IAC-05-E6.1.02

GLOBAL EARTH OBSERVATION FOR COMPLIANCE OF INTERNATIONAL ENVIRONMENTAL AGREEMENTS

Masami Onoda
Graduate School of Global Environmental Studies, Kyoto University
Kyoto, Japan
masami.naito@gakushikai.jp

ABSTRACT

This paper will discuss how satellite Earth observation is to support the compliance of international agreements for the protection of the global environment, and how to balance interests of global to national, and governmental to commercial, through considering State agreement and practice. Satellite Earth observation can serve a role in issues related to implementation, by providing environmental information required through the supervisory techniques of modern international environmental law. To serve such a role effectively, however, problems arise such as the reliability and independence of information, and accessibility. This is where international bodies may coordinate or integrate, and the public sector may come in to subsidize. Thus, there will be issues of global environmental information consisting of data or information held by different governments as well as the private companies. To address such issues, various approaches have been taken, including legal and policy arrangements. An essential task is to explore how to integrate the different national and regional approaches into a global one, while maintaining balance among the respective interests.

1. Introduction

As observation of the Earth's environment is becoming a major application of satellite Earth observation, national and international organizations are taking the momentum to link their initiatives to international environmental agreements[1].

Thus, recent studies often argue the potential of satellite Earth observation of supporting "compliance" with such agreements[2]. However, the scope of "compliance" seems to vary among those studies, and there is much room for further discussion. In general, it seems to be agreeable that Earth observation must and will have a significant role in enhancing States' compliance to international environmental agreements. However, what role precisely, can it play in the legal framework? Do treaties and other agreements actually call for satellite Earth observation, or a function equivalent to it? And the more if so,

it is essential to identify where exactly the needs of the international community are, as represented in State agreement, to focus observations among the vast range of parameters that could be related to the protection of the environment. Identifying this has to be the work of scientists and lawyers together.

In the field of space law, with the development of satellite remote sensing technology, States agreed upon a set of Principles (Remote Sensing Principles)[3] as a United Nations General Assembly resolution, which consist a substantial body of international law concerning remote sensing activities to date[4]. Since environmental issues have become a major world agenda, States have developed a number of Earth observation satellites to respond to the call for improved environmental information. In the twenty years since the Remote Sensing Principles were adopted, the role of Earth observation programs have evolved significantly, while the legal status of the Principles has not been updated.

This paper will consider the relatively new role of Earth observation to serve for the compliance of international agreements, while addressing the issues relevant to Earth observation data as a source of environmental information. The following sections will examine the significance of "monitoring" as procedural techniques to enhance compliance. It will then point out what problems there would be for ensuring access to Earth observation data or information, giving some thoughts on how to balance the conflicting interests of global to national, and public to private.

2. Earth Observation as a Procedural Technique to Support Compliance

2.1 Supervisory techniques

Ensuring compliance with international environmental obligations continues to be a matter of increasing concern[5]. Non-compliance raises issues of implementation, enforcement, and dispute settling[6]. The modern environmental law often takes an approach where non-compliance will be dealt through mechanisms of international supervision and prevention. These are called non-compliance procedures as adopted in the Montreal Protocol[7] and UNFCCC[8]. Thus, the focus is on the implementation of the international obligations, avoiding enforcement or dispute settlement procedures involving issues of state responsibility and remedy[9]. Among the various phases of compliance, it is in the task of information gathering that Earth observation plays a major role. The act of providing and disseminating the information acquired is also within the extension of its role.

The protection of the global commons, or areas of common concern, such as the high seas, ozone layer or global climate, is often suggested to present a comparable problem to the protection of human rights as *erga omnes*[10]. This is especially in that without community standing there might be no "injured" state capable of holding States responsible for the violation of these obligations[11]. Thus, "collective supervision of such global responsibilities by inter-governmental treaty commissions or conferences of the parties will often be a more effective and realistic remedy than public interest claims and countermeasures by individual States"[12].

The most widespread supervisory systems that provide both verification of States' compliance to international standards as well as promoting respect for standards, may be grouped into four main classes: States' self-reporting procedures; inspection, so-called non-compliance procedures; and preventive global monitoring. The fourth system as being different from the others in that it is not primarily designed to verify whether States infringe international rules for the protection of the environment, but rather to collecting data and information so to better prevent possible damage to the environment[13].

Another classification is to recognize this in the context of information provision and dissemination.

This is based on the recognition that improving the ability of information on the state of the environment and on activities which have adverse or damaging effects are well-established objectives of international environmental law, as information is widely recognized as a pre-requisite to effective national and international environmental management, protection and co-operation[14]. There are several related techniques concerning the provision and dissemination of information, such as information exchange; reporting and the provision of information; consultation; monitoring and surveillance; notification of emergency situations; public right of access to environmental information; public education and awareness; and eco-labeling; co-auditing and accounting. "Monitoring" here is the requirement of recent international environmental agreements for information relevant to specific or general environmental obligations to be collected, and is also expressed in terms such as "systematic observation", "surveillance", "inspection", and "verification" [15].

Treaties requiring such supervisory techniques are: The 1959 Antarctic Treaty (inspections by consultative parties of all areas of Antarctica, and rights of aerial observation),[16] the 1972 London Convention (requiring each party to designate an authority to monitor the condition of the seas)[17], 1982 UNCLOS (providing that States should observe, measure, evaluate and analyze the risks or effects of pollution of the marine environment),[18] the 1992 OSPAR Convention (requiring parties to undertake and publish joint assessments of the quality status of the marine environment)[19], 1979 LRTAP Convention (establishing a cooperative program for the monitoring and evaluation of the long-range transmission of air pollutants in Europe",[20] the 1997 Kyoto Protocol (requiring in its Clean Development Mechanism to monitor levels of greenhouse gas emissions related to clean development projects in order to calculate the proper admissions reductions credits to be issued to the party)[21], the 1992 Biodiversity Convention (requiring all parties to identify and monitor the components of biological diversity and the processes and categories of activities which are likely to have significant adverse impacts on the conservation and sustainable use of biodiversity)[22], and many others.

As to action plans agreed upon by States at U.N. conferences, Agenda 21[23] calls for "Information for Decision Making", and the Johannesburg World Summit Plan of Implementation[24] has a number of propositions relevant to monitoring. These include international joint observation and research for the water cycle and disaster prevention[25]; systematic observation for climate change prediction[26]; promotion of observation strategies including the integrated earth observation strategy[27] ; and to realize Earth observation technology development including satellite remote sensing, global mapping and GIS .[28]

Thus, the crucial role of environmental information lies here in that all the fundamental bases for decision of States would be based on information of the state of environmental harm or risk. In protecting the global commons, there is little possibility that responsibility of a certain state, or States, can be identified for a damage or risk, or even if the damage or risk itself can be proved. Therefore, in implementing international environmental agreements, it is recognized that a different approach is needed, and "supervisory techniques" have thus been developed[29].

2.2 The 1985 Vienna Convention and UNFCCC

The 1985 Vienna Convention for the Protection of the Ozone Layer[30], was the first multilateral agreement to adopt the term "systematic observations" as one of the agreed major undertakings of the Parties. The main thrust of the Convention was to encourage research and overall cooperation among countries and to exchange information.

As the major obligation under the Vienna Convention, "Parties" have agreed to undertake, "in accordance with the means at their disposal and their capabilities" to "Co-

operate by means of systematic observations, research and information exchange".[31] This includes satellite observations and research using satellite data, instrument development and the establishment of an operational observing system integrated with groundbased systems, as technically outlined in Annex I.[32]

American satellite observations offered the initial proof of severe ozone depletion, making the need for definite measures more urgent. As a result, agreement was reached on specific measures to be taken and the Montreal Protocol on Substances that Deplete the Ozone Layer was signed[33].

The Montreal Protocol also refers to the assessment of the control measures on the basis of available scientific, environmental, technical and economic information. As the control measures[34] are to be based on the understanding and assessment through systematic observations, research and information exchange[35] , it follows that periodical assessment should be based on reliable updated information on the ozone layer.

The UNFCCC[36] recalls the Vienna Convention and its Montreal Protocol, in its Preamble, and provides that all Parties shall "Promote and cooperate in scientific, technological, technical, socio-economic and other research, systematic observation and development of data archives ..."[37] It also provides that Parties shall support and further develop international and intergovernmental programs and networks or organizations, taking into account the need to minimize duplication of effort.[38]

The Kyoto Protocol[39] provides that "Parties shall cooperate in scientific and technical research and promote the maintenance and the development of systematic observation systems and development of data archives... and promote the development and strengthening of endogenous capacities and capabilities to participate in international and intergovernmental efforts, programs and networks on research an systematic observation, taking into account Article 5 of the Convention".

"Research and Systematic Observation" has regularly been an agenda item of the Convention's Subsidiary Body for Scientific and Technological Advice (SBSTA).[40] The Global Climate Observing System (GCOS) and other agencies participating in World Meteorological Organization's (WMO) Climate Agenda have been active in building cooperation with the UNFCCC Parties for the implementation of research and systematic observation. The Conference of Parties (COP) has adopted reporting guidelines[41] on global climate observing systems and invited Parties to provide detailed reports on systematic observation as part of their national communications (on a voluntary basis, in the case of non-Annex I Parties[42]) SBSTA 18 (Bonn, June 2003) considered the state of the global observing systems for climate, on the basis of the second adequacy report[43], endorsed by SBSTA 15 and prepared by GCOS. COP 9 (Milan, December 2003) adopted a decision on global observing systems for climate[44]. This decision calls for the preparation of an implementation plan for global climate observations to be coordinated by GCOS in collaboration with the Group on Earth Observations (GEO), developing a Global Earth Observation System of Systems (GEOSS) [45]. The GCOS Secretariat has made available the final implementation plan for consideration by SBSTA 21/COP 10 (Buenos Aires, December, 2004). COP 10 also adopted a decision on research and systematic observation -/CP.10[46].

Mechanisms such as GEOSS would in part contribute to systematic observation, as well as supporting other procedures such as monitoring environmental damage or harm including disaster monitoring and monitoring compliance by supporting reporting capability of States. Thus, in practice, Earth observation data may be used in various areas of the treaty process[47].

Thus, Earth observation has gained a substantial role as supervisory techniques for international environmental agreements. For

effective implementation of such potential uses of Earth observation, it is essential to effectively incorporated them in the international procedures. In this process it is necessary that Earth observation technologies develop in a manner to serve effectively to the requirements of the frameworks, such as aiming at parameters and quantitative accuracy as well as products that meet the international requirements, and developing appropriate data sharing and dissemination policies in collaboration with national authorities and other users.

3. Balancing Interests

3.1 Environmental information as a public good[48]

In relation to Earth observation as a supervisory technique, the Outer Space Treaty is significant in its three major principles. First, space is "province of all mankind"[49]; the principle of free exploration and use of outer space[50]; and the principle of international cooperation[51] with the call for due regard to interests of all other States.[52] These principles have set the foundation for countries to conduct global Earth observation, promote international cooperation and integration, for the protection of the environment. The Outer Space Treaty is, however, silent on the role of information obtained by the scientific investigations it encourages.

Remote sensing originated as national programs, often with meteorological or military purposes, and with a wide range of applications including not only environmental monitoring but also intelligence, land use detection, resource exploration and many others, which are more of a national interests rather than global common interests. The technology to observe the Earth's surface from space was not evident at the time the Outer Space Treaty was negotiated. However, it developed rapidly during the 1970s and 1980s, and was brought to the agenda of COPUOS, resulting in the formulation of the U.N. Remote Sensing Principles.

Principle XII provides that data and information shall be accessible on a "non-discriminatory basis" and on "reasonable cost terms"[53]. The Remote Sensing Principles call for disclosure of remote sensing environmental "information" concerned with environmental harm in general,[54] and "processed data and analysed information" concerned with the protection of humankind from natural disasters.[55] There is no mention made of cost in either of these principles, so it could be understood that data and information obligations are established at no cost to the States concerned. Information and data promoting environmental protection is, thereby, given special status, i.e. that of a public good[56].

The U.S.A. [57] launched the first of the civil Earth observation satellite series known as Landsat today, which, at the end of the 1970s, was transferred from NASA to the National Oceanic and Atmospheric Administration (NOAA) in the U.S. Department of Commerce with a view to ultimately transferring operations to the private sector[58]. Commercialization was promoted through the 1984 Land Remote Sensing Commercialization Act[59]. However, as the infancy of the market was realized[60], the legal statute has been changed, and currently the U.S. commercial remote sensing activities are governed under the Land Remote Sensing Policy Act of 1992[61]. It provided for continued government procurement and support of remote sensing systems, including Landsat 7 and its successor, if necessary[62]. The Policy Act also sought to make scientific remote sensing data available to the widest spectrum of users, particularly data acquired from government-owned systems[63]. This open access approach is consistent with U.S. laws and procedures that recognize taxpayer-funded data as a public good[64].

In the U. S., unenhanced data from government-owned satellites are distributed for the cost of fulfilling user requests, while value-added data is provided by the private sector. Consistent with the Remote Sensing Principles, the Policy Act further requires that unenhanced data from such systems should be

made available to a sensed state as soon as it becomes available.[65] This approach has great importance for public applications such as disaster monitoring and environmental monitoring.

On the other hand, for commercial systems, the U.S. government has been granting licence to high-resolution remote sensing systems, while the government-owned Earth observation systems provide moderate to low resolution data. In addition, the Commercial Space Act of 1998[66] requires that NASA acquire its Earth science data from commercial providers as much as possible. The Commercial Space Act requires NASA to treat such data "as a commercial item", at the same time permitting the government to acquire "sufficient rights in data to meet the needs of the scientific and educational community or the needs of other government activities"[67].

When there are conflicting global-national interests with open access to information, access is restricted under certain circumstances. For instance, for national security reasons, there is a vaguely worded prohibition on collecting and disseminating imagery of Israel "unless such imagery is no more detailed or precise than satellite imagery of the country or geographic area concerned that is routinely available from commercial sources"[68].

By contrast, in Europe, an explicit return on the government investment is to be collected.[69] The prices are defined by the categories of use, while data of higher levels are also given to the hands of the private sector.[70]

The French distribution policy for space-based Earth observation data[71] states that the basic principle to be that the distribution of Earth observation data should produce a return on the investment, because of the scale of government effort in the development of the earth observation systems, and to guarantee the durability. Thus, unenhanced and processed data are protected and maintained control over by copyright and other forms of intellectual property, for the benefit of the satellite operator[72]. The non-discriminatory access to data of the Remote Sensing Principles are also reaffirmed, and that this does not contradict with the idea of a return on investment. Further, in the context of the protection of the environment and humankind against natural disasters, reference is made exclusively to the Remote Sensing Principles. There may be restrictions on the dissemination of and access to data for national security reasons[73]. This approach set by the French SPOT program was then followed by the European Space Agency[74] and Canada[75].

The Japanese data policy[76] is, in principle, close to the European approach. However, with the U.S. diverting policy, it has become increasingly difficult to maintain conformity in data policy internationally. As the satellite data system becomes more and more global, as is planned in the Advanced Land Observing Satellite (ALOS) data node system, it should become necessary to fundamentally examine the existing data policy.

States operating Earth observation programs, in principle follow the rules of the Remote Sensing Principles , thus regarding their data as public good. At the same time, most programs at the outset had been designed to foster commercialization, often through licensing or contractual agreements. Protection of data rights under applicable legal terms include copyright, database protection, confidentiality clauses, or non-redistribution clauses, and extra legal means such as encryption or secrecy.

2.2 Private, public, and global Interests

For the environmental information gathered through satellite Earth observation to be effectively used for the implementation of the agreement, there would be two major problems: the reliability and independence of information, and accessibility.

The first point relates to the obvious weakness that lies in these procedural techniques for improving environmental information as a global public good[77]. That is, much will

depend on the diligence and accuracy of the reporting authorities or the bodies that conduct the research and observation. Thus, it is important that these bodies should not be dependent on government scientists for expertise, but should be able to employ their own experts, or call on international scientific bodies[78]. The same would be said for the source of information, which should be a system independent from national interests, or at least should not rely heavily on the capacity of one nation or certain nations.

The second point relates to the duty to provide - and the right to obtain - access to information on the environment, whether to the public at large or to specific categories of persons, as a "recent but now firmly entrenched development of international law"[79]. This coincides with the general public status of government-owned satellite data, while the private data provider may require its data as private property subject to protection. Moreover, there would be certain reluctance on the part of States to allow unlimited access to their data, for reasons such as national security, and certain limitations would be applied.

In addition, presently, it would be an impossibly heavy task for the public sector alone to ensure continuity of all environmental parameters required by the vast realm of international environmental agreements. As States would endeavor to streamline their governmental programs for achieving a cost-effective Earth observation system, it also becomes a requirement to involve commercial funds in this process, and to achieve a system that could provide data in a self-financing manner, ensuring continuity of data.

These points are where the international body may coordinate and integrate, and the private sector may subsidize. This suggests the possibility that the Earth observation data as supporting supervising techniques in the environmental framework might become a combination of public (comprising data and information owned by respective governments) and private data.

It is important to note here that commercial activities would imply protected data rights and interest in principle. On the contrary, the Remote Sensing Principles requires that States provide to the sensed State non-discriminatory access on reasonable cost terms[80], and disclosure and transmission for certain environmental and disaster applications, without mention of cost[81]. The relation of commercial activities to non-discriminatory access to data and information, and pricing policy is still quite debatable.

In practice, most satellite operators speak of data rights belonging to the owner of the instrument (or jointly to the owner of the satellite that carries it). Also it seems established that remote sensing is open for access except for certain special circumstances where the sensing State places restrictions for national security reasons[82]. States practice in nationally implementing the Remote Sensing Principles have formed some important mechanisms which will directly or indirectly serve as part of compliance measures to environmental obligations.

As the protection of the environment is now a global common concern, communities engaged to the international coordination of Earth observation programs have made efforts to bring standardization and harmonization to data policies, such as in the Committee on Earth Observation Satellites and World Meteorological Organization, particularity in view of the growing importance of global environmental data needs. These efforts however, have often been adopted as informal recommendations or decisions of informal international groups, only reaching safe agreement among different national policies. This is only natural, since different countries have different interests in space programs in which they have spent large investments. As the efforts to build up effective links with environmental initiatives has lead to the establishment of a global "system of systems" encompassing national and private Earth observation programs, the issue of balancing and integrating national and regional interests would arise again.

4. Conclusion

For the compliance of international environmental agreements, satellite Earth observation can serve a role in issues related to implementation, by providing environmental information required through the supervisory techniques of modern international environmental law. The coming era of environmental Earth observation imposes yet another challenge upon the next generation: balancing not only public-private interests, but also global-national interests. States practice in the last few decades show that there are different approaches to be taken as to government-commercial relationships and limitations to be required for securing national interest against international sharing of data. Thus, an essential task in developing global Earth observation for compliance to international environmental agreements is how to integrate the different national and regional approaches into a global one, while maintaining balance among the respective interests.

1 See Committee on Earth Observation Satellites, *Earth Observation Handbook*, 2002; Integrated Global Observing Strategy, *Coordination with Convention Secretariats* , IGOS-P5/ Doc.12, http://ioc.unesco.org/igospartners/docs/igosp512.pdf; Global Climate Observing System, *Second Report on the Adequacy of the Global Climate Observing Systems for Climate in Support of the UNFCCC*, GCOS-82, April 2003, WMO/TD No. 1143, http://www.wmo.ch/web/gcos/gcoshome.html; and The Global Earth Observation System of Systems (GEOSS), *10-Year Implementation Plan*, adopted at the Third Earth Observation Summit, 16 February 2005, Brussels, http://earthobservations.org/docs/EOS%20III/10YR%20IMPLEMENTATION%20PLAN.doc

2 Kline, Karen and Raustiala, Kal, *International Environmental Agreements and Remote Sensing Technologies*, Background paper prepared for the Workshop on remote Sensing and Environmental Treaties: Building More Effective Linkages, December 4-5, 2000; Macauley, Molly K. *Is the Vision of the Earth Observation Summit Realizable?*, A Case Study prepared for the American Meteorological Society, 2004 Summer Policy Colloquium, 2004; and Kuriyama, Ikuko, "Supporting multilateral environmental agreement with satellite Earth observation," *Space Policy* 21, (2005) pp. 151-160.

3 Principles Relating to Remote Sensing of the Earth from Space, UN Doc. A/RES/41/65, annex [hereinafter *Remote Sensing Principles*] .

4 Gabrynowicz, Joanne, "Expanding Global Remote Sensing Services: Three Fundamental Considerations", Discussion Paper, in *Proceedings Of The Workshop On Space Law in the* Twenty-first Century, International Institute of Space Law & United Nations Office for Outer Space Affairs, New York, 2000, pp. 97-125.

5 See Sands, Philippe, *Principles of International Environmental Law*, Second Edition, Cambridge: Cambridge University Press, 2003, p.171.

6 For the phases in which States implement their international obligations, see ibid. p.174.

7 Protocol on Substances that Deplete the Ozone Layer (Montreal), 26 ILM (1987) [hereinafter *Montreal Protocol*].

8 Framework Convention on Climate Change [hereinafter *UNFCCC*], 31 ILM (1992), 851.

9 Kotera, A., Iwasawa, Y. and Morita, A. eds., *Kougi Kokusaiho (International Law)*, Tokyo: Yuhikaku, 2004, pp. 353-381.

10 Kiss, Alaxzandre Charles and Shelton, Dinah, *International Environmental Law*, 2nd ed,. New York: Transnational Publishers, Inc, 2000, pp.23-25; For the management of the global commons referring to the oceans, outer space, and Antarctica, see World Commission on Environment and Development, *Our Common Future*, New York: Oxford University Press, 1987, Chapter 10

11 Birnie, Patricia and Boyle, Alan, *International Law & the Environment*, 2nd Edition, New York: Oxford University Press, 2001, p. 196.

12 Ibid., p. 198.

13 Cassese, Antonio, *International Law*, New York: Oxford University Press, 2001, p. 375-393.

14 See Sands, op. cit., p. 826.

15 Ibid., pp.847-868.

16 Antarctic Treaty (Washington), 402 UNTS (1959) 71.

17 Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London), 11 ILM (1972), 1294.

18 UN Convention on the Law of the Sea, Misc. 11 (1983), 21 ILM (1982), 1261.

19 Convention for the Protection of the Marine Environment of the North-East Atlantic, 32ILM (1993), 1072.

20 Convention on Long-Range Transboundary Air Pollution (Geneva), 18 ILM (1979), 1442.

21 Protocol to the Framework Convention on Climate Change (Kyoto), 37 ILM (1998) [hereinafter *Kyoto Protocol*].

22 Convention on Biological Diversity, 31 ILM (1992), 818.

23 Agenda 21 Chapter 40. http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=52&ArticleID=

24 "Plan of Implementation of the World Summit on Sustainable Development", Resolution 2, adopted at the 17th plenary meeting, September 2002, in Report of the World Summit on Sustainable Development, UN Doc. A/CONF. 199/20.

25 paras 27 and 35 (c).

26 para 36.

27 para 104.

28 para 119.

29 Birnie and Boyle., op. cit., p.206-211.

30 Convention for the Protection of the Ozone Layer, Vienna, UNEP Doc. IG 53/5; Misc.13 (1985), 26 ILM (1987), 1529 [hereinafter Vienna Convention].

31 Art. 2.

32 Annex I.

33 See UNEP Ozone Secretariat website: http://www.unep.org/ozone/Treaties_and_Ratification/2A_vienna_convention.asp

34 Montreal Protocol, Art. 6

35 Vienna Convention, Art. 2 (1) (a)(b).

36 UNFCCC, supra, note 8.

37 UNFCCC, Art. 4.1. (g).

38 Art. 5.

39 Art.10 (d).

40 See UNFCCC website "Research and Systematic Observation": http://unfccc.int/methods_and_science/research_and_systematic_observation/items/2312txt.php

41 Review of the Implementation of Commitments and of other Provisions of the Convention: UNFCCC guidelines on reporting and review, FCCC/CP/1999/7.

42 See States Parties to UNFCCC, Annex I.

43 Second Report on the Adequacy of the Global Climate Observing Systems for Climate in Support of the UNFCCC, GCOS-82, April 2003, WMO/TD No. 1143. Available at http://www.wmo.ch/web/gcos/gcoshome.html

44 Report of the Conference of the Parties on its Ninth Session, Addendum, FCCC/CP/2003/6/Add1, 11/CP.9, pp.20-22.

45 Group on Earth Observations website http://earthobservations.org/

46 Report of the Conference of the Parties on its Tenth Session, Addendum, FCCC/CP/2004/-/Add1, -/CP.10.

47 See Kline and Raustiala, op. cit., for the five potential beneficial use of remote sensing technology in environmental policy making: multilateral environmental agreement negotiation, implementation review, compliance and dispute resolution, broader political process, and environmental assessment. Also see: Rosenqvist, A., Imhoff, M., Milne, A. and Dobson, C. eds., *Remote Sensing and the Kyoto Protocol: A Review of Available and Future Technology for Monitoring Treaty Compliance*, Report of International Society for Photogrammetry and Remote Sensing (ISPRS), WG VII/5 and VII/6, Ann Arbor, Oct. 1999.

48 See Kaul, Inge, Isabelle, Grunberg, and Stern, Marc A. eds, Global Public Goods: *International Cooperation in the 21st Century*, New York: Oxford University Press, 1999.

49 The Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies, 18 U.S.T. 2410, 610 U.N.T.S. 2005 (entered into force on Oct. 10, 1967), UN Doc. A/RES/2222(XXI) 25 January 1967; TIAS No. 6347 [January 27, 1967], Art. 1 [hereinafter *Outer Space Treaty*].

50 Ibid.

51 Outer Space Treaty, Art. III.

52 Outer Space Treaty, Art. IX.

53 See Winter, Gerd, "Access of the Public to Environmental Data from Satellite Remote Sensing," *Journal of Environmental Law*, Vol. 6, No.1. pp. 51-52.

54 Principle X.

55 Principle XI.

56 Winter, op. cit., p. 52.

57 See Hall, John F., Jr., Esq., "United Sates Laws, Regulations, and Policies Concerning Commercial Remote Sensing Activities", in *Project 2001 Working Group on Remote Sensing: Legal Framework for Commercial Remote Sensing Activities, Proceedings of the project 2001- Workshop on legal Remote Sensing Issues*, Toulouse, 1998, pp.24-32 and Shaffer, Lisa, "US data policy for Earth observation s from space," in *Space in the service of the changing Earth*, vol. III, TD Guyenne and JJ Hunt eds., ESA SP-341, ESTEC, 1992, pp.1477-81.

58 H.R. Rept. 102-539, 102d Cong., 2d Sess., at 14.

59 U.S., Land Remote Sensing Commercialization Act, Pub. L. 98-365. Land Remote Sensing Commercialization Act, 15 U.S.C. § 4201 - 4292 (1984); also see the White House Fact Sheet: Presidential Directive on National Space Policy, 11 Feb. 1988.

60 See Hall, supra note 56, and Shaffer, Lisa, and Backlund, Peter, "Towards a coherent remote sensing data policy," *Space Policy* (February 1990), pp.45-50.

61 Pub. L. 102-555, Land Remote Sensing Policy Act, 15 U.S.C. § 5601 - 5642 (1992) [hereinafter *Policy Act*].

62 Ibid., §§ 5612, 5641.

63 Ibid., §§ 5621(e), 5651.

64 OMB Circular A-130 , Codified in the U.S. Paperwork Reduction Act, Pub. L. 104-13, §3606(d)

65 Ibid., §5622(b)(2).

66 U.S., Commercial Space Act., Pub. L. 105-303.

67 Ibid., §107(a).

68 U.S., National Defence Authorization Act for Fiscal Year 1997, Pub. L. 104-201, §1064.

69 EOPOLE Earth Observation Data Policy and Europe; Final Report, 30 September 2000, ENV4-CT98-0760, 4.3.2. http://www.geog.ucl.ac.uk/~eopole/final-rep.html#4.2.1.

70 See the table of user categories in Ferrazzani, Marco, "ESA Rules and Practices", *Project 2001 Working Group on Remote Sensing:*

Legal Framework for Commercial Remote Sensing Activities, Proceedings of the project 2001- Workshop, p.52.

71 See a summary of the April 1995 interdepartmental report on "Distribution policy for space-based Earth observation data" presented by Phillipe Clerc in "Legal Framework for Commercial Remote Sensing Activities", *Proceedings of the project 2001- Workshop on legal Remote Sensing Issues*, Toulouse, 1998, pp.41-42.

72 Ibid., p.41.

73 Ibid., p.42.

74 Ferrazzani, op. cit., pp. 44-45.

75 Canadian Space Agency, RADARSAT Data Policy, RSCA-PR0004, CSA, July 13, 1994. A legislation has recently been proposed to the parliament in November 2004, establishing a licensing regime for remote sensing space systems and provides for restrictions on the distribution of data gathered by these systems. See Bill C-25: An Act Governing the Operation of Remote Sensing Space Systems. http://www.parl.gc.ca/common/Bills_ls.asp?Parl=38&Ses=1&ls=C25

76 Basic Principles on the Provision and Pricing of Earth Observation Data, NASDA Executive Board FY15-16: 2-2, 9 September 2003. (On file with the author.)

77 See Kaul, Inge, Isabelle, Grunberg, and Stern, Marc A. eds, Global Public Goods: *International Cooperation in the 21st Century*, New York: Oxford University Press, 1999

78 Birnie and Boyle, op. cit., p. 206.

79 Ibid., p. 852.

80 Remote Sensing Principles, Principle XII.

81 Principles X and XI.

82 See section 3.1.