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# JOURNAL OF SPACE LAW

UNIVERSITY OF MISSISSIPPI SCHOOL OF LAW  
A JOURNAL DEVOTED TO SPACE LAW AND THE LEGAL PROBLEMS  
ARISING OUT OF HUMAN ACTIVITIES IN OUTER SPACE.

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## FOREWORD

### EARTH OBSERVATION, THE ENVIRONMENT, SPACE, AND REMOTE SENSING LAW IN THE PACIFIC RIM: MEETING AND LIVE BLOGCAST

*Joanne Irene Gabrynowicz*<sup>1</sup>

This volume of the *JOURNAL OF SPACE LAW* contains most of the papers presented at the *Earth Observation, Environment, Space, and Remote Sensing Law in the Pacific Rim: Meeting and Live Blogcast* (Meeting) hosted by the National Center for Remote Sensing, Air, and Space Law at the University of Mississippi School of Law (Center) and held in Hawaii, U.S., on June 16 - 18, 2010.

The purpose of the Meeting was to build upon the success of the first Pacific Rim National Space Law Summit (Summit) hosted by the Center in 2009. The 2009 meeting focused on the national space laws of Pacific Rim nations.<sup>2</sup> The 2010 meeting addressed the law of Earth Observation, the environment and related topics of various Pacific Rim nations. Like the first event, this meeting also provided a forum for an in-depth experience in which the participants had the opportunity to learn from one another and to discuss, in detail, remote sensing and related law and their developing features in the Pacific Rim. As with the original Summit experts from Australia, China, Hong Kong (special administrative region of China), Japan, Korea

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<sup>1</sup> Joanne Irene Gabrynowicz is the Editor-in-Chief of the *JOURNAL OF SPACE LAW*. She is also a professor of space law and remote sensing law and the Director of the National Center for Remote Sensing, Air, and Space Law at the University of Mississippi School of Law. Prof. Gabrynowicz was the recipient of the 2001 Women in Aerospace Outstanding International Award and is a Director of the International Institute of Space Law and a member of the American Bar Association Forum on Air and Space Law.

<sup>2</sup> 35(2) *J. SPACE L.* (2009).

(South), the United States of America, and the United Nations participated. New to this year's gathering were scholars from the Group on Earth Observations, Colombia, and Mexico. The private bar was represented as well this year with practitioners from the Hawaiian, U.S., and Sydney, Australia bar. Also new this year was an interdisciplinary paper addressing both science and law.

The meeting format was designed to promote the exchange and understanding of information. This was accomplished by providing each speaker with half an hour to present his or her paper and each presentation was followed by at least another half hour during which the participants—and, new this year, commentators—raised questions and discussed the details of the presented paper. For most of the participants, it was the first time they had had the opportunity to meet one another, and this added another dimension to the learning experience. Exchanges were lively, sometimes heated, but always professional and informative. In addition to the exchange of information and ideas that was occurring at the Meeting itself, distant participants kept informed of its contents via a live, real-time blogcast.

This volume of the *Journal of Space Law* includes the papers of Prof. Setsuko Aoki of the Faculty of Policy Management, Keio University, who addresses the quickly changing topic of *Japanese Law and Regulations Concerning Remote Sensing Activities*; Fermín Romero, Director para Asamblea General y Organismos Internacionales Dirección General para la Organización de las Naciones Unidas Secretaría de Relaciones Exteriores and Sergio Camacho Lara, Centro Regional de Enseñanza de Ciencia y Tecnología del Espacio para América Latina y el Caribe who, in their paper, recommend *What Lawyers Need to Know About Science to Effectively Make and Address Laws for Remote Sensing and Environmental Monitoring*; Prof. Steven Freeland, Professor of International Law and Associate Head of School (Research), School of Law, University of Western Sydney, describes the legal possibilities presented by Australia's new space policy in *Sensing a Change? The Re-Launch of Australia's Space Policy and Some Possible Legal Implications*; Prof. Jae Gon Lee, Professor of Law, School of Law, Chungnam National

University, raises *Remote Sensing Issues as they Relate to Korea*; some of China's law is described by Prof. Yan Ling, Faculty of International Law, China University of Political Science and Law in her paper, *Remote Sensing Data Distribution and Application in the Environmental Protection, Disaster Prevention, and Urban Planning in China*; and in *Regulation of Remote Sensing Activities in Hong Kong: Privacy, Access, Security, Copyright, and the Case of Google*, Dr. Yun Zhao, Associate Professor, Faculty of Law, the University of Hong Kong continues the data distribution discourse.

Two papers, *Legal Aspects of Reducing Green House Gases Emitted by Aircraft Registered in Korea: A Ripple Effect of EU Initiatives* by Prof. Won-hwa Park of Korea Aerospace University, and *Access to Water on the Moon: Lessons from Water Law in Hawai'i and Elsewhere* by Dr. Jon M. Van Dyke, Professor of Law and Carlsmith Ball Research Fellow, William S. Richardson School of Law, University of Hawaii at Manoa, provide inquiry into practice and precedent from the Pacific Rim that have relevance to larger environmental considerations and space law as a whole. Dr. Van Dyke's paper provides an excellent segue to the only paper in this volume written independently from the meeting papers, *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* by Dr. Fabio Tronchetti of the Harbin Institute of Technology School of Law.

Rounding out this professional discussion were the commentators Ms. Ikuko Kuriyama and Dr. Masami Onoda. Other participants, who made presentations but who do not have papers in the current volume include, Prof. PJ Blount and Dr. Sara M. Langston, both from the National Center for Remote Sensing, Air, and Space Law, University of Mississippi School of Law; Ms. Sherry P. Broder, Law Offices of Sherry P. Broder; Ms. Donna Lawler, Corporate Counsel, SingTel Optus Pty Limited; Dr. Ricky Lee, Senior Associate, Schweizer Kobras, Sydney NSW; Mr. James T. Mahoney, Lead Counsel, Space Operations Missions Directorate, NASA; and Dr. Sylvia Ospina, S. Ospina & Associates.

Overall, when the meeting ended, the participants came away knowing more about space law in the Pacific Rim as well as the Pacific Rim space law community itself. The readers of the *Journal of Space Law* will now also have the same opportunity by reading the contents of this volume and the on-line blog-cast at [http://www.spacelaw.olemiss.edu/event\\_Pacific%20Rim%202010.html](http://www.spacelaw.olemiss.edu/event_Pacific%20Rim%202010.html).

# CALL FOR PAPERS

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### Volume 37, Number 2

The National Center for Remote Sensing, Air, and Space Law of the University of Mississippi School of Law is delighted to announce that it will publish Volume 37, issue 2 of the JOURNAL OF SPACE LAW in the second half of 2011.

Authors are invited to submit manuscripts, and accompanying abstracts, for review and possible publication in the JOURNAL OF SPACE LAW. Submission of manuscripts and abstracts via email is preferred.

Papers addressing all aspects of international and national space law are welcome. Additionally, papers that address the interface between aviation and space law are welcome.

Please email manuscripts and accompanying abstracts in Microsoft Word or WordPerfect to:

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Or, alternatively, a hardcopy of the manuscript and abstract, along with a computer diskette containing them in Microsoft Word or WordPerfect format may be sent to:

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To be considered for the next issue, submissions should be received on or before October 15, 2011. However, the JOURNAL OF SPACE LAW will continue to accept and review submissions on an ongoing basis.



# JAPANESE LAW AND REGULATIONS CONCERNING REMOTE SENSING ACTIVITIES

*Setsuko Aoki\**

## I. INTRODUCTION

Currently, Japan does not have any national laws to directly regulate remote sensing activities. However, more than two decades of experience operating remote sensing satellites<sup>1</sup> have produced established national practices on the data distribution of government-owned remote sensing satellites. Additionally, the first comprehensive space policy of Japan, Basic Plan for Space Policy,<sup>2</sup> contains an outline of the satellite-based image data policy to be formulated within one or two years from the time of this Policy was publicized.<sup>3</sup> In addition, in May 2010, a new space policy was released reflecting the change of government in September 2009. That policy contains the measures to make a remote sensing data distribution an established industry as well as a diplomatic tool for better contributing to international society. The concept of the “Guardian of the Environment” is newly articulated as an important function of remote sensing satellites in that policy.<sup>4</sup>

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<sup>1</sup> Japan has launched and registered in the UN registry seven remote sensing satellites. In addition, Japan has been participating in three international programs. As of 2010, four such satellites are in operation. Japan Aerospace Exploration Agency (JAXA), *Satellites and Spacecraft, Earth Observation Satellites*, [http://www.jaxa.jp/projects/sat/index\\_e.html](http://www.jaxa.jp/projects/sat/index_e.html) (last visited Jan. 23, 2011).

<sup>2</sup> Strategic Headquarters for Space Policy, *Basic Plan for Space Policy: Wisdom of Japan Moves Space* 35 (June 2, 2009), available at [http://www.kantei.go.jp/jp/singi/utyuu/basic\\_plan.pdf](http://www.kantei.go.jp/jp/singi/utyuu/basic_plan.pdf) [hereinafter *Basic Plan for Space Policy*]; see also, Setsuko Aoki, *Current Status and Recent Developments in Japan's National Space Law and Its Relevance to Pacific Rim Space Law and Activities*, 35 J. SPACE L. 363, 389-90, 415-38 (2009).

<sup>3</sup> *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

<sup>4</sup> Strategic Headquarters for Space Policy [hereinafter Strategic Headquarters], *Uchūbunya nikansuru jūtenshisaku nitsuite- wagakuni no seichō o motarasu senryaku-*

This article explains Japanese laws, regulations, and policies concerning remote sensing activities and tries to explore the implications in a broader perspective of Pacific Rim space law and activities. Annexed to this article is the latest space policy of Japan, “Important Measures in the Space Policy: Strategic Space Policy to Promote Japan’s Growth.” It was translated into English by the present author.

## II. JAPAN’S CURRENT POLICIES CONCERNING REMOTE SENSING SATELLITES

### A. *Basic Plan for Space Policy*

Article 24 of the Basic Space Law,<sup>5</sup> Japan’s first national space legislation, adopted on 21 May 2008, provides that Strategic Headquarters for Space Policy (hereinafter Strategic Headquarters),<sup>6</sup> newly established by that law, shall formulate a basic space plan concerning space development and use to fulfill the purposes and principles of the Basic Space Law including scientific research; civil application to accomplish safe and secure society; enhancing national and human security; and space diplomacy.<sup>7</sup> The Basic Plan for Space Policy was approved on June 2, 2009.<sup>8</sup>

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*teki uchuseisaku no suishin [Important Measures in the Space Policy: Strategic Space Policy to Promote Japan’s Growth]* May 25, 2010, available at <http://www.kantei.go.jp/jp/singi/utyuu/kettei/100525/sisaku.pdf> [hereinafter *Important Measures*]. English translation by the present author is appended at the end of this article. See Appendix, *infra* at 350 [hereinafter Appendix].

<sup>5</sup> Uchū kihonhō [Basic Space Law] Law No.43 of May 28, 2008, available at <http://law.e-gov.go.jp/announce/H20HO043.html>, see unofficial English translation of the Basic Space Law, *Fundamental Act of Outer Space* (Law No. 43, 2008), 34 J. SPACE L. 203, 471 (2008).

<sup>6</sup> In this author’s previous articles, this author translated the Japanese name for that Headquarters into English as “Strategic Headquarters for Space Development.” However, since the Strategic Headquarters started to use “Strategic Headquarters for Space Policy” as its official English name since June 2009, this author also uses the same English name in this article. See, e.g., Aoki, *supra* note 2, at 389-90.

<sup>7</sup> Basic Space Law, *supra* note 5, at art. 24.

<sup>8</sup> *Basic Plan for Space Policy* was discussed at the Experts Research Committee on the Space Development Strategy [hereinafter Expert Research Committee] established by the Strategic Headquarters based on the Cabinet Order on September 12, 2008. *Uchūkaihatsusenryaku senmon chōsakai ni tsuite* [Decision on the Experts Research Committee on the Space Development Strategy], Sept. 12, 2008, available at

Satellite-based image data policy is found in Action Plan 1, one of the seven action plans enumerated in the Basic Plan for Space Policy. Action Plan 1 refers to the promotion of space use to contribute to making a safe, secure, and affluent society through the establishment of an effective space-based data use system.<sup>9</sup> Three points are highlighted in Action Plan 1: 1) the collection of the users' opinions; 2) construction of a user-friendly data use system; and 3) creation of a standardized data policy. A "Coordination Committee" consisting of data suppliers and various users will be established to figure out the current status of data utilization and to identify the areas to be improved in the methods of operation and functions of satellites and sensors. Users' opinions will be duly reflected in the future design, manufacturing, and use methods of satellites and sensors.<sup>10</sup> Relating to the third point, the Basic Plan noted that a standard data policy on the distributable resolution, pricing, and other matters should be made in a manner that strikes a good balance in the distribution methods between the data collected through the use of the public funds, aiming at distributing them as widely as possible for the public interest, and data produced by the commercial entities to obtain proceeds.<sup>11</sup>

It is specified in the Basic Plan that the distribution system of the value-added image data and information has to be created in line with the "Basic Plan for the Advancement of Utilizing Geospatial Information"<sup>12</sup> and other relevant guidelines. The Basic Plan for Space Policy makes it clear that the data policy should be made within one to two years from the time this Policy is publicized.<sup>13</sup>

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<http://www.kantei.go.jp/jp/singi/utyuu/pdf/1.pdf>. See also, Aoki, *supra* note 2, at 386. The author was a member of the Experts Research Committee from Sept. 12, 2008 to Sept. 11, 2010.

<sup>9</sup> *Basic Plan for Space Policy*, *supra* note 2, at 34-36; Aoki, *supra* note 2, at 389-90, 424-46.

<sup>10</sup> *Basic Plan for Space Policy*, *supra* note 2, at 35-36; Aoki, *supra* note 2, at 425.

<sup>11</sup> *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

<sup>12</sup> *Chiri kukanjohoo katsuyō suishin kihonkeikaku* [*Basic Plan for the Advancement of Utilizing Geospatial Information*], Apr. 15, 2008, available at <http://www.space.law.olemiss.edu/library/space/Japan/policies/2008-4-15-GIS.pdf>; *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

<sup>13</sup> *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

Further, Action Plan 2 is aimed at space use for the national security and also stipulates the data management plan for commercial users including “shutter control” or restrictions on the distribution of the commercial data in a certain area during a certain period of time, as a method which is usually maintained in spacefaring nations with or without the specific law. It is reported in Action Plan 2, that given that Research and Development (R & D) for high resolution imaging satellites will be developed in Japan in the future, the government should formulate necessary rules on satellite image distribution in terms of national security in cooperation.<sup>14</sup>

However, as of June 30, 2010, it seems little progress has been made with respect to Action Plans 1 and 2 due mainly to the first real change in government in about fifty-five years. This occurred in September 2009 and the political turbulence continued reflecting a second change of the Prime Minister, or three Prime Ministers in one year, as of June, 2010.<sup>15</sup>

### B. GOSAT Data Policy

Although there is no comprehensive data policy of remote sensing satellites, the growing recognition of the importance of such policy resulted in a data policy on the latest remote sensing satellite for Japan, Greenhouse gases Observation SATellite, *GOSAT (Ibuki)*.<sup>16</sup> Since *GOSAT* data policy has become the standard for the distribution of data produced from the govern-

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<sup>14</sup> *Basic Plan for Space Policy*, *supra* note 2, at 37; Aoki, *supra* note 2, at 426.

<sup>15</sup> After the completion of this article, the Working Group (WG) to Study a Remote Sensing Policy was established under the Experts Research Committee. The mandates of this WG include the study on the following items: (1) the promotion of remote sensing industry; (2) strengthened coordination between the satellite operators and data users; (3) data distribution policy; (4) coordination with the data use for security purposes; (5) strengthened international cooperation; and (6) other items necessary to comprehensively promote remote sensing activities. The present author is one of the eight members of this WG. *Rimōto sensingu seisaku kentō Working Group no secchi ni tsuite [Decision on the Establishment of a Working Group to Study a Remote Sensing Policy]*, Dec. 20, 2010, available at <http://www.kantei.go.jp/jp/singi/utyuu/senmon/dai10/siryō6.pdf>.

<sup>16</sup> JAXA, *Greenhouse gasses Observation SATellite “Ibuki” (GOSAT)*, [http://www.jaxa.jp/projects/sat/gosat/index\\_e.html](http://www.jaxa.jp/projects/sat/gosat/index_e.html) (last visited Dec. 27, 2010).

mental satellites in Japan, it will be briefly mentioned in this section.<sup>17</sup>

*GOSAT* data policy was made among Japan Aerospace Exploration Agency (JAXA), the National Institute for Environmental Studies (NIES), and Ministry of the Environment (MOE) on 11 November 2008, prior to the launch of *GOSAT*, and revised on 16 April 2009.<sup>18</sup> *GOSAT* data policy is made on the premise that the *GOSAT* data will be distributed on a “non-discriminatory” basis as provided for in the UN Principles Relating to Remote Sensing of the Earth from Space (1986).<sup>19</sup> Purposes of the use of the *GOSAT* data are categorized into two groups in the Policy. The first is the development of Earth-observing systems and Earth science research, or non-commercial purposes, and the second is for commercial purposes.<sup>20</sup> For the former purpose, only actual expenses for reproduction of the data are charged. In principle, the data will be provided on-line and, in such cases, is free of charge.<sup>21</sup> For commercial purposes, users will be charged usage fees in accordance with certain conditions including the number of products provided aside from the actual expenses necessary for reproduction.<sup>22</sup> Data shall not be used in opposition to peaceful uses or for any other purposes than the agreed use. Redistribution of data to any third party is also prohibited.<sup>23</sup>

Different categories of users are given different treatment on the timing and priorities of distribution as well as the types and the quality of data to be provided. *GOSAT* data products are categorized, depending on the processing level, from Level 1 to Level 4, or from raw data to more processed data, and to information added data. Further, each level of such data products

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<sup>17</sup> See, *supra* note 15.

<sup>18</sup> JAXA, NIES, & MOE, *Greenhouse gases Observing SATellite (GOSAT) Data Policy* (Revision Apr.16, 2009), available at [http://www.gosat.nies.go.jp/eng/technology/download/GOSAT\\_Data\\_Policy\\_en.pdf](http://www.gosat.nies.go.jp/eng/technology/download/GOSAT_Data_Policy_en.pdf) [hereinafter *GOSAT Data Policy*].

<sup>19</sup> *Id.* at 1, para. 2.; GA Res. 41/65, U.N. Doc. A/RES/41/65 (Dec. 3, 1986), at principle XII, available at [http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares\\_41\\_0065.html](http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares_41_0065.html).

<sup>20</sup> *GOSAT Data Policy*, *supra* note 18, at 2, para. 6 (1), (2).

<sup>21</sup> *Id.* at 2, para. 8 & at 8, para. 12 (1).

<sup>22</sup> *Id.* at 8, para.12 (2).

<sup>23</sup> *Id.* at 8-9, para.14 (1)-(3).

is classified into three types: (i) standard, (ii) research products, and (iii) internal products. Standard products are to be distributed to all users, research products are available to a limited community of users, and internal products are for further limited research investigators and research organizations.<sup>24</sup> *GOSAT* data policy will be basically maintained in the prospective comprehensive satellite-based data policy to be adopted in about a year.<sup>25</sup>

### III. JAPAN'S SPACE LAW IS RELEVANT FOR THE REMOTE SENSING ACTIVITIES

#### A. *Prospective Space Activities Act*

Article 35 of the Basic Space Law,<sup>26</sup> Japan's first national space legislation adopted on 21 May 2008, provides that Strategic Headquarters, which is newly established by that law, shall further enact space law or laws for the following purposes: (i) to implement Article VI of the Outer Space Treaty;<sup>27</sup> (ii) to ensure public health and safety; (iii) to guarantee third party liability for potential victims arising out of space activities; (iv) to promote private space activities; and (v) to ensure that Japan plays an active role in fulfilling international responsibility for the sustainable development of space.<sup>28</sup> Likewise, Article 6 of the Diet resolutions relating to the Basic Space Bill adopted on 13 May 2009<sup>29</sup> and 20 May 2009,<sup>30</sup> respectively, by the House of

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<sup>24</sup> *Id.* at 2-8, paras. 7, 9-11.

<sup>25</sup> *See, supra* note 15.

<sup>26</sup> Basic Space Law, *supra* note 5, at art. 35.

<sup>27</sup> 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.

<sup>28</sup> Working Group (WG) to study a Space Activities Act, *Chūkantorimatome [The Final Report]*, (March 5, 2010), 3-5 available at <http://www.kantei.go.jp/jp/singi/utyuu/katudo/houkokusho.pdf>.

<sup>29</sup> *Uchū no kaihatsu oyobi riyō no suishin ni kansuru ken [Issues Concerning the Promotion of Development and Use of Space]*, Cabinet Standing Comm., House of Representatives (May 13, 2009), available at [http://www.soranokai.jp/pages/kihonhouA\\_ketsugi.html](http://www.soranokai.jp/pages/kihonhouA_ketsugi.html).

<sup>30</sup> *Uchū kihonhōan ni taisuru hutaiketsugi [Attached Resolution Concerning Basic Space Bill]* Cabinet Standing Comm., House of Councilors (May 20, 2009), available at [http://www.soranokai.jp/pages/kihonhouA\\_080523b.html](http://www.soranokai.jp/pages/kihonhouA_080523b.html).

Representatives and the House of Councillors request that efforts be made to adopt a law to regulate space activities in accordance with international agreements within two years from entering into force of the Basic Space Law.

Strategic Headquarters, established under Chapter IV of the Basic Space Law, is responsible for drafting a law to regulate space activities.<sup>31</sup> Substantial work was conducted at a Working Group (WG) to study a Space Activities Act, set up on 1 October 2008<sup>32</sup> under the Expert Research Committee on the Space Development Strategy (Expert Research Committee).<sup>33</sup> The Interim Report of the prospective Space Activities Act was adopted on 24 August 2009 by that WG.<sup>34</sup> After public comments were invited for the Interim Report from 2 October to 23 October 2009,<sup>35</sup> the Final Report was publicized on March 5, 2010.<sup>36</sup> Final Reports provided for the scope of application of the prospective Space Activities Act, different types of authorization, conditions for obtaining authorization, third party liability, compulsory insurance, etc., but it did not contain the necessary legal frameworks on operating remote sensing satellites and a data distribution system for remote sensing satellites.<sup>37</sup>

For the purposes of the Final Report, authorization is needed for the following activities: (i) launch of a space object; (ii) procurement of a foreign launch; (iii) reentry of a space object; (iv) general operation of satellites; and (v) launch and reen-

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<sup>31</sup> The Strategic Headquarters consists of all Ministers, with the Prime Minister as the Director-General. Basic Space Law, *supra* note 5, at arts. 24-34.

<sup>32</sup> That Working Group was formed on October 1, 2008, by the decision of the Experts Research Committee under the Strategic Headquarters. See *Uchū katsudō ni kansuru hōsei kentō working group no secchi ni tsuite [Decision on the Establishment of a Working Group to Study a Space Activities Act]*, Oct. 1, 2008, available at <http://www.kantei.go.jp/jp/singi/utyuu/pdf/7.pdf>. See also Aoki, *supra* note 2, at 391. The author is a member of the Working Group to Study a Space Activities Act.

<sup>33</sup> *Supra* note 8.

<sup>34</sup> Minutes of the six meetings are available at [http://www.kantei.go.jp/jp/singi/utyuu/kaisai\\_before090916.html](http://www.kantei.go.jp/jp/singi/utyuu/kaisai_before090916.html) (last visited Jan. 26, 2011).

<sup>35</sup> Secretariat of the Strategic Headquarters, *Uchūkatsudō ni kansuru hōsei WG hōkokushoan (chūkantorimatome) ni taisuru ikennoboshū (paburikku komento) no kekka ni tsuite [Result on the Public Comment on the Interim Report by the WG to Study a Space Activities Act]* (Mar. 5, 2010), available at <http://www.kantei.go.jp/jp/singi/utyuu/katudo/pabcomme.pdf>.

<sup>36</sup> *The Final Report*, *supra* note 28.

<sup>37</sup> *Id.*

try site operation.<sup>38</sup> The general operation of satellites means control of the position and posture of a satellite, or so called “station-keeping” as well as the control of the temperature and pressure, etc. within a satellite to maintain the normal function thereof, or so-called “house-keeping.” “Station-keeping” includes de-orbit and re-orbit to mitigate space debris.<sup>39</sup> In other words, operation of a satellite as a system is the scope for the required application of a Space Activities Act, but not a specific mission management, such as the control of remote sensing sensors to collect land and ocean images or positioning data on board a satellite.<sup>40</sup> The exclusion of the operation of a remote sensing satellite and a navigation satellite from the scope of the authorization system mainly stems from the fact that there has been no such privately owned satellites until now.

*B. Proposals by the Aerospace Industry to Promote Remote Sensing Data Distribution Business*

Under such circumstances, on behalf of the aerospace industry, the Society of Japanese Aerospace Companies (SJAC), presented a “Request to a Space Activities Act to Promote Space Industry” (Request) at the second meeting of the WG to Study a Space Activities Act in January 2009.<sup>41</sup> The SJAC requested that a separate law be drafted at the same time as a Space Activities Act to solely promote the space industry in which the regulations on remote sensing activities will be included. That law was tentatively named by the SJAC as Space Industry Promotion Act (SIPA).<sup>42</sup> SJAC maintained that the government shall formulate a basic policy on data management to advance private business.<sup>43</sup>

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<sup>38</sup> *Id.* at 7-8.

<sup>39</sup> *Id.* at 8.

<sup>40</sup> *Id.*

<sup>41</sup> Society of Japanese Aerospace Companies (SJAC), *Uchūkatsudōhō eno yōbō uchūsangyō shinkō no kanten kara [Request to a Space Activities Act to Promote Space Industry]* (Jan. 26, 2009), available at <http://www.kantei.go.jp/jp/singi/utyuu/housei/dai2/siryuu5.pdf>.

<sup>42</sup> *Id.* at 4.

<sup>43</sup> *Id.* at 12. The SJAC’s requests include the establishment of a consultative commission to discuss the conditions for private sectors to use satellite-based data and in-

Additionally, the SJAC Request provides that the government should archive satellite-based raw data because it is beyond the capability of the private entities, and alternatively, the government should consign such archiving for the private operators.<sup>44</sup> Since matters which are not suitable for the subject of law can be a key to the successful industrialization of remote sensing business, the SJAC requested that the government shall also make a remote sensing policy included in a comprehensive Space Industry Promotion Policy (SIPP) (tentative name by the SJAC).<sup>45</sup> In the SIPP, the SJAC proposed that the privatization of the management of public facilities and Private Finance Initiative (PFI), as well as long-term purchase guarantee by the governmental users, or a so-called “anchor-tenancy” contract, should be realized.<sup>46</sup>

At the time when the SJAC submitted such request to the WG to Study a Space Activities Act, the Basic Plan for Space Policy was under discussion at the Experts Research Committee, and therefore, some of the requests by the SJAC were included in Action Plans 1 and 2 of the Basic Plan for Space Policy, released on June 2, 2009.<sup>47</sup> Still unsatisfied, the SJAC continued to submit its proposals to the WG at its third and fourth meetings held in May and July of 2009, urging the WG to include the items not adopted in the Basic Plan such as “anchor tenancy” in a future SIPA or SIPP.<sup>48</sup>

It turned out in the Final Report of the WG, however, that none of the SJAC proposals were expressly adopted. The Report

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formation produced by the government, the adoption of a comprehensive national data policy, and a confirmation that only a Cabinet Order will regulate matters limiting the exports of satellite-based data, information, and value-added products. *Id.*

<sup>44</sup> *Id.*

<sup>45</sup> *Id.* at 2.

<sup>46</sup> *Id.* at 22.

<sup>47</sup> See II.A. of this Article.

<sup>48</sup> SJAC, *Uchükatsudöhö eno yöböo sono 2 uchüsangyö shinköhö uchüsangyöshinköeisaku* [Request No.2 to a Space Activities Act, the Enactment of Space Industry Promotion Act and Space Industry Promotion Policy] (May 25, 2009), at 14-15 & 30, available at [http://www.kantei.go.jp/jp/singi/utyuu/housei/dai4/ho4\\_shiryö3.pdf](http://www.kantei.go.jp/jp/singi/utyuu/housei/dai4/ho4_shiryö3.pdf); SJAC, *Uchükatsudöhö eno yöböo sono 3 uchüsangyö shinköhö uchüsangyöshinköeisaku Shüseiban* [Modified Version of Request No. 3 to a Space Activities Act, the Enactment of Space Industry Promotion Act and Space Industry Promotion Policy], (July 6, 2009), at 14-15, 30, available at [http://www.kantei.go.jp/jp/singi/utyuu/housei/dai5/ho5\\_siryö3.pdf](http://www.kantei.go.jp/jp/singi/utyuu/housei/dai5/ho5_siryö3.pdf).

concludes that a drafting of a SIPA requested by the SJAC will be decided depending on the results of the implementation of the Basic Plan for Space Policy, and that only a continued study will be conducted at the WG as to whether SIPA is urgently needed.<sup>49</sup>

#### IV. RECENT DEVELOPMENT ON THE REMOTE SENSING DATA POLICY: IMPORTANT MEASURES APPROVED IN MAY 2010

##### A. Background

The landslide victory of the Democratic Party of Japan (DPJ) on August 30, 2009, in the national election led to an historic change of government. Although the Basic Space Law is a bipartisan law, and therefore, the Basic Plan for Space Policy should not be influenced by the election result, a new government was not active enough to promptly take measures to implement the seven Action Plans in the Basic Plan. On the contrary, the new Minister for Space, Mr. Seiji Maehara, made a new “Expert Commission to Study a Future Space Policy” on February 23, 2010,<sup>50</sup> irrespective of the continued existence of the Expert Research Committee set up in September 12, 2008.<sup>51</sup> After the seven meetings, the report of the Expert Commission,<sup>52</sup> Important Measures in the Space Policy: Strategic Space Policy to Promote Japan’s Growth (Important Measures)<sup>53</sup> was approved May 25, 2010, at the fourth meeting of the Strategic Headquarters which consisted of all Ministers.<sup>54</sup>

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<sup>49</sup> *The Final Report*, *supra* note 28, at 29.

<sup>50</sup> Cabinet Secretary, *Kongo no Uchuseisaku no arikata ni kansuru yushikishakon-dankaino kaisai ni tsuite [Establishment of the Expert Commission to Study a Future Space Policy]* (Feb. 23, 2010), available at <http://www.kantei.go.jp/jp/singi/tyuseisakukaigi/dai1/gijiyoushi.pdf>.

<sup>51</sup> The term of the membership of the Expert Research Committee is two years from the day of the appointment, or until September 11, 2010.

<sup>52</sup> Minutes of the seven meetings are available at <http://www.kantei.go.jp/jp/singi/utyuu/kaisai.html> (last visited Dec. 29, 2010).

<sup>53</sup> *Important Measures*, *supra* note 4. See also Appendix, *supra* note 4.

<sup>54</sup> Strategic Headquarters, *Daiyonkai kaigō gijiyōshi [Summary of the Fourth Meeting]*, 2 (May 25, 2010), available at <http://www.kantei.go.jp/jp/singi/utyuu/honbu/dai4/gijiyoushi.pdf>.

The status of the Important Measures is slightly ambiguous, partly because the Expert Commission is a private advisory group to the Minister for Space, not a formal committee as is the Expert Research Committee made by the Cabinet Order,<sup>55</sup> and partly because the Important Measures is not scrutinized by public comment. Thus, Important Measures should be read as a complimentary document to implement the Basic Plan. However, it should be noted that the preamble of the Important Measures states, “in accordance with the progress of such Measures, ‘Basic Plan for Space Policy’ (decided by the Strategic Headquarters for Space Policy on June 2, 2009) will be reviewed for the possible amendment by the Strategic Headquarters for Space Policy.”<sup>56</sup> Additionally, the DPJ enjoys a large margin in the more important House of Representatives. Therefore it is not unreasonable to think that the Important Measures will virtually replace the Basic Plan for Space Policy if the contents of the Measures conflict with those of the Basic Plan for Space Policy.

*B. Remote Sensing Satellite Policy in the Important Measures*

The Important Measures refers to remote sensing satellites as having the potential to boost industrialization of space as well as being able to establish a “Guardian of the Environment.”<sup>57</sup> The latter purpose highlights the use of satellites for the public interest, rather than directly for economic gain. However, it is stipulated in the Important Measures that use of remote sensing satellites as the “Guardian of the Environment” is useful for Japan to play an important role in international society, and is thus more important from the standpoint of space diplomacy.<sup>58</sup>

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<sup>55</sup> Strategic Headquarters, *Uchūkaihatsusenryaku honburei heisei 20nen seirei dai 251 gō* [Cabinet Order No.251 of 2008 on the Strategic Headquarters], (Aug. 27, 2008), available at <http://www.kantei.go.jp/jp/singi/utyuu/pdf/2.pdf>.

<sup>56</sup> *Important Measures*, *supra* note 4, at 1.

<sup>57</sup> *Id.* at 10.

<sup>58</sup> *Id.*

i. Conditions of Commercialization of Satellite  
Data Distribution

For commercialization and marketing of the remote sensing industry, Important Measures underlines the conditions of i) real-time data acquisition and distribution; ii) data provision to users on a continuous basis; and iii) user-friendly data distribution, affordably priced data, and information so as to be able to adequately respond to various user needs.<sup>59</sup> To establish the first condition, the Measures suggest specific steps:

[t]he present situation lacks, however, real-time provision of data needed for business, because there is currently only one observation satellite “Daichi” (*ALOS*) operating in Japan and it revisits the same place about twice a week (every 3 days). It is pointed out, in the Measures, that the lack of timely data gathering restricts the growth of satellite data market in Japan. High frequency of the data gathering of revisiting the same spot every 3 hours is required to enter the international market. For that purpose, it is important to construct and operate an Earth observation satellite network consisting of the *Daichi*-series satellites, from 4 to 8 small satellites named “*ASNARO* (tentative name)” in addition to micro satellites. By acquiring such satellites, a growth of the satellite imaging market will be expected for a wide variety of purposes, centering on disaster monitoring and advancement of agriculture, fisheries and other industries, and also for the purposes of diplomacy and security.<sup>60</sup>

The ultimate goal, according to the Important Measures, is to construct a near real-time satellite imagery market in the entire Asian region. It is assessed that such an Earth observation satellite constellation will only be made possible through cooperation among Asian countries. It is recommended, therefore, that a Public Private Partnership (PPP) be used to construct a new satellite constellation among these countries in

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<sup>59</sup> *Id.* at 5. See Appendix, *supra* note 4, at 1 (1) (2).

<sup>60</sup> *Important Measures*, *supra* note 4, at 5-6; Appendix, *supra* note 4, at 1 (1) (3).

addition to integrating the respective satellites of Asian countries currently operated.<sup>61</sup>

The second condition will be satisfied by promoting the serialization of satellites and sensors. This supports the necessity of evolving Japan's space activities from being R & D driven to being utilization and application driven, one of the reasons for passing the Basic Space Law.<sup>62</sup>

The third condition will be addressed by making an easy to handle platform to promote the use of satellite data. As Japan's portion of the responsibility, the construction of such a platform is strongly urged. The Important Measures states as follows:

Space utilization will grow into a big industry by making an integrated utilization platform of satellite-based data and information and by establishing an infrastructure through which not only images, data and information, but also positioning information and communication functions could also be simultaneously distributed. These are indispensable to better serve the data and information users. More specifically, an example is the setting up of a utilization platform in which data acquired by a series of the Earth observation satellites system, consisting of "Daichi", "ASNARO (tentative name)", "Himawari" (MTSAT-X), "Ibuki" (GOSAT), etc., and information obtained from other sources, or information from the Earth-, sea- and air-based apparatus will be integrated. (---) "[T]he Utilization Promotion Platform Council (tentative name)" will be established and the Council meetings shall be held for about a year to come to consider "the data policy" including standardization of the integrated data, a system, data distribution guideline and the operation principles, so that an operation of that utilization platform will be able to start in FY 2012.<sup>63</sup>

As for the third condition, it is emphasized that the government shall take the initiative in establishing a borderless plat-

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<sup>61</sup> *Important Measures*, *supra* note 4, at 5-6; Appendix, *supra* note 4, at 1 (1) (3).

<sup>62</sup> *See, e.g.*, Aoki, *supra* note 2, at 366-68.

<sup>63</sup> *Important Measures*, *supra* note 4, at 6; Appendix, *supra* note 4, at 1 (1) (4).

form through the cooperation with not only other players in Japan but also with Asian countries which own satellites.<sup>64</sup>

ii. Satellites as “Guardian of the Environment”

“The New Growth Strategy” in December 2009 declared that Japan shall become an environment and energy power through “green innovation,” a developing field in which Japan has an advantage.<sup>65</sup> One of the important “green innovation” measures is spreading renewable energy, and from the viewpoint of satellite use, an application satellite to measure the concentration distribution of greenhouse gases. For example, in the case of Japan, *GOSAT* is an effective tool to verify the effect of renewable energy on concentration distribution.<sup>66</sup> Currently there are only about 280 Earth-based observation spots. Since it is possible to drastically augment the number of observing spots by space-based systems, and since Japan plans to launch the *Global Change Observation Satellite - Water (GCOM-W)* and *Global Change Observation Satellite - Climate (GCOM-C)*,<sup>67</sup> it seems to be a promising area for contributions from Japanese satellites. Even today, *GOSAT* has attained about 56,000 observing spots. Doubling the number of spots for observation is said to be possible in the future.<sup>68</sup> Japan has to take an initiative to build an environmental observation satellite network, not only for exploiting the space industry, but more importantly, for being equipped with a verification tool to countermeasure global environmental challenges.<sup>69</sup>

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<sup>64</sup> *Important Measures*, *supra* note 4, at 6; Appendix, *supra* note 4, at 1 (1) (4).

<sup>65</sup> Prime Minister of Japan and his Cabinet, *Shinseichosenryaku (kihon hoshin) ni tsuite*[*The New Growth Strategy*] (Dec. 31, 2009), available at <http://www.kantei.go.jp/jp/kakugikettei/2009/1230sinseichosenryaku.pdf>.

<sup>66</sup> *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2).

<sup>67</sup> JAXA, *Satellites and Spacecrafts: Under Development*, [http://www.jaxa.jp/projects/sat/index\\_e.html](http://www.jaxa.jp/projects/sat/index_e.html) (last visited Jan. 24, 2011).

<sup>68</sup> *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2).

<sup>69</sup> *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2). *Id.*

## V. CONCLUSION

In Japan it seems rather difficult to see a robust remote sensing data distribution business in the near future. However, it may be possible to construct a remote sensing satellite network in cooperation with Asian-Pacific countries to better address the global and regional agenda. The Asian-Pacific region must recognize the common challenges from global warming and natural disasters such as earthquakes, tsunami, forest fires, and volcano eruptions. The region must also recognize human-created threats such as piracy and the illicit trafficking of people and goods. Making a usable data platform of satellites in this region, increasing the number of mutually interoperative remote sensing satellites, and preparing an effective data policy can lead to an Asia-Pacific satellite network that helps tackle these common challenges. Among the Asian-Pacific countries, nearly ten of them already have a remote sensing satellite or satellites.<sup>70</sup> In the era of small satellites, the number will be drastically increased in the next decade. Thus, in addition to the hardware aspect of efforts to make a financing scheme such as PPP, prompt action is expected to prepare a legal framework as a software aspect. The newly introduced concept in the 2010 space policy of a satellite as a “Guardian of the Environment” can be a key phrase to construct a new regime in the Pacific Rim in the future.

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<sup>70</sup> In Asia-Pacific, at least Brazil, Canada, China, India, Korea, Malaysia, Thailand, U.S., and Japan own and operate remote sensing satellites.

### Appendix

#### **Important Measures in Space Policy: Strategic Space Policy to Promote Japan's Growth, decided on May 25, 2010 by the Strategic Headquarters for Space Policy<sup>71</sup>**

In line with the "New Growth Strategy (Basic Policies)," decided by the Cabinet Meeting on December 30, 2009, a space policy to be implemented with particular emphasis was established in the document below by the title of the "Important Measures in Space Policy" so as to contribute to the prospective growth of Japan.

As a result of the adoption of the "Important Measures in the Space Policy," in accordance with the progress of such Measures, "Basic Plan for Space Policy" (decided by the Strategic Headquarters for Space Policy on June 2, 2009) will be reviewed for the possible amendment by the Strategic Headquarters for Space Policy.

### Attachment

#### **"Important Measures in the Space Policy: Strategic Space Policy to Promote Japan's Growth"**

Research and Development (R & D) of space brings about the innovation, breakthrough in the state-of-the-art science and technology (S & T) and the nurturing of the capable human resources. Thus, space R & D is placed in the New Growth Strategy (Basic Policies), decided by the Cabinet Meeting on December 30, 2009, in the new frontier fields in the S & T, or a platform to support the growth of Japan, and therefore, the New Growth Strategy declares that the space exploration shall be promoted.

Looking at the world trends, in case of the United States of America (U.S.), a U.S. Budget Message released in February 2010 announces the increase of the budget of the National Aeronautics and Space Administration (NASA) by approximately \$6 billion over the next 5 years (FY 2011-2015), considering the contribution of the space policy to the industrial devel-

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<sup>71</sup> *Supra* note 4, at 1. This is an unofficial translation by the present author. It is being offered to the readership of the JOURNAL OF SPACE LAW as a convenience.

opment, as well as to the potential of an innovation engine and security. (A total of the increase of the 5-year U.S. space budget amounts to \$100 billion.)<sup>72</sup> A big budget is to be allocated to the exploration of the solar system through robots for preparing for the future human space activities and scientific fields including the environmental observation, although the manned exploration of the Moon was reconsidered. Likewise, the released U.S. space budgets indicate that measures will be taken for the increasing use of the private enterprises and the enlarging the circle of the space industry, taking note of the matured space industry.

In addition to the U.S. measures aiming at enlarging the circle of private-sector activities and growing use of private enterprises, etc. mentioned just above, space utilization has been rapidly expanding in the E.U., China, India, and other countries. Considerable growth of the space utilization industry is recognized world-wide as it becomes twice the size in the past 5 years (an annual 14.2% growth was recorded on the average from 2003 to 2008). International Society has entered into the “era of space utilization.” This trend also applies to the space-emerging countries in Asia and other regions, where the new types of satellite uses and their demonstration tests have begun. Examples are the use of satellite images for disaster monitoring, tele-medicine, and tele-education via high-speed internet.

In contrast, in case of Japan, most of the about 230 billion yen (FY2007) earned by the space equipment industry including satellites and rockets depend on the governmental procurement. (True that the governmental procurement is needed for the space equipment industry in the U.S. and Europe, but the private-sector demands amount to approximately 40% in Europe because of the successful space policies for the market acquisition such as the EGAS policy.)<sup>73</sup> Finally, in Japan as well, a va-

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<sup>72</sup> Space-related budgets of the U.S. include those of Department of Defense (DoD) and other departments and agencies in addition to that of NASA. The space-related budget of Japan is approximately one thirteenth that of the U.S., and less than one half of that of Europe. *See Important Measures, supra* note 4.

<sup>73</sup> EGAS means European Guaranteed Access to Space, which is the policy that European Space Agency (ESA) takes responsibility for a part of the fixed expenses for manufacturing and operation relating to Ariane rockets.

riety of space-based service business, e.g., broadcasting & telecommunication, car navigation, ship, and aircraft navigation support, and weather information provision, are under development. The total amount of the entire space industry, including the space utilization industries mentioned just above, amounts to more than 7 trillion yen, or about 30 times as big as the profits of space equipment industry.<sup>74</sup> The problem lies in the present situation that most of the satellites and rockets used in such space utilization industries are foreign-made (19 out of 20 broadcasting and telecommunications satellites are foreign made), or the increasing profits of space utilization industries do not contribute to the development of the space equipment industry. International competitiveness in that space equipment industry should be strengthened through technology development satisfying the users' needs by the public and private cooperation. Also, space utilization industry should be further enlarged through the basic infrastructural system and other environmental development. If such conditions are realized, it is expected that such space industries will greatly contribute to the economic growth of both Japan and Asia.

Considering a drastic change the world is now going through, the space policy to decide for the future is of critical importance. While international cooperation with the U.S. and other countries is important in promoting Japan's space activities, however, it is essential that Japan retain the independent capability in exploration and use of space as well as establish its own clear and firm space strategy. By so doing, Japan's space policies will not be susceptible to the space policies of other spacefaring nations. Having recognized the importance of the national space policy, the present document has selected some of the measures upon which the whole government, as the Strategic Headquarters being a linchpin for the time being, shall place a special emphasis. Such selected important measures will be conducted aiming at developing space equipment industry by strengthening the international competitiveness, etc. and expanding the circle of space utilization industries so as to con-

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<sup>74</sup> SPACE INDUSTRY DATABOOK 2008 (The Society of Japanese Aerospace Companies ed., Mar., 2009).

tribute to the economic growth of Japan by doubling the size of the space industry, or making a 14 - 15 trillion yen market, in 10 years.

**1. Create a World Top Class Space Utilization Community: Growth Brought by Space Uses (in the Fields of Science, Public Service, Education and Business)**

(1) Realize Space Development and Use to Duly Reflect Users' Needs and to Have Competitiveness

Japan put more efforts on R & D in its space development, because its main goal was to catch up with the advanced space-faring nations such as the U.S., European countries, and Russia. The importance of R & D in space development and use will never be diminished because space R & D is the center of the state-of-the-art S & T and the international competitiveness comes from such R & D. However, in the era of the full-scale space utilization, it is urgently required to transform Japan's space policy into a user-driven, demand-side one as a part of the growth strategy of Japan. "The Space Activities Promotion Committee Conference (tentative name)" comprised of the industry-academia-government experts involved with R & D, utilization and application of space shall be established. Measures 1) to 4) presented below shall be taken:

1) Create a New Market by Small Satellites (including Micro Satellites) and Small Rockets

Space Equipment Industry of Japan has been greatly dependant on the results of the R & D by the Japan Aerospace Exploration Agency (JAXA). Finally, small and medium-sized enterprises (SMEs) and universities are gradually entering into the space business as seen in examples of a small enterprise in Higashi-Osaka city and a private weather forecast company. Another trend is that the smaller but high-quality mission equipment on board spacecraft and small satellites, which is soon-to-be used for the practical operation of telecommunications and Earth observation purposes. Less expensive small satellites, made in a shorter period, have a great potential to create a new market provided that certain conditions will be met such as the standardization of satellite equipment, larger number of

manufactured equipments, and the reduction of the price of equipments as a result of the increased production.

Growing the number of new players in Japan's space business is strongly needed to vitalize spacecraft industry in Japan, which will be accomplished by accelerating the trends mentioned above.

Making an environment preferable for the SMEs and universities is essential for that purpose, and the following measures shall be taken to make Japan's space industry more competitive in addition to the relevant financial policies such as the long-term risk money supply:

(a) support the development and use of small satellites to realize an easier and less expensive access to space;

(b) develop a launch vehicle to effectively and economically launch a small satellite (small solid propellant rocket, air launch, etc.);

(c) develop telecommunications equipment to efficiently transmit the satellite-acquired data to the ground stations;

(d) standardize parts and components of spacecraft.

#### 2) Promote to Serialize Satellites and Sensors

Manufacturing satellites for the purpose of R & D as taken by the Japanese space practices has inevitably resulted in an expensive and small number of satellites that Japan owns, for R & D aiming at a satellite with cutting-edge technology requires high-cost. Full-scale use of satellites in continuation has thus been hampered, and that situation has not satisfied the users' needs. To better promote space utilization, it is extremely important that satellite-based data and information be provided on the frequent and continuous basis and as inexpensively as possible so as to adequately respond to the users' needs in coming years when a growing number of satellites will be used.

In order to expand the use of data and information derived from Japan's satellites, a series of the identical type of, but gradually added the advanced quality, satellites and sensors shall be continuously manufactured, duly taking note of the needs of the users, instead of continuing the current Japanese practice of basically making one satellite from one specific R & D. That goal can be accomplished by pursuing "economies of scale" (international competitiveness to be strengthened by the

larger number of satellites made and, as a result, reducing the development cost per satellite) in satellite manufacturing and the “continuity” of data and information provision.

### 3) Construct a Real-Time Earth Observation Satellites Network

Earth observation is used in a variety area of civilian uses including public safety (e.g., disaster monitoring), land preservation and management, and enhancing agriculture and fisheries, etc., and plays an important role in information gathering for the security purposes. Thus, the expanding satellite-based Earth observation is strongly expected to be one of the most promising fields in space utilization which can contribute to the industrial growth and higher living standard of the citizenry in Japan.

The present situation lacks, however, the real-time provision of data needed for the business, because there is currently only one Earth observation satellite, “*Daichi*” (*ALOS*), operating in Japan, and it revisits the same place about twice a week (every 3 days). It is pointed out that the lack of the capability of timely data collection restricts the growth of satellite data market in Japan. High frequency of data gathering of revisiting the same spot every 3 hours is required to enter the international market. For that purpose, it is important to construct and operate Earth observation satellites network consisting of *Daichi*-series satellites, from 4 to 8 small satellites named “*ASNARO*” (tentative name), in addition to micro satellites. By acquiring such satellites, a growth of the satellite imaging market will be expected for a wide variety of purposes, centering on disaster monitoring and advancement of agriculture, fisheries, and other industries, and also for the purposes of diplomacy and security.

In the future, efforts will be made for the more frequent data collection throughout the entire Asian region by means of cooperation such as the effective use of the Public Private Partnership (PPP) with Asian space emerging countries. The ultimate goal is to construct an Earth observation satellites network using also the satellites owned by such Asian countries and create a market of near real-time satellite images provision.

### 4) Construct a Platform to Promote the Utilization of Satellite Data

Space utilization will grow into a big industry by making an integrated utilization platform of satellite-based data and information and by establishing an infrastructure through which not only images, data, and information, but also positioning information and communication functions could also be simultaneously distributed which are indispensable to better serve the data and information users. More specifically, an example is the setting-up of a utilization platform in which data acquired by a series of the Earth observation satellites system, consisting of “*Daichi*”, “*ASNARO*” (tentative name), “*Himawari*” (*MTSAT-X*), “*Ibuki*” (*GOSAT*), etc., and information obtained from other sources, or information from the Earth-, sea- and air-based apparatus will be integrated. Such utilization platform will make it possible to provide value-added services to the users based on the positioning information of such users concerning the information which is mainly obtained by navigation satellites. For that purpose, “the Utilization Promotion Platform Council” (tentative name) will be established and the Council meetings shall be held for about a year to come to consider “the data policy,” including standardization of the integrated data, a system, data distribution guideline, and the operation principles, so that an operation of that utilization platform will be able to start in FY 2012.

Note has to be taken to improve users convenience through various measures including developing a user-friendly software, because the purpose of the platform is to expand the users from the current ones as mostly experts in the space-related field to companies and private persons outside the space community. It should be always remembered that Japan shall take the initiative in establishing a borderless platform through the cooperation with not only other players in Japan but also with Asian countries which own and will own satellites.

Reference: precedents and cases conceivable for the future use the platform beneficial to the wide range of users are enumerated below:

(a) to combat disasters and piracy as well as advance and enhance profits agriculture, forestry, fisheries, and other primary sector of industry

(i) fact-finding and monitoring natural disasters such as earthquakes, volcanic activity, wind and flood disasters, and other natural disasters;

(ii) monitoring the acreage of planting in agriculture and harvest prediction based on the components, etc. (some cases are already in operation in foreign countries);

(iii) monitoring the illicit forest cutting and the precision information on forest acreage;

(iv) exploring mineral resources (in cooperation with the field of the marine resources development).

(b) new services enabled by the collaboration of the platform with global positioning satellites (GPS) information

(i) creating more precise car-navigation and man-navigation;

(ii) automated farming on large-sized farms and fields;

(iii) custom-made information provision to satisfy the users' demands making the most of the communications networks (satellites-based and Earth-based). (That will also create various new businesses based on the information acquired by such communications networks.).

(c) new services making the most of the information (such as the meteorological satellite information) through the platform

(i) meteorological data made use of by the insurance companies and retailers, which use such data for the development and purchase of new insurance products and merchandize;

(ii) detecting a school of fish by observing the surface temperature;

(iii) monitoring the emissions and absorption of greenhouse gases based on the information on the concentration of greenhouse gases.

(2) Establish the Appropriate Environment for Space Utilization including the Development of a National Legal System

1) Develop a National Legislation for the Reduction of the Risks of Private Space Activities

Up to now, Japan's space activities have been mainly conducted by the government and quasi-governmental organizations. However, new stakeholders are expected to enter into

space activities as the space industry matures. Under such circumstances, legislating national laws on space activities will be carried on for the following purposes: (i) to ensure the implementation of the national obligations provided for in the UN space treaties on outer space vis-à-vis private space activities; (ii) to reduce the risks of new players in a space industry and to contribute to the healthy development of the space industry by establishing a mechanism in which safe private-sector space activities will be conducted and an appropriate third party liability scheme on space damage will be established.

#### 2) Make the Most of Measures to Expand the Circle of the Stakeholders

It is necessary to minimize the risks of entering into the space activities as much as possible to increase the number of new stakeholders. Already, such conditions are being established as witnessed by the increasing participation of SMEs and universities. To accelerate such trend, the measures below should be taken: (i) the inclusion of a satellite for the subject of the Act on Promotion of Private Finance Initiative (PFI Act); thus utilizing PPP in a satellite manufacturing will be possible; (ii) making the most of the industries investment and low-interest loan; (iii) introduction of appropriate regulations (such as the Space Activities Act; see, subsection 1) of this chapter); and (iv) the possible introduction of new policies and ideas such as “anchor tenancy” and “dual-use.”

#### 3) Establish the Facilities and Equipment to Promote Data Use Aiming at the World Leading-Edge Results

A utilization promotion and analysis centers for satellite data, launching sites, communication facilities, and other facilities and equipment shall be constructed and refurbished in order to promote measures enumerated in the present document so as to achieve the world leading-edge results.

## **2. Expand Cooperative Countries through Space Diplomacy and Promote Japan’s Overseas Space Utilization: Promote Space Utilization with Space-Emerging Countries in Asia and Other Regions**

### (1) Promote Space Diplomacy

Space assets can contribute to the global agenda such as natural disasters and global environmental problems, beneficial not only to one country, but to the global society as a whole. In addition, as proved in some countries, where Earth-based infrastructures are underdeveloped, space-based systems play a vital role in providing, effectively and efficiently, communications and other information to their nationals. Since Japan's technology, experience, and human resources in space development can assist such countries in establishing space assets, Japan should promote such international cooperation as a diplomatic resource, or a source of "soft power" of Japan, through which Japan can occupy an honored place in the international society.

The extension of the operational period of the *International Space Station (ISS)*, originally planned until 2015, is now being considered. At present, Japan has been intensively utilizing its module *Kibo* for the experiments of, e.g., new materials and medicines irrespective of the future of the *ISS*. *Kibo* should also be used as a diplomatic resource that can provide a precious opportunity to conduct scientific tests to non-members of the *ISS*, considering that Japan is the only Asian nation which has been participating in the *ISS* program and has a module of its own.

In addition, as referred to in 1 (1) 3) & 4), it is important to cooperate with emerging space countries in Asia and other regions in the construction of the Earth observation satellites network and in the utilization of its data and information in a mutually beneficial manner. One candidate for the cooperative program would be the setting up of an East Asia disaster monitoring satellite network through which the image of the same spot is frequently collected.

#### (2) Promote the Overseas Development Using Inclusive Space Systems

At present, space emerging countries tend to purchase and operate launching services, satellites, and ground facilities without developing national rockets and satellites. This implies that there is a promising international market for Japan's space business, especially in Asia where the rapid economic developments are found. Advanced spacefaring nations are energetically marketing to sell inclusively their own space asset sys-

tems, from launching services to ground stations, especially countries which have just decided to own a satellite, because the types of satellites and ground stations introduced for the first time tend to be a standard type in the recipient country for a long time to come.

Thus, to develop a space industry, it is essential not only exploiting internal demands but also to obtain a foreign contract by meeting foreign demands. That could be only realized by accumulating good records on the use of Japanese spacecraft and data and information from Japanese satellites in a domestic market in the first place. However, it will not be so easy as far as the present situation is assessed. It is true that the latest meteorological satellite *Himawari* is made by a national company as a fruit of the long-time R & D efforts, but the result is not so promising in the overseas market. While procuring and operating satellites are progressing in Asian countries, it is only one communications satellite for a Taiwan/Singapore corporation that a Japanese company got a contract to develop and manufacture; likewise, a Japanese company got only one launching service contract using the H-II A rocket from the South Korean government to launch its satellite. To create a robust industry, the precise demands of the users have to be found and to be reflected in future R & D in the promising fields of information and communications as well as Earth observation. Economies of scale of the industry shall also be pursued for the cost reduction. The consistent "Three Step Approach" mentioned below has to be flexibly taken to satisfy the true needs of a recipient country by the government and the private sector based on the social conditions in the developing countries:

- (i) public relations and dissemination activities concerning space utilization to the developing countries;
- (ii) technical cooperation for the necessary capacity-building required for promoting a specific space application program;
- (iii) support in the provision and operation of space equipment and services to developing countries. In one word, making efforts to meet the true needs of a recipient country is important. To recognize the true demands, the following measures shall be comprehensively conducted as a package of the space business toward the possible recipient countries as already have

been taken in the other industry when entering the foreign markets was pursued:

(i) Prime Ministerial level and Ministerial level “top sales” initiatives as well as the close cooperation with the local embassies and similar authorities of Japan;

(ii) utilization of the long-term system of money supply risk by Japan Bank for International Cooperation (JBIC) and the use of the insurance program of Nippon Export and Investment Insurance (NEXI) (For instance, policy finance, trade insurance, and industry investment can be made use of);

(iii) appropriate use of Official Development Assistance (ODA) based on the request from developing countries. It has to be noted that it is essential that Japan be involved with the development of the infrastructures of a recipient country from the very first stage. In this respect, priority of the efforts should be given to the countries with which the cooperative basis has already been established through joint research programs and the agency-to-agency cooperation. Examples of such countries are Vietnam, Thailand, and Indonesia. In approaching those countries, it is necessary to strategically develop the consistent “Three Step Approach” mentioned above. For that purpose, close cooperation has to be established with not only space-related agencies, but also with the government-related agencies, both in Japan and in a potential partner country, as well as international organizations that are to engage in a specific project for international cooperation. Examples of such agencies and organizations would be the local embassies concerned, Japan International Cooperation Agency (JICA), Japan External Trade Organization (JETRO), and JBIC.

### **3. Strengthen State-of-the-Art Science and Technology as an Innovation Engine**

(1) Obtain and/or Ensure the Fundamental Technology (including Transportation and Satellites Systems) Needed for Japan to Ensure the Autonomous Space Capability

It is indispensable to retain the autonomous capability concerning space activities, considering the current and future importance of space. More specifically, transportation systems (in-

cluding H-IIA Rocket and small-sized solid rockets) which enable access to outer space, buses as a common part of satellites, sensor technologies for the various kinds of observations shall be maintained. In order to advance such technologies to retain the autonomous capability, it is of essential importance to continuously develop and enhance the comprehensive S & T capability through the continuous development of cutting-edge technologies from the long-term standpoint, nurturing human resources and accumulating the experience and knowledge.

It should also be remembered that it is necessary to develop and maintain the ability to manufacture the strategic parts and components of satellites and rockets which can support those technologies. Because some of the parts traditionally imported from overseas are likely to be unavailable in the near future, that problems should be addressed as a priority agenda. Another urgent matter to address is to secure a second source material if only the single source material has been utilized for making space equipment. It is also important to expand the application of civil parts including the excellent technologies owned by SMEs and universities.

(2) Contribute to Green Innovation (Satellite Utilization as the “Guardian of the Environment”)

“The New Growth Strategy” declares that Japan become an environment and energy power through “green innovation,” a developing field on which Japan has an advantage. Spreading renewable energy is stated as one of the “green innovation” measures, and to better contribute to the international society and to be a global leader in the field of the global warming countermeasures, Japan shall verify the effect of the renewable energy in combatting global warming on a global scale.

For that purpose, obtaining global observation data is essential, but currently there are only about 280 Earth-based observation spots. Space-based systems will be able to surmount that limitation. In addition to *Ibuki* and *Daichi*, now in operation, Japan plans to launch *Global Change Observation Mission-Water (GCOM-W)* and *Global Change Observation Mission-Climate (GCOM-C)* satellites, by which concentration distribution of greenhouse gases and situations of the world forests, an absorption source of carbon dioxide, can be monitored and as-

sessed. (At present, *Ibuki* has about 56,000 observing spots and doubling the number of the spots for observation is possible in the future.) To pursue a strategy to become an environment and energy power, Japan has to be equipped with a verification tool as an indispensable means. It leads Japan to have an initiative to build an environmental observation satellites network.

(3) Space Science and Technology (Moon and Planetary Exploration as well as Space Astronomy)

Space S & T such as Moon and planetary exploration as well as space astronomy will strengthen the foundation of state-of-the-art S & T as a new frontier field. It could be an investment for the future that gives a dream and an inspiration for the future to the children who will create the world of tomorrow, that helps to nurture human resources responsible for the future S & T, and that assists Japan to be more visible in the international society.

Japan so far has been accomplishing a world top level results concerning S & T of space and will continue to seek the top level accomplishments focusing on Japan's strong points in this field. Among various subjects in the space S & T, the goal and roadmap of the lunar exploration, with which China and India are most enthusiastically involved, is currently studied at the Lunar Exploration Council established at the Strategic Headquarters. Although the conclusion remains to be decided, the direction of the discussion, at present, is as follows: since mastering the exploration technology on the gravity astral body closest to the Earth will bring a key technology to venturing into the planetary exploration within the solar system, establishing such technology should be given a priority. The Council is also of the view that long-term lunar exploration by robots and sample return from the Moon by 2020 should be a goal in order to advance science concerning the Moon, because, at present, Japan takes advantage as a leading country of the Moon exploration based on the successful outcomes of *Kaguya*, and in order to play a leading role in the international rule-making on the peaceful use of the Moon.

It is important that Japan should engage in strategic R & D for future independent human space activities. Such R & D includes, for instance, the re-entry technology which is presently

lacking and indispensable to ensuring and advancing the independent space capability of Japan. A possible candidate for R & D is, therefore, a demonstration experiment of the re-entry technology based on the *H-II Transfer Vehicle (HTV)*, a cargo transfer spacecraft that delivers supplies to the *ISS*.

(4) Agenda to be Tackled by the International Society (such as Space Debris Mitigation)

Space debris mitigation is pointed out as one agenda item to be addressed by the international society in terms of the environmental protection of outer space. Japan has been conducting research on determining the distribution of space debris, minimizing space debris generation and even removing space debris as a future possibility.

From now, in order to fulfill its international role, it is important that Japan actively participates in the international rule-making to ensure the long-sustainability of space activities, which is discussed as one of the agenda items at the Committee on the Peaceful Uses of Outer Space (COPUOS) that has been dealing with debris mitigation.

# WHAT LAWYERS NEED TO KNOW ABOUT SCIENCE TO EFFECTIVELY MAKE AND ADDRESS LAWS FOR REMOTE SENSING AND ENVIRONMENTAL MONITORING

*Fermín Romero Vázquez\** and  
*Sergio Camacho Lara\*\**

## INTRODUCTION

In space law, it is important to understand the role played by each of the experts involved in drafting legislation to regulate remote sensing (RS) as applied to effective environmental monitoring and protection. While countries create legislation based on national interests, the legislation must be consistent with the international space regime and with the various international guidelines that have become customary practice.

The purpose of this paper is to clarify, from our point of view, the critical path to be followed in drafting effective legislation for environmental monitoring and protection. First, the general principles and basic concepts related to RS must be clearly defined. Second, it is important to understand the international, regional, and national or local legal frameworks within which the lawyers can act. The work of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and of the United Nations General Assembly represents the quintessential multilateral framework, especially for promoting guidelines on the use of geospatial data for the protection of the environment and natural resources. Legislators must also analyze the International Telecommunication Union (ITU) regula-

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tions on communications frequencies to be used for transmitting remote sensing data.

The paper concludes with some final remarks and recommendations for the legal experts and decision-makers responsible for drawing up environmental policy as it relates to space applications.

Given our knowledge of the issues on the space agenda gained through experience within the Mexican government and CRECTEALC, we believe that it is important for both States and international agencies to provide those responsible for creating the regulatory framework for environmental monitoring and protection with the necessary elements to do their work effectively, while above all, taking into account the costs and benefits involved in applying this technology.

A. *General Principles and Basic Concepts for Understanding Remote Sensing*

The fifteen Principles relating to remote sensing of the Earth from space<sup>1</sup> provide guidance for the application of RS to the monitoring and protection of natural resources. Scientists must take these Principles into account to become more aware of how these Principles may affect access to the data and the practical application of their findings. In addition, regardless of the concept or definition used at the national level, common terminologies and basic concepts used by both legal experts and scientists must be established. The following is a set of definitions and descriptions that could serve to establish a common understanding amongst lawyers and scientists.

- Natural resources are components of the environment, renewable or nonrenewable; that meet economic, social,

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<sup>1</sup> Principles Relating to Remote Sensing of the Earth From Outer Space, G.A. Res. 41/65, U.N. GAOR, 41<sup>st</sup> Sess., 95<sup>th</sup> plen. Mtg., U.N. Doc. A/Res/41/65 (Dec. 3, 1986) [hereinafter Principles Relating to Remote Sensing].

and cultural needs; and that ensure the equilibrium of ecosystems and continuity of life on earth.<sup>2</sup>

- The environment is a system of biotic, abiotic, and socio-economic elements with which man interacts and to which he adapts, transforms, and uses to meet his needs.<sup>3</sup>
- Sustainable development is development “that meets the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>4</sup>
- Remote sensing can be understood as a way of obtaining information about an object by analyzing the data acquired through a device that is not in physical contact with said object.<sup>5</sup> Remote sensing (RS) is an important component for synoptic studies of large land areas, especially those of difficult access. RS is particularly useful for multi-temporal studies, i.e., the study of one specific area over time. These two features make remote sensing an irreplaceable tool for studying and protecting the environment.
- Remote sensing consists of collecting information about a specific object or area with various sensors. Earth observation by weather satellites, ocean and weather buoys, X-rays, the signals from space probes, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET) are, *among many others*, examples of remote sensing. For the purpose of this article, we will refer to the detection of the Earth’s surface from space by sensors re-

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<sup>2</sup> See Recursos Naturales, [http://www.econlink.com.ar/definicion/recursos\\_naturales.shtml](http://www.econlink.com.ar/definicion/recursos_naturales.shtml) (last visited Jan. 21, 2011).

<sup>3</sup> See D. L. Johnson et al., *Meanings of Environmental Terms*, 26 J. ENVTL QUALITY 581 (1997).

<sup>4</sup> Report of the World Commission on Environment and Development, G.A. Res. 42/187, U.N. GAOR, 42<sup>nd</sup> Sess., 96<sup>th</sup> plen. Mtg., U.N. Doc. A/RES/42/187 (Dec. 11, 1987).

<sup>5</sup> NASA, Nicholas M. Short, Sr., *Remote Sensing Principles: The Concept of Remote Sensing*, April 28, 2010, <http://rst.gsfc.nasa.gov/>.

ceiving electromagnetic radiation that has been reflected or emitted by the objects under study to improve natural resource management, land use, and environmental protection. The UN principles on remote sensing refer specifically to *space or satellite remote sensing*. In this context, remote sensing for military purposes is not discussed.

- Geomatics refers to all sciences that gather, process, analyze, interpret, disseminate, and store geographic or geospatial information. The term, a combination of “geo” (Earth) and “informatics,” was coined in Canada.<sup>6</sup>
- Geographic Information Systems (GIS) are databases compiled from multiple sources (e.g., censuses, maps, satellite images) that can be georeferenced. A GIS is the integration of hardware, software, and geographic information, used to gather, store, manipulate, analyze, and display all types of geographically-referenced information in order to find solutions to specific problems.<sup>7</sup>
- Earth sciences are a set of disciplines that study the internal structure, morphology, surface dynamics, and the evolution of the planet. They are a valuable tool for planning the rational use of natural resources, and for understanding the causes of natural phenomena that interact with human beings and how human conduct can affect nature.<sup>8</sup>

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<sup>6</sup> See Natural Resources Canada, What is Geomatics, [http://ess.nrcan.gc.ca/2002\\_2006/gsdnr/geomatics\\_e.php](http://ess.nrcan.gc.ca/2002_2006/gsdnr/geomatics_e.php) (last visited Jan. 21, 2011); see also Canadian Institute of Geomatics, <http://www.cig-acsg.ca/english/> (last visited Jan. 21, 2011).

<sup>7</sup> See GIS.com, The Guide to Geographic Information Systems, <http://www.gis.com/> (last visited Jan. 21, 2011).

<sup>8</sup> See Goddard Space Flight Center, Global Change Master Directory, <http://gcmd.nasa.gov/records/EarthScienceDataInterface.html> (last visited Jan. 21, 2011).

- **Artificial satellites:**<sup>9</sup> The classification of an artificial satellite may vary according to its use or application. For instance, ITU classifications are based on the type of service provided, including: fixed, mobile, broadcasting, navigation, and Earth exploration. An artificial satellite also may be classified according to its orbital location: geostationary (GEO) satellites are located on the equator at an altitude of approximately 36,000 km; non-geostationary satellites are subdivided into Medium Earth Orbit (MEO) satellites, located at an altitude of 10-25,000 km, and Low Earth orbit (LEO) satellites, located at an altitude of 250-1,500 km. Because of their altitude, both MEO and LEO satellites have a rotational velocity that is faster than that of the Earth, and are used for remote sensing, navigation, and positioning. Satellites in GEO orbit are used mainly for weather and telephone services.<sup>10</sup>

While RS has a long history, two eras particularly mark its development. First, the Second World War gave impetus to the use of aerial photography and other types of remote sensing. Second, in the 1960s, satellite images began to replace aerial photographs, and multispectral electronic sensors, coupled with computers, provided spectral data beyond what photographic cameras could provide.

In the operation of an Earth observation satellite, terrestrial objects are illuminated by solar radiation or by the radiation emitted by a satellite antenna (in the case of radar). The terrestrial objects reflect the incident radiation in a characteristic way determined by the structure and composition of these objects, which allows for their differentiation. The reflected radiation is captured by satellite sensors and partially processed before being relayed to ground receiving stations for processing and analysis (point source, sensor, brain). Other sensors re-

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<sup>9</sup> See Stephan Hobe et al. eds., 1 COLOGNE COMMENTARY ON SPACE LAW: OUTER SPACE TREATY 8 (2009).

<sup>10</sup> NASA, NASA and World Book, [http://www.nasa.gov/worldbook/artificial\\_satellites\\_worldbook.html](http://www.nasa.gov/worldbook/artificial_satellites_worldbook.html) (last visited Jan. 21, 2010).

spond to the thermal radiation emitted by the objects being observed.

Currently, advancements in RS techniques allow for the use of satellite images (at a local, national, regional, or global scale) for various applications, including the monitoring and protection of natural resources.

RS makes it possible to have specific imagery products for effective decision-making. This possibility makes it essential for lawyers to understand the basic concepts explained above—as well as more specialized terms, including spatial and spectral resolution, electromagnetic spectrum, types of sensors, satellite platforms, RS software, ground receiving stations and systems, etc.—in order to draft appropriate laws to govern this type of space-related activity.

In addition, lawmakers should take into account that the RS community is always in search of technology to provide better spectral and spatial resolutions, higher frequency coverage, and faster image processing, and develop laws that are capable of accommodating continuing technical advancements. Furthermore, statistical processing of the high-resolution images provides products with a highly detailed information that could have an impact on national security and should, in some cases, be regulated.

This new reality presents a legal vacuum that permits countries possessing this technology to observe others, while those without it must resort—in a best case scenario—to registering a complaint with COPUOS or the ITU for having been observed without their consent or authorization. In some cases, countries without the capability to obtain this product domestically must purchase information about their own territory at market price. In addition, and related to the interaction between the scientific and legal communities, is the fact that the scientists do not take into account the limitations often faced by both the legislation itself and the lawyers that draft it. This situation might be seen as circumstantial, but it actually poses serious difficulties and creates legal vacuums that are used by those possessing the technological capabilities to make observations by using satellite platforms around the world.

Conversely, this situation also creates legal problems related to the protection of the intellectual property rights of the images obtained and value-added products belonging to those who do possess the necessary technological capacities. Thus, legislation regulating the use of remote sensing by public, private, academic, and research institutions is necessary, with the ultimate goal of protecting national interests without infringing upon the intellectual property rights of others.

In a broader sense, beyond merely technological considerations, an understanding of the local, regional, and international systems associated with environmental protection programs is also essential. In this context, two additional terms require definition.

- National System of Protected Areas<sup>11</sup> refers to all of the protected areas that together interact as a territorial system, which, through the management and protection of its individual units, contributes to achieving certain goals of environmental protection.
- National Environment Program refers to the specific environmental policy of a government or country for protecting the environment and achieving sustainable development.<sup>12</sup>

#### *B. The Codification of International Environmental and Space Law and their Necessary Interconnection*

As mentioned, communication between scientists and lawyers to foster mutual understanding of the basic terms and concepts of RS is essential to creating effective RS law and policy, especially regarding its use in monitoring and protecting the environment and natural resources at the national level as well as to contribute to formulating non-binding guidelines applied voluntarily at the regional and global levels.

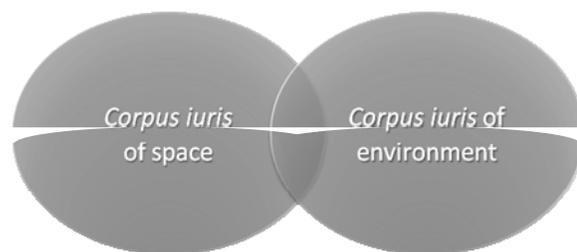
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<sup>11</sup> See Comision Nacional de Areas Naturales Protegidas, <http://www.conanp.gob.mx/> (last visited Jan. 21, 2010).

<sup>12</sup> See Programa Sectorial de Medio Ambiente y Recursos Naturales, <http://www.semarnat.gob.mx/programassubsidios/psmarn/Documents/PSMAyRN%2021%20ene%2008.pdf> (last visited Feb. 1, 2011).

A big advantage in both areas—outer space and the environment—is that the United Nations (UN), with input from its agencies and specialized programs, has contributed to developing international law through the five treaties on space and the principles for the use of outer space for peaceful purposes, and by establishing an international legal framework for the environment that should ideally include space applications, such as RS. The UN has also encouraged the negotiation of instruments and conventions that address the growing concern of society about these issues. These two areas, combined, comprise the subject matter of this article.

The *corpus juris* of space and the environment must intersect, through the joint work of scientists and lawyers at international and other appropriate fora, in order to facilitate the provision of services using satellite platforms to protect the environment. With the Scientific and Technical Subcommittee and the Legal Subcommittee, the Committee on the Peaceful Uses of Outer Space (COPUOS) is an excellent example of a body in which to accomplish this task. This multidisciplinary integration, including the collection of environmental history from before and during the existence of humankind, would complement both the space and environment fields in complex areas, such as scientific monitoring of emissions of the polluting gases believed to contribute to climate change<sup>13</sup> caused by global warming.



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<sup>13</sup> See e.g. Juan Carlos Villagran de Leon, *Tracking Climate Change from Space*, UN CHRONICLE, JAN. 1, 2009, available at, [http://www.un.org/wcm/content/site/chronicle/home/archive/Issues2009/pid/5086?ctnscroll\\_articleContainerList=1\\_0&ctnlistpagination\\_articleContainerList=true](http://www.un.org/wcm/content/site/chronicle/home/archive/Issues2009/pid/5086?ctnscroll_articleContainerList=1_0&ctnlistpagination_articleContainerList=true).

The complexity of this issue requires establishing international conditions that encourage universal access to the benefits of space applications given that, in principle, one of the objectives of space technology for the exploration of space and its various applications are the common good, safety, and welfare of humanity.

In addition, the need to protect the environment has led to important legal instruments designed to establish new principles and behaviors in States. Furthermore, many countries have developed policies aimed toward environmental protection as a function of their specific needs—although in reality the issue transcends borders—and have harmonized their national legislation with the international agreements, treaties, protocols, and other instruments.

Five legal instruments govern outer space activity. The first is the Outer Space Treaty.<sup>14</sup> According to this treaty, “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”<sup>15</sup> Therefore, outer space is not subject to national appropriation. The second treaty, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,<sup>16</sup> guarantees the return of space objects or their component parts found in territory outside of the jurisdiction of the launching authorities<sup>17</sup> and assistance for spacecraft personnel in the event of an emergency landing or accident.<sup>18</sup> The third is the Convention on International Liability for Damage Caused by Space Objects,<sup>19</sup> which makes the

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<sup>14</sup> 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.

<sup>15</sup> *Id.* at art. I.

<sup>16</sup> Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119.

<sup>17</sup> *Id.* at art. V.

<sup>18</sup> *Id.* at art. IV.

<sup>19</sup> Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.

launching State liable to pay compensation for damage caused by space objects falling on the surface of the Earth<sup>20</sup> or damaging aircraft in flight, including individuals or property on board the space object.<sup>21</sup> The fourth, the Convention on Registration of Objects Launched into Outer Space,<sup>22</sup> calls on States to provide launching information to the United Nations Office for Outer Space Affairs.<sup>23</sup> The last space treaty, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, is based on the principles of the Outer Space Treaty and establishes the rules necessary for exploring and exploiting the resources on those bodies.<sup>24</sup>

In the same vein, the United Nations has enacted legislation on environmental protection. The United Nations Environment Programme (UNEP) is responsible for administering some of the agreements and treaties related to these issues.<sup>25</sup>

Among the most important international environmental legal instruments are the United Nations Framework Convention on Climate Change and its Conference of the Parties that held its 16th meeting in Mexico in 2010 to address very significant challenges; the Convention on Biological Diversity (Biodiversity Convention),<sup>26</sup> and Agenda 21,<sup>27</sup> adopted in Rio de Janeiro, Brazil in 1992 as part of the Earth Summit; the Dublin Statement

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<sup>20</sup> *Id.* at art. II.

<sup>21</sup> *Id.* at art. III.

<sup>22</sup> Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

<sup>23</sup> *Id.* at art. IV.

<sup>24</sup> 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.

<sup>25</sup> *See generally* United Nations Environment Program: Ecosystem Management, *Cf.* <http://www.unep.org/ecosystemmanagement/> (last visited Jan. 21, 2011); United Nations Environment Programme: Strengthening the Scientific Base of UNEP, <http://www.unep.org/scienceinitiative/> (last visited Jan. 21, 2011); United Nations Environment Programme: Environmental Governance, <http://www.unep.org/environmental-governance/> (last visited Jan. 21, 2011).

<sup>26</sup> Convention on Biological Diversity, *opened for signature* June 5, 1992, 1760 U.N.T.S. 79 (although considered a failure because it was not signed by major countries and only resulted in “good intentions,” the Earth Summit did achieve international recognition of the importance of environmental problems through Agenda 21, *infra* note 27).

<sup>27</sup> Agenda 21: Programme of Action for Sustainable Development, U.N. GAOR, 46<sup>th</sup> Sess., U.N. Doc. A/Conf.151/26 (Jun. 14, 1992) [hereinafter Agenda 21] (Agenda 21 is a non-binding policy statement). *Cf.* <http://habitat.igc.org/agenda21/> (last visited Jan. 21, 2011).

on Water and Sustainable Development adopted at the International Conference on Water and the Environment;<sup>28</sup> the Montreal Protocol on Substances that Deplete the Ozone Layer;<sup>29</sup> the Kyoto Protocol;<sup>30</sup> the Protocol Concerning Marine Pollution from Land-Based Sources (1999);<sup>31</sup> the Protocol on Specially Protected Areas and Wildlife (SPA—adopted in 1990 and entered into force in 2000);<sup>32</sup> the Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification Particularly in Africa (1994);<sup>33</sup> the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994); the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989—sponsored by UNEP);<sup>34</sup> the Vienna Convention for the Protection of the Ozone Layer (1985);<sup>35</sup> the Cartagena Convention (1983, entered into force in 1986);<sup>36</sup> the Oil Spills Protocol to the Cartagena Convention (1983, entered into force in 1986);<sup>37</sup> the Caribbean Environment Programme and

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<sup>28</sup> The Dublin Statement on Water and Sustainable Development, International Conference on Water and the Environment, Jan. 26-31, 1992, Dublin, Ireland, *available at* <http://www.un-documents.net/h2o-dub.htm>.

<sup>29</sup> Montreal Protocol on Substances that Deplete the Ozone Layer, *opened for signature* Sept. 16, 1987, 1522 U.N.T.S. 3.

<sup>30</sup> Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22.

<sup>31</sup> Protocol Concerning Pollution From Land-Based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Oct. 6, 1999, *available at* [http://www.cep.unep.org/pubs/legislation/lbsmp/final%20protocol/lbsmp\\_protocol\\_eng.html](http://www.cep.unep.org/pubs/legislation/lbsmp/final%20protocol/lbsmp_protocol_eng.html).

<sup>32</sup> Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Jan. 18, 1990, *available at* <http://www.cep.unep.org/pubs/legislation/spaw.html>.

<sup>33</sup> Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, June 17, 1994, 33 ILM 1328 (1994), *available at* <http://www.unccd.int/convention/menu/php>.

<sup>34</sup> Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, March 22, 1989, 28 I.L.M. 649., *available at* <http://www.basel.int/text/documents.html>.

<sup>35</sup> Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, T.I.A.S. No. 11, 097, 1513 U.N.T.S. 293.

<sup>36</sup> Convention on the Protection and Development of the Marine Environment of the Wider Caribbean Region, Mar. 24, 1983, TIAS No. 11,085, 22 ILM 227.

<sup>37</sup> Protocol Concerning Cooperation in Combating Oil Spills in the Wider Caribbean Region, March 24, 1983, *available at* <http://sedac.ciesin.org/entri/texts/acre/Caribbprot.txt.html>.

the Cartagena Convention (1983);<sup>38</sup> the Convention on Long-Range Transboundary Air Pollution (known as the Acid Rain Convention) and its four protocols (1979);<sup>39</sup> the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973);<sup>40</sup> the Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971);<sup>41</sup> the International Convention on Oil Pollution Preparedness, Response and Cooperation (1991);<sup>42</sup> the International Convention for the Prevention of Marine Pollution from Ships (1973);<sup>43</sup> the International Convention on the Dumping of Wastes (1972);<sup>44</sup> the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969);<sup>45</sup> the International Convention for the Prevention of Pollution of the Sea by Oil (1954);<sup>46</sup> the Rotterdam Convention Applied to International Trade (1998),<sup>47</sup> which allows importing countries of hazardous chemicals to decide which products they wish to receive or reject; and the Convention Concerning the Protection of the World Cultural and Natural Heritage<sup>48</sup> adopted at the 17th UNESCO General Conference (1972), one of the most important international legal instruments for the protection of cultural and natural properties.

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<sup>38</sup> Action Plan for the Caribbean Environment Programme, U.N. Doc. CEPAL/IG.27/3 (1981).

<sup>39</sup> Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, TIAS No. 10,541, *reprinted in* 18 ILM 1442 (1979).

<sup>40</sup> Convention on International Trade in Endangered Species of Wild Fauna and Flora, March 3, 1973, 27 U.S.T. 1087; 12 I.L.M.1085.

<sup>41</sup> Convention on Wetlands of International Importance especially as Waterfowl Habitat, Feb. 2, 1971, TIAS No. 11,084, 996 UNTS 245.

<sup>42</sup> International Convention on Oil Pollution Preparedness, Response and Cooperation, Nov. 30, 1990, 30 I.L.M. 733 (1991).

<sup>43</sup> International Convention for the Prevention of Marine Pollution from Ships, Nov. 2, 1973, 1340 UNTS 184, *as modified by* Protocol, Feb. 17, 1978, 1340 UNTS 61.

<sup>44</sup> International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, 26 UST 2403, TIAS No. 8165.

<sup>45</sup> International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, Nov. 29, 1969, 26 UST 765, 970 UNTS 211.

<sup>46</sup> International Convention for the Prevention of Pollution of the Sea by Oil, May 12, 1954, 12 U.S.T. 2989.

<sup>47</sup> Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Sept. 11, 1998, 30 ILM 1 (1999).

<sup>48</sup> Convention Concerning the Protection of the World Cultural and Natural Heritage, Nov. 16, 1972, 27 U.S.T. 37, T.I.A.S. No. 8226.

This brief mention of various international agreements, treaties and conventions attests to the United Nations wide-ranging interest in these issues as well as the UN REDD Programme. However, the existence of this regulatory framework does not guarantee its proper implementation for the benefit of humanity, due to the lack of political will among States and the existence of private interests that are strongly linked to these issues.

*C. The International Telecommunication Union (ITU) and Regulation of RS*

The International Telecommunication Union (ITU), responsible for regulating telecommunications as well as information and communications technologies (ICTs), has three major sectors: radio communications (ITU-R), standardization (ITU-T), and development (ITU-D). The ITU-R sector is responsible for managing the radio-frequency spectrum and satellite orbits.<sup>49</sup> The ITU-T sector establishes standards to ensure the interconnection and interoperability of networks and global telecommunication systems. The ITU-D sector helps countries gain equitable access to public telecommunications networks and ICT, creating synergies to exploit economies of scale and providing technical and financial resources to develop networks and services that connect remote and marginalized communities.

Since UNISPACE (1982) and its recommendations, the ITU has made progress in codifying international space law, especially with respect to geostationary orbits.

Applying the principle of equal access to the allocation of frequency bands and geostationary satellite orbits, while taking into account the needs of the developing countries and the geographic situation of certain countries, would help to overcome the current obstacles to access. The legal framework governing space issues must be updated in order to provide flexibility given the scientific and technical progress that has been made.

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<sup>49</sup> International Telecommunication Union, Yvon Henri, *Long-Term Efficiency of the Space Regulatory Framework*, <http://www.itu.int/ITU-R/information/promotion/eflash/2/article6.html> (last visited Jan. 24, 2011).

Technological progress and lower costs have allowed many countries to develop nano- and small satellites for various applications, including environmental protection. These small satellites are used for remote sensing or as platforms to relay environmental data collected *in situ*. This is another area that lawyers need to know about in order to regulate the use of frequencies and to conduct the appropriate negotiations with the ITU.

Satellite images are a valuable tool for information processing, environmental monitoring and protection, and for quickly accessing devastated areas or areas at risk from human activity or natural disasters. They are also valuable tools for risk assessment and for managing ecological recovery after an adverse event.

The need to share information and warnings about these events or to assist with the recovery of the affected areas has resulted in the development of sophisticated disaster monitoring systems using remote sensing data that operate at the global level.<sup>50</sup>

The use of interpretation techniques and systems for orbital RS images, geographic information systems for the spatial analysis of geographic data, and applications in natural resource and environmental management in Earth observation should allow for more effective interaction between scientific and technological knowledge and the conceptual and methodological regulatory framework in the use of these tools for environmental management.

## CONCLUSIONS

Principles X and XI on remote sensing of Earth from space, state that remote sensing “shall promote the protection of Earth’s natural environment” and protect “mankind from natu-

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<sup>50</sup> See UN High Commissioner for Refugees, Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, April 25, 2000, Rev.3 (25/4/2000).2, available at <http://www.unhcr.org/refword/docid/41de73544.html> (last visited Jan. 24, 2011) (In case of a disaster, this Charter calls for the activation and cooperation of satellites such as: SPOT, LANDSAT, IRS (India), RADARSAT (Canada), TERRA (USA), ENVISAT (ESA), NOAA, SAC-C (Argentina), ALOS (Japan), DMC (Disaster Monitoring Constellation)).

ral disasters,” respectively.<sup>51</sup> Taking this as a starting point inevitably leads us to reflect on the following issues.

RS of the environment requires ongoing communications between RS scientists and lawyers. Legal experts and decision-makers should have as much information as possible on the technical and scientific issues at hand in order to do their work effectively. While it is not necessary for the legal experts to master the science and technology behind remote sensing, they should understand the basic aspects outlined in this paper in order to decide what aspects of RS can and should be subject to legislation, as well as what should not be legislated, as it could become an obstacle to national development or international cooperation.

A new field for many countries is that of small satellites (nano, cube, or pico sats). This is a very broad area and a significant challenge for lawyers. Because it involves satellites, they must bear in mind the existing international treaties on issues such as frequency assignment or the registration of objects launched into outer space while drafting national legislation. Legal experts should also consider customary international practices, such as the United Nations guidelines on space debris mitigation, and the implementation of these practices into national space legislation.

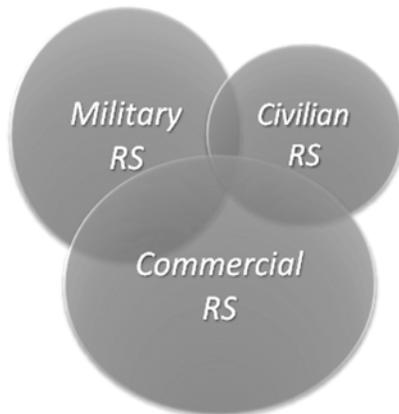
As can be seen, there is an urgent need for interaction between the scientific profession and the legal experts regarding the monitoring and protection of the environment and natural resources. Through its Subcommittees, UNCOPUOS can assist in these efforts. In the same vein, there is also the need for a study on the compatibility of international space law and international environmental law.

However, the existence of a regulatory framework does not guarantee its proper implementation for the benefit of humanity if there is no political will among States. Although not covered in this paper, the existence of private interests linked to these subjects is another important issue to deal with.

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<sup>51</sup> Principles Relating to Remote Sensing, *supra* note 1.

For these reasons we must ask ourselves whether the UN Principles on RS of 1986 have failed to anticipate the growth of the Earth observation field, or whether they are still relevant. In any case, the spread of RS developments and capacities around the world is a phenomenon which should become more equitable in this space era. It means that the international framework instituted by way of the UN should be reviewed considering the increasing dual use technologies for civilian and military uses and commercial interests where the competitive system developments, high resolution images, and increasing data accessibility are commonly developed.



As the technology involved in military satellite programs has evolved to possible commercial applications, firms will aim to exploit these concepts, products, and services to obtain numerous emerging lucrative ends. Such is the case of the use of global navigation satellite systems (GNSS) and RS applications to protect the environment. As costs decline and resolution improves everyday, these technologies show great potential for new and improved monitoring applications.

# SENSING A CHANGE? THE RE-LAUNCH OF AUSTRALIA'S SPACE POLICY AND SOME POSSIBLE LEGAL IMPLICATIONS

*Steven Freeland\**

## I. INTRODUCTION

One of the more surprising revelations for space historians is the fact that a number of countries other than the two main space superpowers of the time – the United States and the Soviet Union – made significant pioneering contributions to the early development of humankind's endeavours in space. These include countries that are not now regarded as major space-faring nations. Australia was just such a pioneer and in fact has a rich heritage in space. Indeed, the initial seeds of a cogent, relevant, and competitive space policy for the country had been laid in the 1950s and 1960s. In subsequent years, however, Government support for, and interest in, a proactive national approach to space fell away, only to be briefly reignited in the late 1990s by the finalisation of national law premised on the (unrealistic and unfulfilled) prospect of Australia becoming a major player in the global launch services industry.

The Government subsequently altered its approach yet again in the aftermath of the September 11 attack, directing that its involvement in space should instead be closely related to national security. In so doing, however, it failed both to expand upon and amend its space laws, or provide any incentives or guidance to most sectors of Australia's space industry, with the

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then revised “policy” lacking real direction and not facilitating the growth of space related activities.

More recently, however, the Government has actively sought to reassess Australia’s role in space, having largely accepted a Senate Committee Inquiry Report that makes significant recommendations for a new direction for Australia’s space science and industry sectors, as well as its overall space policy. Coupled with this, the subsequent Department of Defence 2009 White Paper, which sets out the Government’s approach to defence planning, emphasises the increasingly significant role that satellite technology plays in the conduct of Australia’s military defence activities. The past eighteen months have therefore seen some important initial steps towards a possible (re)formulation of the space policy of Australia, one of the most significant countries in the Asia-Pacific region.

However, the fact remains that Australia still does not have its own space agency or any coherent, up-to-date, and comprehensive space law and policy to match these newly developing considerations. Nor do its current national space laws readily allow for such developments. Instead, Australia relies upon a random mixture of local and foreign commercial enterprises, as well as other Governments, for access to the vast majority of its essential satellite services, leaving the maintenance of space skills and technologies on the ground almost entirely to chance and market forces.

This article discusses the evolution of Australia’s national space policy, focussing particularly on these more recent developments, and assesses what tangible steps, both in terms of direct action and also in the development of more comprehensive and relevant national laws, must now be taken if Australia is to regain lost ground and secure continuous and assured access to vital space resources.

## II. AUSTRALIA’S RICH EARLY HERITAGE IN SPACE

As noted above, Australia has had a long involvement in space activities, beginning at the very dawn of the space age. Its technical expertise, geographic location, and long and close alliance with the United States has meant that it has played, and

continues to play, an important role in tracking and communications activities with all manner of space objects. In addition, as early as 1949, a test launch facility was developed at a site in Woomera, a remote area in South Australia surrounded by desert, principally to support the United Kingdom's nuclear program.<sup>1</sup> However, as its relationship with the United States further strengthened, Australia permitted that country to utilise Woomera and other facilities – thus cementing what has become an increasingly strong bond of cooperation between the two countries in various military, strategic, and space-related matters.

The development of technical expertise at the Woomera facility meant that Australia became an early “leader” in space rocket science. At its peak, Woomera was the world's second most heavily used launch site (after Cape Canaveral), involving the launch of American, European, and Australian rockets,<sup>2</sup> and the Australian Government still describes it as “the largest land-based test range in the world.”<sup>3</sup> On 29 November 1967, Australia launched the *WRESAT-1* satellite from Woomera.<sup>4</sup> This was the first Australian Government “indigenous” launch,<sup>5</sup> making Australia only the fourth country in the world to have

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<sup>1</sup> Brett Biddington & Roy Sach, *Australia's Place in Space: Toward a National Space Policy*, KOKODA PAPER NO. 13, June 2010, at 13, available at [http://www.kokoda.org/Resources/Files/KP13\\_Space\\_Biddington\\_Final.pdf](http://www.kokoda.org/Resources/Files/KP13_Space_Biddington_Final.pdf).

<sup>2</sup> AUSTRALIAN SENATE STANDING COMM. ON ECON., LOST IN SPACE? SETTING A NEW DIRECTION FOR AUSTRALIA'S SPACE SCIENCE AND INDUSTRY SECTOR, ¶ 4.1 (Nov. 2008) [hereinafter SENATE INQUIRY REPORT] (citing SENATE STANDING COMM. ON TRANSP., COMMUNICATIONS AND INFRASTRUCTURE, DEVELOPING SATELLITE LAUNCHING FACILITIES IN AUSTRALIA AND THE ROLE OF GOVERNMENT, 1, 6 (Apr. 1992)).

<sup>3</sup> Defence Alert, Austl. Dep't of Defence, *Japanese Spacecraft to Land in Australia*, (June 2 2010), available at <http://www.defence.gov.au/media/AlertTpl.cfm?CurrentId=10368> (last visited Jan. 7 2011).

<sup>4</sup> For further details of the *WRESAT-1* launch, see Information Furnished in Conformity with General Assembly Resolution 1721 B (XVI) by States Launching Objects into Orbit or Beyond, Letter Dated Dec. 1, 1967, from the Permanent Representative of Australia Addressed to the Secretary General, ¶¶ 1&2, U.N. Doc. A/AC.105/INF.180 (Dec. 5, 1967).

<sup>5</sup> See, however, Jo-Anne Gilbert, “We Can Lick Gravity, but...”: *What Trajectory for Space in Australia?*, 25 SPACE POL'Y 174, n.2 (2009) (casting some doubt as to the extent that the launch of *WRESAT-1* was, in fact, “indigenous”).

successfully completed such a launch, and only the third to launch a satellite from its own soil.<sup>6</sup>

Australia also took an active position from the very beginning in the development of the international legal framework regulating the exploration and use of outer space, following the launch by the Soviet Union of *Sputnik 1* in October 1957. Australia was a founding Member State of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), being one of the eighteen Member States of an ad hoc Committee on the Peaceful Uses of Outer Space established in 1958 by the United Nations General Assembly to consider:

i) the activities and resources of the United Nations, the specialized agencies and other international bodies relating to the peaceful uses of outer space;

ii) international cooperation and programmes in the exploration and use of outer space that could appropriately be undertaken under United Nations auspices;

iii) organizational arrangements to facilitate international cooperation in the exploration and use of outer space within the framework of the United Nations; and

iv) legal problems that might arise in programmes to explore outer space.<sup>7</sup>

Australia stayed on as a Member State of UNCOPUOS when, in 1959, it was established as a permanent body with twenty-four Member States,<sup>8</sup> and has remained an active Member since that time.<sup>9</sup> It was a signatory to the Treaty on Princi-

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<sup>6</sup> Cheryl Jones, *Watch this Empty Space*, THE AUSTRALIAN (March 31, 2010, 12:00 AM), <http://www.theaustralian.com.au/higher-education/watch-this-empty-space/story-e6frgcjx-1225847659700>.

<sup>7</sup> See G.A. Res. 1348 (XIII), 13 U.N. GAOR, Supp. No. 18, U.N. Doc. (Dec. 13, 1958). The eighteen States were Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Iran, Italy, Japan, Mexico, Poland, Sweden, the Union of Soviet Socialist Republics, the United Arab Republic, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

<sup>8</sup> See G.A. Res. 1472 (XIV), U.N. Doc. A/4987 (Dec. 12, 1959). In addition to the original eighteen States, Albania, Austria, Bulgaria, Hungary, Lebanon, and Romania were included at that time as Member States of this permanent body.

<sup>9</sup> This being said, it is this author's personal observation and experience that, at least in recent years, the chair at the Australian delegation desk at UNCOPUOS Meet-

ples Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty)<sup>10</sup> when that instrument was opened for signature (27 January 1967), and ratified it on the day that it came into force (10 October 1967).

Indeed, Australia is one of only thirteen States (as of 1 January 2010) that are parties to all five of the main international space treaties. It was the seventh State Party to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement),<sup>11</sup> having acceded to that treaty on 7 July 1986,<sup>12</sup> primarily due to its arms limitations aspects, which complemented Australia's strong stance against the proliferation of nuclear weapons, a major priority of its foreign policy.<sup>13</sup> Having said this, Australia has since conceded that the Moon Agreement "does not embody a set of principles common to most Member States."<sup>14</sup>

Australia also regularly complies with its obligations to provide information to the United Nations Secretary-General<sup>15</sup>

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ings is as often left empty as it is occupied. *See also* Biddington & Sach, *supra* note 1, at 15.

<sup>10</sup> 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].

<sup>11</sup> 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 [hereinafter Moon Agreement]. The earlier States Parties to the Moon Agreement were Austria, Chile, The Netherlands, Pakistan, The Philippines, and Uruguay.

<sup>12</sup> The Moon Agreement entered into force for Australia on August 6, 1986. *See* JOINT STANDING COMM. ON TREATIES, REP. 106: NUCLEAR NON-PROLIFERATION AND DISARMAMENT, APPENDIX E - NUCLEAR NON-PROLIFERATION AND DISARMAMENT TREATIES 223 (2009), *available at* [http://www.aph.gov.au/House/committee/jsct/nuclearnon\\_proliferation/report/appendixe.pdf](http://www.aph.gov.au/House/committee/jsct/nuclearnon_proliferation/report/appendixe.pdf).

<sup>13</sup> For a discussion of Australia's strong stance against nuclear weapons, *see* Gilbert, *supra* note 5, at 178-9.

<sup>14</sup> *See, e.g.*, Comm. On the Peaceful Uses of Outer Space, Legal Subcomm. Unedited Transcript, 3, UN Doc. COPUOS/LEGAL/T.629 (Mar. 30, 2000)(statement of C. Cannan, Rep. of the Australian Delegation), *available at* [http://www.oosa.unvienna.org/pdf/reports/transcripts/legal/LEGALT\\_629E.pdf](http://www.oosa.unvienna.org/pdf/reports/transcripts/legal/LEGALT_629E.pdf).

<sup>15</sup> *See, e.g.*, Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space, Note verbale dated Nov. 30, 2009 from the Permanent Mission of Australia to the United Nations (Vienna) addressed to the Secretary-General, UN Doc. ST/SG/SER.E/584 (Jan. 18, 2010), *available at* [http://www.space.gov.au/SpaceLicensingSafetyOffice/Documents/Australian\\_space\\_object\\_register\\_table\\_14-12-09.pdf](http://www.space.gov.au/SpaceLicensingSafetyOffice/Documents/Australian_space_object_register_table_14-12-09.pdf).

pursuant to Article IV of the Convention on Registration of Objects Launched into Outer Space (Registration Convention).<sup>16</sup>

In 1961, Australia entered into bilateral arrangements with the United States regarding that country's satellite program, through the Exchange of Notes Constituting an Agreement between the Government of Australia and the Government of the United States of America for Cooperation in a Transit Navigational Satellite Program.<sup>17</sup> This and subsequent agreements with the United States led to the establishment of a number of important space tracking stations in Australia. These continue to play an important part in Australia's role in space.

During the 1960s, Australia was a Member of the European Launcher Development Organisation (ELDO)<sup>18</sup> – the only non-European country to have that status – and has provided various launch services to several European countries.<sup>19</sup> For example, in 1975 Australia entered into an Exchange of Notes constituting an Agreement between the Government of Australia and the Government of the Federal Republic of Germany concerning the Launching of a Skylark Vehicle and Payload at Woomera for Scientific Purposes.<sup>20</sup> This arrangement included an indemnity by the German Government in respect to loss or damage suffered by either the Australian or United Kingdom Governments,<sup>21</sup> as well as any potential claims for liability against the Australian Government, except where Australia failed “to exercise any of its responsibilities” under the Agreement.<sup>22</sup> A similar

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<sup>16</sup> Convention on Registration of Objects Launched into Outer Space, art. IV, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention]. Article IV of the Registration Convention requires a State Party to furnish certain information relating to space objects carried on its national registry to the Secretary-General of the United Nations. *Id.*

<sup>17</sup> U.S.-Austl., June 5, 1961, 12.1 U.S.T. 789, *available at* [http://untreaty.un.org/unts/1\\_60000/12/13/00022643.pdf](http://untreaty.un.org/unts/1_60000/12/13/00022643.pdf).

<sup>18</sup> As an interesting aside, one of the main hotels in Woomera is called the ELDO Hotel.

<sup>19</sup> Gilbert, *supra* note 5, at 174, 177.

<sup>20</sup> Austl.-Ger., Aug. 7, 1975, 975 U.N.T.S. 137, *available at* [http://untreaty.un.org/unts/1\\_60000/27/16/00052798.pdf](http://untreaty.un.org/unts/1_60000/27/16/00052798.pdf) [hereinafter Skylark Agreement].

<sup>21</sup> The various States of Australia had been “colonies” of the United Kingdom before independence on January 1, 1901, and, as noted above, the United Kingdom at the time maintained facilities and operations at the Woomera site.

<sup>22</sup> *See* Skylark Agreement, *supra* note 20, at art. V.

arrangement was entered into with Canada in 1976,<sup>23</sup> and there were several other launch agreements reached with the United States.<sup>24</sup>

Despite its close involvement in the early space activities of several European countries, Australia did not, however, take up the opportunity to become a Member of the European Space Agency (ESA) when that body began to function de facto from May 1975,<sup>25</sup> although it did conclude a bilateral cooperation treaty with ESA in 1979.<sup>26</sup>

### III. INERTIA FOLLOWED BY A (STILL) BIRTH OF POLICY AND LAW

Despite this early legacy of space involvement, and a momentum driven by the comparative advantages Australia offered as, potentially, a significant participant in the ongoing evolution of space activities, the euphoric days up until the 1970s were not followed through by tangible Government action that would have allowed Australia to retain its place in the "space world." Somewhat ironically, as an increasing number of other countries, including some in the Asian region,<sup>27</sup> began to develop their capabilities in relation to space, Australia seemed to lose interest, allowing itself to relinquish its role as a significant participant.

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<sup>23</sup> Exchange of Notes Constituting an Agreement Between the Government of Australia and the Government of Canada Relating to the Launching of a Canadian Scientific Rocket from Woomera, Austl.-Can., Aug. 26-27, 1979, 1133 U.N.T.S. 3, available at [http://untreaty.un.org/unts/60001\\_120000/1/36/00001764.pdf](http://untreaty.un.org/unts/60001_120000/1/36/00001764.pdf).

<sup>24</sup> See, e.g., Exchange of Notes Constituting an Agreement Between the United States of America and Australia Relating to a Space Research Program, U.S.-Austl., Sept. 18, 1973, 24.2 U.S.T. 2006. Exchange of Notes constituting an Agreement between the Government of Australia and the Government of the United States of America on the Launching of Sounding Rockets, Sept. 1, 1987, [1987] ATS 13.

<sup>25</sup> See Convention for the Establishment of a European Space Agency, concluded May 30, 1975, 1297 UNTS 161. The ESA Convention came into force on October 30, 1980. Australia has, since then, on four occasions been offered associate membership of ESA, but has declined to take up the opportunity each time. Gilbert, *supra* note 5, at 174, 177.

<sup>26</sup> Agreement for a Co-operative Space Vehicle Tracking Program, Austl.-E.S.A., June, 15 1979, 1217 U.N.T.S. 201.

<sup>27</sup> In the Asian region, China, Taiwan, Japan, Malaysia, Indonesia, Vietnam, South Korea, and Thailand (the latter principally through its membership of the Asia-Pacific Space Cooperation Organization) all have dedicated space programs and continue to develop increasing space capability.

Instead of building upon its early successes and developing a clear focus on space into the future, a period of what has been described as “bureaucratic inertia”<sup>28</sup> took hold, and the Government ignored a number of opportunities to expand Australia’s research and commercial involvement in space, just at the time that others were seizing upon the potential (and need) to do so. Whatever steps it did take in this period were only half-hearted. For example, the Government did establish an Australian Space Office (ASO) in 1987, but this was underfunded and lacked real political support during its operation,<sup>29</sup> and was eventually disbanded in 1996.

Things seemed to change again, however, in the late 1990s, when the Government began to consider seriously the potential for the establishment of a significant commercial space launch industry in the country. As the international commercial launch industry became more competitive and sophisticated during that decade, several private overseas consortia sought to explore the possibilities of providing commercial satellite launches from Australia. Given the historical reluctance of the Australian Government to encourage the development of a large-scale domestic space launch vehicle system, these projects were largely conceived by the Government as being consistent with the need to “import” launch vehicles and associated technology, and as the foundation to allow for the development of a domestic launch industry.<sup>30</sup>

Largely in response to this private sector interest in the development of a launch industry in Australia, in December 1998, the Government passed the Space Activities Act, thereby becoming only the sixth country to introduce specific domestic legislation directed towards space activities.<sup>31</sup>

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<sup>28</sup> Gilbert, *supra* note 5, at 174.

<sup>29</sup> *Id.* at 175.

<sup>30</sup> Heather Walker, Bi-lateral Agreements to Facilitate Launch Projects and Satisfy Non-Proliferation Obligations, unpublished paper presented to the 47<sup>th</sup> Colloquium on the Law of Outer Space (Oct. 2004) (on file with author).

<sup>31</sup> The previous countries were the United States, Sweden, the United Kingdom, the Russian Federation, and South Africa. Frans G. von der Dunk, *Launching from “Down Under”: The New Australian Space Activities Act of 1998*, in PROCEEDINGS OF THE FORTY-THIRD COLLOQUIUM ON THE LAW OF OUTER SPACE 132, 139, n.9 (Am. Inst. of Aeronautics & Astronautics ed., 2000).

Prior to this, there had been no existing Australian legislative or regulatory framework – including in relation to licensing, safety, and liability issues – that specifically applied to ‘national’ space activities, particularly launch activities from Australia.

Much has been written about the specific terms of the Space Activities Act, as well as the 2001 Space Activities Regulations, which expand on the general provisions of the Space Activities Act, and it is not necessary to repeat those details here.<sup>32</sup> For present purposes, it should be noted that, in terms of detail, including the licensing regime established in relation to launch activities, the Space Activities Act was generally regarded as representing the most complex domestic launching regulations at the time. Unfortunately, as will be seen below, the main *raison d'être* for the legislation did not come to fruition, although it is still relevant in certain licensing matters.

In relation to its policy implications, the Government described the principal object of the legislation as:

reflect[ing] in an Australian law, Australia's obligations as a signatory to the key United Nations space treaties and provid[ing] a legally certain and predictable environment for the development and operation of Australia's space launch facilities.<sup>33</sup>

In keeping with this stated objective, the primary purposes of the legislation were expressed as follows:

- (a) to establish a regulation regime for commercial space activities carried out either from Australia or by Australian nationals outside Australia;

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<sup>32</sup> For a description of the principal terms of the Space Activities Act and Regulations, see Steven Freeland, *Difficulties of Implementing National Space Legislation Exemplified by the Australian Approach*, in “PROJECT 2001 PLUS” - GLOBAL AND EUROPEAN CHALLENGES FOR AIR AND SPACE LAW AT THE EDGE OF THE 21<sup>ST</sup> CENTURY: PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM 65 (Stephan Hobe, Bernhard Schmidt-Tedd and Kai-Uwe Schrogl eds., 2006), and the various references therein.

<sup>33</sup> NICK MINCHIN, AUSTL. MINISTRY FOR INDUS., SCIENCE AND RESOURCES, EXPLANATORY MEMORANDUM TO THE SPACE ACTIVITIES BILL 1998, ¶ A1 (Dec. 1998), available at [http://www.austlii.edu.au/au/legis/cth/bill\\_em/sab1998177/memo1.html](http://www.austlii.edu.au/au/legis/cth/bill_em/sab1998177/memo1.html).

(b) to provide for the payment of adequate compensation for damage caused to persons or property as a result of space activities regulated by [the legislation];

(c) to implement certain of Australia's obligations under the United Nations Space Treaties; and

(d) to implement certain of Australia's obligations under specified space cooperation agreements.<sup>34</sup>

In essence, the legislation was designed to facilitate a commercial space launch industry in Australia, as well as launches of Australian payloads from overseas sites, and the possible return of a space object that was not launched from a launch facility located within Australia, all within the context of protecting public safety. At the time of entering into the 2001 Cooperation Agreement with Russia noted above, the Australian Government heralded the establishment of Australia as a "significant player in the satellite launch industry"<sup>35</sup> and pledged AUD\$100 million as a Strategic Investment Incentive towards the development of the AUD\$800 million Christmas Island Spaceport Facility. Moreover, the Government announced that, over the following ten years, Australia could reasonably expect to gain between 10-20% of the worldwide demand for satellite launches, generating approximately AUD\$2.5 billion of revenue to Australia.<sup>36</sup> The first launch was expected to take place in 2003,<sup>37</sup> and, by 2005, there were expectations of ten to twelve satellite launches per year.

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<sup>34</sup> Space Activities Act 1998, (Cth)s 3 (Austl.). Purpose (d) was subsequently added to the legislation under the Space Activities Amendment (Bilateral Agreement) Act 2001 to take into account the arrangements for cooperation between the Australia and Russian Governments, as reflected in the Agreement between the Government of Australia and the Government of the Russian Federation on Cooperation in the Field of the Exploration and Use Of Outer Space for Peaceful Purposes, 23 May 2001, [2004] ATS 17.

<sup>35</sup> The then Minister for Industry, Science and Resources Nick Minchin, quoted in Michael Perry, *Australia Announces Christmas Island Spaceport*, SPACE FLIGHT (June 25, 2001) [http://theartofpolitics.homestead.com/files/Australia\\_AnnouncesChristmas\\_Island\\_Spaceport.htm](http://theartofpolitics.homestead.com/files/Australia_AnnouncesChristmas_Island_Spaceport.htm).

<sup>36</sup> *Id.*; *Australia Signs Space Launch Agreement with Russia*, SPACE DAILY, (May 23, 2001), <http://www.spacedaily.com/news/aust-01a.html>.

<sup>37</sup> *Christmas Island Asia Pacific Launch Facility, Australia*, AEROSPACE-TECHNOLOGY.COM, <http://www.aerospace-technology.com/projects/christmas/> (last visited Jan. 21 2011).

The reality has, however, been completely different, and there is no commercial launch service likely in Australia for a considerable period of time, if ever. In the words of the recent Government Senate Inquiry Report (which is described in more detail below),

[w]hile not opposed in principle to Australia regaining its role as a launch site if a commercial venture wishes to do so (whether for satellites or tourists), the committee does not see this as likely, nor as something the government should be supporting with taxpayers' money.<sup>38</sup>

In this regard, therefore, the policy underpinning the existing national space law of Australia has proven largely to be irrelevant and unattainable. Indeed, shortly afterwards, the direction for Australian space involvement was to take another turn (see below). Having said this, however, it must be noted that the licensing regime that is established under the legislation continues to be used to authorize overseas launches by a major Australian telecommunications company,<sup>39</sup> as well as, very recently, the planned return in mid-June of a Japanese spacecraft – the *Hayabusa* asteroid probe – that had been launched from Japan in 2003.<sup>40</sup>

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<sup>38</sup> SENATE INQUIRY REPORT, *supra* note 2, ¶ 4.16 (2008).

<sup>39</sup> One of the licences established under the Space Activities Act is an Overseas Launch Certificate, which is required for an Australian national to launch “a space object ... from a launch facility located outside Australia”. Space Activities Act, *supra* note 34, s 12(a). For example, in August 2009, Optus Networks Pty Limited launched its D3 communications satellite from French Guyana, pursuant to an Overseas Launch Certificate.

<sup>40</sup> See Steven Freeland, *Space Jump Better Late Than Never*, THE AGE, June 7, 2010, at 11, available at <http://www.theage.com.au/opinion/politics/space-jump-better-late-than-never-20100606-xn3t.html>; *Dearth of Australian Space Presence Highlighted*, THE CANBERRA TIMES, June 12, 2010, at 27; Paul Rincon, *Asteroid probe 'on home straight'*, BBC NEWS (May 31, 2010, 6:52 AM), [http://news.bbc.co.uk/2/hi/science\\_and\\_environment/10196807.stm](http://news.bbc.co.uk/2/hi/science_and_environment/10196807.stm). One of the licences established under the Space Activities Act is an Authorization to Return, which is required for the “return to a place anywhere in Australia of a space object that was not launched from a launch facility located within Australia.” Space Activities Act, *supra* note 34, at ss 14(a) & (b).

## IV. REVERTING TO A “NON-POLICY”

The failure of every proposal to develop a commercial launch industry, coupled with the post September 11 geopolitical climate, resulted once again in a rather sudden change of focus by the Australian Government as to how it believed the country should engage in space activities. This was implemented, however, not by the necessary refinements to the law, but rather by generalised and ad hoc “policy” statements. The Government issued a paper – *Australian Government Space Engagement: Policy Framework and Overview*<sup>41</sup> – in 2003 (revised again in 2004), which took no cognisance of the need to change the existing national space law, but rather gave a clear message to space lawyers and the broader space industry that there was no pressing necessity, and consequently no Government support, for a centrally funded “space office” or a “dedicated space program” in Australia,<sup>42</sup> notwithstanding that it was, by this time, the only developed country in the world without such a program.

The Government also announced the termination of funding in 2005 for the Cooperative Research Centre for Satellite Systems (CRCSS),<sup>43</sup> which had built and operated the fifty kilogram Australian research satellite *FedSat*, the first Australian-built satellite in more than thirty years, which was launched in December 2002. *FedSat*’s signal eventually failed in 2007.<sup>44</sup>

At this time, the Government seemed to consider the space sector as being similar to any other high technology industry in Australia and did not provide specific support for space development, but rather called for competition with other technology and industry development through the general range of indus-

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<sup>41</sup> Australian Department of Industry, Tourism and Resources, *Australian Government Space Engagement: Policy Framework and Overview* (Aug. 2004) (on file with author).

<sup>42</sup> *Id.* at 3.

<sup>43</sup> CRCSS combined the resources and skills of twelve Australian organizations (four companies, six universities, and two government agencies). It was established on 1 January 1998 with a budget of about \$60 million over a seven-year period, of which about \$22 million was provided by the Australian Government. Australian Department of Industry, Tourism and Resources, *supra* note 41 at 10.

<sup>44</sup> Jones, *supra* note 6.

try and science support programs. As such, Australia continued to lack a central body and a coordinated approach to its space-related activities and development, and provided no tangible incentives to encourage growth and innovation among those already involved in domestic space-related industries. Instead, the 2003/2004 policy document indicated that the focus of the country's future engagement with space activities was to be increasingly driven by those areas where Australia has existing competitive advantages.<sup>45</sup>

In this respect, it was anticipated that much of Australia's participation in future space activities would revolve around the provision of technological expertise and ground station tracking services, utilizing several of those facilities established under the terms of the previous bilateral arrangements noted above, particularly those with the United States.<sup>46</sup> In essence, there was no real Government support for a space policy that would effectively promote an increasing role for Australia in space activities. Even more significantly, there was no serious Governmental consideration of Australia's need for, and dependence upon space technology for its future economic, strategic, and military effectiveness. In this context, there was also no suggestion that Australia's domestic space laws required enhancement or consolidation.

#### V. GREEN SHOOTS ..... A (POSSIBLE) REBIRTH OF POLICY .....

There are now indications that, with a relatively recent (2007) change of Government, the future of Australia's participation in space may again take a different (and more positive) direction. In particular, two important documents – the Government Senate Inquiry Report (November 2008) and the Department of Defence 2009 White Paper (April 2009) – were produced in rapid succession. Both of these documents have raised interesting issues in relation to Australia's ongoing involvement

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<sup>45</sup> Australian Department of Industry, Tourism and Resources, *supra* note 41.

<sup>46</sup> Indeed, one commentator suggests that the alliance with the United States 'has arguably been an important contributor to Australia's *lack* of space policy.' Gilbert, *supra* note 5, at 177 (emphasis added).

in space activities and will have an undoubted impact on Australia's future space policy and legal regulation.

*A. Government Senate Inquiry Report*

In March 2008, at the instigation of the newly elected Rudd Labour Government, the Australian Senate convened a Senate Standing Committee to conduct a public inquiry, and then report, on the current state of Australia's space science and industry sector. Its purpose was to examine options to "strengthen and expand Australia's position in fields that strongly align with space science and industry," with particular reference to:

- (a) Australia's capabilities in space science, industry, and education, including:
  - a. existing Australian activity of world-class standard; and
  - b. areas in which there is currently little or no activity, but that are within the technical and intellectual capacity of the country;
- (b) Arguments for and against expanded Australian activity in space science and industry, including:
  - a. an assessment of the risks to Australia's national interest of Australia's dependence on foreign-owned and operated satellites;
  - b. the potential benefits that could accrue to Australia through further development of its space capability;
  - c. economic, social, environmental, national security and other needs that are not being met or are in danger of not being met by Australia's existing space resources or access to foreign resources;
  - d. impediments to strengthening and expanding space science and industry in Australia, including limiting factors relating to spatial information and global positioning systems, including but not limited to ground infrastructures, intergovernmental arrangements, legislative arrangements and government/industry coordination; and

e. the goals of any strengthening and expansion of Australia's space capability, both in the private sector and across government;

(c) Realistic policy options that facilitate effective solutions to cross-sector technological and organisational challenges, opportunity capture and development imperatives that align with national need and in consideration of existing world-class capability.<sup>47</sup>

The Committee received eighty-eight submissions and held public hearings across the country over a five month period. It issued an interim report in June 2008 and its final report – somewhat mischievously (partly) entitled *Lost in Space* – in November 2008. The Government Senate Inquiry Report contains a series of recommendations that are contained in Appendix 1 of this article and provides a possible platform upon which Australia could develop a revised national space strategy for the future, incorporating a coordinated space policy and a dedicated space agency.<sup>48</sup>

As can be seen from the recommendations, the thrust of the Government Senate Inquiry Report is geared towards a “whole of Government” approach to space. In the view of the authors of the Government Senate Inquiry Report,

the recommendations ... chart a course towards Australia regaining an important place in global space science and industry by gradually developing a dedicated space agency.<sup>49</sup>

A year after its release, the Government issued its response to the recommendations contained in the Government Senate Inquiry Report.<sup>50</sup> It has generally accepted the findings of that

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<sup>47</sup> SENATE INQUIRY REPORT, *supra* note 2, at vii (Terms of Reference).

<sup>48</sup> For a discussion of the recommendations contained in the Government Senate Inquiry Report, see Noel Siemon & Steven Freeland, *Regulation of Space Activities in Australia*, in NATIONAL REGULATION OF SPACE ACTIVITIES (Ram Jakhu, ed., Springer 2010); Biddington & Sach, *supra* note 1.

<sup>49</sup> SENATE INQUIRY REPORT, *supra* note 2, at ¶ 1.4.

<sup>50</sup> GOVERNMENT RESPONSE TO THE INQUIRY BY THE SENATE STANDING COMMITTEE ON ECONOMICS INTO THE CURRENT STATE OF AUSTRALIA'S SPACE SCIENCE AND INDUSTRY SECTOR (Nov. 2009) [hereinafter GOVERNMENT RESPONSE], *available at*

report. As an important interim step, and in accordance with some of the recommendations, in its 2009 Government budget, AUD\$160.5 million was dedicated to space science and astronomy infrastructure acquisitions and development, and a further AUD\$8.6 million was allocated to establish the Space Policy Unit (SPU) within the Department of Innovation, Industry and Resources. The SPU began operations in mid 2009 and is tasked with various functions, including:

- (a) to act as a central point of contact and coordination for all civil space activities with international space organisations;
- (b) to examine Australia's current civil space activities with a focus on Earth observation, satellite communications and navigation, and continue to hold the Australian Government Space Forum;
- (c) to develop a national space policy; and
- (d) to administer the AUD\$40 million Australian Space research program, which will support space research, innovation and skills development in areas of national significance.<sup>51</sup>

In addition, the Government has set up a dedicated website dealing with space-related matters (accessed via [www.space.gov.au](http://www.space.gov.au)) and, at the time of issuing the Government Response in November 2009, established the Australian Space Industry Innovation Council to provide strategic advice to the Government, as it seeks to develop a national space policy and increase its support for space science and technology.<sup>52</sup>

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<http://www.space.gov.au/SpacePolicyUnit/Documents/GovernmentResponsetoSenateinquiryintoSpace.pdf>.

<sup>51</sup> See, *Australian Space Science Program – Space Policy Unit*, AUSTL. GOV'T, DEP'T OF INNOVATION, INDUSTRY, SCIENCE AND RESEARCH, <http://www.space.gov.au/SpacePolicyUnit/NationalSpacePolicy/Pages/default.aspx> (last visited Jan. 13, 2011); see also GOVERNMENT RESPONSE, *supra* note 50.

<sup>52</sup> Media Release, Senator The Hon. Kim Carr, Industry Council to Boost Australian Space Innovation: Government Response to Senate Space Report (Nov. 19, 2009), *available at* <http://minister.innovation.gov.au/Carr/Pages/INDUSTRYCOUNCILTOBOOSTAUSTRALIANSPEACEINNOVATION.aspx>.

*B. Department of Defence 2009 White Paper*

Following a review of the existing capabilities and requirements of its Navy, Army, and Air Force, in April 2009 the Australian Department of Defence issued a White Paper designed to meet the following purposes:

(a) [to explain] how the Government plans to strengthen the foundations of Australia's defence so that we are ready to meet the challenges of an uncertain strategic future. It sets out the Government's future plans for Defence, and how it will achieve those plans[; and]

(b) [to lay] out the Government's future plans for the development of Force 2030, including the major capability investments that will need to be made in the coming years. Most importantly, it explains the level of resources that the Government is planning to invest in Defence over coming years and what the Government, on behalf of the Australian people, expects in return from Defence.<sup>53</sup>

The Defence White Paper is a very comprehensive document, dealing with all aspects of the current and future defence capabilities and needs of the country, including issues relating to its increasing demand for assured access to specific space-related technology. In general terms, the document concludes that Australia's defence policy must enable the country to

- a. act independently where we have unique strategic interests at stake, and in relation to which we would not wish to be reliant on the combat forces of any foreign power;
- b. lead military coalitions where we have shared strategic interests at stake with others, and in relation to which we would be willing to accept a leadership role, in part to compensate for the limited capacity or engagement of others; and

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<sup>53</sup> AUSTRALIAN DEP'T OF DEFENCE, DEFENCE WHITE PAPER: DEFENDING AUSTRALIA IN THE ASIA PACIFIC CENTURY: FORCE 2030 ¶¶ 1.1 & 1.2 (Apr. 2009) [hereinafter DEFENCE WHITE PAPER].

c. make tailored contributions to military coalitions where we share wider strategic interests with others and are willing to accept a share of the burden in securing those interests.<sup>54</sup>

The Defence White Paper emphasizes the need of the Australian Defence Forces (ADF) to be in a position to exercise greater self-reliance, whilst at the same time maintaining and utilising the strong existing strategic alliances, predominately with the United States. Importantly, it recognises that the nature and capacity of the ADF must be able to adapt to changes of a political, strategic, economic, and military nature in the Asia-Pacific region, including the modernization of the military and the increasing space capability of Australia's regional neighbours, fuelling what some observers have called an "Asian space race."<sup>55</sup> Indeed, the Australian Defence Minister has suggested that "[a]s the Asia-Pacific region becomes more prosperous, we will see an increase in the region's military capability."<sup>56</sup>

Implicit in the Defence White Paper is a shift in emphasis towards planning based on possible strategic threats and developments in Asia.<sup>57</sup> Interestingly in the context of this meeting in Hawaii, the title of the Defence White Paper refers to this century as "the Asia Pacific Century."

In relation specifically to space technology, the Government Senate Inquiry Report had already heard evidence from the Department of Defence that over 50% of the ADF's major capability developments for the period 2006-2016 "have a dependency on services that are derived from space."<sup>58</sup> Yet, although Austra-

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<sup>54</sup> *Id.* at 13.

<sup>55</sup> See, e.g., *South Korean Rocket Launch Delayed*, BBC NEWS, (June 9, 2010), [http://news.bbc.co.uk/2/hi/science\\_and\\_environment/10269459.stm](http://news.bbc.co.uk/2/hi/science_and_environment/10269459.stm).

<sup>56</sup> Media Release, The Hon. Joel Fitzgibbon, Minister for Defence, A New Strategic Environment, (May 2, 2009), <http://www.defence.gov.au/whitepaper/mr/06NewStrategicEnvironmentFixed.pdf>.

<sup>57</sup> As an example, as this article is being written, there is increasing tension in the Korean peninsula following the claim by South Korea that North Korea fired a torpedo that sank the South Korean navy ship, the Cheonan, in March 2010, with the loss of forty-six lives. See *The Sinking of the Cheonan*, THE NEW YORK TIMES, May 20, 2010, at A26, available at <http://www.nytimes.com/2010/05/21/opinion/21fri2.html?scp=1&sq=The%20sinking%20of%20the%20Cheonan&st=cse>; *Their Number Is Up*, THE ECONOMIST (May 20, 2010), <http://www.economist.com/node/16167868>.

<sup>58</sup> SENATE INQUIRY REPORT, *supra* note 2, at ¶ 5.56.

lia does benefit from a comprehensive network of communications satellites, for its other satellite needs such as remote sensing and GPS, it is at present entirely reliant on satellites operated and controlled offshore, despite the fact that it is uniquely dependent upon space technology for defence, security, and economic reasons due to its huge coastline. Of course, these “offshore” satellites are not subject to Australian ownership or jurisdiction and control – the latter either in a practical day-to-day sense, and/or as contemplated in the Outer Space Treaty.<sup>59</sup> As a consequence, the reality is that access to these satellites in a crisis would be solely dependent on the strength and enforceability of contractual terms and political ties.

The Defence White Paper therefore places a “high priority on assured access to high quality space-based imagery” in order to meet the ADF’s requirements for “mapping, charting, navigation and targeting data.”<sup>60</sup> In addition, great emphasis is placed on the need to enhance Australia’s Intelligence, Surveillance and Reconnaissance (ISR) capabilities,<sup>61</sup> designed to give it the ability “to collect, share, interpret and act upon information in a timely manner.”<sup>62</sup>

As a result, the Defence White Paper confirms the Government’s intention to improve the country’s intelligence collection capability “by acquiring a satellite with a remote sensing capa-

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<sup>59</sup> Article VIII of the Outer Space Treaty provides in part as follows:

A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth.

Outer Space Treaty, *supra* note 10, at art. VIII.

<sup>60</sup> GOVERNMENT RESPONSE, *supra* note 50, at 3, [http://www.aph.gov.au/senate/committee/economics\\_ctte/space\\_08/gov\\_response/gov\\_response.pdf](http://www.aph.gov.au/senate/committee/economics_ctte/space_08/gov_response/gov_response.pdf) (last visited Jan. 13, 2011).

<sup>61</sup> DEFENCE WHITE PAPER, *supra* note 53, at ¶ 9.78.

<sup>62</sup> Media Release, The Hon. Joel Fitzgibbon, Minister for Defence & The Hon. Warren Snowden, Minister for Defence Science and Personnel, A Smarter Defence for a more Complex World, May 2, 2009, [http://www.defence.gov.au/whitepaper/mr/07\\_A\\_SmarterDefence.pdf](http://www.defence.gov.au/whitepaper/mr/07_A_SmarterDefence.pdf).

bility, most likely to be based on a high-resolution, cloud-penetrating synthetic aperture radar.”<sup>63</sup>

These strategies are to be augmented into the existing strategic alliances with the United States, which involve the sharing of imagery access with that country, as well as enhancing Australia’s ISR capability by linking it with that of the United States. The Australian Minister for Defence has indicated that “[p]ossession of an indigenous [remote sensing] satellite ... will add to Australia’s status as a contributing partner within the alliance framework.”<sup>64</sup>

These new initiatives complement the terms of a 2008 Statement of Principles between the respective Governments establishing the United States – Australia Military Satellite Communications Partnership (United States – Australia Partnership Agreement),<sup>65</sup> which specifies that the countries will “jointly pursue the development of satellite capabilities – both commercial and military.”<sup>66</sup> It is clear that, without these strategic alliances, Australia would have to allocate even greater resources towards the development of essential space capabilities.

Moreover, these proposals are in addition to other committed joint projects with the United States, including a AUD\$927 million arrangement to provide funding to, and participate in, the Wideband Global Satellite Communications constellation (WGS).<sup>67</sup>

The Defence White Paper, recognising both a need for “space situational awareness” and appropriately skilled space professionals, also indicates that the ADF will develop a “career

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<sup>63</sup> DEFENCE WHITE PAPER, *supra* note 53, at ¶ 9.80; GOVERNMENT RESPONSE, *supra* note 50, at 3.

<sup>64</sup> Media Release, The Hon. Joel Fitzgibbon, Minister for Defence, Government to Acquire Satellite with Remote Sensing Capability (May 2, 2009), [http://www.defence.gov.au/whitepaper/mr/48\\_SatelliteCapability.pdf](http://www.defence.gov.au/whitepaper/mr/48_SatelliteCapability.pdf).

<sup>65</sup> See Austl. Gov’t, Australian-United States Ministerial Consultations (AUSMIN), 2008 Joint Communiqué, [http://www.dfat.gov.au/geo/us/ausmin/ausmin08\\_joint\\_communique.html](http://www.dfat.gov.au/geo/us/ausmin/ausmin08_joint_communique.html).

<sup>66</sup> Gilbert, *supra* note 5, at note 13 (*citing* DEFENCE WHITE PAPER, *supra* note 53, at 121).

<sup>67</sup> For further details of this and other planned joint projects, see Gilbert, *supra* note 5, at 176.

stream for space specialists.”<sup>68</sup> At present, there are only a small number of people within the military dealing with an increasingly broad and complex array of space-related issues, so that this emphasis on the development of specific and up-to-date technical expertise is to be welcomed. This will also require the involvement of lawyers across a whole range of issues related to the interaction of the laws of armed conflict, military law, and space regulation, a convergence that is not in itself entirely straightforward under existing international law.<sup>69</sup>

#### VI. .... BUT (HOW) WILL THE LAW FOLLOW?

The recent developments and proposed initiatives referred to in the previous section of this article give rise to (cautious) optimism as to the future direction of Australia's participation in space, particularly if one is to compare them with prior attempts to articulate a space policy for the country. No doubt, there are many issues of detail to be determined regarding the proposals, and it may well be some time before the precise direction of Australia's space initiatives are apparent, even more so given the sometimes rapidly changing geopolitical factors at play, not to mention the constantly evolving technological developments. Moreover, any long-term strategy will require considerable and unwavering governmental support and political will, something that has been sadly lacking in the past.

The articulation of clear, relevant, and comprehensive domestic laws, as well as appropriate binding multi- and bilateral international arrangements, will also be vital elements in Australia's future space policy. These are necessary to provide the proper legal and regulatory framework for the implementation of this new policy. Some aspects of what is required, and the issues that these may raise, are briefly considered below.

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<sup>68</sup> DEFENCE WHITE PAPER, *supra* note 53, at 85.

<sup>69</sup> For a general discussion of the possible application of the international laws of war (*jus in bello*) within the international legal regulation of outer space, see Steven Freeland, *The Applicability of the Jus in Bello Rules of International Humanitarian Law to the Use of Outer Space*, in FORTY-NINTH COLLOQUIUM ON THE LAW OF OUTER SPACE 338 (Am. Inst. of Aeronautics & Astronautics ed., 2006).

A. *Retention of the Space Activities Act*

Of course, Australia already has domestic space law. Indeed, at the time it was introduced, the Space Activities Act was aptly described as “an interesting and generally positive contribution to the national implementation of international space law.”<sup>70</sup> As noted, the legal regime established under the legislation is a rather sophisticated and detailed example of domestic space law, but (despite its broad title), it only applies to a relatively narrow field focused on the creation of a licensing mechanism (with associated safety oversight) to deal with commercial space launches (and returns).

Nevertheless, the Space Activities Act should remain in place to deal with any relevant activities that fall within its coverage. It works quite well in relation to the very limited scope of space activities with which it is currently involved. Indeed, despite the fact that the primary motivation for the promulgation of the law did not translate into reality, the licensing regime it has established appears to operate effectively for overseas launches and returns. Moreover, the legislation also deals in some detail with issues of financial responsibility for liability arising from launch activities and, in certain aspects, is (or at least was at the time it came into force) quite innovative, for example, in relation to the still vexed question as to “where space begins.”<sup>71</sup>

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<sup>70</sup> von der Dunk, *supra* note 31, at 139.

<sup>71</sup> The Space Activities Act incorporates into the definitions of a “launch”, a “launch vehicle”, a “return,” and a “space object” a reference to “the distance of 100 [kilometres] above mean sea level” (section 8). At the time of introducing these definitions, the relevant Government Ministry explained that this was necessary to

address the issue that there is uncertainty as to where “outer space” begins given that there is no definitive explanation of the term in either Australian or international law. The effect of these amendments is that the [Space Activities] Act will now apply to launches or attempted launches that go to a clearly defined point – being an area beyond the distance of 100 [kilometres] above mean sea level. In doing so, it will provide certainty to industry about the point where industry players become subject to the provisions of the [Space Activities] Act.

AUSTL MINISTRY FOR INDUSTRY, TOURISM AND RESOURCES, EXPLANATORY MEMORANDUM TO THE SPACE ACTIVITIES AMENDMENT BILL 2002, ITEM 2 (2002), *available at*

Yet, while the innovations in the Space Activities are of great interest to space lawyers, the stark fact remains that the current domestic legal framework in Australia is far from adequate to deal with the much broader range of activities that the revised space policy initiatives envisage. A considerable body of additional law will be necessary. The Government Senate Inquiry Report and Defence White Paper convincingly argue for an expansion of Australia's space capabilities, their centralized coordination and the development of additional links with both private industry and international and inter-governmental organisations. Yet, these major policy documents make scant reference to the changes that are required to existing legal arrangements to accommodate these ambitions, as well as the need for additional laws. This is a worrying oversight.

*B. The Need for Additional (Remote Sensing) Legislation*

For one thing, as noted, it is intended that Australia acquire its own remote sensing satellite, thus both enhancing its indigenous capabilities in this regard and also contributing to its cooperative relationships with its strategic allies, principally the United States. While it is not yet entirely clear as to the precise range of activities in which this indigenous satellite will be engaged, the clear implication is that it will be primarily involved with sensitive ISR operations. This in itself poses an interesting dilemma as to the form and substance that the necessary legal regulation of remote sensing activities in Australia should/will take.

A major theme at this meeting is the growing body of law and regulation in the Asia-Pacific region in relation to remote sensing activities. Given the proposals suggested in the major Australian documents discussed above, it is apparent that there will also be an increasing need for some form of Australian national law to deal in more detail with such activities – no doubt this issue will be explored in another paper presented at this meeting. Yet, given the (seemingly) sensitive nature of those

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[http://www.austlii.edu.au/au/legis/cth/bill\\_em/saab2002257/memo1.html](http://www.austlii.edu.au/au/legis/cth/bill_em/saab2002257/memo1.html) (last visited Jan. 13, 2011). See also Steven Freeland, *supra* note 31, at 79-81.

proposed activities, it is not entirely certain that whatever Australian national law is eventually drafted will be particularly clear (as opposed to vague) or comprehensive (as opposed to limited).

It may well be that, therefore, in the area of remote sensing legislation, Australia may see a “staged” process of law-making, initially dealing with data collection and imagery for sensitive purposes and, only later, when (or if) the use of the imagery expands in a broader (perhaps commercial) sense, with a wider range of remote sensing activities. This expanded range of activities may eventuate particularly given the other needs that Australia has for remote sensing images, which include agricultural and crop management, resources exploration, disaster management, and monitoring the effects of climate change.

There may therefore quite likely be controls put in place to restrict the use and dissemination of information obtained from the utilisation of our newly acquired remote sensing capabilities. If this were to be the case, it may raise interesting legal questions, and pose a challenge to the general principle of “non-discriminatory” access to remote sensing data that is articulated in the Principles Relating to Remote Sensing of the Earth from Outer Space (Remote Sensing Principles).<sup>72</sup> No doubt, the contra argument will focus on those national security concerns that resonate whenever the phenomena of “shutter control” is discussed. However, the fact remains that Australia has, in the past, generally been a good “international citizen” when it comes to its obligations under the various international space treaties and principles, and it would be disappointing if this were not to be the case when it came to its remote sensing activities.

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<sup>72</sup> Principles Relating to Remote Sensing of the Earth from Space, G.A. Res. 41/65, U.N. GAOR, 41<sup>st</sup> Sess., 95<sup>th</sup> plen. mtg., U.N. Doc. A/RES/41/65 (Dec. 3, 1986). Principle XII of the Remote Sensing Principles provides in part as follows:

“As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall have access to them on a non-discriminatory basis and on reasonable cost terms.” *Id.*

*C. The Legal Framework for the Establishment of a National Space Agency*

Just as the implementation of the Space Activities Act required the establishment of the Space Licensing and Safety Office (SLASO) to administer the legislation and regulate those space activities undertaken under the regime it created, the proposed eventual establishment of a national space agency will also require appropriate legislative establishment and direction. This will almost certainly require new legislation, since the establishment of a space agency does not easily fit within the existing structure of the Space Activities Act.

Many examples exist of discreet domestic laws establishing a national space agency. One of the most comprehensive of these is The National Aeronautics and Space Act of the United States (NAS Act).<sup>73</sup> Under the NAS Act (as amended), the functions of that agency are to

- (1) plan, direct, and conduct aeronautical and space activities;
- (2) arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations;
- (3) provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof;
- (4) seek and encourage, to the maximum extent possible, the fullest commercial use of space; and
- (5) encourage and provide for Federal Government use of commercially provided space services and hardware, consistent with the requirements of the Federal Government.<sup>74</sup>

Obviously, however, the precise functions and responsibilities of any national space agency will depend upon issues of sov-

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<sup>73</sup> Pub. L. No. 85-568, 72 Stat. 426 (July 29, 1958) (as amended).

<sup>74</sup> *Id.* § 203(a).

ereignty, as well as the internal constitutional and administrative requirements of the relevant country – not to mention, of course, its peculiar economic, political, developmental, societal, and cultural situation. Of course, the precise scope of intended space activities will also be highly relevant. The Government Senate Inquiry Report itself recognises that there are “various models of space agency within the OECD and emerging economies.”<sup>75</sup>

It therefore remains to be seen exactly what “model” will be considered as the most appropriate for Australia. Clearly, although the revised space policy for Australia will, if implemented, see a significant broadening of its participation in space, the scope of these expanded activities will never approach those administered by NASA. Australia’s space needs and dependencies will also differ in various respects from those of many of its regional neighbours who have already established a national space agency. It will therefore be of great interest to see exactly what “medium/long-term priorities” for a space agency will be suggested by the Space Industry Advisory Council, as well as the “draft strategic plan for the establishment of a space agency and the most appropriate form of that agency, including public/private funding, budget and staffing priorities that it develops in due course.”<sup>76</sup>

#### *D. Laws to Encourage Government – Private Partnerships*

Although this is probably not widely known, Australia does have an active private space industry in several areas of specialised technology. The major problem in the past has been the lack of a coordinating body to properly lobby Government on the part of this industry. There have also been occasions when it has not spoken with one voice. This has been a cause of frustration on all sides. The creation of a centralised space agency must incorporate legal and administrative mechanisms to enable clear communication and cooperation between Government

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<sup>75</sup> GOVERNMENT RECOMMENDATION, *supra* note 50, at 4.

<sup>76</sup> *Id.* at 5.

and industry. This will be an essential element to the successful implementation of any revised space policy.

Even more importantly, legislation must be introduced as required to provide appropriate financial incentives to private industry, both to undertake the necessary research and development to allow it to “joint venture” with Government in a true Public-Private enterprise in the furtherance of Australia’s space activities, and also to enhance its capacity building. It is trite to note that any space venture requires very considerable financial as well as technical capital. From the perspective of private industry – and increasingly from that of Government as well, particularly in the wake of the recent Global Financial Crisis – an appropriate and realistic commercial “business case” must be made. The state of Australia’s private space industry is such that, notwithstanding its undoubted technical capabilities, it would in general require significant tax, subsidy, and/or other types of financial and administrative incentives and support to provide effective input to the increasingly ambitious space-related plans of Government. This will require amendment to tax/other laws and perhaps also the introduction of specific legislation related to the establishment of a space industry financial support mechanism,

It is to be hoped that the Australian Government also turns to lawyers with space-related expertise to assist in the preparation of these and any other necessary national laws.

*E. International Legal Agreements for Cooperation with Asia-Pacific Countries*

Coupled with the necessary changes and additions to Australian national law that the implementation of the proposed new space policy initiatives will require, there is another important issue to consider. Australia is one of the most important countries in the Asia-Pacific region and continues to reaffirm its commitment to engagement with South East Asian and Pacific

nations.<sup>77</sup> The countries of this region share a number of significant challenges, ranging from security concerns, disaster management, people smuggling, drug trafficking, and dealing with so-called “failed States” in the region. The appropriate use of space technology plays an important role in addressing every one of these challenges.

It is therefore imperative that, as well as continuing to strengthen existing strategic alliances with respect to space-related matters, Australia work (more) closely with its regional neighbours in the use and exploration of outer space directed towards meeting these difficult issues head on. The proposed return to Woomera of the Japanese *Hayabusa* space probe in mid-June provides an excellent example of inter-regional cooperation giving rise not only to mutual benefits, but also actively promoting international cooperation in relation to space activities.

It will thus become increasingly important for Australia to develop further multi- and bilateral international arrangements with the countries in the region involving the shared access to data obtained through the utilization of space technology. Such initiatives should not be seen as conflicting with the cooperative partnership that Australia has with the United States, but rather as an important adjunct to that partnership that enhances regional prosperity, cooperation, and stability, as well as the peaceful use of outer space. Given the various geopolitical and other forces at work, however, such negotiations and the conclusion of any binding legal arrangements, will require careful drafting by the international legal departments of all countries involved.

## VII. CONCLUDING REMARKS

Australia’s early promise as a major space-faring nation has not materialised, due largely to the lack of direction and support on the part of successive Governments. In Australia’s

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<sup>77</sup> See, e.g. , Media Release, The Hon. Joel Fitzgibbon, Minister for Defence, Cooperation with South East Asia and Pacific Nations, May 2, 2009, available at [http://www.defence.gov.au/whitepaper/mr/04\\_SE\\_AsiaPacificFixed.pdf](http://www.defence.gov.au/whitepaper/mr/04_SE_AsiaPacificFixed.pdf).

case, the Government's approach to the development of a focused domestic space policy has often appeared to be a case of "two steps forward – one and a half steps back." At the same time many other developed and developing countries around the world, including those in the Asia-Pacific region, have devoted considerable legal, technical, and management expertise towards capacity-building in relation to their own space activities. Australia's failure to invest in space technology in the past, and to promote a legal climate that encourages such endeavours, has caused it to fall well back in the space race.

More recently, however, the newly elected Government has initiated a series of studies into Australia's role in space, and the initial recommendations and the action that has followed show some encouraging signs. A key difference between these proposals and previous attempts to promote (albeit half-heartedly) a space policy for the country is that the recent recommendations incorporate what one might describe as "top-down" initiatives,<sup>78</sup> driven by a Government that, at least in its public statements thus far, is committed to a "whole of nation" approach to space. Of course, there is a considerable amount of work yet to be done. Much of the detail of the proposed enhancements to Australia's space policy remains to be finalised. Notably, the costs associated with many of the announced initiatives have not been comprehensively reported; nor is it clear what the budget implications will be, particularly given the prevailing uncertain financial international position.<sup>79</sup> Moreover, no work of substance has been done on the legal implications of the new policy and there is little formal representation of lawyers on the advisory bodies that have been established.

Yet, it is clear that Australia must follow the example set by many of the countries represented in this meeting and direct its attentions to the very considerable benefits to be gained by playing a more significant role in space activities. Or perhaps

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<sup>78</sup> Australian Space Industry Chamber of Commerce (ASICC), *Newsletter #1*, Dec. 2009, at 3, <http://www.symbioscomms.com/ASICC/newsletter.html>. See also Gilbert, *supra* note 5, at 176.

<sup>79</sup> See Jonathon Amos, *German Space Escapes Budget Cuts*, BBC NEWS (June 9, 2010), <http://www.bbc.co.uk/news/10271637>.

put another way, Australia can no longer afford to fall further behind its friends and neighbours in relation to important aspects of the use and exploration of outer space. Moreover, this will involve not only introspective law- and decision-making, but also a further expansion of the binding cooperative ties that Australia already has on matters of security with countries in the region.<sup>80</sup> Such initiatives may also be important in the broader context of Australia's proposed bid for a seat on the United Nations Security Council for 2013-2014.<sup>81</sup> These enhanced cooperative arrangements may perhaps also extend to space agencies further afield, such as Canada and the ESA.<sup>82</sup>

In this regard, one further observation bears emphasizing. Whatever the final model that is ultimately considered to be the most appropriate, it is crucial that an Australian *space agency* is ultimately established. There have recently been some unsubstantiated rumours to the effect that the policy makers within Government may be tending away from the idea of establishing a dedicated agency, despite the recommendations made in the Government Senate Inquiry Report that were subsequently endorsed by the Government. The point remains, however, that no matter what the reasons for this might be (even if they can be objectively justified), a failure to establish an agency in due course would send negative signals to the rest of the world about the extent of seriousness with which the Australian Government approaches its commitments to active space participation in the future. That would set Australia's ambitions back considerably.

Australia's need to carefully consider its future path in space is not unique to that country. Other countries are currently undertaking a reassessment of their participation in space activities – the United Kingdom has, for example, recently

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<sup>80</sup> For example, Australia is an active member of the International Proliferation Security Initiative and remains committed to assisting regional states to implement arms control and non-proliferation treaties, and promote effective national export control regimes. DEFENCE WHITE PAPER, *supra* note 53, at ¶ 11.45.

<sup>81</sup> See, e.g., Media Release, The Hon. Joel Fitzgibbon, Minister for Defence, Australia's Commitment to the United Nations and Multilateral Engagement, May 2, 2009, [http://www.defence.gov.au/whitepaper/mr/03\\_UN\\_Multilat.pdf](http://www.defence.gov.au/whitepaper/mr/03_UN_Multilat.pdf).

<sup>82</sup> Gilbert, *supra* note 5, at 177.

conducted a mapping inquiry and concluded a Civil Space Strategy for the period 2006-2010.<sup>83</sup> The new English Minister for Universities and Skills in the just-elected Conservative-Liberal Democrat Coalition Government, David Willets, has pledged to build upon and enhance developments that had taken place just prior to the election. One of these was the establishment of an executive space agency tasked with the coordination of policy and funding for space initiatives in that country.<sup>84</sup>

Australia must follow through on its stated determination to take a similar path towards a well-articulated and relevant engagement with space. The effective implementation of a focussed space policy, coupled with the establishment of a comprehensive and relevant body of national law and additional international cooperative arrangements, is important for Australia's future and will enable it to better compete and play an important role in an ever changing world.

## Appendix 1

### Recommendations Contained in the Government Senate Inquiry Report November 2008

#### Recommendation 1

The committee recommends as a first step that the Government give the existing unit within the Department of Innovation, Industry, Science, and Research more resources to enable the establishment of an Australian government Space Information Website. This would provide information on government programmes and contacts, and links to Australian companies working in the space industry as well as Australian universities offering courses in space science and space engineering.

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<sup>83</sup> *Id.* at 180.

<sup>84</sup> Jonathan Amos, *Coalition Wants UK Space Lift off*, BBC NEWS (May 28, 2010), [http://news.bbc.co.uk/2/hi/science\\_and\\_environment/10176761.stm](http://news.bbc.co.uk/2/hi/science_and_environment/10176761.stm).

#### Recommendation 2

The committee notes that Australia is the only OECD country without a national space agency and, as a consequence is missing out on opportunities to engage in this important area of innovation and technology. The committee also notes the comments by the Chief Scientist and the conclusion of the Cutler Report in relation to the importance of the space industry for innovation within Australia. The committee recommends that immediate steps are taken to coordinate our space activities and reduce our over reliance on other countries in the area of space technology.

#### Recommendation 3

The committee notes the wealth of expert, well informed evidence received by the committee. Despite some deviations, the overwhelming majority of witnesses strongly supported the formation of a government unit to coordinate Australian space activities, including those in the private sector. The committee supports this conclusion and notes that there must be a proper balance between industry and government involvement.

#### Recommendation 4

The committee notes the various models of space agency within the OECD and emerging economies and supports Australia having a space agency. The committee recommends initially establishing a Space Industry Advisory Council comprising industry representatives, government agencies, defence, and academics. The committee recommends that the advisory Council be chaired by the Minister for Innovation Industry Science and Research or his representative.

#### Recommendation 5

As a precursor to the establishment of the space agency the Advisory Council would:

- Conduct an audit of Australia's current space activities within six months of the establishment of the Council;
- Analyse the strengths, weaknesses, opportunities and threats to Australia's emerging space industry;
- Focus on the key 'workhorse' space applications of Earth observation, satellite communications and navigation as the most practical and beneficial initial priorities;
- Systematically evaluate the medium/long-term priorities for a space agency including the national benefit of defence related activities, Earth observation, environmental, land management, exploration, national disaster prevention and management, treaty monitoring, e-commerce and telemedicine;
- Examine the benefits to Australia of improved international collaboration including membership of the international space groups;
- Develop a draft strategic plan for the establishment of a space agency and the most appropriate form of that agency, including public/private funding, budget and staffing priorities; and
- Identify critical performance areas such as research, technological development, development of the skill base, effective partnerships, delivery of new services, and financial management.

#### Recommendation 6

The committee recommends that any Australian Space Agency reassess the case for Australia becoming more closely linked to an international space agency.



# REMOTE SENSING ISSUES AS THEY RELATE TO KOREA

*Jae Gon Lee*\*

## I. INTRODUCTION

The development of space activities in Korea, despite its relatively brief history, has grown at a tremendously rapid and remarkable pace, similar to the swift progress of industrialization in Korea. Particularly, activities related to remote sensing have emerged as one of the most active fields in space industry. Remote sensing activities have been developed on two tracks: the first one relates to the development of satellites for the purpose of remote sensing, and the other concerns the interpretation and utilization of data obtained through satellite observation. For this reason, Korea, like other advanced countries, is challenged by legal problems arising from remote sensing issues. Some legislation exists, although it is at a very early stage. The purpose of this article is to introduce space activities in Korea, particularly focusing on remote sensing issues, and to discuss the legal regulations and problems related to remote sensing within the framework of relevant Korean laws.

## II. EVOLUTION OF REMOTE SENSING IN KOREA

Even though Korea was at one time crushed into ruins at the outbreak of the Korean War (from 1950 to 1953) and left with traumatic wounds throughout the period of Japan's colonization (from 1910 to 1945), Korea has achieved astounding economic growth and miraculously transformed itself into one of the top ten economic powers in the World. The rapid pace of development of space activities in Korea is quite remarkable as be-

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ing analogous to its rapid economic growth. During the early stages of industrialization, Korea was not ready to invest in a high-technology industry such as the space industry, which would require an *enormous* amount of *capital*, because the elimination of national poverty remained the most urgent priority in order to fulfill its very fundamental needs. Korea's Aviation Industry Act whose sole purpose was to regulate the aviation industry subsequently led to the enactment of Aerospace Industry Development Act in 1987, which, at last, included the regulation of activities in outer space.<sup>1</sup> Since then, the investment in R & D of space activities began to be vigorously encouraged. The development of the very first satellite, named *KISAT-1*, began around this time and was launched as a test satellite in 1992. Along with two scientific sounding rockets, the second satellite, known as *KISAT 2*, was also launched in 1993. The Korea Telecommunication Company (KT) subsequently deployed the communications satellites, *KOREASAT 1, 2* and *3*, in 1995, 1996, and 1997 respectively. As a result, the use of satellites was extended to include commercial purposes. However, those commercial satellites and rockets which reached orbit were still manufactured by foreign corporations.

Serious efforts were made to achieve self-developed satellites and finally realized through the development of *KISAT 3*, a Micro Science Satellite with a weight of 100 kg, as well as the very first multipurpose satellite called *KOMPSAT 1*. *KOMPSAT 1*, whose life span has now expired, was manufactured in 1999 by the Korea Aerospace Research Institute (KARI) together with TRW in the United States. In 2003, Korea launched *KOMPSAT 2* and began the Communication, Ocean Monitoring & Metrological Satellites Program. Currently, *KOMPSAT 3* is being manufactured jointly with Astrium, a German corporation, and is to be launched in 2011. *KIMPSAT 5* is also being jointly manufactured with Thales, an Italian company, and is scheduled for launch in 2010. In 2003, *Science Satellite 1* was launched using a Russian launch vehicle and completed its mis-

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<sup>1</sup> See Doo Hwan Kim, *The Main Contents of the New Space Development Promotion Act in Korea*, PROCEEDINGS OF THE 48<sup>TH</sup> COLLOQUIUM ON THE LAW OF OUTER SPACE OF IISL 290, 291 (2005).

sion in 2006. *Science Satellite 2* was launched on a KSLV-1, Korea's first jointly manufactured rocket with Russia, in August 2009. However, it was not able to carry out its function due to a launch failure. Consequently, it was re-manufactured and re-scheduled for launch again on June 9, 2010. However, the second attempt was not successful either. Therefore, the satellite currently under operation is *KOMPSAT 2*.

Along with the manufacture and launching of satellites, in 2009, the Korean government attempted to launch the very first self-made Korea Space Launch Vehicle (KSLV) from the NARO Space Center in Oeinaro Island, located in the southern province. Though the attempt to launch failed, a test for a micro rocket was successfully conducted with the aid from Russia. The second launch also failed on June 9, 2010.

The following tables show the status of various satellites which are already developed or are expected to be developed in the near future.

#### Scientific Satellites

Category	KISAT No.1	KISAT No.2	KISAT No.3	Scientific Satellite No.1	Scientific Satellite No.2	Scientific Satellite No.3
Purpose	obtain basic technology	utilize obtained technology	Develop technology	Earth observation	earth observation	earth/space observation
Weight	50kg	50kg	110kg	106kg	99.4kg	Within 150kg
Altitude	1,300km	800km	720km	680km	300 ~ 1,500 km	Within 700km
Life Span	5 years	5 years	3 years	3 years	2 years	2 years
Total Cost	3.2 million(\$)	2.6	6.7	9.4	11.8	15
Rocket	Ariane-4(France)	Ariane-4(France)	PSLV (India)	Cosmos(Russia)	KSLV-•(Korea)	TBD
Launch Venue	France	France	India	Plesetsk(Russia)	Korea	TBD
Launch Date	Aug'. 11,'92.	Sep.26,'93.	May 26, 99.	Sep.27,'03.	1 <sup>st</sup> :Aug..25,'09. 2 <sup>nd</sup> :June 9, 2010	'10(expected)
Operating Status	mission completed ('96.12) operation terminated ('4.08)	Mission completed ('97.12) operation terminated ('02.10)	mission completed ('01.04) operation terminated ('02.12)	mission completed ('06.05) under technical test	1 <sup>st</sup> launch failed 2 <sup>nd</sup> launch failed	not launched

### Multipurpose Satellites, Communication, Ocean Monitoring and Metrological Satellites

Category	multipurpose satellite No. 1	multipurpose satellite No. 2	multipurpose satellite No. 3	multipurpose satellite No. 3A	multipurpose satellite No.5	Communication Ocean Monitoring & Metrological Satellite
Purpose	earth observation	Detailed observation of earth	detailed observation of earth	detailed observation of earth	All-weather earth observation	Communication, Ocean Monitoring, Metrological observation
Weight	470kg	800kg	1,000kg	1,000kg	1,400kg	2,500kg
Altitude	685km	685km	685km	530km	550km	36,000km
Life Span	3 years	3 years	4 years	4 years	5 years	7 years
Resolution	Black/white image 6.6m	black/white image 1m Color image 4m	black/white image 0.7m Color image 2.8m	infrared image 5.5m black/white image 0.55m Color image 2.2m	radar image 1m	Metrology 1km Ocean 500m
Launch Date	Dec.21,'99.	Jul. 28,'06.	'11(expected)	'13(expected)	'10(expected)	'10(expected)
Operation Status	mission completed (08.2)	on operation	not launched	not launched	not launched	not launched
Total Cost	187mil.(%)	219	239	178	207	296
Budgets by Ministries	MOST : MOI MOIC	MOST MOI MOIC	MOEST MOKE	MOKE	MOEST MOKE	MOEST CBC MOLMA MA
Manufacture Company	KARI TRW (USA)	KARI Elop(Israel)	KARI, Astrium (Germany)	KARI Astrium (Germany)	KARI Thales (Italy))	KARI Astrium (France)
Rocket Projectile	Taurus (USA)	Rockot(Russia)	H-IIA(Japan)	TBD	Dnepr(Russia)	Ariane-5(France)
Launch Venue	USA	Russia	Japan	TBD	Russia	France

### III. VARIOUS USES OF REMOTE SENSING IN KOREA

Remote sensing technology is used for various purposes in Korea, and such uses have been significantly increasing in terms of both quality and quantity. The Korean Society of Remote Sensing was established and publishes a bi-monthly journal with articles covering various topics related to remote sens-

ing.<sup>2</sup> Other academic societies in the field of science and technology have also joined to solve the various issues pertinent to remote sensing. Remote sensing is specifically used in cartography; forestry; environment; agriculture; ocean; meteorology; geosciences and mineral resources; land and urban planning; water resources; and lifestyle information.

First, remote sensing is used for cartography. In previous years, a map was often created from a ground survey and aerospace photographs, a time-consuming and costly endeavor involving a substantial number of human resources. However, generating and updating a map became much more prompt and efficient over a wide region with high-resolution images obtained by remote sensing. Moreover, the remote sensing technique made it much less expensive and more convenient to update information as data could now be obtained on a regular basis. A rather unusual case, Korea has also generated a map of the Military Demarcation Line – where aerial photographs are prohibited due to the military confrontation – in the scale of 1:10000 by using high-resolution satellite images.

The second area is forestry. Remote sensing technology is used to research vegetation and soil as well as to study biological and ecological groups in forestry. To be specific, the research covers a wide range of studies including observations of changes in vegetation growth and soil moisture on an annual basis, the intensiveness of soil erosion, drawing the boundary between forests and grasslands, ecological approaches to forest fires, crop growth and organic soil, estimation of the crop situation, time-series of harvest, warning of pest infection, and crop disease.

Third, in the field of environmental protection, remote sensing technology is used to analyze the condition of environmental resources in order to ascertain the feasibility of the data for land cover classification or ecological maps. In case of environmental remodeling, the integrated interpretation of satellite images and documents from field research is also used.

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<sup>2</sup> See *e.g.*, Seok Hyun Lim and Hae Chun Choi, presentation at the Korean Society for Marine Environmental Engineering Conference: Thermal Discharge along the South Channel of Myodo in Gwangyang Bay using a Numerical Model and Remote Sensing (2007) (on file with author).

Fourth, high-resolution satellite images by remote sensing is also used in agriculture in order to assess crop conditions, conduct physiochemical analysis on soil, or to prevent agricultural disasters.

Fifth, remote sensing is used in ocean surveillance. Korea, a costal country, is surrounded by sea on three sides. Thus, it efficiently utilizes the high-resolution satellite images to monitor its infrastructures on costal area, reclamation projects, harbor facilities, and fisheries. Particularly, remote sensing is significant to preserve ecology, as it is useful for assessing the present conditions and changes of wetlands in the west coast. Also, remote sensing technology is very valuable to protect the ocean environment, as it can detect illegal aqua farms.

Sixth, remote sensing is used in meteorology as a means of assessing atmospheric environmental conditions and developing weather prediction systems through satellite images.

Seventh, in the sphere of geosciences and mineral resources, remote sensing is used for the exploration of precious underground resources, detecting earthquake and geological features, monitoring abandoned mines, and evaluating water quality in their surrounding areas.

Eighth, remote sensing also functions as a means to solve problems arising from the rapid land and urban development. It is employed to grasp the physical structures of urban cities and metropolitan areas, as well as to predict the patterns for urban growth. Furthermore, it also facilitates research activities in developing the demilitarized zone where civilians are not allowed to enter and management of the green belts and land release.

Ninth, remote sensing is used for analyzing river basins, water systems, and conducting feasibility studies on water resources such as reservoir, dams, precipitation, and flow rate.

In addition, remote sensing is also used for military purposes. For instance, it is helpful in Korea's unique situation with regard to the military confrontation with North Korea, as it is difficult to acquire such confidential information. However, there was a case in 1992 when North Korea announced intentions to build a *Geumgangsán* dam which was a reasonable indication of possible flood attacks on the South Korean side, and

remote sensing technology was utilized to assess the water situation to prevent possible flooding.

Another case relates to the protection of cultural assets. In fact, there was a case where remote sensing was used for revealing preserved cultural properties in North Korean regions. Other cases involved assessing forest damage by cemeteries due to Korea's unique funeral traditions. Also, remote sensing technology can potentially be used in the course of law enforcement, which will be discussed in the following chapter.

#### IV. LEGAL REGULATIONS OF REMOTE SENSING IN KOREA

##### 1. Overview

As aforementioned, the legal concerns of space activities emerged in 1987 when the Korean government began to participate in space development. Initially, the government's highest priority was the development of space industry as a whole, so the relevant law was enacted to incorporate the space industry, to a certain extent, into the pre-existing Aviation Act. From then on, a number of laws have been enacted to comply with international obligations including: the peaceful uses of outer space,<sup>3</sup> the registration of objects launched into outer space,<sup>4</sup> as well as a more detailed law concerning compensation for damages arising from space activities.

##### 2. Space Activities in general

The basic law that governs the space activities in Korea is the Space Development Promotion Act.<sup>5</sup> The purpose of this Act is to facilitate the peaceful use and scientific exploration of outer space, and to contribute to national security, the sound growth of the national economy, and the betterment of life of

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<sup>3</sup> See Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, art. 3, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.

<sup>4</sup> See Convention on Registration of Objects Launched into Outer Space, art. II, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

<sup>5</sup> Space Development Promotion Act (Act No. 10087), *enacted on* May 31, 2005, *entered into force on* Dec. 1, 2005 (as partially amended Mar. 17, 2010).

citizens through the systematic promotion of the development of outer space and the efficient use and management of space objects.<sup>6</sup> Its main objectives include: establishment of a “Basic Plan” for the promotion of space development,<sup>7</sup> establishment of a National Space Committee,<sup>8</sup> designation of an agency specializing in space development,<sup>9</sup> registration of space objects, launch permits for space objects,<sup>10</sup> responsibility/liability for damages caused by space accidents,<sup>11</sup> support for space development projects by private sector,<sup>12</sup> utilization of satellite information,<sup>13</sup> rescue of astronauts,<sup>14</sup> and return of space objects.<sup>15</sup>

Second, the Act on Compensation for Damages Caused by Space Activities<sup>16</sup> provides the more detailed rules of liability for damages available under the foregoing Space Development Promotion Act by setting forth the scope of compensation for damage and limitation of liability in the event of damage caused by space activities.<sup>17</sup>

Third, the very first law related to space is the Aerospace Industry Development Promotion Act.<sup>18</sup> The scope of this law is not only confined to outer space, but also covers aerospace matters broadly in order to rationally support and promote the aerospace industry, as well as to efficiently support research and development in aerospace science and technology.<sup>19</sup>

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<sup>6</sup> *Id.* at art. 1.

<sup>7</sup> *Id.* at art. 5.

<sup>8</sup> *Id.* at art. 6.

<sup>9</sup> *Id.* at art. 7.

<sup>10</sup> *Id.* at arts. 8, 9.

<sup>11</sup> *Id.* at arts. 8, 14.

<sup>12</sup> *Id.* at arts. 18, 20.

<sup>13</sup> *Id.* at art. 17.

<sup>14</sup> *Id.* at art. 22.

<sup>15</sup> *Id.* at art. 23.

<sup>16</sup> Act on Compensation for Damages Caused by Space Activities (Act No. 8852), enacted on Dec. 21, 2007, entered into force on Feb. 29, 2008.

<sup>17</sup> *Id.* at art. 1.

<sup>18</sup> Aerospace Industry Development Promotion Act Enacted on December 4, 1987, entered into force on December 5, 1988, and amended on April 1, 2009 (Act No. 9589) (on file with author)

<sup>19</sup> *Id.* at art. 1.

### 3. Remote Sensing in the Practice of Law Enforcement

A number of laws have been enacted to regulate the use of remote sensing by satellites in the course of law enforcement, mainly in the field of environmental law. First, The Natural Environment Conservation Act<sup>20</sup> requires the Minister of the Environment to perform an investigation of the natural environment of the nation every ten years in cooperation with the head of the competent central administrative agency.<sup>21</sup> Furthermore, the detailed methods of investigation pursuant to the foregoing clause and other necessary matters are prescribed in the Presidential Decree. Accordingly, the Presidential Enforcement Decree of the Natural Environment Conservation Act, as amended on December 30, 2005,<sup>22</sup> lays down the method of investigation and allows remote sensing via aircraft or artificial satellite along with other indirect methods through documents to be employed in Article 23(2). Moreover, the Special Act on the Preservation of Ecosystem in Island Areas including Dokdo Island<sup>23</sup> prescribes the obligation to conduct a fundamental survey on natural ecosystems.<sup>24</sup> The Enforcement Decree of this Special Act also lists remote sensing via artificial satellites as one of the investigation methods.<sup>25</sup> Next, the Act on Preservation and Management of Uninhabited Islands<sup>26</sup> requires the investigation of the actual conditions of uninhabited islands,<sup>27</sup> and the En-

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<sup>20</sup> Natural Environment Conservation Act (Act No.9982), enacted on Dec. 31, 1991, entered into force on Sep. 1, 1992 (amended on Jan. 28, 2011) (on file with author).

<sup>21</sup> *Id.* at art. 30(1).

<sup>22</sup> Enforcement Decree of the Natural Environment Conservation Act, wholly amended by Presidential Decree No. 19245, Dec. 30, 2005 (on file with author).

<sup>23</sup> Special Act on the Preservation of Ecosystem in Island Areas including Dokdo Island (Act No.9696), enacted on Dec.13, 1997, entered into force on June, 4, 1998 (amended May 21, 2009) (on file with author).

<sup>24</sup> *Id.* at art. 6.

<sup>25</sup> Enforcement Decree of the Special Act on the Preservation of Ecosystem in Island Areas including Dokdo Island, Presidential Decree No.22467, Nov. 2, 2010, at art. 4(3) (on file with author).

<sup>26</sup> Act on Preservation and Management of Uninhabited Islands (Act No.10331), enacted on Aug. 3, 2007, entered into force on Feb. 4, 2008, Dec. 1, 2010 (on file with author).

<sup>27</sup> *Id.* at art. 9.

forcement Decree<sup>28</sup> of this Act also includes a provision similar to Enforcement of Decree related to Dokdo.<sup>29</sup> Other similar provisions are also found in the Enforcement Decree of the Erosion Control Act,<sup>30</sup> Enforcement Decree of the Fishing Villages and Fishery Harbors Act,<sup>31</sup> Enforcement Decree of the Coast Management Act,<sup>32</sup> Enforcement Decree of the River Act,<sup>33</sup> and Enforcement Decree of the Conservation and Management of Marine Ecosystems Act.<sup>34</sup>

In addition, remote sensing is explicitly referred to in Presidential Decree on Metrological Agency and Its Organizational System<sup>35</sup> and Enforcement Decree of the Ministry of Knowledge and its Organizational System.<sup>36</sup>

#### 4. *Protection of Remote Sensing Data and Regulation on its Use*

To date, national legislations exclusively dealing with remote sensing issues, such as the Land Remote Sensing Policy Act of the United States<sup>37</sup> have yet to be enacted in Korea. Furthermore, legal disputes concerning remote sensing data have not yet given rise to relevant court cases. At present, the rele-

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<sup>28</sup> Enforcement Decree of Act on Preservation and Management of Uninhabited Islands, Presidential Decree No.22151, May 5, 2010 (on file with author).

<sup>29</sup> *Id.* at art. 10.

<sup>30</sup> Enforcement Decree of the Erosion Control Act, Ministerial Decree of Agriculture, Forestry and Fisheries, No.65, Mar. 27, 2009, at art. 1 *bis* (2), remote sensing by aircraft and satellite (on file with author).

<sup>31</sup> Enforcement Decree of the Fishing Villages and Fishery Harbors Act, Presidential Decree No.22525, Dec. 13, 2010, at art. 3 (on file with author). This article includes remote sensing by aircraft, surveying ships, and equipment for underwater shooting, etc.

<sup>32</sup> Enforcement Decree of the Coast Management Act, Presidential Decree No.22077, Mar.26, 2010, at art. 2(5) (on file with author) (includes remote sensing by satellites).

<sup>33</sup> Enforcement Decree of the River Act, Presidential Decree No.22931, Dec.31, 2009, at art. 9(5) (on file with author) merely mentions "survey obtained from remote sensing" without specific reference to "remote sensing by satellites."

<sup>34</sup> Enforcement Decree of the Conservation and Management of Marine Ecosystems Act, Presidential Decree No.22449, Oct.16, 2010, at art. 5(2) (on file with author) refers to remote sensing by aircrafts, satellites and surveying ships, etc.

<sup>35</sup> Presidential Decree on Metrological Agency and Its Organizational System, Presidential Decree No.22115, Apr.13, 2010, at Art.22 *bis* (on file with author).

<sup>36</sup> Enforcement Decree of the Ministry of Knowledge Economy and its Organizational System, Ministerial Decree of Knowledge Economy, No.163, Nov.1, 2010, at art.8(15) (on file with author).

<sup>37</sup> Land Remote Sensing Policy Act, 15 U.S.C. 5601 et seq. (1992).

vant existing laws can be applicable, to a large extent, and these laws govern the issues when necessary. In conjunction with the existing laws, the regulations stipulated by the Ministry of Education, Science, and Technology, which is in charge of managing space activities together with the Korean Aerospace Research Institute (KARI), also function as substantive rules.

The primary relevant law here is the Space Development Promotion Act. Specifically, Article 17 regulates the utilization of satellite information.<sup>38</sup>

(1) The Minister of Education, Science and Technology may adopt measures necessary for facilitating the distribution and utilization of satellite information acquired by an artificial satellite developed in accordance with a master plan, such as the designation and establishment of an organization exclusively dedicated to such activities. In such cases, the Minister of Education, Science and Technology shall consult with the Minister of Land, Transport and Maritime Affairs in regard to national spatial data under the National Spatial Data Infrastructure Act.

(2) The Minister of Education, Science and Technology may subsidize expenses necessary for the facilitation of distribution and utilization of satellite information within the extent of budget.

(3) The Government shall endeavor to avoid any invasion of privacy during the course of utilizing satellite information

Pursuant to Article 17(1), Korean Aerospace Research Institute (KARI) was designated as an exclusive organization in charge. It should be noted that this article emphasizes protection from an invasion of privacy, which is stipulated in the Korean Constitution as a fundamental right, in the utilization of satellite information.

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<sup>38</sup> Space Development Promotion Act, *supra* note 5, at art. 17.

The second relevant law is the National Spatial Data Infrastructure Act<sup>39</sup> mentioned in Article 17(1) of the Space Development Promotion Act. This Act provides for matters concerning the efficient construction of national spatial data system<sup>40</sup> and the integrated utilization and management thereof.<sup>41</sup> For the purposes of this Act, spatial data refers to the data location of natural or artificial objects existing in space, including the space above ground, space under ground, space above and below water, as well as the data necessary for spatial identification and decision-making related thereto. Such information is required to be managed under an integrated database and is published in an official gazette by the Minister of Land, Transport, and Maritime Affairs. Obviously spatial information does not explicitly refer to satellite information; however, satellite information may certainly be included in the definition of spatial data. The Act also requires the head of a management institution to establish and enforce necessary security management regulations to prevent improper access to, or the use or leakage of, spatial data for which discourse is restricted in the construction, management, and utilization of spatial data.<sup>42</sup> Pursuant to this article, the Ministry of Education, Science, and Technology have been enforcing necessary regulations on security management and satellite information.<sup>43</sup>

Third, another relevant law is the Copyright Act<sup>44</sup> which protects the intellectual property rights of remote sensing information. In so far as intellectual property rights are concerned, relevant international agreements including the TRIPs agreement<sup>45</sup> can also be applied since the Korean Constitution stipulates that “treaties duly concluded and promulgated under

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<sup>39</sup> National Spatial Data Infrastructure Act Entered into force on August 23, 2009 (Act No.9705) (on file with author).

<sup>40</sup> *Id.* at art. 1.

<sup>41</sup> *Id.* at art. 12.

<sup>42</sup> *Id.* at art. 28.

<sup>43</sup> *See, infra* note 72.

<sup>44</sup> Copyright Act (Act No.9785), enacted and entered into force on Jan. 28, 1957 (amended on Feb.1, 2010) (on file with author).

<sup>45</sup> Agreement on Trade-Related Aspects of Intellectual Property Rights, signed on Apr. 15, 1994, available at [http://www.wto.org/english/tratop\\_e/trips\\_e/t\\_agm0\\_e.htm](http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm) (last visited Jan. 24, 2011).

the Constitution and the generally recognized rule of international law shall have the same effect as the domestic laws of the Republic of Korea.”<sup>46</sup> A substantial part of the international treaties on intellectual property, to which Korea is a State Party, has been reflected in the provisions of the Copyright Act.

Remote sensing information can be classified under different categories depending on its condition.

If the data is in the form of mere signals it would not be protected under the copyright legal framework. However, if the original data can be identified as images or other forms, it may then be protected under the regulations for either copyright or database.

According to the Copyright Act, the term, “database,” refers to the compiled matters whose subject matters are systematically arranged or composed, so that they may be individually approached or retrieved.<sup>47</sup> Also, for the purpose of this Act, “a producer of database” means the person who has made human or physical investments considerably in the production of database, or in the renewal or verification thereof.<sup>48</sup> Chapter IV of this Act explicitly stipulates detailed provisions on database protection for producers.<sup>49</sup> With regard to the national protection for database producers, foreigners are also protected by the treaties to which Korea has acceded to or which it has ratified in relation to the protection of databases. The specific rights of database producers include the rights to reproduce, distribute, broadcast, or transmit the whole or considerable parts of a relevant database. Individual subjects of a database are not deemed to be considerable parts of the database. When the reproductions of the individual database subjects, or portions falling short of their considerable parts, come into conflict with the ordinary exploitation of the databases, or when such usage infringes unduly on the benefits of database producers by making reproductions repeatedly or systematically for specific purposes; then they are considered reproductions of considerable parts of

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<sup>46</sup> Korean Constitution, at art. 6(1).

<sup>47</sup> Copyright Act, *supra* note 44, at art. 2(19).

<sup>48</sup> *Id.* at art. 2(20).

<sup>49</sup> *Id.* at arts. 91, 98.

the database. As far as judicial proceedings are concerned, it is permissible to reproduce a work, to the extent necessary, for the purpose of judicial proceedings and internal use by legislative or administrative organs, provided that it does not apply to a case where such reproduction of the database would unreasonably prejudice the interests of the holder of the property right. The reproductions are permissible to an extent so as to include non-profit public and broadcasting performances, non-commercial private use, other uses for examination questions, the visually disabled, and for temporary sound or video recording by broadcasting service providers.<sup>50</sup>

The rights of database producers originate with the time the database is completed, and continue to exist for five years, reckoning from the first day of the next year thereafter.<sup>51</sup> However, where a considerable human or physical investment has been made towards the renewal of a database, the rights of database producers for the relevant parts originate from the time of making the renewal and continue to exist for five years, reckoning from the first day of the next year thereafter.<sup>52</sup>

Remote sensing information may infringe upon the privacy of individuals and may become a threat to national security. With regard to the protection of an individual's privacy, the Constitution of Korea stipulates that "the privacy of no citizen shall be infringed."<sup>53</sup> The Military Secret Protection Act also sets forth that any person who detects or collects military secrets by means other than due process of law, shall be punished by imprisonment for not more than ten years.<sup>54</sup>

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<sup>50</sup> *Id.* at arts. 23, 28-34.

<sup>51</sup> *Id.* at art. 95.

<sup>52</sup> *Id.* at art. 98. The Article stipulates that "the provisions of Articles 53 through 55...shall apply *mutatis mutandis* to the registration of rights of database producers."

<sup>53</sup> Korean Constitution, *supra* note 46, at art. 17. According to the provision, some seventy Acts and Regulations including the Act on the Protection of Communication Privacy (Act No.9819) and Act on Administrative Procedure (Act No.8852) contain clauses for the protection of privacy.

<sup>54</sup> Military Secret Protection Act (enacted and entered into force Dec. 26, 1972, amended on July 22, 2005, Act No. 7613), at art. 11 (on file with author).

*5. Access to Satellite Information*

According to Regulation on Dissemination and Utilization of Satellite Information<sup>55</sup> enacted by the Korean Ministry of Education, Science, and Technology, the term “satellite information” is defined as the image data obtained through the satellites developed by the said Ministry such as scientific satellites and multi-purpose satellites, or the combined information thereof.<sup>56</sup> In order to systematically utilize satellite data, the Satellite Information Activities Promotion Committee was established to review matters mainly concerning the utilization of satellite information, annual plans for utilization of satellite information, selecting the agency for distributing satellite information, and fixing the standard price for dissemination.<sup>57</sup>

Next, the following agencies are designated as the organizations-in-charge in accordance with the scope of their activities pertinent to satellite information. KARI is primarily responsible for controlling affairs, such as the inspection of satellites, identification of satellite location, and transmission of instructions. The reception of satellite information is carried out by “the demanding governmental department” and KARI.<sup>58</sup> The receiving station may manage the obtained satellite information.<sup>59</sup> KARI is also allowed to build a receiving station overseas.<sup>60</sup>

The satellite information from artificial satellites is distributed and utilized through the contract with the designated distributors in order to promote the utilization of satellite information on the behalf of KARI or government agencies,<sup>61</sup> which are being operated independently to obtain image data on national security. KARI, which is principally in charge of managing satellite information for public and scholarly purposes, may still

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<sup>55</sup> Regulation on Dissemination and Utilization of Satellite Information, Sept. 28, 2007 (Regulation of MEST No. 69) (on file with author) [hereinafter Regulation of MEST No. 69].

<sup>56</sup> *Id.* at art. 2(1).

<sup>57</sup> *Id.* at arts. 4 & 5.

<sup>58</sup> *Id.* at art. 7.

<sup>59</sup> *Id.* at art 9. However, when the receiving station is established overseas, the foreign receiving station can also manage the satellite information.

<sup>60</sup> *Id.* at art. 8.

<sup>61</sup> For example, the Ministry of National Defense and National Intelligence Service.

select the distributing agency to disseminate the commercial-oriented satellite information.<sup>62</sup>

As far as the standard price of satellite information is concerned, information can be provided free of charge if the information is needed for purposes of promoting scientific programs, verifying the usefulness of satellite information, public promotion through broadcasting, or in any other case where the authoritative organization deems it to be necessary. In the present case, KARI directly disseminates the information for public and scholarly purposes, at the “actual price” (only expenses). Whereas, the information disseminated by distributing sales agencies are offered at a “regular price”<sup>63</sup> (expenses and benefits). The fixing and changing of the standard price for domestic dissemination is determined by a vote of the Satellites Information Utilization Promotion Committee.<sup>64</sup>

Meanwhile, KARI established the Dissemination Code for Multipurpose Satellites<sup>65</sup> in accordance with Article 10 of the Regulation and Dissemination and Utilization of Satellites Information enacted by the Ministry of Education, Science, and Technology. In the light of the foregoing Code, KARI holds the intellectual property rights of images obtained from the multipurpose satellites. Thus, users who are supplied with such information should not arbitrarily give out the information to others or use it for profit purposes, without prior permission from KARI. Moreover, KARI and secondary reproducers share the intellectual property rights for the value-added data supplied by KARI.<sup>66</sup> The process of dissemination of image data begins with submitting an application form after searching for the necessary information through the online search engines.<sup>67</sup> KARI manages and disseminates the standard image; however, it can provide

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<sup>62</sup> Regulation of MEST No. 69, *supra* note 55, at art. 10. SPOT and KAI has been designated as distributing agencies. SPOT is for Europe, Asia, Latin America and Africa; BAI is for Korea, the United States and Mid-East Asia.

<sup>63</sup> *Id.* at art. 12.

<sup>64</sup> *Id.* at art. 13.

<sup>65</sup> Dissemination Code for Multipurpose Satellites, Dec. 5, 2007 (Code of KARI, No.337) (on file with author).

<sup>66</sup> *Id.* at art. 4.

<sup>67</sup> *Id.* at art. 12.

the image at different levels upon the user's request.<sup>68</sup> The data is saved in an electronic file and transferred through the saving device.<sup>69</sup> The agency, which has been allowed to disseminate the satellite image for business purposes, must show the copyright mark of KARI when the agency advertises the image on the market, or when it discloses the satellite images to the public.<sup>70</sup>

Pursuant to Article 28 of National Spatial Data Infrastructure Act, the Ministry of Education, Science, and Technology has also adopted the Regulation on Security Management of Satellites Information.<sup>71</sup> This Regulation confers duties to the heads of management institutions to protect satellite data and its databases, and the Regulation requires them to enact necessary measures to protect such information.<sup>72</sup> Under this Regulation satellite information is classified into three types of information: non-disclosure, restriction, and disclosure.<sup>73</sup> In terms of the criteria for classifying the information, first, "non-disclosure" information is satellite information which reveals three-dimensional military facilities where civilians are not allowed to enter. The "restricted information" refers to data exceeding 30m resolution, which contains precisely revised second-dimensional coordination, data exceeding the resolution of 4m which discloses military facilities, and data exceeding the resolution of 90m with three-dimensional coordination. The information classified under "disclosure" includes all other data that are not subject to non-disclosure or restriction, such as a three-dimensional satellite data and information on general areas containing the detailed satellite information at the time of taking a photograph. However, when one provides or sells satellite images exceeding the resolution of 50cm, records of the seller's personal information and contents of the photos must be kept.

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<sup>68</sup> *Id.* at art. 13. Distribution Homepage is available in Korean at <http://www.spacecapture.kr/> (last visited Jan. 27, 2010).

<sup>69</sup> Code of KARI, No.337, *supra* note 65, at art. 14.

<sup>70</sup> *Id.* at art. 11(4).

<sup>71</sup> Regulation on Security Management of Satellites Information, Mar. 14, 2001 (Regulation of MEST, No. 68) (on file with author).

<sup>72</sup> *Id.* at art. 3.

<sup>73</sup> *Id.* at art. 10.

For non-disclosure or restricted satellite data, only those people who directly require it for purposes of their work, are allowed to handle the satellite data, and such information should not be open to the public.<sup>74</sup> In addition, the Regulation sets forth measures to block access by assigning individual ID and password and locking devices. It also employs preventive measures, by building up a firewall or securing copies of the satellite databases, in the event satellite information is damaged or leaked.<sup>75</sup> When it becomes necessary to open the non-disclosure or restricted information to the public, it may be revealed only after the Satellite Data Review Committee thoroughly reviews the purpose for the disclosure, as well as the time and means for disclosure.<sup>76</sup> Non-disclosed or restricted satellite data should not be copied or printed except in cases where a head of a non-disclosed information management institution grants permission, or it is already legally permissible.<sup>77</sup> Also, non-disclosed or restricted satellite data should not be transferred out of the country except in cases where the data is reciprocally exchanged pursuant to an international agreement, concluded between Korea and a foreign government, or in cases where the representatives of the Korean government require it in order to negotiate with a foreign government, or to use it as reference materials when participating in international conferences or international organizations. Even when the transfer is allowed, prior permission by a head of the management institution is required.<sup>78</sup>

## V. CONCLUDING REMARKS

Remote sensing activities in Korea are still at quite a humble stage compared to advanced countries. Yet, Korea has reached a significant technological level in designing and manufacturing remote sensing satellites. It has also been extensively utilizing satellite data. However, rules that regulate such activi-

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<sup>74</sup> *Id.* at art. 11.

<sup>75</sup> *Id.* at arts.12 & 13.

<sup>76</sup> *Id.* at art. 15.

<sup>77</sup> *Id.* at art. 16.

<sup>78</sup> *Id.* at art. 17.

ties are only available through departmental guidelines or via the internal rules of management agencies. As it is very likely that private sectors will soon participate in remote sensing activities for commercial purposes, the prompt enactment of a more detailed law is urgent and indispensable. Furthermore, provisions from existing decrees and regulations have to be updated in order to reflect the changes which have occurred since their legislation.



# REMOTE SENSING DATA DISTRIBUTION AND APPLICATION IN THE ENVIRONMENTAL PROTECTION, DISASTER PREVENTION, AND URBAN PLANNING IN CHINA

*Yan Ling*<sup>\*</sup>

Satellite remote sensing activities that were initiated in the 1970s opened new opportunities to the world for observing the Earth from outer space. By using remote sensing satellite data, it became possible to investigate the Earth's resources and environmental phenomena. The applications of this space technology in various fields have brought great benefits to the whole of humankind. China is one of the Nation-States capable of carrying out remote sensing activities. Satellite remote-sensing application systems in China have been put into regular operation in many important fields. They are playing an important role in *inter alia*, "the nationwide land resources survey, ecological construction and environmental protection, as well as in major State projects."<sup>1</sup>

This paper first introduces the remote sensing activities carried out by China alone or in cooperation with other countries. Then it discusses the policy for the distribution of remote sensing data and demonstrates the applications of remote sensing data and products in China. Finally, it makes brief sugges-

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<sup>1</sup> Information Office of the State Council of the People's Republic of China, *China's Space Activities in 2006*, a White Paper (Oct. 12, 2006) available at <http://www.cnsa.gov.cn/n615709/n620682/n639462/79381.html>.

tions for the future Chinese national law governing the dissemination of remote sensing data.

### I. REMOTE SENSING ACTIVITIES CARRIED OUT BY CHINA

Although China began to use remote sensing satellite data in the early 1970s, it was not until 1986 when the Remote Sensing Satellite Ground Station of the Chinese Academy of Science (RSGS) was founded, according to the Sino-American Scientific-Technical Co-operation Memorandum,<sup>2</sup> that China embarked on remote sensing activities. Since the ground station began to receive remote sensing data from *Landsat-5*, China has never stopped improving remote sensing technologies and broadening their applications. China announced its space activities plan in 2000 to build an Earth observation system for long-term stable operation. The Earth observation system consists of “meteorological satellites, resource satellites, oceanic satellites and disaster monitoring satellites . . . to conduct stereoscopic observation and dynamic monitoring of the land, atmosphere, and oceanic environments of the country, the peripheral regions and even the whole globe.”<sup>3</sup> So far, the development of the four series of remote sensing satellites has been going well as planned.

#### A. *Earth Resources Satellite (CBERS Series)*

Under the spirit of the Outer Space Treaty<sup>4</sup> and the Principles Relating to Remote Sensing of the Earth from Space (Remote Sensing Principles),<sup>5</sup> “the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scien-

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<sup>2</sup> See China Remote Sensing Satellite Ground Station, <http://www.rsgs.ac.cn/english.html> (last visited Feb. 4, 2011).

<sup>3</sup> The Information Office of the State Council of the People's Republic of China, *China's Space Activities, a White Paper* (Nov. 22, 2000), available at <http://www.spaceref.com/china/china.white.paper.nov.22.2000.html>.

<sup>4</sup> 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].

<sup>5</sup> Principles Relating to Remote Sensing of the Earth from Outer Space, at princ. VII, G.A. Res. 41/65, U.N. GAOR, 41 st Sess., 95th plen. mtg., U.N. Doc. A/Res/41/65 (Dec. 3, 1986) [hereinafter Remote Sensing Principles].

tific development.”<sup>6</sup> Principle V of the Remote Sensing Principles further encourages the States carrying out remote sensing activities to “promote international co-operation in these activities.”<sup>7</sup> Negotiations between Brazil and China for long-term co-operation in Earth observation from space resulted in the conclusion of two agreements on joint development, launch and operation of the *China-Brazil Earth Resources Satellites (CBERS)* in 1988.<sup>8</sup> The first *CBERS* was launched in October 1999, which ended the history of China’s entire dependence on the foreign remote sensing data. *CBERS-2* and *CBERS-2B* were launched in October 2003 and September 2007, respectively. *CBERS-3* is expected to be launched in 2011.<sup>9</sup> The *CBERS* program between Brazil and China is a major success model of south-south cooperation in space technology.

In addition, it is reported that China and the Asia-Pacific countries are developing a small Earth observation and communications satellite, which is expected to be launched in 2010. The satellite can be used not only for environmental protection, but also for scientific experiments.<sup>10</sup>

### B. Meteorological Satellites (*Fengyun (FY) Series*)

*Fengyun* in Chinese means “wind and cloud.” *FY* series are meteorological Satellites. Since the first *FY-1A* was launched in September 1988, up until now ten *FY* meteorological satellites

<sup>6</sup> Outer Space Treaty, *supra* note 4, at art. I.

<sup>7</sup> Remote Sensing Principle, *supra* note 5, at princ. V.

<sup>8</sup> The agreement between CAST and INPE on the joint development of China-Brazil Earth Resources Satellite was signed by Ministers of Foreign Affairs of the two countries on August 22, 1988. The two governments signed an agreement to approve the program in July 6, 1988. See China-Brazil Earth Resources Satellite became a model of south-south cooperation, Dec. 10, 2009, available at [http://news.xinhuanet.com/ziliao/2009-12/10/content\\_12624326.htm](http://news.xinhuanet.com/ziliao/2009-12/10/content_12624326.htm). See also, José Monserrat Filho & Álvaro Fabrício dos Santos, *Chinese-Brazilian Protocol on Distribution of CBERS Products*, 31 J. SPACE L. 271 (2005).

<sup>9</sup> *Brazil, China to postpone joint satellite launching to 2011*, PEOPLE’S DAILY ONLINE, Feb. 11, 2010, <http://english.peopledaily.com.cn/90001/90776/90883/6893646.html>.

<sup>10</sup> 社评：亚太空间合作呈和平互利发展观 [Asia-Pacific Space Cooperation for peaceful and mutually beneficial development], CHINA REVIEW NEWS, June 24, 2009, <http://gb.chinareviewnews.com/doc/1009/8/9/5/100989542.html?coluid=7&kindid=0&docid=100989542&mdate=0624002246>.

have been put into orbit. *FY-I* series (four satellites) are the first generation of polar-orbiting meteorological satellites with the capability to send real-time cloud images to ground stations all over the world, to observe ocean color, and to sense sea surface temperature. *FY-II* series (five satellites) are the first generation of meteorological satellites in geostationary orbit. Their main mission is to observe the Earth and obtain visible light, infrared, and water vapor cloud of the Earth. Currently, the research and manufacturing work have been carried out for three more geo-stationary satellites to replace the previous ones. *FY-III* series (six satellites) are the second generation of polar-orbiting meteorological satellites, mainly for the monitoring of heavy fog, icicle, snow cover, water, and fire situations etc. The first *FY-III* experimental satellite was successfully launched on 27 May 2008.

### *C. Oceanic Satellites (Haiyang (HY) Series)*

China is a coastal State. The environment and resources in the territorial sea and exclusive economic zone are of great importance to China's sustainable development. To protect the coastal environment and resources from over-exploitation and from pollution caused by land-based pollutants, offshore oil and gas exploitation, and shipping, China has taken a wide range of measures, including the development of oceanic satellites. According to a general plan, *HY-1A* is the starting point of an ocean color satellite series to be followed by an ocean dynamic environmental satellite series and an ocean surveillance satellite series that will gradually form China's ocean surveillance network.<sup>11</sup>

Ocean color remote sensing satellites *HY-1* series (*HY-1A* and *HY-1B*) are using infrared remote sensing technology to monitor ocean pollution and topography in shallow waters. The first such satellite *HY-1A* was independently developed and launched by China in May 2002. *HY-2* series are the dynamic environmental satellites using microwave remote sensing tech-

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<sup>11</sup> Sun Zhihui, *The Development of China's Ocean Satellite Industry for 20 Years*, 24 (3) OCEAN DEV. & MGMT. 5 (2007) (on file with author).

nology to monitor sea surface wind fields, sea surface height, and sea surface temperatures. *HY-2A* is scheduled for launch in 2010.<sup>12</sup> *HY-3* series will have the combined features of the previous two series.

#### *D. Environmental Satellites (Huanjing Series)*

Disasters such as earthquakes, typhoons, rainstorms, floods, debris flows, landslides, tornadoes, snowstorms, sandstorms, etc. frequently hit China. Natural disasters cause serious human casualties and huge property losses. According to China International Committee for Natural Disaster (CICND), about 200 million people suffer from effects of various natural disasters every year.<sup>13</sup> In order to take advantage of remote sensing technology in the field of disaster and environment monitoring, China's State Council approved the satellite constellation project in February 2003. The Small Satellite Constellation for Environment Protection and Disaster Monitoring (*Huanjing* constellation) consists of eight small satellites. Their main objective is to extensively monitor disasters, environmental damage, and pollution in all weather and at all times so as to provide a scientific basis for emergency help and disaster relief. This project is also part of the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER)<sup>14</sup> and part of the anti-disaster platform in the Asia-Pacific region.<sup>15</sup>

In addition, a China-owned small satellite *Beijing 1*, launched in October 2005, is part of the Disaster Monitoring Constellation (DMC). "DMC is an international program consisting of five small remote sensing satellites constructed by SSTL and operated for the Algerian, Nigerian, Turkish, UK and

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<sup>12</sup> *China Plans to Launch Third Ocean Survey Satellite in 2010*, SPACE DAILY, Feb 19, 2009, [http://www.spacedaily.com/reports/China\\_Plans\\_To\\_Launch\\_Third\\_Ocean\\_Survey\\_Satellite\\_In\\_2010\\_999.html](http://www.spacedaily.com/reports/China_Plans_To_Launch_Third_Ocean_Survey_Satellite_In_2010_999.html).

<sup>13</sup> Shao Zongwei, *Disaster-monitoring satellites to be launched*, CHINA DAILY, Apr. 27, 2004, [http://www.chinadaily.com.cn/english/doc/2004-04/27/content\\_326809.htm](http://www.chinadaily.com.cn/english/doc/2004-04/27/content_326809.htm).

<sup>14</sup> *Chinese satellites begin UN environment service*, XINHUA, Mar. 31, 2009, [http://news.xinhuanet.com/english/2009-03/31/content\\_11102981.htm](http://news.xinhuanet.com/english/2009-03/31/content_11102981.htm).

<sup>15</sup> Yong Xue, et al., *Small satellite remote sensing and applications—history, current and future*, 29 (15) INT'L J. OF REMOTE SENSING 4339, 4365 (2008).

Chinese governments by DMC International Imaging. The objective is to provide a daily global imaging capability . . . for rapid-response disaster monitoring and mitigation.”<sup>16</sup>

## II. REMOTE SENSING DATA DISTRIBUTION

### A. Data Receiving, Processing, and Distribution Systems

China has established five satellite data reception and distribution systems at national level. They are systems for *CBERS*, Meteorological satellites, Oceanic satellites, *Beijing 1*, and foreign remote sensing satellites respectively.

#### i. National Satellite Meteorological Center (NSMC)

The National Satellite Meteorological Center (NSMC) is an auxiliary organ of the China Meteorological Administration with the responsibility for receiving and processing the data of Chinese and foreign meteorological satellites, and distributing the data and products to users for applications.<sup>17</sup> The data processing center in Beijing and the ground receiving stations in Beijing, Guangzhou, and Urumqi receive and process data from more than ten domestic and foreign meteorological satellites. The system produces more than thirty kinds of images and quantitative products each day and distributes real-time satellite data and products to the government, meteorological, forestry, and scientific research institutes via special data lines and networks to support government decision-making and to provide support services to the public.<sup>18</sup>

#### ii. National Satellite Ocean Application Service (NSOAS)

The State Oceanic Administration established the National Satellite Ocean Application Service (NSOAS) on 30 March 1998.

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<sup>16</sup> *Id.* at 4361.

<sup>17</sup> National Satellite Meteorological Center, <http://www.nsmc.cma.gov.cn/> (last visited Jan. 4, 2011).

<sup>18</sup> 遥感数据地面接收、处理与分发系统 [*Remote Sensing Ground Station Receiving, Processing and Distributing Systems*], PEOPLE'S DAILY ONLINE, JULY 4, 2008, <http://scitech.people.com.cn/GB/7473326.html>.

NSOAS then established four ocean satellite ground receiving stations in Beijing, Sanya in southern Hainan province, Mudanjiang in northeastern Heilongjiang province, and Hangzhou in northern Zhejiang province. The main tasks of the satellite ground application system are to receive the remote sensing data from oceanic satellites, to produce products of all levels, and to distribute products to domestic users. Another ground receiving station will be built in Antarctica to better monitor the global ocean environment.<sup>19</sup>

### iii. Center for Resources Satellite Data and Applications (CRESDA)

Center for Resources Satellite Data and Application (CRESDA) was set up in 1991. It completed the resources satellite application system in August 1999. CRESDA has built advanced satellite data processing systems and has developed data-processing software. Data qualities have been significantly improved. The data processing system proved to run successfully after *CBERS-1* satellite was launched in October 1999. CRESDA is responsible for unified archiving and distribution of the *CBERS* data in China. It distributes data via internet, a better means to serve users. CRESDA also distributes environmental satellite data.

### iv. *Beijing 1* Operational Center

*Beijing 1* operational center consists of the receiving system, the product generation system, application processing system, and customer service and product distribution system. *Beijing 1* data products include radiometric calibration products, systematic geometric correction products, geometric correction products, correction products, data integration products, and three-dimensional products. Customer service and product distribution system allows users to browse, search, and purchase data products via internet.

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<sup>19</sup> *China to build remote-sensing satellite receiving station in Antarctica*, XINHUA, Nov. 28, 2009, [http://news.xinhuanet.com/english/2009-11/28/content\\_12554617.htm](http://news.xinhuanet.com/english/2009-11/28/content_12554617.htm).

## v. Remote-Sensing Satellite Ground Station (China RSGS)

The Remote-Sensing Satellite Ground Station, Chinese Academy of Sciences was inaugurated and put into operation in December 1986. Its main responsibilities are to receive, process, archive, and distribute remote sensing data from various foreign remote-sensing satellites, and also to improve the relevant techniques and methods. The satellite remote-sensing data received and processed by China RSGS covers 80% of the land of the country. As of 2005, one million scenes of multi-spectral satellite data and 50,000 scenes of microwave remote-sensing data were archived, and “about 2,000 requests on service from users were accepted and met annually.”<sup>20</sup>

Now, China RSGS has become one of the ground stations capable of receiving and processing data from the largest number of satellites. It regularly receives and processes data from *Landsat* (USA), *ERS* (European Space Agency), *JERS* (Japan), *SPOT* (France), *Radarsat* (Canada), *CBERS* (China and Brazil), and *ENVISAT* (ESA). It has also obtained Japan’s *ALOS* data distribution license and has been authorized to distribute *Quick Bird* (USA) data and *ASTER* (Japan) data in China.<sup>21</sup> The ground station is unique in that it has accumulated and preserved Earth observation data up to twenty years. It has around 600 domestic and international users.<sup>22</sup>

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<sup>20</sup> China Remote-Sensing Satellite Ground Station, Chinese Academy of Sciences, <http://www.rsgs.ac.cn/english.html> (last visited Jan. 27, 2011).

<sup>21</sup> 中国遥感卫星地面站分发日本ALOS卫星数据 [China Remote Sensing Satellite Ground Station Distributes Japanese ALOS Satellite Data], LSSF, June 23, 2006, [http://lssf.cas.cn/ygwxdmz/ywdt/200909/t20090901\\_2461725.html](http://lssf.cas.cn/ygwxdmz/ywdt/200909/t20090901_2461725.html).

<sup>22</sup> China Remote-Sensing Satellite Ground Station, *supra* note 20.

## B. Distribution of Remote Sensing Data

### i. Distribution of CBERS Data Products

#### a. Policy for Distribution of CBERS Data Products at Home

According to the data policy adopted in 2004 by China and Brazil, the policy for distribution of data collected by the ground stations operated by INPE (in Brazil) and CRESDA (in China) will be defined by each operator.<sup>23</sup> “Brazil adopted the free of charge CBERS data distribution policy when data are requested in electronic format.”<sup>24</sup> Likewise, the Commission of Science, Technology and Industry for National Defense (COSTIND), now replaced by the State Administration for Science, Technology, and Industry for National Defense (SASTIND), announced on March 17, 2006, that the CBERS-2 satellite data would be distributed online free of charge starting from April 1, 2006.<sup>25</sup>

The free distribution of data is limited to domestic use.<sup>26</sup> Users, after the confirmation of online registration, can directly browse a quick view of CBERS-2 data and freely download the required data. A list of the first 70 users authorized to enjoy free online distribution services was also announced.<sup>27</sup>

COSTIND promulgated Administrative Regulation<sup>28</sup> on CBERS Domestic Produced Data (trial version) on November

<sup>23</sup> CBERS Data Policy (Brazil-China), at art. 7, June 2004, available at José Monserrat Filho & Álvaro Fabricio dos Santos, *Chinese-Brazilian Protocol on Distribution of CBERS Products*, 31 (2) J. SPACE L. 281 (2005) [hereinafter CBERS Data Policy].

<sup>24</sup> Jose Carlos N. Epiphano, *Remote Sensing Cooperation between Brazil and China*, 23 IMAGING NOTES 16, 18 (Summer 2008), available at [http://www.imagingnotes.com/ee\\_downloads/Imaging%20Notes%202008%20Summer.pdf](http://www.imagingnotes.com/ee_downloads/Imaging%20Notes%202008%20Summer.pdf).

<sup>25</sup> 国防科工委发中巴资源卫星02星数据免费分发政策 [Commission of Science, Technology, and Industry for National Defence Announced CBERS Data Free Distribution Policy], March 20, 2006, available at [http://www1.www.gov.cn/gzdt/2006-03/20/content\\_231785.htm](http://www1.www.gov.cn/gzdt/2006-03/20/content_231785.htm).

<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> Administrative Regulation on CBERS Domestic Data, 15 November 2007, available at [http://www.gov.cn/gzdt/2007-11/26/content\\_816397.htm](http://www.gov.cn/gzdt/2007-11/26/content_816397.htm).

15, 2007. The regulation covers the aspects of acquisition, storage, distribution, and service of *CBERS-1/2/2B* data.

(1) The responsibility of CRESDA

According to the Regulation, CRESDA is responsible for *CBERS* operational management and data receiving, processing, archiving, and distributing. It *decrypts* high-resolution data in accordance with national laws, policies, regulations, and relevant department requirements. It provides users with relevant technical services, publicizes, and promotes applications of data products.<sup>29</sup>

The data distribution policy is client-oriented. The Regulation reads that CRESDA should prepare satellite imaging programs and complete the scheduled tasks of satellites and payloads on the basis of the user's needs under the actual operational circumstance of the satellites. CRESDA shall make nadir images and periodically obtain remote sensing data under normal working conditions within the framework of Beijing, Guangzhou, and Urumqi ground stations. If a user has special imaging requirements on timing or geography, CRESDA shall meet their needs in accordance with the relevant policy of COSTIND on encouraging domestic users to utilize *CBERS* data.<sup>30</sup> Actually, CRESDA is required to meet users' needs as much as possible on the condition of the safe operation of satellites. Adjustment of normal receiving and processing data or certain parameters to meet a user's demand seems possible as the Regulation states that the adjustment shall be promptly notified to the user.<sup>31</sup>

Further, CRESDA is required to make long-term archiving and backup all levels of *CBERS-1/2/2B* data and to get them ready for users to browse, search, and order. For easy searching of the data, each *CBERS-1/2/2B* data product must contain a clear description of the product.<sup>32</sup>

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<sup>29</sup> *Id.* at Clause 5.

<sup>30</sup> *Id.* at Clause 8.

<sup>31</sup> *Id.* at Clause 10.

<sup>32</sup> *Id.* at Clause 13.

## (2) Users

Individuals or institutions that need *CBERS* data products must register with CRESDA via its official website or in writing. They will become users only after their registration is verified, and their use of data products is authorized. Users are required to properly store the obtained data and keep the data concerning national security or sensitive areas confidential.<sup>33</sup> Users have to clearly credit the *CBERS* data on their data application results and report to CRESDA about the use of the data and the achievements or results of the data application.<sup>34</sup>

## (3) Distribution of data products

The data products are classified into 0-5 levels. They respectively are: raw data, radiometric correction product, systematically geometric correction product, precise geometric correction product, DTM-based correction product, and standard mosaic image product.<sup>35</sup>

CRESDA can provide users with level 1-5 data products generated from *CBERS'* four payloads: CCD camera, infrared multi-spectral scanner (IRMSS), Wide Field Imager (WFI), and high-resolution camera (HR).<sup>36</sup> Under normal working conditions, online access to level 1 and level 2 *CBERS-2/2B* data products shall be made available for browsing, searching, ordering, or downloading on the same day after the satellite's crossing. Users can also browse, search, order, or download level 1 and level 2 *CBERS-1* data products in archive.<sup>37</sup>

*CBERS-1/2/2B* data products can be ordered online or by telephone, fax, and other means. CRESDA may provide users with data products embodied in computer-readable media (CD-ROM, hard drives, etc.) by computer network or other means<sup>38</sup> to make the products easily accessible.

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<sup>33</sup> *Id.* at Clause 6.

<sup>34</sup> *Id.* at Clause 7.

<sup>35</sup> *Id.* at Clause 2.

<sup>36</sup> *Id.* at Clause 3.

<sup>37</sup> *Id.* at Clause 9.

<sup>38</sup> *Id.* at Clause 11.

However, not all data products are distributed free of charge. Data products of all levels generated from the HR camera in the pilot phase of the operation shall be distributed at no cost. After the end of the phase, the data products shall be distributed with license fees. Low level (level 1 and level 2) data products of CCD camera, IRMSS, WFI shall be publicly distributed free of charge, while distribution of high level (levels 3, 4 and 5) products shall be charged. The data products shall be distributed with license when users make use of satellite-side swing function or recording equipment on the satellite imaging.<sup>39</sup>

#### b. Distribution of *CBERS* data at home

As of the end of 2009, CRESDA has distributed a total of more than 1 million scenes, among which 790,000 were *CBERS* scenes, 260,000 were environmental satellite scenes. It had 5,200 registered individual users and 2,500 registered institution users, of which 310 institutions signed a confidentiality agreement with CRESDA to order and download high-resolution data. Institutions' data ordering came from thirty-two provinces, autonomous regions, and municipalities, including national ministries, research institutes, universities, companies, etc. Since 2005, the average annual growth rate of the number of users is 200%, and the volume of data distribution has yearly doubled.<sup>40</sup> CRESDA has become one of the world's largest satellite data distribution centers. The free data distribution policy allows many users to take advantage of domestic-made data for regular operation, greatly reducing the cost of procurement of large amounts of data from foreign market.

#### c. Distribution of *CBERS* Data Overseas

Policy for distribution of *CBERS* data abroad was jointly made by China and Brazil. *CBERS* imagery is distributed by

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<sup>39</sup> *Id.* at Clause 14.

<sup>40</sup> 我国陆地卫星数据分发突破百万景 [Distribution of *CBERS* Data over One Million Scenes], CRESDA, Aug. 3, 2009, <http://www.cresda.com/n16/n1100/n1310/8716.html>.

licensed representatives who operate an application system. Each ground station receives the raw data, processes it into image products, and then distributes those products to users. The licensing of *CBERS* data downlinks is charged on a per-minute basis. “China and Brazil may, in a few special cases, upon mutual consultation, decide on the transfer of data free of charge.”<sup>41</sup>

According to Principle VII of the Remote Sensing Principles that “States participating in remote sensing activities shall make available technical assistance to other interested States on mutually agreed terms,”<sup>42</sup> China and Brazil decided to provide satellite observation data for African countries through a joint space program. The Earth receiving stations of Hartbeeshoek in South Africa, Aswan in Egypt, and Maspalomas in Spain will process and distribute data from *CBERS 02B* to African states. “It’s also for the first time China became an exporter of Earth observation data.”<sup>43</sup>

#### ii. Distribution of *FY* Satellite Data

*FY* satellite data are distributed to domestic and international users free of charge. NSMC distributes *FY* satellite data by satellite broadcasting and network technology. The distribution system distributes near real-time *FY* satellite data and products. The data-sharing users are all over the country. In addition, the Chinese government donated *FY* satellite data broadcasting receiving systems to the member States of Asia-Pacific Space Cooperation Organization in 2006,<sup>44</sup> sharing *FY* satellite data and products with those countries.

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<sup>41</sup> *CBERS Data Policy*, *supra* note 23, at art. 2.

<sup>42</sup> Remote Sensing Principles, *supra* note 5, at princ. VII.

<sup>43</sup> *China, Brazil to Offer Satellite Data to Africa*, XINHUA, May 20, 2009, [http://news.xinhuanet.com/english/2009-05/20/content\\_11407388.htm](http://news.xinhuanet.com/english/2009-05/20/content_11407388.htm).

<sup>44</sup> 遥感数据地面接收、处理与分发系统 [*Remote Sensing Ground Station Receiving, Processing and Distributing Systems*], PEOPLE’S DAILY ONLINE, July 4, 2008, <http://scitech.people.com.cn/GB/7473326.html>.

### iii. Distribution of *HY* Satellite Data

*HY-1A* satellite data distribution officially started on 14 December 2002 with the provision of sample data to the units of the State Oceanic Administration, governments of coastal provinces and cities, Chinese Academy of Sciences, the Navy, universities, and institutions engaged in marine research.<sup>45</sup> According to the State Oceanic Administration statistics, as of 2007, NSOAS produced forty-two remote-sensing product categories based on *HY-1A* satellite data, and the number of users reached 126.<sup>46</sup> *HY-1B* data is also distributed free of charge. NSOAS distributes data via FTP downloads, e-mail, or sending CD-ROMs by post to the users.

### iv. Distribution of *Huanjing* Satellite Data

A Center for Environmental Satellites Data and Application is being established by the Ministry of Environmental Protection. The Center's office building is under construction. Meanwhile, CRESDA is responsible for *Huanjing* satellite data processing and distribution.

In June 2009, CRESDA signed an agreement with the Government of Thailand to build a ground station in Thailand for receiving the data from the *Huanjing 1A*, which will enable the data to be distributed in Southeast Asian countries. CRESDA also plans to construct *Huanjing 1A/B* ground stations in Brazil and Australia.<sup>47</sup>

In addition, the China National Space Administration (CNSA) signed the International Charter on Space and Major Disasters in 2007, "agreeing to provide free data and information to countries hard-hit by natural disasters, so they can monitor disasters and assess their impact."<sup>48</sup> CRESDA was on

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<sup>45</sup> Sun Zhihui, *supra* note 11, at 7.

<sup>46</sup> *Id.*

<sup>47</sup> 国产资源卫星遥感数据将在东南亚地区分发 [China-Made Resources Satellite Data Will Be Distributed in Southeast Asia], 3S NEWS Nov. 25, 2009, <http://blog.3snews.net/html/84/n-25784.html>.

<sup>48</sup> National Space Agency of the Ukraine, *China to Monitor Global Disasters through Satellite*, Jan. 29, 2008, <http://www.pryroda.gov.ua/en/index.php?newsid=5000050>.

duty nine times, in compliance with the International Disaster Charter, and has provided timely data and technical support to disaster affected countries and regions. When the bushfires happened in Australia in February 2009, CRESDA provided the Australian fire department with free satellite imagery data and monitored results during a period of more than forty days.<sup>49</sup>

### III. APPLICATIONS OF REMOTE SENSING DATA

#### A. Centers and Institutes for Satellite Data Applications

In order to promote the application of remote sensing data, centers and institutes for satellite data applications have been established by state departments and local governments. The China National Remote Sensing Center (CNRSC) is one of such centers established by the State Science and Technology Commission in 1981 to coordinate users in different ministries, research institutes, and local governments. The CNRSC is responsible for the study of the development and industrialization of remote sensing technology, policymaking, planning, and key project support. The CNRSC participates in U.N. meetings and signs memoranda of understanding with foreign governments for the PRC. It maintains close contact with more than twenty countries and international organizations and has made a positive contribution to the promotion of the development and application of remote sensing technology through scientific and technological cooperation and exchanges.

The Institute of Remote Sensing Applications (IRSA) of the Chinese Academy of Sciences<sup>50</sup> is another example. The IRSA was founded in 1979 with the approval of the State Council. The IRSA conducts research on the basic theories and advanced technologies of remote sensing as well as on the integrated applications of remote sensing data and products. There are twelve research laboratories and four national organizations of remote sensing under the IRSA. The IRSA also built multilat-

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<sup>49</sup> *China-Made Resources Satellite Data Will Be Distributed in Southeast Asia*, *supra* note 47.

<sup>50</sup> Institute of Remote Sensing Applications, <http://english.bic.cas.cn/NE/200910/P020091027369863507783.pdf> (last visited Jan. 7, 2011).

eral cooperative relationships with foreign countries such as Kenya, Ghana, Egypt, Thailand, etc.<sup>51</sup>

One of the important projects of the IRSA is the application of remote sensing in atmosphere. The IRSA established an Air Quality Remote Sensing Monitoring System to monitor air in Beijing, which started its work before the 2008 Olympic Games. After the Wenchuan Earthquake in 2008, the IRSA used remote sensing technology to monitor and assess building damage and collapse; to detect landslides, landslide lakes, and dams; and to assess transportation destruction in the Earthquake areas.<sup>52</sup>

The Remote Sensing Technology Application Research Center of China Institute of Water Resources and Hydropower Research (IWHR)<sup>53</sup> was founded in 1980. The IWHR has established a remote sensing data sharing system which collects multi-sources remote sensing data and distributes them in China. The processed remote sensing data are widely applied to flood control and drought resistance.<sup>54</sup> For example, IWHR completed the research projects involving the flood monitoring, evaluation, control, and command system in Jiangxi province. In the field of water resources and ecology, the IWHR's main research projects include remote sensing monitoring and evaluation of the ecological effects on water diversion in arid and semi-arid areas; the dynamic remote sensing monitoring and evaluation of international rivers, reservoirs, and estuarine sediment; the remote sensing survey of soil erosion; the remote sensing survey and planning of the effective irrigation area; and south-to-north water transfer project.

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<sup>51</sup> *Id.*

<sup>52</sup> Institute of Remote Sensing Applications, <http://english.bic.cas.cn/NE/200910/P020091027369863507783.pdf> (last visited Feb. 4, 2011).

<sup>53</sup> China Institute of Water Resources and Hydropower Research, <http://www.iwhr.com/english/newsview.asp?NewsID=16197> (last visited Jan. 7, 2011).

<sup>54</sup> Zhang Xiao-hong & Li Mao-tang, *Application of Remote Sensing Data Sharing System to Flood Control and Drought Resistance*, 39 (7) WATER RESOURCES & HYDROPOWER ENGINEERING 72-74 (2008) [hereinafter *Application of Remote Sensing Data Sharing System*].

*B. Applications of Remote Sensing Data in Environmental Survey and Protection*

As Principles X and XI of the Remote Sensing Principles stress the role of remote sensing in promoting “the protection of the Earth's natural environment” and “the protection of mankind from natural disasters,”<sup>55</sup> remote sensing data and products are frequently used in the monitoring and the protection of environment.

*HY-1A* observed China's territorial sea a total of 1211 times during 2005-2007 and acquired a large number of ocean color remote sensing images. The processed data and information have been used in the development of marine resources, ocean management, disaster warning, environmental forecasting, and marine scientific research.

In the coastal zone management, fifty-two maps of China's three major estuary (Yellow River Estuary, Yangtze River Estuary, and Pearl River Estuary) regions were made by using *HY-1A* data in 2003.<sup>56</sup> The use of *HY-1A* data in combination with other relevant information played an important role in the monitoring and early warning of marine red tide. Remote sensing data indicated that the red tide occurred in the Bohai Sea, Yellow Sea, and East China Sea twenty-four times in 2002 – 2004. Twenty monitoring bulletins were issued for China's marine disaster prevention and environmental protection.<sup>57</sup>

Ice in Bohai Sea and Yellow Sea for about three months every winter has great impact on sea transportation and offshore activities. *HY-1A* data has been used in the real-time monitoring of the sea ice. The information received was widely distributed, via China Central Television and other media, to the public and professional users.<sup>58</sup>

As CRESDA vigorously promotes the application of satellite data, users of *CBERS* data are very active, especially after the announcement of the free online data distribution policy. The

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<sup>55</sup> Remote Sensing Principles, *supra* note 5, at princ. X & XI.

<sup>56</sup> Sun Zhihui, *supra* note 11, at 8

<sup>57</sup> *Id.*

<sup>58</sup> *Id.*

average monthly volume of distribution is near 10 thousand scenes. The Ministry of Land and Resources, National Commission for Disaster Reduction, and the Ministry of Environmental Protection are the three main users of *CBERS* data and environmental satellite data. The Ministry of Land and Resources used more than 10 thousand scenes of the *CBERS-2B* high-resolution data in the second national land resources survey project. Using *Huanjing* satellite data in the daily work of the National Commission for Disaster Reduction and the Ministry of Environmental Protection has achieved remarkable results. Other users, such as the Resource Information Institute of China Academy of Forestry, Institute of Geology of China Seismological Bureau, Surveying and Mapping Bureau of Jiangsu Province, etc. have downloaded more than 10,000 scenes each.<sup>59</sup>

China has a natural wetland area of 308,000 square kilometers as of 2000, including natural lakes, marsh, shallow water along the coast, and inter-tidal shoals, which are mainly located in Tibet and Inner Mongolia Autonomous Regions as well as Qinghai and Heilongjiang provinces. Scientists from Chinese Academy of Sciences (CAS) made the first satellite map of China's wetland areas, in order to monitor and manage the areas better. "The map, which took scientists two years to complete, comprises 600 scenes of satellite images with each scene covering an area of 34,225 square kilometers."<sup>60</sup> The map shows a 50,800 square kilometer decrease compared with the data collected ten years ago. "The Chinese government earmarked 16.5 billion yuan . . . to protect and restore wetlands during the 11th five-year plan period (2006-2010)."<sup>61</sup> Also, *CBERS* data were used in the research projects of desertification in Gulang area, soil salinization, and water quality in Taihu Lake.<sup>62</sup>

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<sup>59</sup> See China Centre for Resources Satellite Data and Application (CRESDA), 我国陆地卫星数据分发突破百万景 [Distribution of CBERS Data over One Million Scenes], CRESDA, Aug. 3, 2009, <http://www.cresda.com/n16/n1100/n1310/8716.html>. (last visited Jan. 7, 2011).

<sup>60</sup> *Scientists make first satellite map for China's wetlands*, PEOPLE'S DAILY ONLINE, Feb. 19, 2009, <http://english.peopledaily.com.cn/90001/90776/90881/6596132.html>.

<sup>61</sup> *Id.*

<sup>62</sup> Song Yuejun et al, *Application Status of China Brazil Earth Resources Satellite*, 28 (6) WORLD SCI-TECH RES. & DEV. 63 (Dec. 2006) (on file with author).

### *C. Applications in the Disaster Monitoring*

The satellite data have been used in the monitoring of Huaihe River flood and waterlogging disasters, the freezing rain in Southern regions and snow disaster, Heilongjiang forest fires, and Australia bushfires.<sup>63</sup> In early 2008, China's Southern regions suffered from a rare freezing rain and snow disasters. From January 29 to February 22, CRESDA monitored a total area of 220 million square kilometers, and identified snow coverage of an area of 850,000 square kilometers in Southern China. The monitoring results greatly assisted the disaster relief work.

After the Wenchuan earthquake on 12 May 2009, CRESDA launched an emergency response mechanism to quickly arrange a satellite imagery program. It obtained images of the earthquake disaster area on 13 May. *CBERS* imaging of the disaster areas was then arranged every day. A total of twenty-three earthquake monitoring operations had been conducted and timely disaster monitoring reports had been provided to the higher authorities and national disaster mitigation department.<sup>64</sup>

Using *CBERS-2B* data to monitor ice flood barrier bursts exit door location, barrier bursts, the submerged area of flood, etc., the Yellow River Conservancy Commission Information Center has been enabled to track, monitor, and assess the disaster, which provided a scientific basis for the Yellow River Flood Control Department to entirely control the flood situation, the reservoirs, and to timely deploy the work for flood prevention.<sup>65</sup>

### *D. Applications in Regional and Urban Planning*

The information about land and natural resources and environment received and analyzed from remote sensing data was provided to local authorities as a basic reference for further

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<sup>63</sup> *Id.*

<sup>64</sup> 中巴地球资源卫星应用成就与展望 [Achievement and Prospect of *CBERS* Data Application], 3S NEWS, Dec. 15, 2009, available at [http://news.3snews.net/industry/20091215/1585\\_3.shtml](http://news.3snews.net/industry/20091215/1585_3.shtml).

<sup>65</sup> *Id.*

regional or urban planning. It is reported that such information was used for the Yellow River estuary regional planning and sustainable development monitoring and Liaodong regional planning. The authorities of Hunan Province conducted remote-sensing surveys on the urban environment, pollution, and urban expansion in the three cities of Changsha, Zhuzhou, and Xiangtan.

Multi-source remote sensing data was used to study urban heat island status in Beijing and Nanjing. The result showed that there existed obvious urban heat island effect in these cities, and the causes were identified.<sup>66</sup> These remote sensing data-based researches assist the authorities in urban planning.

It is also reported that remote sensing data helped the selection of Qinghai-Tibet railway route, was applied to the south-to-north water transfer project, and served the Three Gorges Dam project and the 2008 Olympics in the construction of Olympic venues and neighboring transportation facilities.<sup>67</sup>

#### IV. NATIONAL LAW GOVERNING REMOTE SENSING ACTIVITIES

China has neither enacted a comprehensive national space law nor a remote sensing law. Nevertheless, as a Contracting Party to the Outer Space Treaty,<sup>68</sup> China has an obligation to abide by its provisions. The U.N. Remote Sensing Principles also provide guidelines for carrying out remote sensing activities.<sup>69</sup> Besides, the “Interim Measures on the Administration of Licensing the Project of Launching Space Objects” and the “Measures for the Administration of Registration of Objects Launching into Outer Space,” promulgated in 2001 and 2002 respectively, are applicable to the civil space remote sensing activities carried out by a person, natural or judicial, or an organization within the territory of

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<sup>66</sup> See Peng Zhong, *Research on Urban Heat Island in Beijing Based on Multi-source Remote Sensing Data*, 37 (22) J. ANHUI AGRIC. SCI. 10527-29 (2009). Wang Guiling et al., *An Assessment of Urban Heat Island Effect Using Remote Sensing Data*, 30 (3) J. NANJING INST. OF METEOROLOGY 298-304 (Jun. 2007).

<sup>67</sup> CRESDA, <http://www.cresda.com/n16/n1175/n41408/index.html> (last visited Feb. 4, 2011).

<sup>68</sup> Outer Space Treaty, *supra* note 4.

<sup>69</sup> Remote Sensing Principles, *supra* note 5.

China.<sup>70</sup> Under the licensing regulation, a space remote sensing operator has to obtain a permit or license from COSTIND prior to the launch of the remote sensing satellites.<sup>71</sup> The remote sensing activities shall be supervised and inspected by COSTIND and the authorized officials.<sup>72</sup> The COSTIND is empowered to cease the illegal space activities if the operators undertake unauthorized space activities.<sup>73</sup> Further, the COSTIND shall impose administrative penalties in accordance with relevant domestic laws if a space activity violates the regulation and national interests.<sup>74</sup> These provisions are similar to those in many national space or remote sensing legislations. For example, the Canadian Act Governing the Operation of Remote Sensing Space Systems establishes a licensing system for the operation of remote sensing satellite systems.<sup>75</sup> In the U.S., the Land Remote Sensing Policy Act of 1992 authorizes the Secretary of Commerce to license private sector parties to operate private space systems.<sup>76</sup> German remote sensing law provides in a slightly different way that only “the operation of a high-grade earth remote sensing system requires an operator license.”<sup>77</sup>

However, the two Chinese space regulations are not sufficient to cover all aspects of remote sensing activities, especially in terms of dissemination of satellite data. As mentioned before, there is a provisional policy for the dissemination of *CBERS* domestic-made data. Authorities in charge of different matters made policies for dissemination of different satellite data. What China needs to do is to establish a

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<sup>70</sup> Interim Measures on the Administration of Licensing the Project of Launching Space Objects, Nov. 21, 2002 (P.R.C.), at arts. 2 & 3, *available at* 33 J. OF SPACE L. 442 (2007).

<sup>71</sup> *Id.* at art. 6, pp.443-444.

<sup>72</sup> *Id.* at art. 23, p.447.

<sup>73</sup> *Id.* at art 25, p.447.

<sup>74</sup> *Id.* at art. 24, p.447.

<sup>75</sup> See Bill C-25: An Act Governing the Operation of Remote Sensing Space Systems (Can.), clauses 5-16 [hereinafter Bill C-25].

<sup>76</sup> See Land Remote Sensing Policy, 15 U.S.C. §§5601-5672, §5621.

<sup>77</sup> Act to Give Protection against the Security Risk to the Federal Republic of Germany by the Dissemination of High-Grade Earth Remote Sensing data, Nov. 23, 2007, Part 2, §3, *available at* 34 (1) J. SPACE L. 115, 119 (2008) [hereinafter Protection against the Security Risk].

general data policy for dissemination of all kinds of remote sensing satellite data. China may benefit from the legislative experiences of foreign countries. The future national law regarding the general remote sensing data policy may include that, *inter alia*, the China Government should maintain a comprehensive archive of all Chinese remote sensing data for historical, scientific, and technical purposes just like the U.S. law has provided.<sup>78</sup> Private sectors should be encouraged to develop commercial market for remote sensing data and products.<sup>79</sup> However, remote sensing data and information about weather that concerns everyone's daily life should not be commercialized.<sup>80</sup> The same should apply to the remote sensing data and information about disasters as they concern disaster prevention and disaster relief, which may affect thousands of human lives and a large amount of properties. Distribution of remote sensing data should be based on the principle of non-discrimination. Considering the special features of remote sensing activities which most likely involve national interests, security and foreign affairs, the government's requests for remote sensing data or products in urgent circumstances should be given priority.<sup>81</sup> Sensitive data may cause harm to national interests or foreign relations. Sensitivity of remote sensing data should be checked and distribution of sensitive remote sensing data and information should require a permit from competent authorities.<sup>82</sup> So far, most of the China-made remote sensing data have been distributed free of charge. But to ensure the sustainable development of remote sensing technology, even un-enhanced data could be distributed at a reasonable cost.<sup>83</sup>

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<sup>78</sup> See Land Remote Sensing Policy, *supra* note 76, §5601 (16) & §5652 (a).

<sup>79</sup> *Id.* §5601 (14).

<sup>80</sup> *Id.* §5671.

<sup>81</sup> See Bill C-25, *supra* note 75, clause 15; Protection against the Security Risk, *supra* note 77, at Part 4, § 21.

<sup>82</sup> See Protection against the Security Risk, *supra* note 77, at Part 3, § 19.

<sup>83</sup> Under the U.S. law, unenhanced data are available to all users at the cost of fulfilling user requests. See Land Remote Sensing Policy, *supra* note 76, §5615(a) (1); Ray Harris, *Current Status and Recent Developments in UK and European Remote Sensing Law and Policy*, 34 (1) J. SPACE L. 33, 36 (2008).

## CONCLUSION

In conclusion, China carries out remote sensing activities in accordance with international law and the Outer Space Treaty. The Remote Sensing Principles are also followed by China, although the Principles are not binding. Seeking self-development on the one hand, China commits herself “to develop a cooperative win-win relationship”<sup>84</sup> with all countries on the other. China not only distributes most of the remote sensing data and products free of charge to meet social welfare demands at home, but also helps developing countries in Africa and Southern Asia in “the establishment and operation of data collecting and storage stations and processing and interpretation facilities” to “maximize the availability of benefits from remote sensing activities.”<sup>85</sup> Currently, China's remote-sensing products are developing from experimental application types to operational service types. The users at home and abroad will be able to greatly accelerate the wide applications of China-made remote sensing satellite data in environmental protection, urban planning, and disaster prevention. Under the above circumstances, there is a need for China to optimize current national laws to ensure the sustainable and orderly development of the remote sensing technology, to promote widespread dissemination of satellite data, and to encourage the applications of satellite data in various areas.

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<sup>84</sup> Ambassador Tan, Head of the Chinese Delegation, General Statement at the 47<sup>th</sup> Session of Legal Sub-Committee, COPUOS (Apr. 2, 2008), available at <http://www.chinesemission-vienna.at/eng/fyywj/t420204.htm>.

<sup>85</sup> Remote Sensing Principles, *supra* note 5, at princ. VI.



# LEGAL ASPECTS OF REDUCING GREENHOUSE GASES EMITTED BY AIRCRAFT REGISTERED IN KOREA: A RIPPLE EFFECT OF EU INITIATIVES

*Won-hwa Park\**

## I. INCREASING AIRCRAFT EMISSIONS THREATENING GLOBAL WARMING

An alarming increase of the global warming gases (GHG) threatening human environment was noticed by the international community in the 1980s and was the motive for both the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to set up in 1988 the Inter-governmental Panel on Climate Change (IPCC) to study the phenomena scientifically. Further concern was materialized by the conclusion of the United Nations Framework Convention on the Climate Change (UNFCCC)<sup>1</sup> which was opened for signature during the First Earth Summit in 1992 in Rio de Janeiro, Brazil.

Based on the UNFCCC, the international community started negotiations to formulate binding international rules to stabilize GHG in the air, resulting in the increase of global mean temperature of no more than 2°C<sup>2</sup> from the pre-industrial level. In order to do so, the concentrations in the atmosphere of GHG, including the critical carbon oxide (CO<sub>2</sub>) calculated in

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<sup>1</sup> United Nations Framework Convention on Climate Change, May 9, 1982, S. Treaty Doc No. 102-38 (1992), 1771 U.N.T.S. 107 [hereinafter UNFCCC].

<sup>2</sup> “Approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5°C. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, SUMMARY FOR POLICYMAKERS, IPCC FOURTH ASSESSMENT REPORT 11, (Apr. 6, 2007) (hereinafter IMPACTS, ADAPTATION AND VULNERABILITY).

CO<sub>2</sub>-equivalent have to be stabilized to 450 ppmv,<sup>3</sup> after peaking from 2010 - 2015<sup>4</sup> because of their long term effect. With this goal to realize, the global CO<sub>2</sub> emissions in 2050 have to be reduced by 80% over the 2000 level, while “[t]he atmospheric concentration of carbon dioxide increased from a pre-industrial value of about 280 ppmv to 379 ppmv in 2005.”<sup>5</sup>

The emissions of the GHGs, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFC<sub>s</sub>), perfluorocarbons (PFC<sub>s</sub>), sulphur hexafluoride (SF<sub>6</sub>) “have grown since pre-industrial times, with an increase of 70% between 1970 and 2004 from 28.7 to 49 gigatonnes of carbon dioxide equivalents.”<sup>6</sup> As a consequence, global average temperature has increased by 0.74°C for the last 100 years (1906 to 2005) with the global average sea level rising “at an average rate of 1.8 mm per year over 1961 to 2003,” mostly due to anthropogenic activities.<sup>7</sup>

Looking at GHG emissions by sector in 2004, the international transport sector occupied 13.1% with energy supply being the largest source.<sup>8</sup> Aviation CO<sub>2</sub> emissions alone were responsible for approximately 2.4% of the global GHG emissions in 1990 “but the share is projected to rise up to 10% [in 2050] in a business-as-usual scenario<sup>9</sup> of global emissions,”<sup>10</sup> according to the 1999 International Panel on Climate Change (IPCC) Special Report on Aviation and the Global Atmosphere produced at the

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<sup>3</sup> Parts per million by volume.

<sup>4</sup> IMPACTS, ADAPTATION AND VULNERABILITY, *supra* note 2, at 15.

<sup>5</sup> INTER GOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, SUMMARY FOR POLICYMAKERS, IPCC FOURTH ASSESSMENT REPORT 2 (Feb. 2007) [hereinafter THE PHYSICAL SCIENCE BASIS].

<sup>6</sup> CO<sub>2</sub> emissions have grown by about 80% and represented 77% of total anthropogenic GHG emissions in 2004. INTER GOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: MITIGATION OF CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS, IPCC FOURTH REPORT 3, (May 2007) [hereinafter MITIGATION OF CLIMATE CHANGE].

<sup>7</sup> THE PHYSICAL SCIENCE BASIS, *supra* note 5, at 5.

<sup>8</sup> MITIGATION OF CLIMATE CHANGE, *supra* note 6, at 29.

<sup>9</sup> Assuming 5% yearly growth compounded. INTER GOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT: AVIATION AND THE GLOBAL ATMOSPHERE, SUMMARY FOR POLICYMAKERS 6, 10 (1999) [hereinafter AVIATION AND THE GLOBAL ATMOSPHERE].

<sup>10</sup> JAKOB GRAICHEN & BERND GUGELE, ETC/ACC TECHNICAL PAPER 2006/3 European Topic Center on Air and Climate Change 5, (Dec. 2006).

request of International Civil Aviation Organization (ICAO).<sup>11</sup> While the share of aviation is relatively small, i.e. 11.2% of the total GHG emissions of the transport sector in 2005,<sup>12</sup> “the impact of aviation on climate change is [believed] to be [contributing] two to four times higher” to global warming than the radiative forcing of its CO<sub>2</sub> emissions alone.<sup>13</sup> This is because aircraft emissions of nitrogen oxides (NO<sub>x</sub>) at high altitudes trigger the generation of ozone (O<sub>3</sub>) which is “particularly effective in forming GHG ozone when emitted at cruise altitudes.”<sup>14</sup>

CO<sub>2</sub> emissions from international aviation alone are 1.9% compared with 2.7% from international shipping in the total CO<sub>2</sub> emissions in 2005.<sup>15</sup>

Applying IPCC 2006 Guidelines,<sup>16</sup> estimates of Korean CO<sub>2</sub> emissions in the transportation sector, including aviation, has increased at yearly average to 5.7% from 1990 to 2005. This is higher than the 4.9% average increase rate of the total CO<sub>2</sub> emissions.<sup>17</sup> The estimated yearly increase rate of emissions of the three gases, CO<sub>2</sub>, sulphur dioxide (SO<sub>2</sub>), and NO<sub>x</sub>, from aviation in the period 1992 to 2006 can be broken down to 3.9% for domestic operations which stands in stark contrast to 12.9% for international operations.<sup>18</sup>

It is noteworthy that emissions of these gases from international flights for Korean airliners in 2006 occupies 92.2% in contrast to 7.8% for domestic flights, a corollary to a small territory with a lot of outward activities.<sup>19</sup>

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<sup>11</sup> AVIATION AND THE GLOBAL ATMOSPHERE, *supra* note 9; JAKOB GRAICHEN & BERND GUGELE, *supra* note 10, at 5.

<sup>12</sup> *Id.*; Int'l Maritime Org., *Prevention of Air Pollution from Ships*, at 181, IMO Doc. MEPC 59/INF.10 (Apr. 9, 2009) [hereinafter *Prevention of Air Pollution*].

<sup>13</sup> JAKOB GRAICHEN & BERND GUGELE, *supra* note 10, at 5; *see also*, MITIGATION OF CLIMATE CHANGE, *supra* note 6, at 49. However, another study suggests that the “total aviation-induced radiative forcing . . . is . . . twice that from CO<sub>2</sub>.” ICAO, *ICAO Environment Report 2007*, at 123 (2007).

<sup>14</sup> MITIGATION OF CLIMATE CHANGE, *supra* note 6, at 49.

<sup>15</sup> *Prevention of Air Pollution*, *supra* note 12, at 181.

<sup>16</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES, adopted (2006), *available at* <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

<sup>17</sup> MJ KIM & MJ AHN, ESTIMATES AND MANAGEMENT MEASURES OF GREEN HOUSE GASES IN AVIATION 55, Research Paper No. 2008-6 (Korea Transport Institute, 2008).

<sup>18</sup> *Id.* at 66.

<sup>19</sup> *Id.* at 65.

## II. INTERNATIONAL REGIME GOVERNING GHG EMISSIONS BY AIRCRAFT

### 1. *Universal*

In order to implement the Climate Change Convention,<sup>20</sup> its parties started the negotiations to devise quantified emissions reduction soon after the entry into force of the Convention in 1994. The negotiations, which lasted for two and a half years, resulted in the Kyoto Protocol<sup>21</sup> in 1997. The Kyoto Protocol introduced binding requirements for emissions reduction of the six global warming gases for developed countries (all of which are member States of OECD) as listed in Annex I of the Climate Change Convention (1992). Also included in the countries to be subject to the binding regime were economies in transition (EIT), i.e. East European countries. In total, there are thirty-nine countries, to include the USA. All these countries, except the USA, who bolted, are obliged to reduce the above mentioned six GHGs at an average of at least by 5% under 1990 levels, during the five years implementation period, from 2008 to 2012.<sup>22</sup> In this newly devised regime with an enormous impact on the political, economic, and social behaviors of human lives, flexibility was integrated to reflect the different situations of each dutiful country on the one hand and to bring about maximum efficiency to achieve the objectives of the Protocol on the other hand.

Six GHG emissions are subject to reduction regardless of where they are made or where they come from as long as their source derives from human activities. They include emissions from aviation and shipping as long as they are produced in domestic operations. However, international bunker fuels (i.e. fuels burned for international operations of aircraft and ships) were excluded from application because of methodological difficulties at the time in calculating which emissions were attributable to which country for operations crossing many different

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<sup>20</sup> UNFCCC, *supra* note 1.

<sup>21</sup> The Kyoto Protocol to the Convention on Climate Change, adopted in Kyoto, Dec. 11, 1997, 2303 U.N.T.S. 148 [hereinafter Kyoto Protocol].

<sup>22</sup> *Id.* at art. 3.1.

countries and the high seas. The Kyoto Protocol obliged Annex I countries to “pursue limitation and reduction of GHG emissions . . . from aviation and marine bunker fuels, working through the ICAO and International Maritime Organization (IMO), respectively.”<sup>23</sup>

As discussed below, both international organizations were understandably slow in trying to devise mechanisms entrusted to them by the Kyoto Protocol, which had no determinable date of enforcement. This was due to a boycott by the United States, the biggest emitter of GHG in the world.<sup>24</sup> It was only in the year 2005 that, with the ratification of the Russian Federation, the Kyoto Protocol could finally come into force.<sup>25</sup>

## 2. Regional

The European Union (EU) is the front runner in assessing, analyzing, sharing, educating, policing, and enacting all sorts of environmental issues that humans must address to save the Earth environment. The first UN Conference on Human Environment was held in Stockholm, Sweden in 1972 and the UN Environment Program (UNEP) established thereafter to deal with the increasingly important environmental issues in the United Nations.

Witnessing no meaningful ICAO action in accordance with Article 2.2 of the Kyoto Protocol and considering that aviation is the source of the fastest growing GHG emissions, with interna-

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<sup>23</sup> *Id.* at art. 2.2.

<sup>24</sup> Under Article 25 of the Kyoto Protocol there is a “double trigger” requirement for its entry into force. Specifically, the ratification or accession of fifty-five States Parties, and incorporating States included in the Annex I list of countries, which account in total for at least 55% of the total CO<sub>2</sub> emissions in 1990. The Kyoto Conference prepared a report on CO<sub>2</sub> emissions of each of the Annex I countries, and calculated the total emissions in 1990 of all Annex I countries to be 13.7 gigatonnes, 36.1% of which was for the USA as the biggest CO<sub>2</sub> emitter in the world. Hence, the US’ announcement in 2001 that it was abandoning the Kyoto Protocol, after signing it on 12 Nov. 1998, doomed the future of the Protocol.

<sup>25</sup> Despite ratification of most Western countries, a boycott by the US could not easily meet the 55% CO<sub>2</sub> emissions requirement attributable to the Annex I countries. After a period of uncertainty, the requirement was met when Russia, the second biggest CO<sub>2</sub> emitter in 1990 with 17.4%, ratified the Kyoto Protocol in late 2004.

tional aviation taking the lion share,<sup>26</sup> the EU became anxious. The EU warned that if no action was taken within ICAO by 2002 it would undertake specific actions to reduce greenhouse gas emissions from aviation on their own.<sup>27</sup> In fact the EU enacted Directive<sup>28</sup> 2008/101/EC of the European Parliament and of the Council of 19 November 2008, which amended Directive 2003/87/EC to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community.<sup>29</sup> To provide the above Directive with necessary details for implementation, the EU Commission adopted Decision 2009/339/EC on Monitoring and Reporting Guidelines for Emissions and Tonne-kilometre Data from Aviation Activities.<sup>30</sup>

The binding force of EU Directive 2008/101/EC, which applies to all aircraft flying to and from the EU from 1 January 2012 onward, has had an enormous impact. Nearly 4,000 airlines operating within, to, and from the EU are currently preparing to meet it while some airlines are contesting the legality of the Directive, which is discussed further below.

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<sup>26</sup> “Approximately 20% of CO<sub>2</sub> emissions from aviation are due to domestic aviation, another 20% due to flights between EU Member States, and 60% due to flights leaving EU.” JAKOB GRAICHEN & BERND GUGELE, *supra* note 10, at 14; “Combined future bunker emissions from aviation and maritime sectors are projected to grow . . . from about 800 Mt CO<sub>2</sub> in 2000 to about 1,350 Mt by 2020 and nearly 3,000 Mt in 2050, . . . which is equivalent to an increase by about 70% in 2020 and 275% in 2050 compared to 2000. Aviation sector is responsible for most of this growth.” JASPER FABER ET AL., AVIATION AND MARITIME TRANSPORT IN A POST 2012 CLIMATE POLICY REGIME 126, 47, (CE Delft Report, Dec. 2006).

<sup>27</sup> Decision 1600/2002/EC, art. 5.2.(iii), 2002 O.J. (L.242) 7.

<sup>28</sup> A Directive is one of three forms of legislation in the EU, the other two being Regulation and Decision. A Directive is binding on the EU Member States as to the result to be achieved but leaves them the choice of the form and method they adopt to realize the European Community (EC) objectives within the framework of their internal legal order. A Regulation is a general measure that is binding in all its parts. A Regulation is directly applicable, which means that it creates law which takes immediate effect in all the Member States in the same way as a national instrument, without further action on the part of the national authorities. A Decision is the instrument by which the EC institutions give a ruling on a particular matter. By means of a Decision, the EU can require a Member State or a citizen of the EU to take or refrain from taking a particular action, or confer rights or impose obligations on a Member State of EU or its citizen. EUR-Lex, *Process and Players*, [http://eur-lex.europa.eu/en/droit\\_communaire/droit\\_communaire.htm#1.3](http://eur-lex.europa.eu/en/droit_communaire/droit_communaire.htm#1.3) (last visited Jan. 24, 2011).

<sup>29</sup> Council Directive 2008/101/EC, 2008 O.J. (L8) 3.

<sup>30</sup> Commission Decision 2009/339/EC 2009 O.J. (L103) 10.

### 3. ICAO Provisions

Annex 16 to the Convention on International Civil Aviation<sup>31</sup> (Chicago Convention) addresses Environmental Protection by governing Aircraft Engine Emissions.<sup>32</sup> However, the described engine emissions are concerned with smoke and three gases for certification purposes. They are unburned hydrocarbons (HC), carbon monoxide (CO), and NO<sub>x</sub>. It has nothing to do with the six GHGs including the core CO<sub>2</sub> controlled by the Kyoto Protocol.

ICAO slowed the introduction of the new regime to reduce engine emissions when it adopted a resolution<sup>33</sup> at its 36<sup>th</sup> Assembly held in September 2007. It “[u]rges Contracting States not to [apply] an emissions trading system on other Contracting States’ aircraft operators except on the basis of mutual agreement between and among those States.”<sup>34</sup> Obviously, it intended to discourage the EU’s introduction of unilateral legislation in this regard as it did in the past regarding aircraft noise restriction.

The Member States of the European Community and 15 other European States placed a reservation on this Resolution and “reserve[d] the right under the Chicago Convention to enact and apply market-based measures . . . on a non-discriminatory basis to all [aircraft] operators of all States providing services to, from or within their territory.”<sup>35</sup>

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<sup>31</sup> Convention on International Civil Aviation, Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295 [hereinafter Chicago Convention].

<sup>32</sup> *Id.* at Annex 16, Environmental Protection [hereinafter Annex 16].

<sup>33</sup> ICAO, *Consolidated statement of continuing ICAO policies and practices related to environmental protection*, Assemb. Res. A36-22 (2007) compiled in *Assembly Resolutions in Force*, at I-54, ICAO Doc 9902 (Sept. 28, 2007).

<sup>34</sup> *Id.* at Appendix L, I-72.

<sup>35</sup> ICAO, *Extracts of Minutes of the Ninth Plenary Meeting of the 36<sup>th</sup> Assembly Meeting*, at 5, ICAO Doc. A36-MIN.p/9, (Feb. 2, 2008).

### III. KOREA CAUGHT IN-BETWEEN ESTABLISHING AN INTERNATIONAL REGIME

#### *1. Adhesion to the Organization for Economic Co-operation and Development in 1996*

The Republic of Korea (ROK) joined the so-called “rich countries’ club,” the OECD, in 1996 as its 29th member and second Asian member. At the time, the Kyoto Protocol negotiations were in progress. Although Korea was not one of the Annex I countries of the Climate Change Convention, it was under pressure to join the list because it was becoming an OECD Member State. Despite the ROK’s fast growing GHG emissions, its national interests dictated that it avoid joining the Annex I countries upon which obligatory reduction of GHG was to be imposed.<sup>36</sup>

As to CO<sub>2</sub> emissions by country, Korea ranked ninth, ahead of Italy, which was the fifth largest emitter, ahead of the United Kingdom, for international bunker fuels in only 2006.<sup>37</sup> Although Article 2.2 of the Kyoto Protocol does not elaborate on the emissions from aviation and maritime bunker fuels, the international community distinguished emissions from bunker fuels for aviation and shipping engaged in international opera-

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<sup>36</sup> Negotiations for Korea to officially apply for OECD membership took more than a year.

It joined in December 1996. Two critical issues were: first, its laws prohibiting labor from establishing multi-unions, and second, its participation in the ongoing negotiations of the Kyoto Protocol. The ROK could join the OECD by promising to allow multi-union activities and by participating in the negotiations of the Kyoto Protocol as an OECD member. But the written agreement between the OECD and ROK regarding the Kyoto Protocol gives rise to different interpretations depending on the angle perceived. Despite continuous pressures from Western countries to honor its ambiguous pledge, Korea did not join the Annex I countries and was un-cooperative in the final days of the 1997 Kyoto Conference. Mexico is another OECD member that avoided Annex I.

<sup>37</sup> In 2006, the ten big CO<sub>2</sub> emitters (excluding land use change and forestry but including international bunkers) were, in order: China, USA, Russia, India, Japan, Germany, UK, Canada, Korea, and Italy. In 2006, regarding international bunkers the five biggest emitters were USA, Singapore, the Netherlands, UAE, and Korea. Carbon Dioxide Information Analysis Center, *Top 20 Emitting Countries by Total Fossil-Fuel CO<sub>2</sub> Emissions for 2007*, [http://cdiac.ornl.gov/trends/emis/tre\\_tp20.html](http://cdiac.ornl.gov/trends/emis/tre_tp20.html) (last visited Jan. 25, 2011).

tions from those for domestic operations and included only the latter in national total emissions of the countries bound by the Kyoto Protocol for obligatory reduction.<sup>38</sup> Because of methodological problems of which emissions to be attributed to which country for international bunker fuels, the matter was entrusted to the Annex I parties to work through with the relevant international organizations, i.e. ICAO and IMO respectively.<sup>39</sup>

Since Korea was a country with certain important emissions, even though it could avoid Annex I list, it has been, after the conclusion of the Kyoto Protocol, under continuous pressure from Western countries, other than the United States, to accept its responsibility as a member of the OECD and commensurate with its sizable emissions. In this context, the Korean government has been inclined to undertake certain measures with the post-Kyoto process.

### *2. A Change of Attitude by the New Government*

A new government led by President Lee Myung-bak was installed in February 2008, and caused the Korean government to change its reserved attitude. It began to take different approaches towards recognizing its responsibility on major international issues where international cooperation is essential to the success and the benefit of all. Korea often shunned its duties, including moral ones. This was because of its weak history of getting involved in international efforts involving universal values that were deemed to be taken only by the advanced countries. Korea needed more time to adjust to the new international political, economic, and social environment, wherein it had to fulfill its role as an advanced emerging power with rapid and continuing political and economic achievements.

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<sup>38</sup> Conference of the Parties to the Framework Convention on Climate Change, *Decision 21/ CP.3, adopted in Kyoto Conference together with the Kyoto Protocol in 1997, compiled in Report of the Conference of the Parties on Its Third Session, Held at Kyoto from 1 To 11 December 1997, Addendum, Part Two: Action Taken by the Conference of the Parties at its Third Session*, 27, 31, U.N. Doc. FCCC/CP/1997/7/Add.1 (Mar. 25, 1998).

<sup>39</sup> Kyoto Protocol, *supra* note 21, at art. 2.2.

Mr. Lee's election and vision was timely. He began to put his philosophy into government policies. *Low Carbon, Green Growth* was high on his agenda and he began to apply it to internal and external government policies. The government's declaration in 2009<sup>40</sup> to voluntarily reduce GHG by 30%, compared to the business-as-usual in Korea scenario by 2020, was a remarkable gesture for Korea. It was intended to enable Korea to join the ranks of advanced countries.

To implement these policies, the Framework Act on Low Carbon, Green Growth<sup>41</sup> was enacted, followed by the Presidential Decree.<sup>42</sup>

#### IV. EU INITIATIVES ON AIRCRAFT EMISSIONS

##### *1. The Weakening Role of the International Civil Aviation Organization*

As mentioned above, ICAO was a victim of inertia<sup>43</sup> when the Warsaw System<sup>44</sup> on international transportation was crumbling. This was particularly true as regards the action taken by the International Air Transport Association (IATA),<sup>45</sup> together some of its member airlines, in modernizing the com-

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<sup>40</sup> Thirty percent reduction of GHG was an essential element of the Green Growth National Strategy and Five-year Plan which was announced on 6 Jul. 2009 by the Korean government, available at [http://www.unep.org/PDF/PressReleases/201004\\_UNEP\\_NATIONAL\\_STRATEGY.pdf](http://www.unep.org/PDF/PressReleases/201004_UNEP_NATIONAL_STRATEGY.pdf) (last visited Jan. 21, 2011).

<sup>41</sup> Framework Act on Low Carbon, Green Growth, Act No. 9931 (Jan. 31, 2010), available at <http://www.moleg.go.kr/FileDownload.mo?flSeq=30719>.

<sup>42</sup> Enforcement Decree of the Framework Act on Low Carbon, Green Growth, Presidential Decree No. 22124 (Apr. 13, 2010), available at <http://www.moleg.go.kr/FileDownload.mo?flSeq=30708>.

<sup>43</sup> PAUL DEMPSEY & MICHAEL MILDE, INTERNATIONAL AIR CARRIER LIABILITY: THE MONTREAL CONVENTION OF 1999 36-43 (2005).

<sup>44</sup> A series of treaties starting with the Convention for the Unification of Certain Rules Relating to International Transportation by Air, Oct. 12, 1929, 49 Stat. 3000; 137 L.N.T.S. 11 [hereinafter Warsaw Convention] and supplementary and amending protocols thereto to govern on the compensation for delay, death or wounding of passengers and for the damage, delay, loss, or destruction of luggage or cargo, all caused by the accident of aircraft are called the Warsaw System or Warsaw Regime.

<sup>45</sup> International Air Transport Association incorporated in Canada in 1944 as a trade organization for its member airlines also played its role as a trust in deciding the rate and condition of international air flights around the world. Since the liberalization act of the United States in 1978, *de facto* regulatory role in price fixing has substantially diminished.

pensation system. Although ICAO was instrumental in concluding the Convention for the Unification of Certain Rules for International Carriage by Air<sup>46</sup> (Montreal Convention), it was a last minute attempt made in dereliction of its duty to have acted sooner.

The same passive attitudes of ICAO can be seen with regards to reducing aircraft engine emissions. It was only after the EU finalized the 2006 legislation<sup>47</sup> to include aviation activities in the greenhouse gas emissions allowance scheme within the European Community that ICAO reacted. It adopted Assembly Resolution A36-22 in 2007. The Resolution also established the Group on International Aviation on Climate Change (GIACC) to deal with the emissions issue. Based on its deliberations, ICAO held the October 2009 High-Level Meeting just ahead of the critical 15<sup>th</sup> Conference of the Climate Change Convention in Copenhagen, Denmark. There was a high expectation that a possible Post-Kyoto regime would be concluded in Copenhagen to govern beyond 2012.

The Copenhagen Conference was a failure, as were ICAO's actions which failed to focus strongly and early. There were no binding decisions, only aspirational goals or recommendations taken by ICAO. Therefore, ICAO member States are only bound by regional or national measures, if any, as long as they are not discriminatory in nature.

It is also interesting to note the actions of the International Maritime Organization (IMO), which is the other inter-governmental organization with whom the UNFCCC Annex I Parties have to work, in order to set up an emission limitation and reduction regime for marine bunker fuels. Unlike ICAO, IMO addressed the matter early and seriously. Considering the progress achieved in recent sessions<sup>48</sup> of the Marine Environ-

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<sup>46</sup> Convention for the Unification of Certain Rules for International Carriage by Air, May 28, 1999, S. Treaty Doc. No. 106-45, 2242 U.N.T.S. 309.

<sup>47</sup> Commission Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, EU COM (2006) 818 Final (Dec. 20, 2006).

<sup>48</sup> *Prevention of Air Pollution*, *supra* note 12; Int'l Maritime Org., *UN Climate Change Conference 2009*, IMO Doc MEPC 60/INF.9 (Jan. 15, 2010).

ment Protection Committee (MEPC), one of the major committees of the IMO, it is likely that the binding regime for international maritime bunker emissions will be introduced within two years while there is no such attempt being made by ICAO for emissions reduction from international aviation bunker fuels. It is true that the United States is by far the largest aviation country to bolt out<sup>49</sup> of the Kyoto Protocol, and it was not interested in setting up a reduction regime for emissions from aviation bunker fuels.<sup>50</sup> The United States, whilst a modest maritime power in international shipping,<sup>51</sup> does not play a dominant role, thus it may follow the majority view in the deliberations of the IMO. However this does not explain everything. Considering how the Kyoto Protocol entered into force without the United States, it is reasonable to also consider ICAO's past behavior of initially doing nothing and rushing in later in breach of its own rules to catch up with initiatives taken by many civil airlines to modernize the Warsaw System. Similar mistakes may be made again.

## 2. *EU initiatives*

Differing from its COM (2006) 818 Final version whereby the EU aircraft operators were subject to the cap and trade of engine emissions one year ahead of the aircraft operators outside EU, Directive 2008/101/EC obliges both intra-community/international EU aircraft operators to be subject to the same

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<sup>49</sup> Total tonne/km of the scheduled air traffic of USA in 2008, the most recent available year for statistics, was 156,644, the largest in the world, occupying about 18% of the world total and is equivalent to combined air traffic from the second to eighth country's air traffic. Aviation Information Portal System, 주요통계지표, <http://www.airportal.co.kr/knowledge/statistics/KiPop01.html> (last visited Jan. 26, 2011).

<sup>50</sup> The reason is not to restrain the air industry of the United States. With this reasoning for the whole industries, the Bush administration abandoned the Kyoto Protocol in 2001.

<sup>51</sup> "Based on total deadweight tonnage controlled by parent companies located in countries," the USA is the sixth largest shipping power in the world occupying 3.84% of the total controlled fleets, while Greece is the first, with 16.81%. IMO MARITIME KNOWLEDGE CENTRE, INTERNATIONAL SHIPPING AND WORLD TRADE FACTS AND FIGURES 14 (Oct. 2009), p. 14, available at [http://www.imo.org/includes/blastDataOnly.asp/data\\_id%3D28127/InternationalShippingandWorldTradefactsandfiguresoct2009rev1\\_tmp65768b41.pdf](http://www.imo.org/includes/blastDataOnly.asp/data_id%3D28127/InternationalShippingandWorldTradefactsandfiguresoct2009rev1_tmp65768b41.pdf).

rules at the same time. Major points of the Directive 2008/101/EC are:

- Integration of aircraft emissions into the existing emissions trading system (ETS) of the EU;
- Application to both EU and non-EU carriers operating from or to EU from 1 January 2012;
- Cap and trade for aircraft operators;
- Cap of allowed total emissions limited to 97% of annual average of historical emissions from 2004, 2005, 2006 for the calendar year 2012, and 95% from 2013 and onward;
- Share of each airlines' emissions in 2010 will be the basis of distribution of the total allowable emissions already decided as above;
- Actual emissions for non-EU operators in 2010 is revenue-tonne-km (RTK) based on flight legs between any point of EU and beyond it;
- Designation of Administering Member State responsible for administering EU scheme of emissions reduction in respect of aircraft operator for its own aircraft and foreign aircraft operator with the greatest estimated attributed aviation emissions from flights performed.<sup>52</sup>

For newly entering aircraft after the monitoring year, i.e. 2010, and for operating aircraft whose tonne-km data increases by an average of more than 18% annually, 3% of the total quantity of allowances is set aside from the year 2013.<sup>53</sup> However big the increase of the operating aircraft operator may be, its increase from the special reserve is limited to 1,000,000 allowances.<sup>54</sup> "Any unallocated allowances in the special reserve shall be auctioned by member States."<sup>55</sup>

For 2012, the first year of implementation, the reference year is 2010 and each aircraft operator applies for an allocation of allowances to be allocated free of charge to the Administering Member State by March 2011 and for subsequent years at least

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<sup>52</sup> EU Directive 2003/87/EC amended by 2008/101/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. Council Directive 2003/87/EC, at art. 18a1.(a)-(b), 2003 O.J. (L 275) 32.

<sup>53</sup> *Id.* at art. 3.f.1.

<sup>54</sup> *Id.* at art. 3.f.2.

<sup>55</sup> *Id.* at art. 3.f.8.

twenty-one months beforehand.<sup>56</sup> At least eighteen months before the start of the period to which the application relates or for 2012 by the end of June 2011, member States submit applications to the European Commission, which fifteen months before the start of each period, or for 2012 by September 2011, shall calculate and adopt a decision setting out total quantity of allowances, the number of allowances to be auctioned, and the number of allowances in the special reserve.<sup>57</sup>

As to auctions as an element of flexibility in securing the objectives of the Kyoto Protocol and the EU ETS, they are also allowed here. For the period from 1 January to 31 December 2012, “15% of allowances shall be auctioned,” so it shall be for the calendar year 2013 and beyond while the percentage may be increased from 2013.<sup>58</sup> Considering the stipulation of the Directive that review of the functioning of this Directive shall be undertaken by 1 December 2014,<sup>59</sup> the EU seems to have foreseen that the Copenhagen Conference would not have introduced aircraft emissions in the binding regime even if it were successful. The excess emissions penalty shall be EUR 100 for each tonne of carbon dioxide emitted for which the aircraft operator has not surrendered allowances without relieving the operator from the obligation of surrendering the allowances of excess emissions in the following calendar year.<sup>60</sup>

It is not by accident that the European Union introduced the binding rules above. The European Commission has conducted time-consuming analysis and assessment of the harmful effects of the CO<sub>2</sub> emissions of the aircraft and prepared its Communication<sup>61</sup> with following conclusions:<sup>62</sup>

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<sup>56</sup> *Id.* at art. 3.e.1.

<sup>57</sup> *Id.* at arts. 3.e.2, 3.e.3.

<sup>58</sup> *Id.* at art. 3.d.2.

<sup>59</sup> *Id.* at art. 30.4.

<sup>60</sup> *Id.* at art. 16(b)3.

<sup>61</sup> *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions Reducing the Climate Change Impact of Aviation*, COM(2005) 459 Final (Sept. 27, 2005).

<sup>62</sup> *Id.* at 2.

- Although aircraft fuel efficiency has increased by more than 70% over the last 40 years, total amount of fuel burned increased due to even higher growth in air traffic;
- Impact of aviation on climate change is rising: while the EU's total emissions controlled under the Kyoto Protocol fell by 5.5% (-287 MtCO<sub>2</sub>e) from 1990 to 2003, its GHG from international aviation increased by 73% (+47 MtCO<sub>2</sub>e), corresponding to an annual growth of 4.3% per year;
- Emissions from international flights from EU airports will by 2012 have increased by 150% since 1990;
- The above growth would offset more than a quarter of the reductions required by the Community's target under the Kyoto Protocol.

The publication of the European Commission in August 2009 listed nearly 4000 aircraft operators licensed and/or responsible by each of twenty-seven Member States of the EU.<sup>63</sup> All the airlines operating to and from the European Union are busy now to prepare themselves for this newly introduced EU Directive of which implication is to reduce for each operator 30% to 40% of CO<sub>2</sub> in 2012, taking into account of the growth rate of air traffic from 5% to 6% in recent years.<sup>64</sup>

### 3. Legality of the EU initiatives in international law

The Chicago Convention stipulates that “the contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory.”<sup>65</sup>

It allows a contracting State to establish prohibited areas of its territory for the reason of public safety provided that no dis-

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<sup>63</sup> European Federation for Transport and Environment, *EU Checks aviation ETS calculations are robust*, Sept. 11, 2009, <http://www.transportenvironment.org/News/2009/9/EC-checks-aviation-ETS-calculations-are-robust/>.

<sup>64</sup> “The average annual passenger traffic growth rate was 5.3% between 2000 and 2007, resulting in the increased use of fuel in aircraft 8.4%.” European Federation for Transport and Environment, *Climate impact of aviation greater than IPCC report*, May 18, 2009, <http://www.transportenvironment.org/News/2009/5/Climate-impact-of-aviation-greater-than-IPCC-report/>.

<sup>65</sup> Chicago Convention, *supra* note 31, at art. 1.

inction is made between its aircraft and foreign aircraft engaged in the international scheduled airline services.<sup>66</sup>

The Convention also obliges all aircraft engaged in international air navigation to follow the laws and regulations of a territorial State in which the aircraft are flying without distinction of nationality.<sup>67</sup>

It is interesting to note the character of the International Standards or Procedures that the ICAO Council adopted in accordance with Articles 37 and 38 of the Chicago Convention. If the Standards are met, which establish the minimum level for uniform application among ICAO member countries, any contracting State or a group of States can establish a higher level of Standards for application in their territories as long as the differences between them and those of the ICAO are notified on the one hand and are applied without discrimination among States. Taking into account the diversity of Chicago Convention contracting States and the fact that uniform rules for safe and efficient operation of aircraft are still required all around the world, as well as the flexible mechanism by which a State can apply its different practices from the International Standards (as long as ICAO is notified of the differences), it must be interpreted that the Standards represent the minimum level.

On the negative side, although the Kyoto Protocol introduced binding international GHG emissions reduction for the first time in history, only those Annex I countries, OECD members and EITs are obliged to follow them. However, the EU Directive applies to all aircraft operators regardless of the status of the country the aircraft are registered with, Annex I or not, as long as they are operating to or from the EU. It is to be remembered here that the UNFCCC bringing about the Kyoto Protocol recognizes the “common but differentiated responsibility” as an important principle.<sup>68</sup>

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<sup>66</sup> *Id.* at art. 9(a).

<sup>67</sup> *Id.* at art. 11.

<sup>68</sup> UNFCCC, *supra* note 1, at art. 3.

More importantly, EU member States together with European Economic Area<sup>69</sup> and European Free Trade Association<sup>70</sup> members are subject to the Kyoto Protocol to reduce GHG by at least 5% in the implementation period of 2008-2012 over the 1990 level.<sup>71</sup> A particular feature is that all those European countries have to reduce six GHGs from diverse emission sources, including emissions from domestic aircraft operation while emissions from international operation are beyond the scope of the agreement. When the EU Directive applies indiscriminately to all, Europe and non-European countries alike from the year 2012, the last year of the implementation period of the Kyoto Protocol, there comes about the unexpected premium in favor of the aircraft operators of Europe compared to non-European operators of non-Annex I countries who are not subject to any such obligation by the Kyoto Protocol. Because the European aircraft operators are anyway bound to reduce emissions by the Kyoto Protocol in the industry including domestic aircraft operation, in particular 8% reduction<sup>72</sup> for members of the EU, starting a new emissions reduction regime for all aircraft operating to or from Europe from 2012, last year of the implementation period of the Kyoto Protocol, will result in less onerous burden for European carriers, to be considered a comparative edge of the European operators otherwise unavailable when the Kyoto Protocol is strictly observed.

While the non-European operators have to calculate their emissions for international flights only as the basis for allocation from 2012, European aircraft operators calculate both their international and domestic flights for the basis of allocation. Accordingly, the European aircraft operators will no longer have the disadvantage of applying the Kyoto Protocol alone in the

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<sup>69</sup> European Economic Area (EEA), another European economic organization, consists of Norway, Iceland and Liechtenstein, which are not members of the EU. EEA Member States are sometimes bound by the EU laws based on prior basic arrangements of both parties, EU and EEA.

<sup>70</sup> European Free Trade Association (EFTA), a free trade grouping in Europe, is composed of Norway, Iceland, Liechtenstein, and Switzerland, all non-EU member States.

<sup>71</sup> As shown in Annex B in accordance with art. 3(7). Kyoto Protocol, *supra* note 21.

<sup>72</sup> *Id.*

year 2012. But this consequence was not one intended by the Kyoto Protocol, which clearly obliges the Annex I countries only to reduce GHG through 2012. The outcome is that European operators have drawn non-EU airlines, operating to and from the EU, to be on equal footing in reducing GHG from 2012, when legally no other States other than the Annex I countries are subject to the reduction regime, at least until 2012, under the Kyoto Protocol of universal application.

Another phenomenon that is favorable to the EU is that when intra-EU aircraft operations for European operators are considered international flights, the burden of the European operators is that much lessened because it is not subject to emissions reduction pursuant to the Kyoto Protocol. If this is the case, the EU is apparently selecting the most favorable rules in aviation, because its member States are allowed to enjoy *de facto* cabotage rights despite contrary provisions of the Chicago Convention.<sup>73</sup>

Despite the above analyses, it is not clear whether international law permits certain States, here the EU, to impose restrictions on outside aircraft operators as they are prescribed in the EU Directive. As seen earlier, Article 2.2 of the Kyoto Protocol, considered to have universal application, simply entrusts Annex I countries that are Parties to the Protocol to pursue limits or reduce GHG from aviation bunker fuels working through ICAO. No agreement has been reached in this regard.

In December 2009, the Air Transport Association of America (ATA),<sup>74</sup> American Airlines, Continental Airlines, and United Airlines made a claim against the UK Secretary of State for En-

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<sup>73</sup> Article 7 of the Chicago Convention obliges contracting States not to grant "on an exclusive basis" cabotage to another State. However, there are many such examples of *de facto* cabotage among their member States in the area of the European Union on its way to political integration after completing the economic one. Examples are numerous: British Airways operates Toulouse-Paris in France; The Dutch carrier Transavia operates intra-France rights through a daughter company; A Swedish carrier operates Barcelona-Madrid in Spain. Low cost carriers do the same in Europe. The EU may argue that the practices are not contrary to Article 7 of the Chicago Convention, interpreting "on an exclusive basis" in the same article to their favor. Chicago Convention, *supra* note 31, at art. 7.

<sup>74</sup> Founded in 1936, ATA is the oldest and largest airline trade association of the USA, representing the nation's leading airlines. See Air Transport Association, <http://www.airlines.org/pages/home.aspx> (last visited Feb. 4, 2011).

ergy and Climate Change before the Administrative Court of the UK High Court of Justice concerning the scope of application of EU Directive 2008/101/EC.<sup>75</sup> The principal point made by the claimants concerns the extension of the EU ETS to the airspace of third countries that are not EU States and over the high seas, as the Directive defines “aviation activities” as covering “flights which depart from or arrive in an aerodrome situated in the territory of a member State to which the EU Treaty applies.”<sup>76</sup> Moreover, the claimants point out that the EU ETS has been drawn up outside the framework of the ICAO that received the mandate to set up worldwide scheme from the Kyoto Protocol.<sup>77</sup>

The English High Court recently gave the ATA and its three member airlines – American, Continental, and United – permission to take its legal challenge of the EU’s emission trading scheme to the European Court of Justice.<sup>78</sup>

#### 4. *Precedents of EU initiatives*

As the leading guardian of the environment in the world, the EU has the precedents of taking the initiatives earlier on another matter of environment, i.e. noise emissions.

The European Union, through its Directive 80/51/EEC, prohibited EU aircraft that do not meet the Chapter 3 noise level of Annex 16<sup>79</sup> from operating inside EU from the end of 1986 while

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<sup>75</sup> Three airlines filed the lawsuit in the UK since it is the country responsible for overseeing their ETS compliance as the Administering EU Member State. The lawsuit was filed with the UK Administrative Court of the High Court of Justice instead of the European Court of Justice (ECJ) having jurisdiction over all EU Member States because private parties cannot have their case heard by the ECJ without the court of a specific EU Member State directing the case there.

<sup>76</sup> For a brief history of this bringing action to the court see Pablo Mendes de Leon, *ATA and others v. the UK Secretary of State for Energy and Climate Change (2009)*, 35 *AIR & SPACE L.*, 199-200 (2010).

<sup>77</sup> *Id.* at 199.

<sup>78</sup> Lori Ranson, *US Challenge of EU’s ETS moves to the next level*, FLIGHT GLOBAL, May 27, 2010, <http://www.flightglobal.com/articles/2010/05/27/342529/us-challenge-of-eus-ets-moves-to-the-next-level.html>.

<sup>79</sup> One of the 18 Annexes to the Chicago Convention that provide detailed technical Standards and Recommended Practices for the uniform application of air navigation for the sake of safe and efficient operation of aircraft. Annex 16 prescribes rules and procedures on Environmental Protection, Volume I of which provides different levels of noise criteria of aircraft from Chapter 2 to Chapter 4 in the order of noise-making. Annex 16, *supra* note 32.

through its Directive 83/206/EEC<sup>80</sup> prohibiting non-EU aircraft from the end of 1987, with the final clauses that both Directives can be put on hold for two years. The measures evoked outrage from the majority of ICAO member States, which contested their legality and reasonableness. Hence the ICAO summoned a Special Assembly Meeting in 1990 and adopted a resolution,<sup>81</sup> whereby it was urged for member States to phase-out gradually the noisy Chapter 2 aircraft over the period of seven years 1995 to 2002. In the meantime, both Directives were suspended.

As a further measure on noise control, the EU adopted Council Directive 89/629/EEC in 1989 to prohibit the registration of aircraft which did not meet Chapter 3 noise level requirements, as of 2 November 1990. It did not bar, however, the reconditioning of the aircraft engines to have them recertified to meet the Chapter 3 Standard. Consequently, lots of Chapter 2 aircraft were retrofitted with hush-kits<sup>82</sup> to reduce the noise rather than being substituted by costly new aircraft. The EU subsequently took steps to deal with this unexpected circumvention by air carriers and adopted Council Regulation 925/1999<sup>83</sup> in 1999 to prohibit the recertificated aircraft (by hush-kitting) from flying into the EU area. This in turn upset the US government because the majority of Chapter 2 aircraft subject to the EU measures were American-made like Boeing 707, 727, DC-9. The US government made a complaint to the ICAO Council in accordance with Article 84 of the Chicago Convention in 2000.

Faced with the US' official complaint to the ICAO, the EU stepped back and suggested a one year deferment of the Regulation to allow time for American aircraft to replace the noisy engines. Nevertheless, the US government pushed the case forward. The EU submitted to the ICAO Council its Preliminary

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<sup>80</sup> Council Directive 89/629/EEC, 1989 O.J. (L 363) 27-29.

<sup>81</sup> ICAO, Assemb. Res. A28-3 (1990).

<sup>82</sup> Hush-kitting a Boeing 737 cost about US\$1 million, about 330 pounds more in weight, and a fuel burn increase of 0.5%; this could reduce aircraft noise by seventeen decibels, enough to recertify a Chapter 2 as that of a Chapter 3. PAUL DEMPSEY, PUBLIC INTERNATIONAL AIR LAW 425 (2008).

<sup>83</sup> Council Regulation (EC) 925/1999, 1993 O.J. (L 115) 1.

Objection challenging the Council's authority to deal with the case. On 16 November 2000, for the first time in the history of ICAO, the Council made a decision. It rejected the EU position through its decision, although not on the merits, as regards to the dispute settlement referred to it. The EU softened its position and did not bring the case to the International Court of Justice (ICJ), which might have aggravated the situation. Instead, it presented its counter-memorial to the Council, which afterwards recommended negotiation between the disputing parties. With the good offices of the President of the ICAO Council, both parties settled the case in October 2001. The agreed solution was for the EU to repeal the Regulation in April 2002 and the USA withdraw its complaint from the Council.<sup>84</sup>

## V. RELEVANT LAWS AND POLICIES TO REDUCE GHG IN KOREA

### *1. Framework Act on Low Carbon, Green Growth*

Under President Lee Myung-bak of Korea, a major policy shift was to accommodate the world-wide trend of environmentally friendly policies rather than reluctantly following them, as was done in the past. President Lee recognized the importance of coping creatively with the unprecedented challenges of our time and playing a leading role in the international arena by changing our way of thinking and proclaimed "Low Carbon, Green Growth." This green policy combined with an economic development strategy became the new vision to lead the nation's development for the next sixty years.<sup>85</sup>

In the same vein, the Korean government announced the nation's mid-term plan for the reduction of GHG emissions outlining a 30% reduction compared to the business-as-usual by 2020. In order to support this ambitious target, the government

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<sup>84</sup> See WON-HWA PARK, *AIR LAW* 95-99, 160-162 (3<sup>rd</sup> Ed., 2009).

<sup>85</sup> Lee Myung-bak, *Address by President Lee Myung-bak on the 63rd anniversary of national liberation and the 60th anniversary of the founding of the republic of Korea*, Aug. 15, 2006, [http://english.president.go.kr/pre\\_activity/speeches/speeches\\_view.php?uno=270](http://english.president.go.kr/pre_activity/speeches/speeches_view.php?uno=270).

enacted the Framework Act on Low Carbon, Green Growth in 2009, which became effective in January 2010.<sup>86</sup>

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)<sup>87</sup>

### *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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<sup>86</sup> Framework Act on Low Carbon, Green Growth, *supra* note 41.

<sup>87</sup> *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<sub>2</sub> equivalent<sup>88</sup> or over or the entity consumes 500 (350 from Jan. 2012, 200 from Jan. 2014) terajoules<sup>89</sup> 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<sub>2</sub> equivalent or over or when consumes 100 (90 from Jan. 2012, 80 from Jan. 2014) terajoules or over until the end of 2011<sup>90</sup>

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).<sup>91</sup> However, without foreseen schedules, aviation, rail,

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<sup>88</sup> Twenty-five tons of CO<sub>2</sub> equivalent emissions require the burning of twenty-two tons of fuel oil every day.

<sup>89</sup> 100 terajoules' consumption is equal to about 2,400 tons of oil equivalent.

<sup>90</sup> Enforcement Decree of the Framework Act on Low Carbon, Green Growth, *supra* note 42.

<sup>91</sup> 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.<sup>92</sup>

Another relevant law is the Sustainable Transport and Logistics Act.<sup>93</sup> 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<sub>2</sub> 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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<sup>92</sup> Enforcement Decree, *supra* note 42, at art. 37.

<sup>93</sup> 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<sup>94</sup> 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

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<sup>94</sup> 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.<sup>95</sup> 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

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<sup>95</sup> 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.<sup>96</sup>

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<sup>97</sup> 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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<sup>96</sup> *Industry and NGOs say ICAO has lost control*, *supra* note 95.

<sup>97</sup> 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 airlines that have to deal with the impending enforcement of EU. In this regard, Korean airlines 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.<sup>98</sup>

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?<sup>99</sup> On the other hand, the international shipping industry is likely to be subject to the emissions reduction regime in the

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<sup>98</sup> Council Directive 2003/87/EC, *supra*, note 52, at art. 11a.

<sup>99</sup> In 2000, CO<sub>2</sub> 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.<sup>100</sup> 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.

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<sup>100</sup> 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 21<sup>ST</sup> 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,<sup>1</sup> China,<sup>2</sup> India,<sup>3</sup> and Japan<sup>4</sup> have

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<sup>1</sup> 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](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](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/](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.

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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>.

<sup>2</sup> 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](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.chinadaily.com.cn/china/2008-03/11/content\\_6527471.htm](http://www.chinadaily.com.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](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](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>.

<sup>3</sup> 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](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.*

<sup>4</sup> 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](http://www.jaxa.jp/projects/sat/selene/index_e.html) (last visited Nov. 3, 2010).

In this respect, China<sup>5</sup> and India<sup>6</sup> 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.<sup>7</sup>

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,<sup>8</sup> 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 space-faring States, have ratified the Agreement.<sup>9</sup> 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.”<sup>10</sup> Developed and developing States held different interpretations of this concept and

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<sup>5</sup> *China Considering Manned Lunar Landing in 2025-2030*, CHINA VIEW, May 24, 2009, [http://news.xinhuanet.com/english/2009-05/24/content\\_11425131.htm](http://news.xinhuanet.com/english/2009-05/24/content_11425131.htm).

<sup>6</sup> 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>.

<sup>7</sup> See *supra* note 1.

<sup>8</sup> 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].

<sup>9</sup> *Id.*

<sup>10</sup> 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.<sup>11</sup>

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,<sup>12</sup> 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.<sup>13</sup>

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<sup>11</sup> FABIO TRONCHETTI, *THE EXPLORATION OF NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES* 57-61 (2009).

<sup>12</sup> 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*].

<sup>13</sup> 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.<sup>14</sup>

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.<sup>15</sup> 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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<sup>14</sup> FABIO TRONCHETTI, *supra* note 11, at 5.

<sup>15</sup> 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](http://www.nasa.gov/mission_pages/cassini/main/index.html); and [http://www.nasa.gov/mission\\_pages/deep\\_impact/main/](http://www.nasa.gov/mission_pages/deep_impact/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.<sup>16</sup>

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

### 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,<sup>21</sup> 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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<sup>16</sup> 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>.

<sup>17</sup> TRONCHETTI, *supra* note 14, at 6.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

<sup>20</sup> *Id.*

<sup>21</sup> 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*.<sup>22</sup>

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*,<sup>23</sup> namely an area which is not under the sovereignty of any State and hence susceptible of being occupied and acquired by States.<sup>24</sup> 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.<sup>25</sup> 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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<sup>22</sup> 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).

<sup>23</sup> See BROWNLIE, *supra* note 22, at 147; SHAW, *supra* note 22, at 423-26, 432-38.

<sup>24</sup> 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).

<sup>25</sup> 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.”<sup>26</sup> 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.<sup>27</sup>

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

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<sup>26</sup> 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).

<sup>27</sup> 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,<sup>28</sup> others, the majority, argue that by analogy with the rules regulating the freedom of the high seas,<sup>29</sup> the appropriation of space resources merely forms part of the freedom of exploration and use of outer space.<sup>30</sup> 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.”<sup>31</sup> 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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<sup>28</sup> 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).

<sup>29</sup> 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).

<sup>30</sup> 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).

<sup>31</sup> Outer Space Treaty, *supra* note 12, at art. I, para 1.

nity for development for all humankind.<sup>32</sup> 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.<sup>33</sup>

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.<sup>34</sup> The road towards

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

<sup>33</sup> Outer Space Treaty, *supra* note 12, at art. I, para. 3.

<sup>34</sup> 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.<sup>35</sup> As of 1 November 2009 the Moon Agreement has 13 ratifications, with an additional four States being signatories to it.<sup>36</sup> 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.<sup>37</sup>

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).

<sup>35</sup> 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.

<sup>36</sup> 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).

<sup>37</sup> 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.<sup>38</sup> 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 extra-terrestrial 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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<sup>38</sup> 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 Recherche 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.<sup>39</sup> 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.<sup>40</sup>

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,<sup>41</sup> to the need to promote higher standards of living and conditions of economic and social progress and development,<sup>42</sup> and to the necessity to prevent the disruption of the lunar environment.<sup>43</sup>

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.<sup>44</sup> 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.<sup>45</sup> 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.<sup>46</sup>

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<sup>39</sup> Moon Agreement, *supra* note 8, at art. 11, para. 2.

<sup>40</sup> *Id.* at art. 11, para. 3.

<sup>41</sup> See Moon Agreement, *supra* note 8, at art. 4 para. 1.

<sup>42</sup> *Id.*

<sup>43</sup> *Id.* at art. 7 para. 1.

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

<sup>45</sup> See Moon Agreement, *supra* note 8, at art. 6, para. 2.

<sup>46</sup> *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.”<sup>47</sup>

### 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<sup>48</sup> and early 1980s and which found application in two international legal instruments, the Moon Agreement and the 1982 Law of the Sea Convention.<sup>49</sup>

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<sup>47</sup> 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 AUSLÄNDISCHES OFFENTLICHES RECHT UND VOLKERRECHT 312 (1983); Kunihiko Tatsu-zawa, *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).

<sup>48</sup> 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).

<sup>49</sup> 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.<sup>50</sup> 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.<sup>51</sup> 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.<sup>52</sup> 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).

<sup>50</sup> 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 Reevaluation of Values Constituting the International Legal Regime for Outer Space Activities*, 26 RUTGERS L.J. 225 (1994).

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

<sup>52</sup> 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.<sup>53</sup>

The problem with the common heritage of mankind concept is that developing and developed States hold opposite views about its interpretation and application.<sup>54</sup> The former group advances a “common property” interpretation of the common heritage of mankind concept for areas beyond national jurisdiction.<sup>55</sup> 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.<sup>56</sup> 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.<sup>57</sup> 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.<sup>58</sup> 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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<sup>53</sup> 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).

<sup>54</sup> See Harminderpal Singh Rana, *supra* note 50; see also Mary Victoria White, *supra* note 47.

<sup>55</sup> M.C.W. Pinto, Alternatives in Mining, PROCEEDINGS, LAW OF THE SEA INSTITUTE (1978).

<sup>56</sup> 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, 96<sup>th</sup> Cong. 2<sup>nd</sup> Sess. (1980), Statement of Robert B. Owen, Legal Advisor to the United States Secretary of State [hereinafter Hearings].

<sup>57</sup> *Id.*

<sup>58</sup> 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.<sup>59</sup> 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.”<sup>60</sup> 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.<sup>61</sup> 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.”<sup>62</sup> 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.”<sup>63</sup> This indicates that the interpreta-

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<sup>59</sup> 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).

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

<sup>61</sup> 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).

<sup>62</sup> Moon Agreement, *supra* note 8, at art. 11, para. 1.

<sup>63</sup> 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-SECOND 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.<sup>64</sup>

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.<sup>65</sup>

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).

<sup>64</sup> Moon Agreement, *supra* note 8, at art. 11, para. 3.

<sup>65</sup> *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,<sup>66</sup> 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.<sup>67</sup>

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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<sup>66</sup> Convention on the Law of the Sea, *supra* note 49, at Part XI.

<sup>67</sup> 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.<sup>68</sup> 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.<sup>69</sup> 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.<sup>70</sup> 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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<sup>68</sup> Hearings, *supra* note 56.

<sup>69</sup> 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).

<sup>70</sup> 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 it 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.<sup>71</sup> How should this provision be interpreted? What does “equitable” mean?<sup>72</sup> 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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<sup>71</sup> Moon Agreement, *supra* note 8, at art. 11, para. 7.

<sup>72</sup> 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<sup>73</sup>] 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."<sup>74</sup> 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."<sup>75</sup> 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 resources as soon as this exploitation is feasible. Nevertheless, the analysis of the *travaux 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.<sup>76</sup>

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,<sup>77</sup> and the

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<sup>73</sup> This is added to the original Christol's text for reasons of clarity.

<sup>74</sup> 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).

<sup>75</sup> 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).

<sup>76</sup> 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).

<sup>77</sup> 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<sup>78</sup> 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.<sup>79</sup> 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.

<sup>78</sup> 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.

<sup>79</sup> 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.<sup>80</sup>

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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<sup>80</sup> 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.<sup>81</sup> This development, which has been directly influenced by an effort undertaken by the COPUOS aimed at enhancing support of the existing space law treaties,<sup>82</sup> 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.<sup>83</sup> 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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<sup>81</sup> These States are Kazakhstan in 2001, Belgium in 2004, Chile in 2005 and Lebanon in 2007.

<sup>82</sup> 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.

<sup>83</sup> 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.”<sup>84</sup> 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 preclude 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.<sup>85</sup>

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<sup>84</sup> 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.*

<sup>85</sup> 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.<sup>86</sup> 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.<sup>87</sup> 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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<sup>86</sup> 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.

<sup>87</sup> 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.<sup>88</sup> 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.<sup>89</sup>

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-

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<sup>88</sup> 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).

<sup>89</sup> 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.<sup>90</sup> In order to be used, these minerals need to be removed from their original location.<sup>91</sup> 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 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.<sup>92</sup>

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

<sup>91</sup> G. FAURE & T. MENSING, AN INTRODUCTION TO PLANETARY SCIENCE, 165 (2007).

<sup>92</sup> 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<sup>93</sup> 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.

<sup>93</sup> 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).<sup>94</sup> 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.<sup>95</sup> 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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<sup>94</sup> 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).

<sup>95</sup> 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/displ\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/displ_e.htm) (last visited Feb. 4, 2011).

more feasible solution.<sup>96</sup> Surely amending an existing treaty is faster than 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-

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<sup>96</sup> 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,<sup>1</sup> 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.<sup>2</sup> 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,<sup>3</sup> 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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<sup>1</sup> Kenneth Chang, *Scientists See Fresh Evidence of More Water on the Moon*, N.Y. TIMES, March 9, 2010, at D3, col. 1.

<sup>2</sup> *Id.*

<sup>3</sup> 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,<sup>4</sup> 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.<sup>5</sup>

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<sup>4</sup> 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.

<sup>5</sup> *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.<sup>6</sup> 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."<sup>7</sup> 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. Cooperation 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.<sup>8</sup>

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

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<sup>6</sup> 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).

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

<sup>8</sup> 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).

<sup>9</sup> *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,<sup>10</sup> 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.<sup>11</sup> 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.<sup>12</sup> The International Court of Justice recognized this duty to inform in the *Corfu Channel Case*,<sup>13</sup> 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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<sup>10</sup> 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).

<sup>11</sup> 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..."

<sup>12</sup> 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).

<sup>13</sup> *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<sup>14</sup> 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.<sup>15</sup>

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.<sup>16</sup> The Espoo Convention also requires an environmental impact assessment for activities that are likely to cause a significant transboundary impact.<sup>17</sup> Along these same lines, a State also has a duty to provide prior notification for transboundary shipment of wastes. The Basel Convention<sup>18</sup> and the IAEA Code of Practice on the International Transboundary Movement of Ra-

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<sup>14</sup> 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).

<sup>15</sup> *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).

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

<sup>17</sup> 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.”

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

radioactive Waste<sup>19</sup> 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 Gabčíkovo-Nagymaros Dam*,<sup>20</sup> 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 . . .”<sup>21</sup> 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.”<sup>22</sup>

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.<sup>23</sup> 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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<sup>19</sup> 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).

<sup>20</sup> Gabčíkovo Nagymaros Project (Hung. v. Slov.), 1997 I.C.J. 7, ¶ 147 (Sept. 25).

<sup>21</sup> PATRICIA W. BIRNIE AND ALAN E. BOYLE, *INTERNATIONAL LAW & THE ENVIRONMENT* 108 (2d ed. 2002).

<sup>22</sup> *Id.*

<sup>23</sup> *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.*<sup>24</sup>

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:

(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 . . .<sup>25</sup>

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."<sup>26</sup>

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<sup>24</sup> 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).

<sup>25</sup> *Id.* at ¶ 106(1) (emphasis added).

<sup>26</sup> *Id.* at ¶ 106(2).

## III. INTERNATIONAL RIVER LAW

Although at one point, the United States promoted the "Harmon Doctrine,"<sup>27</sup> 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,<sup>28</sup> which has been ratified by 13 countries, contains the following important provision:

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<sup>27</sup> 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).

<sup>28</sup> 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.<sup>29</sup> 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.<sup>30</sup> Because of the scarcity

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<sup>29</sup> R.L. DEWSNUP & D.W. JENSEN, A SUMMARY-DIGEST OF STATE WATER LAWS 35 (1973).

<sup>30</sup> 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,<sup>31</sup> Oklahoma,<sup>32</sup> Oregon,<sup>33</sup> and Texas<sup>34</sup> 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 *au-wai*.”<sup>35</sup> 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.”<sup>36</sup>

As Westerners came to dominate the economic and political life of the islands,<sup>37</sup> 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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<sup>31</sup> Dewsnap & Jenson, *supra* note 29, at 129-154.

<sup>32</sup> *Id.* at 603-618.

<sup>33</sup> *Id.* at 619-636.

<sup>34</sup> *Id.* at 699-714.

<sup>35</sup> 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).

<sup>36</sup> Antonio Perry, *Hawaiian Water Rights*, 23 YALE L.J. 437, 442 (1914).

<sup>37</sup> 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.”<sup>38</sup> 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.<sup>39</sup>

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.<sup>40</sup> 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;
- (2) is a reasonable-beneficial use as defined in section 174-5;[<sup>41</sup>]
- (3) will not interfere with an existing legal use of water;
- (5) is consistent with the public interest;
- (6) is consistent with state and county general plans and land use designations;

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<sup>38</sup> Van Dyke, *Water Rights*, *supra* note 35, at 143.

<sup>39</sup> *See, e.g.*, *Territory v. Gay*, 31 Hawai‘i 376 (1930).

<sup>40</sup> *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).

<sup>41</sup> “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.<sup>42</sup>

The Water Code gives priority to using water for “domestic uses” and “municipal uses” that serve the public interest,<sup>43</sup> and the Hawai‘i Supreme Court has emphasized the underlying principles of the public trust doctrine that apply to all uses of water.<sup>44</sup> 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.”<sup>45</sup> 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.”<sup>46</sup> This doctrine does not “safeguard rights of exclusive use for private commercial gain.”<sup>47</sup>

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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<sup>42</sup> Hawai‘i Revised Statutes, § 174C-49.

<sup>43</sup> *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*).

<sup>44</sup> *Waiahole I*, *supra* note 43.

<sup>45</sup> *Id.* at 128 (internal quotation marks and citations omitted).

<sup>46</sup> *Id.* at 142.

<sup>47</sup> *Id.* at 138.

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

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.<sup>49</sup>

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*.<sup>50</sup> 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."<sup>51</sup> 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.<sup>52</sup> Section 7-1 "was originally enacted in 1850 as section 7 of what has come to be known as the Kuleana Act,"<sup>53</sup> 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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<sup>48</sup> *Robinson v. Ariyoshi*, 65 Hawai'i. 641, 667, 658 P.2d 287, 305-06 (1982).

<sup>49</sup> "[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.

<sup>50</sup> *Reppun v. Board of Water Supply*, 65 Hawaii 531, 656 P.2d 57 (1982).

<sup>51</sup> *Id.* at 539, 656 P.2d at 63.

<sup>52</sup> *Id.* at 550, 656 P.2d at 70.

<sup>53</sup> *Id.* at 549, 656 P.2d at 69.

be applicable to wells and watercourses, which individuals have made for their own use.<sup>54</sup>

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.'"<sup>55</sup> 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."<sup>56</sup>

*B. Robinson v. Ariyoshi (1982)*

Similar conclusions are found in *Robinson v. Ariyoshi*.<sup>57</sup> 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."<sup>58</sup> 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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<sup>54</sup> Hawai'i Revised Statutes, § 174C-1 (2010).

<sup>55</sup> *Reppun v. Board of Water Supply*, *supra* note 50, at 550, 656 P.2d at 70.

<sup>56</sup> *Id.*

<sup>57</sup> *Robinson v. Ariyoshi*, 65 Hawaii 641, 658 P.2d 287 (1982).

<sup>58</sup> *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).<sup>59</sup>

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.”<sup>60</sup> 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.”<sup>61</sup> 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.”<sup>62</sup>

### 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.<sup>63</sup> 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.”<sup>64</sup> “This authority empowers the state to revisit prior diversions and allocations, even those made with due consideration of their effect on the public trust.”<sup>65</sup> Any claim by a private

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<sup>59</sup> *Id.* at 667, 658 P.2d at 305-06.

<sup>60</sup> *Id.* at 649 n. 8, 658 P.2d at 295 n.8.

<sup>61</sup> *Id.*

<sup>62</sup> *Id.* at 677, 648 P.2d at 312.

<sup>63</sup> *Waiahole I*, *supra* note 43.

<sup>64</sup> *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.”)

<sup>65</sup> *Id.*

landowner for a permit must be evaluated in light of “the public interest in instream flows.”<sup>66</sup>

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)].<sup>67</sup>

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.<sup>68</sup>

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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<sup>66</sup> *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”).

<sup>67</sup> *Id.* at 181.

<sup>68</sup> Language in *Robinson v. Ariyoshi*, 753 F.2d 1468 (9<sup>th</sup> 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 (9<sup>th</sup> 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 (9<sup>th</sup> Cir. 1991).

uses.”<sup>69</sup> 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.<sup>70</sup>

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.<sup>71</sup>

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.”<sup>72</sup>

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<sup>69</sup> 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).

<sup>70</sup> *Id.*

<sup>71</sup> *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).

<sup>72</sup> *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.<sup>73</sup> 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,<sup>74</sup> was confirmed in Principle 15 of the Rio Declaration, which states:

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<sup>73</sup> *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.*

<sup>74</sup> *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.*<sup>75</sup>

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.”<sup>76</sup> 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,<sup>77</sup> 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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<sup>75</sup> Rio Declaration, *supra* note 10, at Princ. 15 (emphasis added).

<sup>76</sup> BIRNIE & BOYLE, *supra* note 21, at 115.

<sup>77</sup> 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.<sup>78</sup> 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.<sup>79</sup>

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

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

<sup>79</sup> *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).

<sup>80</sup> 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).

<sup>81</sup> 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).

<sup>82</sup> *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.<sup>83</sup> 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*<sup>84</sup> and the 1996 *Nuclear Weapons Case*.<sup>85</sup>

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.*"<sup>86</sup>

*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.*<sup>87</sup>

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<sup>83</sup> See generally Van Dyke, *The Evolution and International Acceptance of the Precautionary Principle*, *supra* note 74.

<sup>84</sup> 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").

<sup>85</sup> 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").

<sup>86</sup> *Waiahole I*, *supra* note 43, 94 Hawai'i at 155 (emphasis added).

<sup>87</sup> *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?<sup>88</sup> 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<sup>89</sup> 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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<sup>88</sup> 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).

<sup>89</sup> 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.”<sup>1</sup> 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.<sup>2</sup> By providing accurate data information, remote sensing can provide early warning of environmental pollution and further offer invaluable services in

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<sup>1</sup> 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).

<sup>2</sup> 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."<sup>3</sup> 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."<sup>4</sup> 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.<sup>5</sup> 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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<sup>3</sup> Chi-fai Cheung, *HK's Role Limited, Yau Says*, SOUTH CHINA MORNING POST, Dec. 11, 2009, at 9.

<sup>4</sup> 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).

<sup>5</sup> 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](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.<sup>6</sup>

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.<sup>7</sup> 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

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<sup>6</sup> Industrial and Commercial Affairs, [http://www.cgcc.org.hk/b5/chamber/bulletin/files/AnnualArticle\\_1222675178.24654\\_IndustrialandCommercialAffairs.pdf](http://www.cgcc.org.hk/b5/chamber/bulletin/files/AnnualArticle_1222675178.24654_IndustrialandCommercialAffairs.pdf) (last visited Jan. 25, 2011).

<sup>7</sup> 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.”<sup>8</sup>

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.<sup>9</sup>

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.<sup>10</sup> 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.”<sup>11</sup> 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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<sup>8</sup> AsiaSat About Us, <http://www.asiasat.com/asiasat/contentView.php?section=1&lang=0> (last visited Feb. 4, 2011).

<sup>9</sup> 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).

<sup>10</sup> 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).

<sup>11</sup> *Id.*

ple's Republic of China.<sup>12</sup> 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."<sup>13</sup>

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."<sup>14</sup> At the moment, there is no comprehensive data protection law in Hong Kong.

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<sup>12</sup> 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>.

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

<sup>14</sup> 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](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.<sup>15</sup> 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.<sup>16</sup> 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.<sup>17</sup>

### *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).<sup>18</sup> Copyright has been broadly defined in the Ordinance to subsist in “original literary . . . [or] artistic works; . . . broadcasts; . . . and the typographical arrangement of published editions.”<sup>19</sup> 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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<sup>15</sup> Federation of American Scientists, Appendix F: Equivalent Foreign Security Classifications, [http://www.fas.org/irp/doddir/dod/5200-1r/appendix\\_f.htm](http://www.fas.org/irp/doddir/dod/5200-1r/appendix_f.htm) (last visited Oct. 20, 2010).

<sup>16</sup> 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>.

<sup>17</sup> See *id.* §§ 2.1-2.18.

<sup>18</sup> Copyright Ordinance, (2007) Cap. 528.

<sup>19</sup> *Id.* § 2(1).

of the public in Hong Kong or elsewhere.”<sup>20</sup> 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.<sup>21</sup>

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<sup>22</sup> and analyzed information.<sup>23</sup> 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.<sup>24</sup> 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.”<sup>25</sup> As discussed below, the Hong Kong

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<sup>20</sup> *Id.* § 8(1)(a).

<sup>21</sup> STEVEN L. OBERHOLTZER, *THE BASIC PRINCIPLES OF INTELLECTUAL PROPERTY LAW* 35 (Brinks Hoffer Gilson & Lione, 2006).

<sup>22</sup> 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.”).

<sup>23</sup> *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.”).

<sup>24</sup> 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).

<sup>25</sup> 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."<sup>26</sup> 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.<sup>27</sup> 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.<sup>28</sup> 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.<sup>29</sup> 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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<sup>26</sup> Remote Sensing Principles, *supra* note 22, at Principle I (b).

<sup>27</sup> See Dennis.S. Karjala, *Copyright in Electronic Maps*, 35 JURIMETRICS J., 395, 395-415 (1995).

<sup>28</sup> Remote Sensing Principles, *supra* note 22, at Principle XII.

<sup>29</sup> 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.<sup>30</sup> 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.<sup>31</sup> 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.<sup>32</sup> A list of product prices is reproduced below:<sup>33</sup>

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 #

<sup>30</sup> 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).

<sup>31</sup> Satellite Remote Sensing Receiving Station, *supra* note 10.

<sup>32</sup> *Id.*

<sup>33</sup> 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.”

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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.<sup>34</sup> 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.<sup>35</sup>

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<sup>34</sup> 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](http://www.fig.net/pub/fig2007/papers/ts_1d/ts01d_02_so_ng_1339.pdf).

<sup>35</sup> *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.<sup>36</sup>

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 Center-line.<sup>37</sup> 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.<sup>38</sup>

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<sup>36</sup> 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](http://www.devb.gov.hk/filemanager/en/content_384/frv1.pdf).

<sup>37</sup> *Id.* at page 1-8.

<sup>38</sup> Final Report, *supra* note 14, at (1-3)-(1-4).

The Lands Department has set up the web-based Data Dissemination System (DDS) as part of the data-sharing framework within the e-Government. The DDS facilitates the management and distribution of remote sensing data among Government departments, through its support in importing, manipulating, and integrating the data. Furthermore, such data, while enjoying copyright protection, are also “used by other public and private organizations as a common . . . reference for end-users and for value-adding users.”<sup>39</sup> The public can, through the DDS, enjoy the e-government services for the searching, browsing, ordering, and delivery of the data. In this way, the Lands department, through its DDS, is able to provide quality services to the government departments, private entities and individuals.

Licensing agreements have become a preferred means of control over the use and reproduction of spatial databases by suppliers around the world.<sup>40</sup> Hong Kong is no exception in this regard. A license agreement will be reached between data owners and data users through a data agent concerning the use of relevant data.<sup>41</sup> Relevant conditions, especially the copyright issue, data privacy, and sensitivity, will be put down in the agreement.<sup>42</sup> Since data owners are basically government departments, the copyright of the data automatically belongs to the Hong Kong Government. Different government departments might have different practice in this regard. Some “adopt a loosen [sic] approach releasing data freely” used by the user some are “more stringent . . . requiring the data [be used] for a specific purpose.”<sup>43</sup>

As far as fees are concerned, we may also refer to the Code on Access to Information, which requires that “[a]ny charges levied on requests for information will reflect the cost of provid-

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<sup>39</sup> Cheong & Tak, *supra* note 34, at 3.

<sup>40</sup> Smith & Doldrina, *supra* note 24, at 31.

<sup>41</sup> DDS of Lands Department, *Supplementary Feasibility Study Report, User Catalogue*, Ref. No.: T122, at 2.2-7 (June 2004) available at <http://www.landsd.gov.hk/mapping/en/news/frs22.pdf>.

<sup>42</sup> Final Report, *supra* note 14 at (1-2).

<sup>43</sup> Cheong & Tak, *supra* note 34 at 9-10.

ing the information.”<sup>44</sup> The policy of open access in Hong Kong requires that charges for information be simple and inexpensive; as further explained in the Guidelines to the Code on Access to Information, successful applicants for access to information should only be charged for the cost of reproducing the required documents, etc. at the current standard charge where one exists.<sup>45</sup>

#### V. CASE STUDY: GOOGLE’S MOVE FROM MAINLAND CHINA TO HONG KONG

After more than two months’ negotiations with the Chinese Government, Google decided to redirect its Chinese Internet search operations from censored mainland China to an uncensored site based in Hong Kong ([google.com.hk](http://google.com.hk)) on March 23, 2010.<sup>46</sup> This move has aroused heated discussions on various implications to the mainland citizens.

Under its WTO Commitments, China has opened its telecommunications services market to the extent as defined its undertakings: foreign entities can invest up to fifty percent of the joint ventures on value-added telecommunications services; as defined in the list of commitments, value-added services include online information and/or data processing (including transaction processing).<sup>47</sup> Naturally, Internet services belong to value-added services and fifty a percent cap applies to foreign investments in setting up joint-ventures. In spite of the above WTO commitments, China retains the sovereignty to set the laws within its territory as to the content regulation.<sup>48</sup>

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<sup>44</sup> Code on Access to Information, *supra* note 16, at § 1.24.

<sup>45</sup> Code on Access to Information: Guidelines for Departments, 25, *available at* <http://www.access.gov.hk/guidelines.pdf>.

<sup>46</sup> Miguel Helft & David Barboza, *Google Shuts China Site in Dispute Over Censorship*, N.Y. TIMES (March 22, 2010), *available at* <http://www.nytimes.com/2010/03/23/technology/23google.html>.

<sup>47</sup> *Trade in Services, The People’s Republic of China: Schedule of Specific Commitments*, GATS/SC/135 (Feb. 14, 2002), *available at* <http://docsonline.wto.org/DDFDocuments/t/SCHD/GATS-SC/SC135.doc>.

<sup>48</sup> Rachel Perkins, *Google vs. China*, VANDERBILT J. ENT. & TECH. LAW, JETLaw Blog, Mar. 30, 2010, <http://jetl.wordpress.com/2010/03/30/google-vs-china/>.

As such, Google entered the Chinese market with its Chinese search engine (google.cn) in January 2006. Upon entering the Chinese market, Google accepted the policies to censor its search results and signed “a licensing agreement that it will not circulate content on certain taboo subjects.”<sup>49</sup> Now Google has withdrawn from the Chinese market on account of cyber attacks and censorship.<sup>50</sup>

While examining the issues of cyber attacks and censorship in mainland China lies well beyond the research of the current paper, it would be interesting to see the access of Google map and relevant remote sensing data/information available to mainland citizens. As a general practice, Google provides remote sensing data freely on its website. Users can access to the information for their daily use. By moving its search engine to Hong Kong, Google relieves its obligation to censor online contents, leaving the task of censorship to mainland’s powerful Great Firewall,<sup>51</sup> as such, mainland users can still largely make use of Google’s services. And more importantly, as suggested by one commentator, “[a]ny searches conducted on google.com.hk within China, will be filtered and it will likely produce the same filtered results that a search on google.com would produce if performed in China.”<sup>52</sup> At the moment, Google’s map and other services are still available to mainland citizens.<sup>53</sup>

Furthermore, although Hong Kong enjoys a high degree of autonomy from mainland China, “the Chinese government could potentially take steps to block Google servers.”<sup>54</sup> There is no clear indication about whether the Hong Kong-based services

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<sup>49</sup> Elizabeth M. Lynch, *Google & China: Full of Sound & Fury, Signifying Nothing?*, CHINA LAW & POLICY, Mar. 24, 2010, <http://chinalawandpolicy.com/2010/03/24/google-china-full-of-sound-fury-signifying-nothing/>.

<sup>50</sup> Michael Wines & Jonathan Ansfield, Google’s Troubles in China are Just Beginning, *The International Herald Tribune*, Mar. 24, 2010, at 1.

<sup>51</sup> “The Great Firewall is a protective mechanism that filters search results before they enter mainland China.” Lynch, *supra* note 49. No doubt all the information from Hong Kong will be subject to the Great Firewall. *Id.*

<sup>52</sup> *Id.*

<sup>53</sup> Stefan Geens, *Google Maps: Still Doomed in China*, Oct. 26, 2010, <http://ogleearth.com/2010/10/google-maps-still-doomed-in-china>.

<sup>54</sup> Michael B. Farrell, *Google ends Internet Censorship, Dares China to make next move*, THE CHRISTIAN SCIENCE MONITOR, Mar. 22, 2010, <http://www.csmonitor.com/USA/2010/0322/Google-ends-Internet-censorship-dares-China-to-make-next-move/>.

would remain available in the mainland. As such, what will be the legal consequence by blocking the access of those services? This is one legal issue among many others.

By denying complete access to Google services, mainland Government could be in a position to encourage other Internet enterprises to provide similar services as long as such remote sensing data/information does not violate Chinese law. In case substitute services are not available in the mainland, mainland users might revert to Google's Hong Kong branch for such services. As discussed above, Hong Kong takes a liberal attitude in access to remote sensing data; the companies are free to decide on transactions of remote sensing data on market value. Under such circumstances, Google's Hong Kong existence shall have no problem in supplying its Google map services and remote sensing data to mainland consumers, possibly again free of charge. Even if Google does not wish to give away its valuable remote sensing data freely to its competitors in the mainland market, the fees charged for the transaction of such data will reflect market prices and be affordable to consumers.

In this regard, one noteworthy point is the influence on mainland China of the ongoing trend of lifting local restrictions on access to remote sensing data. It is said that "the present global trend of increasing informal e-mail exchanges between individuals and access to relevant Web Sites will undoubtedly help to improve information exchange on a regional scale. However, the information made available on Web Sites may still be subject to restrictions in the absence of formal agreements to the contrary."<sup>55</sup> The event of Google's retreat from the mainland market also directly affirms the two different regimes in mainland China and Hong Kong for public access to remotely sensed imagery.

The importance of the right of individuals to freely choose their sources of information has been recognized worldwide. The right has been well put down in important international human rights documents. The Universal Declaration of Human Rights, adopted in 1948 by the General Assembly of the United Nations,

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<sup>55</sup> Hubert George, *Developing Countries and Remote Sensing: How Intergovernmental Factors Impede Progress*, 16 *SPACE POLICY*, 267, 268 (2000).

has clear wordings that “[e]veryone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.”<sup>56</sup> This document, while not a treaty and binding on the States, has been claimed to constitute customary international law and thus shall be strictly followed by the States.<sup>57</sup> The above right has been further elaborated in the International Covenant on Civil and Political Rights.<sup>58</sup> Although not yet a member, China has signed the document and thus shall act, in good faith, “not to defeat the object and purpose” of the Covenant.<sup>59</sup> This Covenant reiterates the individual’s right to freedom of expression and provides that “the right to freedom of expression . . . include[s] freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice.”<sup>60</sup> Certain restrictions have been identified in this Covenant, which include the circumstances for “respect of the rights or reputations of others,” and/or “for the protection of national security or of public order, or of public health or morals;” but these restrictions shall only be “such as are provided by law and are necessary.”<sup>61</sup> The media mentioned in the above two international documents obviously covers satellite and Internet. Correspondingly, the right of access to Internet information or remote sensing data lies within the scope of the above documents. As a result, Google’s move from mainland to Hong Kong has no doubt serious implications to the mainland citizens’ right concerning their choice of information.

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<sup>56</sup> Universal Declaration of Human Rights, G.A. Res. 217A, Art. 19, U.N. GAOR, 3d Sess., 1st Plen. Mtg., U.N. Doc. A/810 (Dec. 12, 1948).

<sup>57</sup> See Lisa L. Turner & Lynn G. Norton, *Civilians At the Tip of the Spear*, 51 A.F. L. REV. 1, 75-76 (2001).

<sup>58</sup> This document is adopted and opened for signature, ratification and accession by General Assembly resolution 2200A (XXI) of Dec. 16, 1966; it entered into force on Mar. 23, 1976.

<sup>59</sup> Vienna Convention on the Law of Treaties, art. 18, May 23, 1969, 1155 U.N.T.S. 331.

<sup>60</sup> International Covenant on Civil and Political Rights, pt. III, art. 19(2), Dec. 19, 1966, 999 U.N.T.S. .

<sup>61</sup> *Id.* at pt. III, art. 19(3).

At the moment there are no clear rules on the issue of access to remote sensing data in mainland. We may refer to the cooperative framework set up by the Brazil and China for the *CBERS* Application System. Under the framework, *CBERS* data is only available for free for all the Latin American countries and some African countries.<sup>62</sup> The downlink data is available to other countries on per-minute fee basis.<sup>63</sup> Domestically, we may refer to the Interim Measure on the Use of Aero-Remote Sensing Data during the Earthquake Relief Period (the Measure).<sup>64</sup> The use of remote sensing data is restricted to relevant departments under State Council and People's Government in the disaster area.<sup>65</sup> The users should specify the purpose and applicable scope of the data in advance.<sup>66</sup> The users are required to sign confidentiality agreement for the use of secret data.<sup>67</sup>

The above practice shows that remote sensing data are strictly controlled by the Chinese government. Commercialization of remote sensing data has been on the track internationally; however, domestically, the government exerts strict rules on accessing the remote sensing data. On both circumstances, the most prominent restriction lies in the protection of state secrets.

According to the Law on Guarding State Secrets,<sup>68</sup> state secrets include those "concerning major policy decision on state affairs; . . . in the building of national defence and in the activities of the armed forces; . . . in diplomatic activities and in ac-

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<sup>62</sup> National Institute for Space Research, *China-Brazil Earth Resource Satellite Announces the End of the CBERS-2B Operations*, May 12, 2010, [http://www.inpe.br/ingles/news/news\\_dest118.php](http://www.inpe.br/ingles/news/news_dest118.php).

<sup>63</sup> JOANNE IRENE GABRYNOWICZ, *THE LAND REMOTE SENSING LAWS AND POLICIES OF NATIONAL GOVERNMENTS: A GLOBAL SURVEY* (2007), available at <http://www.spacelaw.olemiss.edu/publications/noaa.pdf>.

<sup>64</sup> Interim Measure on the Use of Aero-Remote Sensing Data during the Earthquake Relief Period, May 16, 2008, <http://vip.chinalawinfo.com/newlaw2002/SLC/SLC.asp?Db=chl&Gid=105198> (last visited Jan. 25, 2011).

<sup>65</sup> *Id.* at art. 2.

<sup>66</sup> *Id.* at art. 4.

<sup>67</sup> *Id.* at art. 6.

<sup>68</sup> Law on Guarding State Secrets (promulgated by the Standing Comm. Nat'l People's Cong., Sept. 5, 1988, effective May 1, 1989) (P.R.C.), art. 8, translated at Selected Legal Provisions of the People's Republic of China Affecting Criminal Justice, <http://www.cecc.gov/pages/newLaws/protectSecretsENG.php>.

tivities related to foreign countries as well as to be maintained as commitments to foreign countries; . . . in national economic and social development; concerning science and technology; . . . concerning activities for safeguarding state security and the investigation of criminal offences; and other matter classified” by the state secret-guarding department.<sup>69</sup> State secrets are further classified into three categories: “most confidential, classified and confidential.”<sup>70</sup> Anyone who “intentionally or negligently releases state secrets shall bear criminal liability.”<sup>71</sup>

To strengthen the protection of state secrets, the National People’s Congress is reviewing for possible amendment to the twenty-year-old Law on Guarding State Secrets. The latest version of the draft amendment, according to the report, “in addition to requiring telecom and Internet operators to detect, report and delete information that disclose State secrets, also stipulates the clear obligation for them to work with relevant authorities on investigations.”<sup>72</sup> It is obvious that the Chinese government is stepping up the control of state secrets in the era of information technology, which has potentially profound implications to access to remote sensing imageries in future.

While Google’s Hong Kong existence has no problem in providing relevant remote sensing data to mainland users, there are further concerns over the mainland regime in controlling the flow of such data. Indeed according to recent reports, “Google suggests [mainland] customers use VPNs, secure shell tunneling, and proxy servers for access;” no matter whether this suggestion is feasible or not, the sole fact of bypassing censorship in mainland will entail legal risks for the mainland customers.<sup>73</sup> For example, the 2006 Regulations on the Protection of the Right to Network Dissemination of Information provides

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<sup>69</sup> *Id.* at art. 8.

<sup>70</sup> *Id.* at art. 8.

<sup>71</sup> Criminal Law, (promulgated by the Standing Comm. Nat’l People’s Cong., July 1, 1979, effective Jan. 1, 1980, amended Mar. 14, 1997) (P.R.C.), art. 398, <http://www.cecc.gov/pages/newLaws/criminalLawENG.php>.

<sup>72</sup> Wang Huzhong & Wang Xing, *Police to work with phone, Internet providers*, CHINA DAILY, Apr. 27, 2010, at 4.

<sup>73</sup> Thomas Claburn, *Google Helps Users Cope with Censorship*, INFORMATIONWEEK, Mar. 29, 2010, at 17.

that anyone who purposely avoids or damages the adopted technical measures shall assume civil liabilities and where any crime is constituted, the violator shall be subject to criminal liabilities.<sup>74</sup> “Whoever unlawfully obtain[s] state secrets by stealing, spying or buying” shall also possibly be held criminally liable.<sup>75</sup>

## VI. CONCLUSION

Remote sensing, a great efficient source for data acquisition,<sup>76</sup> is increasingly important to daily life. The 1986 UN Remote Sensing Principles is meaningful in the sense that it is the only official document providing general guidelines for remote sensing activities in the international arena. As a UN resolution, the Remote Sensing Principles does not have binding effect; as general guidelines, the Remote Sensing Principles leaves broad discretionary power to the Member States.

“The basic human right of Freedom of Information concerns both the right to obtain information and the freedom to disseminate the acquired data.”<sup>77</sup> While there is no uniform ap-

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<sup>74</sup> See Ordinance on the Protection of the Right to Network Dissemination of Information (promulgated by the State Council, May 18, 2006, effective July 1, 2006), art. 18. Article 18 of the Ordinance on the Protection of the Right to Network Dissemination of Information provides:

Where anyone violates the present [Regulations] by committing any of the following infringement, he shall, in light of the severity of the situation, assume such civil liabilities as stopping the infringement, eliminating the negative impacts, making an apology and compensating for the losses occurred. In case the public security is injured, the administrative department of copyright may order it to stop the infringement, confiscate the illegal proceeds and may impose thereupon a fine of 100,000 Yuan. In the event of any serious circumstances, the administrative department of copyright may confiscate such facilities as computers that are mainly applied to providing network services. Where any crime is constituted, the violator shall be subject to criminal liabilities according to law: . . . (2) Purposely avoiding or damaging the adopted technical measures . . .

*Id.*

<sup>75</sup> Criminal Law, *supra* note 71, at art. 282. See also, *id.* at art.287.

<sup>76</sup> Yi-Ping Chen & Ming-Der Yang, *Legal Issues on Public Access to Remote Sensing Data in Taiwan*, 2005 IEEE International Geoscience and Remote Sensing Symposium, 264 (2005) (on file with author).

<sup>77</sup> H. Priyatna Abdurrasyid, *The Application of Remote Sensing in Indonesia*, 5 SINGAPORE J. INT'L & COMP. LAW 139, 146 (2001).

proach in dealing with data access issue around the world, the Hong Kong Government is laudable in taking a liberal approach in guaranteeing their citizens' right to information and knowledge. And indeed, one of Hong Kong's key rationales as a financial center is its freedom of information.<sup>78</sup> Remote sensing activities have proven to be successful in the past years to the satisfaction of the users despite the lack of remote sensing law in Hong Kong. It is expected the remote sensing data will have broader applications within society, and we can optimistically expect that the Hong Kong Government will continue its established approach in sharing and disseminating remote sensing data for the betterment of the Hong Kong society.

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<sup>78</sup> See Frederik Balfour & Josh Fellman, *Google Faces No Hong Kong Censors After China Retreat*, BUSINESSWEEK, Mar. 23, 2010, <http://www.businessweek.com/news/2010-03-23/google-faces-no-hong-kong-censors-after-china-retreat.html>.

## COMMENTARIES

### ENVIRONMENTAL MONITORING COOPERATION PAVES THE WAY FOR COMMON RULES ON REMOTE SENSING ACTIVITIES AMONG THE PACIFIC RIM

*Ikuko Kuriyama\**

#### I. INTRODUCTION

The increased speed in technological advancement is one of the major social phenomena in today's era of globalization. Satellite remote sensing is no longer a technology which only super powers can enjoy; it is now getting diffused among states around the globe, including emerging and developing ones. The Pacific Rim is not an exception. Now various countries are engaging in satellite remote sensing activities according to their needs, priorities, and interests and pursuing further benefit from its activities within their capability. Ample examples have already proven that remote sensing technology is useful for various applications, including environmental monitoring and assessment, and has now become indispensable for our daily life. On the other hand, it has been repeatedly pointed out that the proper national and international legal framework to regulate the technology is still missing. The challenge is to move forward beyond the status quo. What kind of measures can be taken in order to facilitate the use of remote sensing for the benefit of the Pacific Rim? The purpose of this paper is to provide the author's observation on the status of remote sensing activities in the Pacific Rim presented at the Earth Observation, the Environment, Space, and Remote Sensing Law in the Pacific

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Rim Meeting (the Meeting),<sup>1</sup> while giving a general synopsis, and to discuss the challenges and possible options for future, as a reviewer of the Meeting.

## II. OVERVIEW OF THE STATUS OF SATELLITE REMOTE SENSING ACTIVITIES IN THE PACIFIC RIM

The status of the satellite remote sensing activities in the Pacific Rim is diverse and dynamic. To begin with, the author touches upon some key properties in order to describe the current status of the satellite remote sensing activities in the Pacific Rim based on the information provided at the Meeting.

The first property relates to access to remote sensing capabilities, namely whether a country possesses their own remote sensing capability or not. While most of the Pacific Rim countries are more or less using satellite data, they can be divided into two groups: “the provider countries” which possess their own remote sensing satellites and “the user countries” which rely on foreign remote sensing capabilities. Based on the presentation at the Meeting, China, Japan, Korea, and U.S.A. are the countries falling into the former category and Australia, Hong Kong, and South American countries<sup>2</sup> are the examples of the latter. Among the provider countries, the active efforts of China and Korea to own more advanced remote sensing capabilities is noteworthy.<sup>3</sup> The global community will increase its interest in cooperation and opportunities with both countries. A surprising fact is that the above distinction is not necessarily related to the economic status and remote sensing needs of the country, rather it is the matter of the policy choice. For example,

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<sup>1</sup> Earth Observation, the Environment, Space, and Remote Sensing Law in the Pacific Rim: Meeting and Live Broadcast, presented by the National Center for Remote Sensing, Air, and Space Law (Otani Hotel Honolulu, Hawaii, USA, June 14-16, 2010), [http://www.spacelaw.olemiss.edu/event\\_Pacific%20Rim%202010.html](http://www.spacelaw.olemiss.edu/event_Pacific%20Rim%202010.html) [hereinafter the Meeting].

<sup>2</sup> For the purpose of the Meeting, five countries: Chile, Colombia, Ecuador, Mexico and Peru.

<sup>3</sup> See generally, Yan Ling, *Remote Sensing Data Distribution and Application in the Environmental Protection, Disaster Prevention, and Urban Planning in China*, 36(2) J. SPACE L. 435 (2010), and Jae Gon Lee, *Remote Sensing Issues as They Relate to Korea*, 36(2) J. SPACE L. 415 (2010).

Australia and Hong Kong who both use remote sensing data heavily and seem to be relatively capable of having their own remote sensing satellites, do not have any. So far, satellite remote sensing is an enterprise which requires a great deal funding, but it is difficult to make profits. States whose interests put more emphasis on commercial side of the benefit from space technology rather than on other objectives, such as national security or technology development, may choose a more practical approach toward the national autonomy of remote sensing capability. In any case, the situation of the Pacific Rim shows that the accessibility to remote sensing capabilities, that is satellite technology, is not equal to the accessibility to remote sensing data that is the results of satellite technology. Further, we notice that the accessibility issue is not as simple as countries who have or do-not-have satellites, but it is a rather complicated problem in reality.

The second property is the countries' approach to the use and access of the remote sensing data. There are roughly two different approaches regarding the data handling conditions in the Pacific Rim. One approach is to try to maintain control over data use and access by establishing more restrictions. The other is to grant the public free use and access to the data with less restriction. Perhaps the Chinese approach is the typical example of the first category and the U.S. approach with its full and open policy is the second. Other countries can be positioned in between the two countries reflecting their culture, philosophy, and institutions behind.<sup>4</sup> Both approaches have pros and cons. More restriction on data use and access can increase the possibility for coping with the case of misuse of data and can enhance the protection of privacy and national security, but it may also hamper the expansion of data use and sacrifice the cost-effectiveness of data control and freedom of information.<sup>5</sup> While

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<sup>4</sup> See Yun Zhao, *Regulation of Remote Sensing Activities in Hong Kong: Privacy, Access, Security, Copyright, and the Case of Google*, 36(2) J. SPACE L. 547 (2010). The discussion that two different policies of data access co-exist in China referring to the Google case is insightful as to the influence of social system on the data policy.

<sup>5</sup> See, e.g., James T. Mahoney, *NASA's Earth Science Data & Information Sharing in 2010 -- Law, Policy and Practice in the Pacific Rim* (2010) (unpublished manuscript, on file with author), and Zhao, *supra* note 4.

both approaches have respective legitimacy, the author views that the latter approach is preferable for the future remote sensing, because it may bring more remote sensing activities and relevant discussion to society. Of course, the data handling policy may vary according to the kind of data (i.e. high resolution land imagery, physical quantity data) and to the purpose for use (i.e. humanitarian aide, scientific research, military) even within a country. In addition, countries are often involved in extensive data policy coordination and are required to compromise in order to agree on a common data policy when implementing a cooperative project (i.e. joint satellite development).<sup>6</sup>

The last property is the status of legal framework for the remote sensing activities which is closely related to the second property. As for the domestic framework, while the U.S. is a unique exception, most countries are still lacking a so-called "remote sensing law" that is generally applicable for the remote sensing activities. In this case, instead of the application of a unified law or regulation, the legal conditions for remote sensing activities are guided by the aggregated interpretations of existing laws and rules in relevant fields. For example, the conditions for handling remote sensing satellite data can be inferred based on the provisions in the laws regarding information, national security, copyright, environment protection, and Geographic Information System (GIS). Under such regulatory conditions in the Pacific Rim, data policy is rarely defined by law but in most cases by agency level documents or contractual bases, while some countries, such as Korea, develop detailed Ministry level rules and regulations for particular side of data use.<sup>7</sup> Policies and rules for data use outside the country are generally underdeveloped compared to the domestic use, which needs to be improved. In general, the author views that the existence of the explicit policy and regulation or law is preferable for expanding business and international cooperation on remote sensing since it can reduce the transaction cost and risk by boosting predictability and stability. However, the author also

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<sup>6</sup> See Mahoney, *supra* note 5.

<sup>7</sup> See Lee, *supra* note 3 (Korea has regulations for satellite data in terms of national security).

observes that countries seldom develop laws and regulations without the awareness of pressing needs. It is worthwhile to keep in mind that market based management, namely a non-regulatory approach, of satellite data is still workable and effective under certain condition as shown in the Hong Kong case.<sup>8</sup> Regarding the international legal framework of remote sensing such as the United Nations Remote Sensing Principles (the Remote Sensing Principles) its legal status and applicability is often a major issue to be discussed though detailed discussion is beyond the scope of this paper. According to the presentation at the Meeting, basically all countries seem to recognize the applicability of the Remote Sensing Principles such as “non-discriminatory” and “reasonable cost” access to data, though their practices are not clear. Under some legal system, however, it is pointed out that the lack of proper national registration raises the question of applicability of international obligations on remote sensing.<sup>9</sup> It is observed that now the call for the revision or replacement of the Remote Sensing Principles is increasing due to the dramatic change in the environment for remote sensing (i.e. the enrollment of new countries and sensing technology advancement).<sup>10</sup> But such a call is not likely to be addressed quickly. Whether domestically or internationally, sufficient support and strong motivation to convince public or global community to adopt new rules on remote sensing is necessary but seems to be missing.<sup>11</sup>

### III. CHALLENGES OF SATELLITE REMOTE SENSING IN THE PACIFIC RIM AND POSSIBLE RESPONSES

In light of the current status shown above, the challenges of remote sensing activities in the Pacific Rim, in the author’s

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<sup>8</sup> See Zhao, *supra* note 4.

<sup>9</sup> Ricky J. Lee, speech at the Meeting (manuscript on file with author).

<sup>10</sup> Sylvia Ospina, South America: The Other Edge of the Pacific Rim (June 14, 2010) (unpublished manuscript, on file with author).

<sup>11</sup> This observation is based on the author’s personal experience at the 45th session of the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, February 11-22, 2008. While some delegates raised the reconsideration needs of the Remote Sensing Principles at the session, the Committee did not take up the issue as the agenda item for the future session.

view, are 1) progress in remote sensing application with more coordinated and operational mechanisms for enhancing the remote sensing capability of the entire Pacific Rim and 2) corresponding development of laws and regulations regarding remote sensing activities.

To coordinate various observation capabilities for the operational use for the benefit of society is a common challenge for the entire Earth observation community today. To the author's knowledge, though no attempt has ever been dedicated to the entire Pacific Rim, various efforts are already being implemented in international, regional, and bilateral basis to demonstrate the benefits of Earth observation applications with a more coordinated and operational approach. These examples include the Global Earth Observation System of Systems (GEOSS) led by Group on Earth Observation (GEO),<sup>12</sup> a European initiative, Global Monitoring for Environment and Security (GMES),<sup>13</sup> and a space agencies international initiative, International Disaster Charter.<sup>14</sup> As we know from the presentation in the Meeting, we have already heard sufficient records to prove the effectiveness of remote sensing for individual cases in a particular country. It is time to consolidate all the remote sensing efforts in the Pacific Rim to provide the utmost benefits for the region. The exchange and sharing of information on national remote sensing activities is an important and necessary step. However, in response to the first challenge, we should now move our focus on to more concrete actions on the basis of shared necessity and motivation amongst the countries in the region.

The response to the second challenge is closely interrelated to the first one as it is assumed that the development of law and regulations usually follow after the advent of issues to be urgently addressed (i.e. the expansion of observational data use). In this regard, some new initiatives may be required to mobilize

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<sup>12</sup> See Group on Earth Observations, <http://www.earthobservations.org/index.html#WhatIsGEO> (last visited Jan. 20, 2011).

<sup>13</sup> See GMES Info, <http://www.gmes.info/> (last visited Jan. 20, 2011).

<sup>14</sup> See Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, Rev.3 (Apr. 25, 2000), available at [http://www.disasterscharter.org/charter\\_e.html](http://www.disasterscharter.org/charter_e.html).

governments' motivation to have new rules or regulations on remote sensing both domestically and internationally. In particular, for initiating international discussion shared issues or awareness to respond is imperative in order to overcoming the differences among states in their needs and capability.

The author views that the discussion on a cooperative project to build operational satellite environmental monitoring system for the Pacific Rim could be one possible starting point. There are two examples where shared objectives among the parties and their active engagement in concrete discussion are expected. One is application of the remote sensing data for implementing particular international treaty obligations, and the other is international cooperative project with focused goal. Since application of satellite remote sensing to treaty implementation has a relevant discussion forum under a respective treaty system,<sup>15</sup> the author focuses the discussion here on a later example. Today environmental monitoring and assessment is the common necessity that all governments generally share, particularly in the case for urgent response to climate change (i.e. mitigation of and adaptation to climate change). Needless to say, the Pacific Rim is an area widely spread over a vast ocean; using satellite remote sensing technology is particularly useful and relevant for this area. An ambitious cooperative project to realize the operational satellite environmental monitoring systems through coordination among the contributed observational and relevant capabilities in the region for specific common needs would stimulate concrete internal and international discussion on the use of remote sensing and its role in the Pacific Rim. It is because much interaction among the participating countries and also vast discussion within a country are both required for responding the project (e.g. definition of common data products and data policy for the system) and the process for success involves not only space agencies but also wide range of actors such as policymakers, user agencies, and various experts. In a way, such a cooperative project could work as an institu-

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<sup>15</sup> For example, the Subsidiary Body for Scientific and Technological Advice (SBSTA) for the United Nations Framework Convention on Climate Change.

tional base for enhancing common ground and momentum for the progress in remote sensing activities and laws in the region.

#### IV. ISSUES AND CONDITIONS TO BE CONSIDERED FOR THE COOPERATION

If a cooperative environmental monitoring project is a possible option for promoting satellite remote sensing activities in the Pacific Rim, what are the conditions for success in terms of legal point of view? This section discusses conditions for some key issues to be considered in planning the environmental monitoring project in the Pacific Rim with reference to the discussion at the Meeting.

The first important issue concerns the rules on handling of provided data. In light of the discussion so far, seeking a data policy with minimum restriction on provided data seems to be a recommended approach for participating countries to take for the purpose of the cooperative project. In coordinating the data policy, we certainly need to respect countries' diverse approaches toward the handling of satellite data. In addition, the protection of privacy, national security, and copyrights is important. On the other hand, a country could avoid such concerns by the careful selection of data to provide for the project. Therefore, a free redistribution policy is desirable in terms of efficient data control and promotion of data use.<sup>16</sup> In parallel, the exception of liability for any use of provided data needs to be explicitly indicated. The discussion in the major international forum such as GEO can be a reference for the consideration of data policy.

The second issue is the formality of the cooperative project. The author views that a non-legally binding base and in-kind contributions from the participating countries are the preferable principles for the implementation of the cooperative project. A voluntary approach would be more workable for the project among the countries with diverse remote sensing capability and

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<sup>16</sup> Mr. Mahony of NASA mentioned in his presentation that "the "user registration" and "no re-distribution" policies have raised the most questions and concerns from the user community regarding full and open data sharing. Many users do not understand what "re-distribution" means. This confusion leads to lots of questions to be fielded by the DAAC personnel. It also is adverse publicity." See Mahony, *supra* note 5.

needs, while it is sometimes at the cost of stable and steady implementation. Stated differently, flexible conditions which do not undermine the countries' motivation to participate in the project are desirable. On the other hand, to enhance the ownership of the project, every party needs to have some contributions to the project depending on its capability regardless of whether it is remote sensing user countries or provider countries. Furthermore, the endorsement of the cooperative project at high official or political levels is recommended wherever possible in order to encourage participating countries to mobilize their resources and make commitment for the project.

The third issue is the applicable laws and regulations for the project. It is obvious that the cooperative project should follow the provisions and principles of international and domestic space and remote sensing law and regulations. In addition, environmental law is a field necessary for consideration because the project objective is the environmental monitoring and assessment.<sup>17</sup>

#### V. CONTEXT OF EARTH OBSERVATION ACTIVITIES IN CURRENT JAPANESE POLICY AND RELEVANT PROJECTS

For the purpose of the discussion on the cooperative monitoring project, it is perhaps worth to introduce the context of Earth observation activities in current Japanese policy and relevant project.<sup>18</sup> The recent policy papers in Japan assigned new roles for Earth Observation as the tools for "implementing space diplomacy" and "verification of green innovation."<sup>19</sup> These policy calls for optimizing Japan's Earth observation technology in solving regional issues and global issues such as climate

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<sup>17</sup> Mr. Fermín Romero Vazquez of Mexican Ministry of Foreign Affairs discusses environmental law as a regulatory framework for remote sensing applied to environmental monitoring and protection in his presentation. See Fermín Romero Vázquez & Sergio Camacho Lara, *What Lawyers Need to Know About Science to Effectively Make and Address Laws for Remote Sensing and Environmental Monitoring*, 36(2) J. SPACE L. 365 (2010).

<sup>18</sup> See generally, Setsuko Aoki, *Japanese Law and Regulations Concerning Remote Sensing Activities*, 36(2) J. SPACE L. 335 (2010) (for the details of the Japanese policy and law).

<sup>19</sup> *Id.* at B.2 and Appendix.

change. To respond to such policy objectives, the “Land and Ocean Observing Satellite System to contribute to Asia and other regions” and “Global Environmental Change and Weather Observing Satellite Systems” are defined by the Basic Plan for Space Policy<sup>20</sup> as the measure to be taken. Therefore it could be said that the concept of a project to build satellite environment monitoring system in the Pacific Rim through cooperation among countries in the region is generally endorsed by the Japan’s policy documents.<sup>21</sup> Moreover, space diplomacy promotion policy requires the space agency to work with the Ministry of Foreign Affairs and the development aide agencies in consideration of the regional needs, which leads to more effective utilization of Earth observation data in the region.

Japan also has much experience to share in relation to implementing the cooperative environmental monitoring project since Japan has been engaging in the cooperative initiatives in the Asia-Pacific region, as well as launching satellites for environmental monitoring. In particular, the activities promoted under the auspice of the Asia-Pacific Regional Space Agency Forum (APRSAF)<sup>22</sup> would provide a model for cooperation regarding environmental and disaster monitoring in the Pacific Rim.<sup>23</sup> Sentinel-Asia is a project to share disaster information including Earth observation data in the region through the Internet.<sup>24</sup> As of January 2010, 65 organizations including 56 space or disaster prevention agencies from 22 countries and 9 international organizations (i.e. UN/ESACP, UN/OOSA) are

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<sup>20</sup> The first national comprehensive strategy of Japan defined in June 2009. See Strategic Headquarters for Space Policy, *Basic Plan for Space Policy – Wisdom of Japan Moves Space* (June 2, 2009), [http://www.kantei.go.jp/jp/singi/utyuu/basic\\_plan.pdf](http://www.kantei.go.jp/jp/singi/utyuu/basic_plan.pdf).

<sup>21</sup> See Aoki, *supra* note 18.

<sup>22</sup> An international grouping of space agencies in the Asia-pacific region to promote cooperation in space founded in 1993 by Japan’s initiative. See APRSAF, <http://www.aprsaf.org/> (last visited Jan. 20, 2011).

<sup>23</sup> See generally, Japan Aerospace Exploration Agency (JAXA), Linking Asia to Tackle Disaster and Environmental Issues, Achieving Safety and Security in Asia through cooperation, Disaster/Environmental Monitoring and Engineer Training Projects at JAXA, [http://www.jaxa.jp/article/special/asia/ishida01\\_e.html](http://www.jaxa.jp/article/special/asia/ishida01_e.html) (last visited Jan 20, 2011).

<sup>24</sup> For more information on Sentinel-Asia, see also, JAXA, About Sentinel Asia, [https://sentinel.tksc.jaxa.jp/sentinel2/MB\\_HTML/About/About.htm](https://sentinel.tksc.jaxa.jp/sentinel2/MB_HTML/About/About.htm) (last visited Jan. 26, 2011).

participating into the project.<sup>25</sup> The main aim of Sentinel-Asia is to platform emergency satellite observation when a natural disaster strikes, and to provide data from these observations to help assess the situation and take necessary measures. Other than that, the monitoring system for wild fires and floods is also being developed under the project. Launched in 2006, it is already being used regularly by disaster management organizations across Asia. Currently data from Japan's satellite *DAICHI* (the *Advanced Land Observing Satellite: ALOS*) and an Indian satellite are mainly used in the Sentinel-Asia with additional data from Thailand and Korea planned. In 2008, based on the experience of Sentinel-Asia, APRSAF started a new initiative, called SAFE, Satellite Application for Environment, which means environmental monitoring through space technology.<sup>26</sup> Its goal is to investigate how satellite data or space technology can be used to solve local environmental problems such as water resource and forest management, land utilization, and to encourage cooperation among related organizations. Currently, some prototypes activities are under development for water resource and forest management. The discussion of the possibility to expand SAFE to the Pacific Rim or to link it to the similar initiative in America, if any, may be an option worth investigating. In this regard, it is noteworthy to touch upon some important lessons learned from APRSAF to promote international Earth observation cooperation in this region. The high-cost of some Earth observation data and lack of capacity in infrastructure, humans, and institutions are examples of major obstacles found in the Asia-pacific region.<sup>27</sup> Therefore the cooperative project needs to include measures to solve these problems (i.e. capacity building segments). In sum, Japan is standing in the

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<sup>25</sup> See Kazuya Kaku, Sentinel Asia JPT Secretariat, JAXA, Overall Status of Sentinel Asia Step 2, presented at APRSAF-16, Bangkok (Jan. 28, 2010), [http://www.aprsaf.org/data/aprsaf16\\_data/D3-1400\\_AP16\\_SA-1\\_Kaku.pdf](http://www.aprsaf.org/data/aprsaf16_data/D3-1400_AP16_SA-1_Kaku.pdf).

<sup>26</sup> For more information on SAFE, see also, SAFE, <http://www.eorc.jaxa.jp/SAFE/> (last visited Jan. 20, 2011).

<sup>27</sup> Personal correspondence from Mr. Chu Ishida, Director, Space Cooperation Office for Asia Pacific Region, Space Applications Mission Directorate, JAXA to author (on file with author).

right position to take initiative by bringing its accumulated experience.

#### IV. CONCLUSION:

From the discussion in the Meeting, the author finds the promotion of the coordinated and operational application of remote sensing capabilities and associated development of remote sensing law and regulations as two challenges for enhancing remote sensing activities in entire Pacific Rim. The discussion on building the Pacific-Rim satellite environment monitoring system through cooperation could be the first step for addressing these challenges. No wonder, for realizing such a project, is easy to say but hard to do. In particular, most countries are currently suffering from budgetary deficits which is always a concern. However, there are some positive signs for the promotion of such a project. In today's world of high inter-dependence, global environmental issues, especially climate change, become high political priorities for all countries to tackle regardless of whether they are a developing or developed one. Recently, new policies and laws have been enacted in some countries (i.e. U.S., Korea, Japan) to support Earth observation activities for environmental application. Accompanying the growth in economy, more countries are expected to enter into the remote sensing activities in the Pacific Rim, especially in Asia as the growth center in 21st Century. These facts show that more active and dynamic remote sensing activities are expected in the Pacific Rim and the momentum of cooperation for satellite environmental monitoring system is stronger than ever. Concrete discussions on such a monitoring project could provide the opportunity to demonstrate more coordinated and operational satellite observations for the benefit of the Pacific Rim and enhance the mutual understanding thereby, gradually shaping the foundation for future discussion on international data policy and legal framework for remote sensing activities.

**EARTH OBSERVATION, THE  
ENVIRONMENT, SPACE, AND REMOTE  
SENSING LAW IN THE PACIFIC RIM:  
MEETING AND LIVE BLOGCAST  
PRESENTED BY THE NATIONAL CENTER  
FOR REMOTE SENSING, AIR, AND SPACE  
LAW  
HONOLULU, HAWAII, USA  
JUNE 16-18, 2010**

REVIEWER'S COMMENTS

*Masami Onoda, GEO Secretariat\**

1. What Lawyers Need to Know About Science to Effectively Make and Address Laws for Remote Sensing and Environmental Monitoring: A presentation by Fermín Romero, Director para Asamblea General y Organismos Internacionales Dirección General para la Organización de las Naciones Unidas Secretaría de Relaciones Exteriores

Comments:

This paper discusses the important subject of how to address the needs of science by policy or law-making, which relates to the emerging discipline of studies on the relationship between scientific knowledge or information and policy. The reviewer's question is how specifically this could be done, and how the scientific issues could be approached from the side of policy.

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In this regard, it is important to note the difference between the aspect of space law as regulations, for instance in the field of debris, licensing, or liability, and the aspect of the treaty framework being a “user” of space technology, such as in the case of environmental law which calls for the need of improved information on various features of the Earth’s environment as the scientific basis of the regulatory measures provided by the treaty, in forms such as monitoring or verification. It is also important to note whether the scientific information is needed in the context of compliance, effectiveness, or to assess the general state of the environment.

2. The Increasing Need for Australian Regulation of Remote Sensing Activities: A presentation by Dr. Ricky Lee, Senior Associate, Schweizer Kobras, Sydney NSW

Comments:

This paper examines the existing laws and regulations relating to satellite remote sensing applications in Australia. It particularly points out the absence of statutes or regulations concerning remote sensing activities and the need to enact legislation to address issues that may pose significant legal and policy concerns, including the lack of control over the use of remote sensing data, the possibility of breaches and contraventions of international law, and overlapping arrangements between Australian government agencies and data providers. Nevertheless, despite these legal concerns there is a lack of required legal instruments. This seems to suggest that perhaps the reasons for the absence of such a legal basis for remote sensing activities in Australia might be political rather than legal.

3. Sensing a Change? The Re-Launch of Australia's Space Policy and Some Possible Legal Implications: A presentation by Prof. Steven Freeland, Professor of International Law and Associate Head of School (Research), School of Law, University of Western Sydney

Comments:

This paper was highly interesting to the reviewer, partly as the reviewer has stayed in Woomera (in the ELDO Hotel) for three weeks in 1996 during her first international assignment. The rich heritage of space activities by the ELDO organization in the 1960-70s was still alive in the people’s hearts in Woom-

era. In the GEO community, Australia is a strong advocate and leader of the Forest Carbon Tracking initiative, which is a project to utilize Earth observation data to monitor forest carbon, with the future goal of establishing an operational system that would possibly contribute to the UN REDD (Reducing Emissions from Deforestation and Forest Degradation) framework. Perhaps there is a disconnect between the environmental sector and the space sector, but Australia, as a country, is very active in the Earth Observation arena in this regard. Finally, concerning the statement that space is expensive, this situation is rapidly changing today with the emerging new technologies. Depending on how to do it, of course, it is possible to have high resolution small satellite capabilities at an affordable price, and that is how many emerging actors in space are acquiring their own satellites.

4. Remote Sensing Data Distribution and Application to Environmental Planning and Protection in China: A presentation by Prof. Yan Ling, Faculty of International Law, China University of Political Science and Law

Comments:

This is a very informative paper on overall Chinese remote sensing activities, and legal instruments and policies. In GEO, lead by the Chinese Meteorological Agency, China is playing an active role on the issue of data sharing. With the numerous ministries involved, the reviewer would like to know more about the actual decision-making process, and who are the driving forces for policy and law making in the field of remote sensing.

5. Legal Issues in the Regulation of Remote Sensing Activities in Hong Kong: A paper by Dr. Yun Zhao, Associate Professor, Faculty of Law, the University of Hong Kong

Comments:

The paper addresses the issue of regulations on remote sensing activities in Hong Kong, applying the case of Google. It is intriguing that the regulation is left completely to the market, and that this seems to lead to a reasonable market price of remote sensing data; whereas, many countries have struggled to somehow regulate the price to an affordable level. In discussing Google in this context, however, one should note that Google, at least at present, is not a business model to actually sell remote

sensing data, but is more of an advertisement model. Thus, Google is not acting as a “data provider” or “data distributor” in the commonly understood meaning of the term.

6. Japanese Laws and Regulations Concerning Remote Sensing Activities: A presentation by Prof. Setsuko Aoki, Professor, Faculty of Policy Management, Keio University

Comments: The paper is a timely and highly informative paper on the latest developments in Japanese remote sensing policy, as well as related laws and regulations, and the newly released space policy of Japan by the Strategic Headquarters for Space Development. The overall trend seems to indicate a mixture of government funded programs for the public good and the desire to promote commercialization, with a strong commercialization (or Public-Private Partnership) factor at present. It would be interesting to see how these trends will converge or be balanced in potential future law or regulation on remote sensing activities in Japan.

7. Practical Implications of International Space Law for the Operation of a Satellite fleet, with particular reference to the Disasters Charter: A presentation by Ms. Donna Lawler, Corporate Counsel, SingTel Optus Pty Limited

Comments: From a viewpoint of a practitioner, this presentation gives excellent examples and lessons on experiences in private satellite projects from development to launch and operation, and the surrounding legal issues. As mentioned earlier, Australia is active in the GEO community as an Executive Committee member (from the Meteorology Bureau) and in the field of forest carbon monitoring, and there might be possibilities for future commercial (or government and industry collaboration) activities on satellite development or applications related to this field as well.

8. Remote Sensing Issues as they Relate to Korea and the Pacific Rim: A presentation by Prof. Jae Gon Lee, Professor of Law, School of Law, Chungnam National University

Comments: The paper provides an overview of the space activities in Korea with a focus on remote sensing, and the relevant laws and regulations. For its relatively new history in space development, Korea has shown a dramatic progress in space technology. It also has a suite of legal instruments con-

cerning space activities in general, as well as laws that address the use of satellite remote sensing in law enforcement, particularly for environmental investigation and survey. As one who has been involved with Korea-Japan Earth observation cooperation from the very early days, the reviewer has great interest and admiration for the developments in Korea. On the subject of remote sensing and enforcement issues, there is a group studying Earth observation as evidence, which the reviewer would like to refer to in relation to this article. The reviewer would also like to know more details on the framework for collaboration with the industry in disseminating satellite data to the public.

9. Legal Aspects of Reducing Green House Gases Emitted by Aircraft Registered In Korea: A Ripple Effect of EU Initiative: A presentation by Prof. Won-Hwa Park, Korea Aerospace University

Comments: The paper elaborates on the issue of greenhouse gas emissions by aircraft, and the international regime governing this issue. The paper in particular points out the plans by EU to expand the existing greenhouse gas (GHG) cap and trade system to the emissions of aircraft operating to and from the area of the EU. It also points out certain legal problems concerning Directive 2008/101/EC. For instance, that its domestic air operation is subject to the Kyoto Protocol, whereas the scheme involves other airlines outside the EU who are not bound by the Kyoto protocol; and secondly, that there is the issue whether “aviation activities,” as defined in the Directive, can include aviation activities conducted in the airspace of the third countries and over the high seas. The reviewer would like to know if there have been any prominent legal counter-arguments in order to justify the EU initiative on these issues from the EU side.

10. South America: The Other Edge of the Pacific Rim: A paper by Dr. Sylvia Ospina, S. Ospina & Associates – Consultants, International Telecommunications / Space Law

Comments: This was a valuable contribution focusing on the four South American “Pacific Rim” countries, providing an overview of their space activities and relevant institutional arrangements and regulations. In the reviewer’s view, multilat-

eral formal frameworks such as the International Disaster Charter, APSCO, UN-SPIDER and the many others emerging, contribute to promoting collective national action, enhanced political and public awareness, and broader international participation, while the disadvantages are often that there is more focus on administrative issues and framework rather than effectiveness, and the multilateral nature of the framework tends to cause an imbalance to the reciprocal relationship between parties. On the other hand, programs with a more technical focus such as SERVIR, Sentinel Asia and SERVIR, often based on bilateral agreements, have an advantage of being more manageable and effective at the technical level. Sometimes duplication or redundancy may not necessarily have negative consequences, but may provide more robustness to the overall international effort by different initiatives compensating with and strengthening each other.

11. NASA's Earth Science Program: A presentation by Mr. James T. Mahoney, Lead Counsel, Space Operations Missions Directorate, NASA

Comments: The NASA data policy provides full and open access in a timely manner at no more than the cost of dissemination. This is also based on the strong technical and financial foundation that NASA has, and driven by the US policy that data or information funded by the government should be a public good. A clarification should be made on the terms of agreement on ALOS PALSAR shown in the presentation: These conditions seem to originate from two different frameworks – the international ALOS DATA Node and the GEO Supersite initiative – and should be distinguished as being under separate data policy arrangements. The former allows the US Data Node to distribute data under the US data policy; the latter is a different international arrangement where PALSAR data was provided to a GEO initiative called the “Supersite” as emergency data provision at no cost to scientists who participate in this initiative.

12. Access to Water on the Moon: Lessons from the Hawaiian Experience - Law and Practice: A presentation by Prof. Jon Van Dyke, University of Hawaii, School of Law

Comments: The paper discusses potential rules to govern access to water resources on the moon, based on the principles

and rules of Earth environmental law on access to water, and the lessons that we could learn from the principles governing water rights in Hawaii. The paper takes an institutional approach and discusses a framework similar to the International Seabed Authority. However the problem might be that the Moon Treaty is not a strong enough basis for building this regime upon it. Concerning the Precautionary Principles, the reviewer is of the view that the precautionary principle (or approach), being a concept that scientific uncertainty should not be the reason to delay action, only makes sense when even stronger emphasis is placed on coupling this approach with continuous monitoring efforts to reduce such scientific uncertainties. This is how environmental law has elaborated on the technique for procedural measures to cover monitoring or supervising activities. This may be a point to be taken into account when discussing a possible new regime, or principles in guiding such a regime, for the development of resources on the Moon and other celestial bodies.



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