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Emerging Approaches in Development Efforts

Chinese Perspective on Space and Sustainable Development

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Abstract

The issue of sustainable development came to the forefront in view of the increasingly serious concerns over space debris. However, this is only the vertical aspect of sustainable development in outer space; space sustainability needs to take into account the horizontal aspect of sustainable development, i.e. all the countries, irrespective of their economic, social and technological development levels, should be able to benefit from outer space and space activities. This paper aims to examine new approaches and perspectives in realizing space sustainability through international cooperation, with China as an example. China's efforts in promoting space cooperation through overseas assistance program exemplify the importance of financial and non-financial assistance efforts in the realization of the horizontal aspect of space sustainability for both space-faring and non-space-faring nations. Space sustainability cannot be achieved without taking into account the interests of developing countries. The China-Brazil cooperation presents an excellent example that space cooperation can take place between and/or among developing countries. While benefiting one state at one stage, space cooperation will bring benefits to cooperating countries in the long term; such benefits will not simply be restricted to these cooperating countries, with proper arrangement, other states can similarly benefit from such cooperation. The paper concludes that space sustainability, as an issue for both space-faring and non-space-faring nations, can only be achieved through international cooperation among nations, regardless of their level of economic and technological development.

1. Introduction

More and more space activities are conducted on a daily basis; the issue of sustainable development came to the forefront in view of the increasingly serious concerns over space debris.¹ Sustainable development is an important

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1 Peter Martinez, Space Sustainability, in K.-U. Schrogl et al. (eds.), Handbook of Space Security, 259-260 (New York: Springer, 2015).

concept in the field of international law, in particular international environmental law. While acknowledging the important of economic development, this concept argues that such development shall not be at the sacrifice of environmental protection and conservation of natural resources.² The 1972 Stockholm declaration spelt out relevant rules calling for “the preservation and improvement of the human environment, for the benefit of all the people and for their posterity.”³ The 1992 Rio Declaration on Environment and Development took sustainable development as the main theme and clarified the scope and contents of this concept in the field of environmental law.⁴ Within a short period of time, the concept of sustainable development received widespread endorsement from the international society. It quickly extends to other fields, including outer space.

Nevertheless, the concept of sustainable development is a difficult one to define; its use in the space field is not limited to such traditional areas as environmental protection and space debris mitigation. Space sustainability is to be understood in a broad sense, covering a wide range of issues.⁵ The final document entitled *The Space Millennium: Vienna Declaration on Space and Human Development* adopted at the Third United Nations (UN) Conference on the Exploration and Peaceful Uses of Outer Space in July 1999 pointed out the importance of space technologies and systems in realizing sustainable development on Earth and the Millennium Development Goals.⁶ The concept of sustainable development is thus closely connected with outer space, though at this stage space technologies and systems are only kind of tools conducive to environmental protection and resources conservation.

With rapid development of space technologies and activities, environmental protection and resources conservation are no longer the issues that are only relevant to the Earth. The outer space environment is facing serious challenges posed by space debris, congestion of geostationary orbit and harmful interference of signals. Space debris mitigation has been heatedly discussed in various international forums. The study of space sustainability

2 Tim Hillier, *Principles of Public International Law* 332 (London: Cavendish, 1999).

3 Declaration of the United Nations Conference on the Human Environment, United Nations Environment Programme, 21st plenary meeting, 16 June 1972, www.unep.org/documents.multilingual/default.asp?documentid=97&articleid=1503.

4 Rio Declaration on Environment and Development, United Nations Environmental Programme, www.unep.org/documents.multilingual/default.asp?documentid=78&articleid=1163.

5 The Secure World Foundation defines space sustainability as “ensuring that all humanity can continue to use outer space for peaceful purposes and socioeconomic benefits”, Secure World Foundation, *Space Sustainability: A Practical Guide*, http://swfound.org/1808/space_sustainability_booklet.pdf.

6 Report of the Third United Nation Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999 (United Nations Publications, Sales No. E.00.I.3), chap. I, resolution 1.

has been largely limited to the protection of space environment and space debris mitigation in the past. However, this is only one side of the coin in understanding the concept of space sustainability.

The 1967 Outer Space Treaty (OST) solemnly prescribes that outer space shall be the province of mankind and that space activities shall be carried out in the interests and for the benefit for all mankind.⁷ The right to access to outer space serves as the basis for the other two types of freedoms identified in the OST, namely, the right to scientific experiment, and the right to use and exploration.⁸ Without the ability to access to outer space, the states will only be passive actors in the space field; this will defeat the ultimate goal that all states have equal access to and the ability to benefit from outer space as defined in the OST.⁹ This is exactly the other side of the coin in understanding the concept of space sustainability.

As such, this paper intends to examine the other aspect of space sustainability. On the vertical aspect, space sustainability emphasized the importance of future generation in using outer space, which has been widely discussed in various platforms on environmental protection. The horizontal aspect of space sustainability has long been neglected; this aspect stresses the importance of developing countries' ability to access to outer space at the current stage.

From the start of the space era, the international society has acknowledged the importance of international space cooperation in bringing benefits to the human beings.¹⁰ The principle of international cooperation remains to be the effective way to achieving space sustainability.¹¹ International cooperation shall be carried out in a way which is mutually beneficial to the cooperating states, though such benefits are not necessarily exchanged at the same stage. Even if the benefits achieved at an earlier stage do not fully represent the efforts contributed by a state, such voluntary contribution will in the long run bring in benefits to be enjoyed by international society as a whole, including the earlier contributing state.¹²

As elaborated in the United Nations General Assembly (UNGA) resolution in 1996, international cooperation can take wide range of forms in a wide

7 Outer Space Treaty, Article I.

8 *Id.*

9 Shouping Li and Yun Zhao, Introduction to the Law of Outer Space, 15 (Beijing: Guangming Daily Press, 2009).

10 S N Hosenball, The United Nations Committee on the Peaceful Uses of Outer Space: Past Accomplishments and Future Challenges, 7 *Journal of Space Law* 95-106 (1979).

11 Chukeat Noichim, International Cooperation for Sustainable Space Development, 31 *Journal of Space Law* 338 (2005).

12 Susana Camargo Vieira, Brazil-South Africa: South-South Cooperation for Sustainable Development, 32 *South African Yearbook of International Law* 361-375 (2007).

variety of areas in space activities.¹³ China, as an advanced space-faring nation, actively participated in space cooperation.¹⁴ It provides an excellent example for the examination of financial and non-financial aspects of sustainable development through the provision of official development assistance (ODA) to other developing countries.¹⁵ In turn, some of the recipient developing countries are now able to contribute to the theme of space sustainability.¹⁶ Changing role of the former recipient countries in development strategies provides a vivid and persuasive case exemplifying the horizontal aspect of space sustainability that international cooperation results in common development in the space field.

As a result, ODA to developing countries is a mutually beneficial mechanism for international space cooperation, which will lead to common development of the international society. By sharing common resources and value, such a new approach in development efforts shall contribute to the realization of ultimate goal in the peaceful uses of outer space, which then is in the common interests of all mankind. Accordingly, the international society realized the importance of examining space environment and application in a comprehensive manner.

This paper aims to examine new approaches and perspectives in realizing space sustainability, with China as an example. Part 2 offers a general

13 Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, UNGA Resolution 1962 (XVIII), 13 December 1963.

14 “The Chinese government holds that each and every country in the world enjoys equal rights to freely explore, develop and utilize outer space and its celestial bodies, and that all countries’ outer space activities should be beneficial to economic development, the social progress of nations, and to the security, survival and development of mankind.” For more Chinese policies and events of space cooperation, see China’s Space Activities in 2011, the Information Office of the State Council of the People’s Republic of China, 29 December 2011, www.scio.gov.cn/ztk/dtzt/69/3/Document/1073810/1073810.htm.

15 “Official development assistance (ODA) is defined as government aid designed to promote the economic development and welfare of developing countries. Loans and credits for military purposes are excluded. Aid may be provided bilaterally, from donor to recipient, or channelled through a multilateral development agency such as the United Nations or the World Bank.” For further information on the definition of ODA and China’s ODA to other developing countries, see Net ODA, <https://data.oecd.org/oda/net-oda.htm>; Lean Alfred Santos, Building the Whole Picture of China’s Growing ODA, 18 July 2014, <https://www.devex.com/news/building-the-whole-picture-of-china-s-growing-oda-83916>.

16 Such as the case of China assists Nigerian Space Program: “In June 2013 Nigeria’s Minister of Science and Technology Ita Ewa announced at a press conference in Abuja that the government would prepare astronauts for space travel likely by 2015. In cooperation with the Chinese government Nigeria would build a spacecraft. A 20 kilometer launch site has already been established in Epe, Lagos State and 12 engineers from the National Space Research and Development Agency are currently training in China.” <http://china.aiddata.org/projects/30988?iframe=y>.

overview of the concept of space sustainability and its development, to be followed by a thorough analysis of the theoretical and substantive aspects of space sustainability. The discussions in this part provide a theoretical basis for understanding the relationship between international cooperation and space sustainability. China's efforts in promoting space cooperation through overseas assistance program will be elaborated in Part 3, exemplifying the importance of financial and non-financial assistance efforts in the realization of the horizontal aspect of space sustainability for both space-faring and non-space-faring nations. The paper concludes that space sustainability, as an issue for both space-faring and non-space-faring nations, can only be achieved through international cooperation among nations, regardless of their level of economic and technological development.

2. International Cooperation and Space Sustainability

2.1 Initial Development of the Concept of Sustainable Development in Outer Space

Outer space is no longer monopolized by the two superpowers during the cold-war period. More and more countries have successfully joined the space club in the last one or two decades, grasping indigenous launching capabilities. Outer space and space resources are increasingly open to the international society. Satellite applications, such as telecommunications, remote sensing and television broadcasting, bring unprecedented convenience to our daily life.

Nevertheless, more frequent use of outer space at the same time brings in serious challenges. The increased number of satellites being launched and manoeuvred in outer space directly leads to the first challenge: space debris. The congested slots in geostationary orbit also raised the issue of managing spectrum resources and potential harmful interference of signals. More recently, the possible use of ground-based missiles against space-based assets caused alarms over space security. All these challenges prove that outer space is fragile; it is time for the international society to take the issue seriously and take some measures to keep outer space a safe and secure place for the international society.

Earlier responses were rather sporadic, without systemic approaches in dealing with the above issue. It started with the study of possible measures to mitigate space debris. As early as 1986, the delegate from the former Soviet Union has stated the view that the issue of space debris requires urgent attention.¹⁷ Unfortunately, the Legal-subcommittee of the UNCOPUOS failed to reach any formal documents after years of discussions. In the meantime,

¹⁷ U.N. Press Release, Outer Space Committee Considers Agenda of Legal Subcommittee, OS/1259, 11 June 1986.

the Inter-Agency Space Debris Coordination Committee (IADC) provided a platform for the member space agencies to exchange information and explore possible options to space debris mitigation. Through years of work, the IADC was able to produce its Space Debris Mitigation Guidelines in 2002.¹⁸ This document provides the basis for further discussions within the UNCOPUOS Scientific and Technical Subcommittee (STSC), which formally adopted the UN Space Debris Mitigation Guidelines in 2007.

However, it was soon found out that the issue of space debris is only one of the many challenges arising in outer space. The International Academy of Astronautics published a report titled Cosmic Study on Space Traffic Management in 2006, placing the issue of space debris mitigation among possible first steps for improving space traffic.¹⁹ Regulatory issues that are identified for further research include prioritization of space activities, notification/information system, prevention of an arms race in outer space, the interests and expectations of private actors.²⁰

As mentioned above, space sustainability is to be understood broadly. Apart from the traditional areas such as environmental protection and space debris mitigation, space sustainability should also include the horizontal aspect of sustainable development that all states have equal access to space and the ability to benefit from space.

2.2 The Realization of Space Sustainability through International Cooperation

The UNCOPUOS played an important role in dealing with the issue of space sustainability.²¹ As early as of 1994, the UNCOPUOS STSC has included the issue of space debris in its agenda²² and prioritized in the following year the consideration of space debris,²³ which led to the production of non-binding Space Debris Mitigation Guidelines in 2007.²⁴ However, more and more

18 IADC Space Debris Mitigation Guidelines, issued by Steering Group and Working Group 4, IADC-02-01, Revision 1, September 2007, www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space_Debris-Guidelines-Revision1.pdf.

19 International Academy of Astronautics, Cosmic Study on Space Traffic Management, 15 (2006), <https://iaaweb.org/iaa/Studies/spacetraffic.pdf>.

20 Id., at 16.

21 Nandasiri Jasentuliyana, Space Debris and International Law, 26 *Journal of Space Law* 146 (1998).

22 “The STS agreed that consideration of space debris was important and that international cooperation was needed to evolve appropriate and affordable strategies to minimize the potential impact of space debris on future space mission.” UNCOPUOS STS, Report on its 31st Session, 21 February-3 March 1994, P 64, U.N.Doc. A/AC.105/571 (10 March 1994).

23 UNCOPUOS STS, Report on its 32^d Session, 6-16 February 1995, P 95, U.N.Doc. A/AC.105/605 (24 February 1995).

24 UNCOPUOS STS, Report on its 44th Session, 12-23 February 2007, Annex IV P 1, U.N.Doc. A/AC.105/890 (6 March 2007).

scholars believe that space debris is only part of the problem in outer space; a more systematic approach should be adopted to deal with space environment. Under such circumstances, the United Nations Committee of Peaceful Uses of Outer Space (UNCOPUOS) decided in 2009 in its 52th session to include the item “Long-term sustainability of outer space activities” on the agenda of its STSC for discussions starting from 2010.²⁵ In the same meeting, the UNCOPUOS agreed to set up a working group to study the item.

The STS established a Working Group (WG) on the Long-term Sustainability of Outer Space Activities in 2010 to study the issue.²⁶ The consensus of the UNCOPUOS to extend the concept of “sustainable development” in the environmental law to outer space culminated in the adoption of the Terms of Reference in 2011 to examine the issue of long-term sustainability in a wider context of sustainable development on Earth.²⁷

The WG stressed the importance of international cooperation in realizing space sustainability, taking into account the concerns and interests of all countries, in particular those of developing countries.²⁸ It further defines that consideration should be given to “acceptable and reasonable financial and other connotations” to ensure that all countries are able to have equitable access to outer space and resources and benefits associated with it.²⁹ The process of international cooperation is mutually beneficial; voluntary contributions from the cooperating parties shall lead to the end result benefiting international society as a whole.

The WG was tasked with coming up with a set of voluntary recommended guidelines for space activities.³⁰ After six years of hard work, the UNCOPUOS adopted the first set of guidelines in June 2016. It is expected that more guidelines will be adopted in the near future when consensus can be reached.

Space sustainability is not an issue peculiar only to space-faring nations; all the members in the international society have a stake in this important issue. Developing countries, including China, played an active role during this process. China submitted its position paper shortly before the adoption of the

25 Official records of the General Assembly, Sixty-fourth Session, Supplement No. 20 (A/64/20), para. 161.

26 Report of the Scientific and Technical Subcommittee, forty-seventh session, Vienna, 8 to 19 February 2010, U.N.Doc. A/AC.105/958.

27 Report of the Committee on the Peaceful Uses of Outer Space, fifty-fourth session, 1-10 June 2011, UN General Assembly document A/66/20, Annex II.

28 Terms of Reference and Methods of Work of the WG on the LTS of Outer Space Activities of the Scientific and Technical Subcommittee, UN General Assembly document A/66/20.

29 Id.

30 UNCOPUOS, Fifty-third session, Vienna, 9-18 June 2010, Item 8 of the provisional agenda, Report of the STS on its forty-seventh session, 8 June 2010, A/AC.105/L.277.

first set of guidelines.³¹ Brazil has similarly submitted a proposal together with other countries.³² The adoption of guidelines has important implications to future development of space activities. As a major space-faring nation and the largest developing country, China has a role to play in further development of guidelines on space sustainability. It would thus be important to study Chinese perspective on the issue of space sustainability and its impact on future development of guidelines on the matter.

The principle of international cooperation, believed to be a means to realize peaceful uses of outer space, has been considered a fundamental principle for space activities from the very beginning of the space era.³³ This principle was put down in the UNGA Resolution in 1961 and later adopted formally in the 1967 Outer Space Treaty.³⁴

The 1996 UNGA Resolution on space cooperation further develops this principle by further elaborating on its actual uses in space activities and encouraging various forms of cooperation in a wide range of areas of space activities.³⁵ It defines the formal and substantive requirements for space cooperation.³⁶ Party autonomy continues to guide space cooperation with the states free to decide on all aspects of space cooperation.³⁷

From the formal aspect, the states are free to decide on the effectiveness and appropriateness of a specific mode of cooperation, which include governmental and non-governmental cooperation, commercial and non-

31 China's Position Paper on the Issues of Long-term Sustainability of Outer Space Activities, Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee, Fifty-third session, Vienna, 15-26 February 2016, A/AC.105/C.1/2016/CRP.13, 16 February 2016.

32 Long-term sustainability of outer space activities: proposal to adopt a first set of guidelines together with a renewed workplan for the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee, Committee on the Peaceful Uses of Outer Space, Fifty-ninth session, Vienna, 8-17 June 2016, A/AC.105/L.305, 28 April 2016.

33 International Cooperation in the Peaceful Uses of Outer Space, UNGA Resolution 1721 A and B (XVI), 20 December 1961.

34 Articles 1 (3), 3, and 9 of the OST.

35 Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (The 1996 UNGA Resolution), UNGA Resolution 51/122, 13 December 1996.

36 For further discussions on the requirements for space cooperation, see Yun Zhao, *The Role of Bilateral and Multilateral Agreements in International Space Cooperation*, 35 *Space Policy* 12-18 (2016).

37 "States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis. Contractual terms in such cooperative ventures should be fair and reasonable and they should be in full compliance with the legitimate rights and interests of the parties concerned, as, for example, with intellectual property rights." Paragraph 2 of the Annex of the 1996 UNGA Resolution.

commercial cooperation, global, multilateral, regional and bilateral cooperation.³⁸ Space cooperation can also be conducted between countries at all levels of development, including space-faring and non-spacefaring nations, developing and developed countries.³⁹

From the substantive aspect, the UNGA resolution, while emphasizing the importance of party autonomy, provides some kind of minimum standards to protect the rights and legitimate interests of relevant states. More specifically, space cooperation should be carried out on a mutually acceptable and equitable basis, showing the real intention of the states. The term and conditions for cooperation shall be reached through negotiation; such terms and conditions should be fair and reasonable, not only to the two cooperating parties, but also to the international society as a whole.⁴⁰ Furthermore, space cooperation shall take into account the special needs, interests and limitations of developing countries.⁴¹

3. China's Overseas Assistance Program in Realizing Space Sustainability

China firmly believe that it is important to help developing countries with their space capacity building.⁴² Long-term sustainability of space activities is an issue that occurred during the development of space industry; correspondingly such issues arising from the development process should be resolved by means of development.⁴³ Thus, international society needs to further achieve consensus, attain synergetic development and build common capacities to tackle common threats facing the international community.⁴⁴ For example, it would be of utmost importance to have concerted actions

38 Paragraph 4 of the Annex of the 1996 UNGA Resolution.

39 Id.

40 See Paragraph 2 of the Annex of the 1996 UNGA Resolution.

41 United Nations Committee on the Peaceful Uses of Outer Space, 598th Meeting, Wednesday 3 June 2009, Vienna, COPUOS/T.598, www.unoosa.org/pdf/transcripts/copuos/COPUOS_T598E.pdf.

42 Tomasz Nowakowski, China's Agreement with United Nations to Help Developing Countries Get Access to Space, 28 July 2016, www.spaceflightinsider.com/organizations/china-national-space-administration/china-agreement-with-united-nations-to-help-developing-countries-get-access-to-space/#dcF1u0Fjz1jZIRO4.99.

43 China's Position Paper on the Issues of Long-term Sustainability of Outer Space Activities, Working Paper by China, Committee on the Peaceful Uses of Outer Space, Scientific and Technical Subcommittee, Fifty-third session, Vienna, 15-26 February 2016, Item 14 of the provision agenda: Long-term sustainability of outer space activities, 16 February 2016, A/AC.105/C.1/2016/CRP.13.

44 Chukeat Noichim, International Cooperation for Sustainable Space Development, 31 *Journal of Space Law* 338 (2005).

from the international society to monitor and forecast space weather as well as prevent space weather hazards.⁴⁵

China has been and is developing practical collaborations with States and advocates enhancing mutual trust and understanding through collaboration.⁴⁶ It is China's firm position that international cooperation should be carried out on the basis of equality and mutual benefits and that China is willing to provide technical and financial assistance to achieve common development.⁴⁷

3.1 China's Official Development Assistance Scheme

As the world's largest developing country, China provides assistance to other developing countries within the framework of South-South cooperation through various channels, with the aim to promote economic and social development in developing countries.⁴⁸ Such cooperation is carried out at different levels, either bilateral, multilateral or regional.⁴⁹ China's foreign aid measures follows the principles of mutual respect, equality, keeping promises, mutual benefits and achieving win-win for both parties.⁵⁰

The budget for China's foreign aid, titled as Official Development Assistance (ODA), was under the unified management of the Ministry of Finance.⁵¹ Normally there are three major types of financial resources for foreign assistance: grant (aid gratis), interest-free loan and concessional loan.⁵² Concessional loan is to be raised by the Export-Import Bank of China on the market as kind of financial subsidies at fixed-rate and low-interest.⁵³ China has sometimes granted debt relief as one way to provide financial assistance to developing countries.⁵⁴ Other Official Flows (OOFs) include non-

45 IGG and the South Korea Space Weather Center Sign a Cooperation Memorandum of Space Weather Observation Research (2016), http://english.igg.cas.cn/NC/News2015/2016/201609/t20160913_167638.html.

46 Such as cooperation with Russia, "Sino-Ukrainian Space Cooperation Program", "Status Quo of China-Europe Space Cooperation and the Cooperation Plan Protocol", China-Brazil Earth resources satellites bilateral cooperation, etc.

47 China's Space Activities in 2011, the Information Office of the State Council of the People's Republic of China, 29 December 2011, www.scio.gov.cn/ztk/dtzt/69/3/Document/1073810/1073810.htm.

48 China's Foreign Aid (2014), the State Council of the People's Republic of China, 10 July 2014, http://english.gov.cn/archive/white_paper/2014/08/23/content_281474982_986592.htm.

49 Id.

50 Shixue Jiang, China's Principles in Foreign Aid, 29 November 2011, www.china.org.cn/opinion/2011-11/29/content_24030234.htm.

51 Rong Xiang, Regulation of Foreign Aid: China, 6 September 2015, <https://www.loc.gov/law/help/foreign-aid/china.php>.

52 *Supra* note 51.

53 *Supra* note 51.

54 China maintains a strong commitment to debt relief. By the end of 2009, China had signed debt relief protocols with fifty countries throughout Africa, Asia, Latin

concessional loans, such as preferential export credits, market-rate export buyers' credits, and commercial loans from Chinese banks.⁵⁵

At the moment, major forms of assistance include completion of projects and provision of goods and materials, technical cooperation, and human resources development cooperation.⁵⁶ First of all, China helps developing countries to improve infrastructure and promote the development of information-based societies. For example, China assisted Turkmenistan, Togo and Eritrea in building IT-related projects, including optical cable telecom networks, e-government websites, and radio and television frequency modulation transmitters.⁵⁷ China also launched telecommunications satellite for Venezuela on 3 October 2008⁵⁸ and provided broadcasting and telecommunications facilities to African countries in 2015.⁵⁹ Secondly, China helps strengthen capacity building in developing countries in the space field. In the area of human resources cooperation, China provides training sessions for technical personnel in the area of telecommunications services, disaster relief and prevention. For example, China provided maintenance of data processing and broadcasting system, and training sessions for Pakistan Observatory Centre in 2014.⁶⁰ Training courses were also provided to Caribbean countries in the establishment of earthquake and tsunami early warning and monitoring systems.⁶¹ In the area of technical cooperation, China sends experts to transfer applicable techniques, and help improve technical management capacities in radio and television.⁶² Thirdly, China helps strengthening environmental protection through assisting in construction projects in the area of meteorological information services in

America, the Caribbean, and Oceania, writing off 380 mature debts amounting to RMB25.58 billion (about US\$ 4.08 billion).

55 Deborah Brautigam, *Chinese Development Aid in Africa: What, Where, Why, and How Much?*, in Jane Golley and Ligang Song (eds.), *Rising China: Global Challenges and Opportunities* 205 (Canberra: ANU E Press, 2011).

56 *Supra* note 51.

57 *Supra* note 50.

58 Symbol of China's strength: China's Space Assistance Arousing excitement in Venezuela, 24 September 2009, http://junshi.xilu.com/2009/0924/news_8_347534_1.htm.

59 The Forum on China-Africa Cooperation Johannesburg Action Plan (2016-2018), 10 December 2015, www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1323159.shtml.

60 Chinese Meteorological Experts Providing Technical Assistance in Pakistan, China Meteorology Press, 2 May 2014, www.cma.gov.cn/2011xwzx/2011xqxxw/2011xqxyw/201405/t20140502_244961.html.

61 Foreign Assistance under Regional Cooperation Mechanism, 10 July 2014, www.china.org.cn/government/whitepaper/2014-07/10/content_32924010.htm.

62 The Interpretations of the Johannesburg Summit of the FOCAC and the Sixth Ministerial Conference on the 10 Major China-Africa Cooperation Plans in Economic and Trade Domains, 16 December 2015, http://english.mofcom.gov.cn/article/policy_release/Cocoon/201512/20151201219036.shtml.

relevant developing countries;⁶³ China further provides assistance in capacity building through the provision of training sessions in early warning of meteorological disasters.⁶⁴

China further provides foreign assistance under regional cooperation mechanisms and platforms, such as the Forum on China-Africa Cooperation (FOCAC), and the China-ASEAN Summit.⁶⁵ For example, under the FOCAC, China helped African countries to improve their ability to cope with climate change, and strengthen cooperation in meteorological satellite monitoring;⁶⁶ China further built for African countries meteorological stations and high-altitude observation radar stations, and provided personnel training and exchanges.⁶⁷

3.2 Case Study: China-Brazil Space Cooperation

China-Brazil space cooperation provides an excellent example showing that South-South cooperation can be carried out leading to the realization of mutual benefits in the end.⁶⁸ The China-Brazil Earth Resource Satellite (CBERS) project was set up in 1986 with the signature of the Protocol on Research and Production of the Earth Resource Satellite in 1988,⁶⁹ leading to the launch of the first satellite (CBERS-1) in 1999.⁷⁰ Several protocols were signed afterwards for the launch of more satellites.⁷¹ Apart from the satellite launch, the cooperation between the two countries covers a wide range of areas, including facilitating the entry and exit of equipment and materials required for the implementation of the project, as well as for the provision of appropriate documentation for citizens to enter, exit and reside in order to carry out relevant activities.⁷²

The protocols reached between the two parties took into full account of the large differences in the level of space development and agreed at the earlier stage of the cooperation that China took up 70% of the total cost. The two

63 China Daily USA, China's Foreign Aid Helps Developing Countries, 11 July 2014, http://usa.chinadaily.com.cn/epaper/2014-07/11/content_17729005.htm.

64 Id.

65 *Supra* note 51.

66 Id.

67 China Promotes New Strategic Partnership with Africa: White Paper, 10 July 2014, www.focac.org/eng/zxxx/t1173107.htm.

68 Yun Zhao, The 2002 Space Cooperation Protocol Between China and Brazil: An Excellent Example of South-South Cooperation, 21 *Space Policy* 213-219 (2005).

69 Zi Yuan CBERS (China-Brazil Earth Resources Satellite), 21 July 2011, www.globalsecurity.org/space/world/china/zy-1.htm.

70 CBERS: A Chinese-Brazilian Collaboration, 20 May 2011, <https://earthzine.org/2011/05/20/cbers-a-chinese-brazilian-collaboration/>.

71 Jose Monserrat Filho and Alvaro Fabricio dos Santos, Chinese-Brazilian Protocol on Distribution of CBERS Products, 31 *Journal of Space Law* 271 (2005).

72 *Supra* note 70.

countries reached a new protocol in 2002 prescribing an equal sharing of the total investment.⁷³

The first three CBERS satellites were launched from China; according to the 2002 protocol, the CBERS-4 was scheduled to be launched from from Alcantara Launch Centre in Maranhao, Brazil.⁷⁴ However, different from originally planned, the CBERS-4 was launched from Taiyuan Satellite Launch Centre in China on 7 December 2014.⁷⁵ The original launch arrangement could have served as a test of viability of the Brazilian launch centre as a future commercial launching site. Nevertheless, even though this did not happen as scheduled, Brazil has made rapid developments in its indigenous launching capability; as such, the space cooperation between China and Brazil has far-reaching effects on satellite launch among developing countries.⁷⁶

The above space cooperation does not simply benefit Brazil in developing its space launching capability; both parties benefits equally from the satellites and their remote sensing data.⁷⁷ When it comes to domestic use of CBERS data in China, the former Commission for Science, Technology and Industry for National Defense (COSTIND) declared a free online distribution policy in 2006.⁷⁸ One year later, the COSTIND released a document providing that the data is owned by the state and that the Centre for Resources Satellite Data and Applications (CRESDA) is authorized to process, archive, and distribute the data.⁷⁹ In the same year, the COSTIND enacted Administrative Rules on CBERS-01/02/02B Domestic Data (Trial Version), which provide detailed rules on acquisition, storage, distribution and use of CBERS data.⁸⁰

It is to be noted that the impact of space cooperation between China and Brazil goes beyond these two states, benefiting other countries. As early as 2004, China and Brazil have reached consensus on data policy for the use of CBERS data outside both territories.⁸¹ While the on-board data recorder shall

73 The 2002 Space Cooperation Protocol Between China and Brazil, Article 11.

74 CBERS-4, <https://en.wikipedia.org/wiki/CBERS-4>.

75 Rui C. Barbosa, 200th Long March rocket launches CBERS-4 for Brazil, 6 December 2014, <https://www.nasaspaceflight.com/2014/12/200th-long-march-launches-cbers-4-brazil/>.

76 *Supra* note 70.

77 Yun Zhao, National Space Law in China: An Overview of the Current Situation and Outlook for the Future, 92-93 (Leiden: Brill&Nijhoff, 2015).

78 The State Council, The COSTIND Announces the Free Distribution Policy for CBERS-2 Data, www1.www.gov.cn/gzdt/2006-03/20/content_231785.htm.

79 Article 1, Several Opinions on Encouraging Domestic Users to Use CBERS Data, the COSTIND, Ke Gong Yi Si [2007], No. 1191, 29 October 2007.

80 Administrative Rules on CBERS-01/02/02B Domestic Data (Trial Version), Ke Gong Yi Si [2007], No. 1417, 15 November 2007.

81 CBERS Data Policy, June 2004, APPL-07-2004, www.obt.inpe.br/cbers/documentos/appl_07_2004.pdf.

be exclusively operated by the two countries, the downlink data are accessible to all countries and international organizations.⁸² The annual fee of using the data shall be determined by the conditions of ground stations.⁸³ Both countries also reached an agreement on international price list for images and equally shared the revenues from distribution of data.⁸⁴ Four years, both countries reached yet another agreement that all Latin American countries and some African countries can obtain images for free.⁸⁵ Consensus was further reached in 2010 that CBERS data shall be freely and openly accessible to all developing countries.⁸⁶

3.3 Implications of China-Brazil Space Cooperation

China-Brazil space cooperation proves to be the most successful south-south cooperation in the space field. It demonstrates vividly to the international community that space cooperation can be carried out between/among countries at different levels of development. We should not simply look at the cooperation at the formal aspect, more importantly, substantive equality in the cooperation is more essential to the realization of the goal that outer space can benefit the cooperating states. China-Brazil cooperation also shows that such cooperation can not only benefit the cooperating states, but also to other members in the international society.

4. Conclusion

It is believed that space sustainability can be achieved through international cooperation. The two concepts, i.e. space sustainability and international cooperation, are interdependent.⁸⁷ Space debris mitigation and the promotion of peaceful uses of outer space have been key sustainability concerns for a long time.⁸⁸ However, in this new era, space sustainability gains another momentum, which goes to the essence of equal access to outer space for all countries. As widely accepted, spectrum and orbit are limited natural resources, space is also a limited commodity;⁸⁹ sustainable development in

82 CBERS Data Policy, Article 2.

83 CBERS Data Policy, Article 6(b).

84 CBERS Data Policy, Articles 2 and 3.

85 CBERS-2B Completes a Full Year in Orbit, 19 September 2008, www.cybers.inpe.br/en_noticias/index.php?cod=not101.

86 Statement by Brazil GEO-The Beijing Ministerial Summit, 5 November 2010, www.inpe.br/noticias/arquivos/pdf/GEO_china.pdf.

87 *Supra* note 11.

88 See generally Surya Gablin Gunasekara, Mutually Assured Destruction: Space Weapons, Orbital Debris, and the Deterrence Theory for Environmental Sustainability, 37 *Air & Space Law* 141-164 (2012).

89 Rajeswari Pillai Rajagopalan, The International Code of Conduct and Space Sustainability, in C. Al-Ekabi et al. (eds.) *Yearbook on Space Policy 2014*, 241 (Wien: Springer-Verlag, 2016).

outer space cannot simply be understood as something only relevant to those developed or space-faring nations.⁹⁰ The ability to use outer space or the freedom of action in outer space is something we should strive for; it is something fundamental in the understanding of space sustainability, through which developing countries can realistically benefit as enshrined in the Outer Space Treaty.⁹¹ It has thus been argued that “more established stakeholders engage emerging space actors on space sustainability efforts and facilitate multi-stakeholder collaboration in promoting responsible behaviour in space”.⁹²

Accordingly, the concept of sustainable development in the field of environmental law received a momentum for future expansion and concretization in the field of space law. Space sustainability should not be limited only to the vertical aspect of sustainable development, i.e. environmental protection and space debris mitigation. At this critical stage, we should not neglect the horizontal aspect of sustainable development, i.e. all the countries, irrespective of their economic, social and technological development levels, should be able to benefit from outer space and space activities.

International cooperation is one major mechanism that we can rely upon to realize the above goal of equal access to outer space. As elaborated in the 1996 United Nations General Assembly (UNGA) Resolution, international cooperation can be carried out in variety of formality in different levels and in a wide range of areas of space activities.⁹³ Beyond the space field, Official Development Assistance (ODA) has been used frequently as the major form of financial and non-financial assistance to developing countries. While acknowledging each state’s unique priorities and interests, one need to be wary of the justifications and accountability required of the ODA to both the donors and the developing countries.⁹⁴ The donors need to persuade relevant domestic authorities in approving relevant assistance to certain countries; while the receiving states need to make sure that such assistance does not in any way violate international rules on sovereignty. This article specifically examines Chinese approaches in dealing with space sustainability and how it affects future development of relevant guidelines for space sustainability.

90 *Supra* note 11.

91 Outer Space Treaty, Article I.

92 Laura Delgado Lopez, Space Sustainability Approaches of Emerging Space Nations: Brazil, Colombia, and Mexico, 30 *Space Policy* 1 (2015).

93 *Supra* note 35.

94 Mitsuaki Furukawa, Management of the International Development Aid System and the Creation of Political Space for China: The Case of Tanzania, JICA Research Institute Working Paper no. 82, October 2014, at 41, https://www.jica.go.jp/jica-ri/publication/workingpaper/jrft3q00000025tq-att/JICA-RI_WP_No.82.pdf.

As stated earlier, international cooperation can be carried out in various manners, including those that are at the bilateral, multilateral and regional levels. While bilateral and multilateral cooperation is relatively easier, we cannot disregard the importance of regional engagement. Regional cooperation can take into account regional perspectives and solidarities, strengthen space development of the region as a whole and put forward a consistent regional voice in the international arena. This is particularly important for developing countries in the space affairs.

Space sustainability cannot be achieved without taking into account the interests of developing countries. The China-Brazil cooperation presents an excellent example that space cooperation can take place between and/or among developing countries, which exemplifies the horizontal aspect of space sustainability. While benefiting one state at one stage, space cooperation will bring benefits to cooperating countries in the long term; such benefits will not simply be restricted to these cooperating countries, with proper arrangement, other states can similarly benefit from such cooperation. This is exactly what we strive for, “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 scientific development,...”⁹⁵

Consequently, sustainable development of outer space is an issue common to all the countries. International cooperation is vital to the realization of space sustainability, not only for the countries to reach consensus in relevant guidelines, but also for all the countries to benefit from space activities.

95 Outer Space Treaty, Article I.