

B. Remote Sensing Data Exchange within the Hong Kong Government

"Under the Digital 21 Information Technology Strategy, the Hong Kong Government has made [remarkable] progress" in recent years aiming to establish itself as "a leading e-business community and digital city" in the world.[34] Geographical information systems (GIS) have been extensively employed in capturing, updating, disseminating, performing query, and analyzing remote sensing data, which was frequently used by the government departments in carrying out their services.[35]

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[34] Kenneth So Man Cheong & Victor Ng Wai Tak, *Spatial Data Exchange within the HKSAR Government – from a Perspective of a Data Agent*, FIG Working Week 2007, at 1, *available at* http://www.fig.net/pub/fig2007/papers/ts_1d/ts01d_02_so_ng_1339.pdf.

[35] *Id.*

The Data Alignment Measures (DAM) project, led by the former Housing, Planning and Lands Bureau of the Hong Kong Government, commenced on October 16, 2002 and completed in March 2004 aims to improve the efficiency and effectiveness in the exchange of spatial data among government departments and to address the deficiencies arising from data definition, compatibility of data format, data quality, data cost and turn around time.[36]

The Lands Department, as the primary digital map data supply agency in Hong Kong, is responsible for the related data collection, creation, conversion, integration, and dissemination. It has been assigned to be the Data Agent of the three Common Spatial Units (CSUs), namely, Building, Lot and Road Centerline.[37] It works closely with the Data owners in implementing the following CSU standards:

> (a) Enforce the specification of CSU - Ensure the data from the Data Owners conform to specification requirements with respect to data completeness, timeliness, symbology standard and file formats standard.
>
> (b) Prepare metadata of each CSU and submit to hosting PD of the Metadata Catalogue System.
>
> (c) Respond to Data Owners/Data Users requests for enquiries on exchanged data.
>
> (d) Issue and maintain CSU IDs - Issue and maintain CSU IDs for the dataset, and ensure the ID's uniqueness to allow PDs to perform translation and matching of their data with respect to the CSU dataset.
>
> (e) Administer dataset ownership;
>
> (f) Observe license arrangement;
>
> (g) Resolve CSU related issues brought up by Data Users and/or Data
>
> Owners, if possible or refer the issues to DAM Management Committee if needed.[38]

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[36] Implementation of Data Alignment Measures for the Alignment of Planning, Lands and Public Works Data: Final Report (Volume 1 of 3), Main Text, at 2-1 (Mar. 2004), http://www.devb.gov.hk/filemanager/en/content_384/frv1.pdf.

[37] *Id.* at page 1-8.

[38] Final Report, *supra* note 14, at (1-3)-(1-4).