

# The environmental responsibility of states for space debris and the implications for developing countries in Africa

*Anél Ferreira-Snyman*<sup>\*</sup>

## *Abstract*

Since the commencement of space activities with the launch of the first artificial satellites and the development of rocket technology in the 1950s by the USA and the then Soviet Union, a growing number of states have engaged in space activities, or intend to use space more intensively. Although these states do not have the capability to establish comprehensive space programmes similar to those of the space powers, some of them have at least set up space agencies in recent years. At present, more than fifty states have, to some extent, invested in domestic space activities, and the number of national space agencies is increasing steadily. Space activities are thus becoming less of a luxury and more of a necessity, as states increasingly regard them as an important political investment in the future. The socio-economic benefits of using outer space have also made the development of space programmes attractive to a number of developing states, including some in Africa. The potential adverse environmental effects of outer space activities are self-evident. Although there are a number of environmental problems related to space activities, the most prominent is the issue of space debris. This contribution highlights some uncertainties and *lacunae* in the current outer space treaty regime. It concludes that the current space treaties are largely outdated and inadequate to address the space debris problem. It is submitted that an international dialogue, involving the developed and the developing states, should be initiated as soon as possible in order to conclude a consolidated binding legal instrument for the regulation of all aspects concerning the use of outer space.

---

<sup>\*</sup> B Juris (PUCHE); LLB (PUCHE); LLM (PUCHE); LLD (UJ). Professor: Department of Jurisprudence, Unisa. The research for this article was conducted in April 2012 by using the research collection of the Institute for Air and Space Law at the University of Leiden. The research was undertaken with a research grant awarded by the College Research and Innovation Committee of the College of Law at Unisa.

## INTRODUCTION

The commencement of space activities with the launch of the first artificial satellites by the then Soviet Union and the United States of America (USA) in the 1950s, and the development of rocket technology during this period, necessitated the creation of a special treaty regime<sup>1</sup> to deal with outer space and celestial bodies.<sup>2</sup> Apart from these treaties, a number of resolutions were adopted unanimously by the General Assembly and immediately accepted as customary international law.<sup>3</sup>

During the Cold War, space activities were intrinsically linked to the political objectives, priorities, and national security or military concerns of the two superpowers, the USA and the Soviet Union.<sup>4</sup> After the Cold War the political relevance and benefits of space continued to be recognised by

---

<sup>1</sup> The United Nations space treaties include: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968); Convention on International Liability for Damage caused by Space Objects (1972); Convention on Registration of Objects Launched into Outer Space (1975); Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979). Apart from these treaties a number of space principles were adopted by the UN General Assembly which are not legally binding: Declaration of Legal Principles Governing the Activities of States in the Exploration of and Use of Outer Space (1962/1963); Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982); Principles Relating to Remote Sensing of the Earth from Outer Space (1986); Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992); 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 (1996). Kopal 'Origins of space law and the role of the United Nations' in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 229 points out that although the principles adopted by the General Assembly are not legally binding, 'they reflect a legal conviction of the present international community and may play a significant role either in establishing customary rules of international law or as a basis for future efforts to regulate the same subjects by international treaties'.

<sup>2</sup> Kopal 'Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, New York, 19 December 1966' *Audiovisual Library of International Law* available at: <http://untreaty.un.org/cod/avl/ha/tos/tos/html> (last accessed 11 January 2012). For a brief chronological overview of the development of space activities, see Mayer 'A short chronology of space flight' in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 22–27.

<sup>3</sup> Dugard *International law – a South African perspective* (4ed 2011) 398.

<sup>4</sup> Venet 'The political dimension' in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 73–74.

states, not only as a foreign policy tool to affirm their sovereignty<sup>5</sup> and increase their power on the international level, but also to solve domestic and transnational problems.<sup>6</sup> Since then a growing number of states have engaged in space activities or intend to use space more intensively. These include some developing states in Africa, fast emerging nations such as Brazil, and industrialised states, such as Australia. Although these states do not have the capability to establish comprehensive space programmes and policies similar to those of the space powers, most of them have at least set up space agencies in recent years.<sup>7</sup> At present, more than fifty states have invested in domestic space activities to some extent, and the number of national space agencies is increasing steadily.<sup>8</sup> Space activities are thus becoming less of a luxury and more of a necessity, as states increasingly regard them as an important political investment in the future.<sup>9</sup> Space activities are, furthermore, not limited to state actors, but include non-state entities which are also becoming serious actors in the field.<sup>10</sup>

The potential adverse environmental effects of outer space activities, are self-evident.<sup>11</sup> Although there are a number of environmental problems related to space activities,<sup>12</sup> the most prominent of these is the issue of space debris.<sup>13</sup>

#### **DEFINING ‘OUTER SPACE’**

The term ‘outer space’ generally refers to the entire universe, in other words, any area beyond the earth’s atmosphere. However, since spaceflight can only be undertaken in a very limited part of outer space, this general meaning is too broad for legal purposes. In a legal sense, ‘outer space’ refers to that part

---

<sup>5</sup> *Id* at 79. An example in this regard is China, with the rapid development of its space programme.

<sup>6</sup> *Id* at 75–76.

<sup>7</sup> *Id* at 84.

<sup>8</sup> Neger & Soucek ‘Space faring: A short overview of the present situation’ in Brüner & Soucek (eds) *Outer space in society, politics and law* (2011) 164.

<sup>9</sup> Venet n 4 above at 88; Neger & Soucek n 8 above at 165.

<sup>10</sup> Hofmann ‘Environmental criteria as condition for space activities of non-entities?’ 2007 *South African Yearbook of International Law* 233.

<sup>11</sup> *Ibid.*

<sup>12</sup> These inter alia include nuclear contamination, solar power satellites, manned space stations and exobiological contamination. See Viikari ‘The environmental element in space law – assessing the present and charting the future’ *Studies in Space Law* (2008) 3 5–54 for a discussion of these environmental problems.

<sup>13</sup> *Id* at 31.

of the universe where human activities are practically possible or feasible.<sup>14</sup> Some activities which are based on earth are, however, intrinsically linked to outer space activities and the question remains whether space law should also apply to these.<sup>15</sup>

The delimitation of outer space essentially concerns the question of where air space ends and where outer space begins. The answer to this question is significant in order to determine which activities are indeed space activities under international space law, and which activities are governed by other legal regimes. In contrast to air space which falls under the territorial sovereignty of the underlying state, international law determines that outer space is not subject to the sovereignty of any particular state.<sup>16</sup>

Clear international consensus on the definition of ‘outer space’ has, however, not yet been reached. Although some commentators are of the opinion that the demarcation of outer space would be premature or even unnecessary, the need for a well-defined border line in order to avoid uncertainties and conflict situations is clear.<sup>17</sup> At present it is accepted, as a matter of customary international law, that the altitude of 100 kilometres above sea level can be considered as the legally relevant ‘edge of space’.<sup>18</sup> This means that activities executed and objects placed beyond 100 kilometres above sea level, are space activities and space objects. Although this delimitation continues to be debated in theory, and may constantly vary

---

<sup>14</sup> Neger & Walter ‘Space law – an independent branch of the legal system’ in Brüner & Soucek (eds) *Outer space in society, politics and law* (2011) 238.

<sup>15</sup> *Id* at 238–239.

<sup>16</sup> *Id* at 239.

<sup>17</sup> Diederiks-Verschoor *An introduction to space law* (2ed 1999) 18. Cheng ‘International responsibility and liability for launch activities’ 1995 *Air and Space Law* 298 identifies three schools of thought on the delimitation and definition of outer space: (i) The *spatialists* who assert that there should logically be a legally determined delimitation of the end of national airspace and the beginning of outer space. (ii) The *functionalists* who argue against the need for such delimitation, as the lawfulness or unlawfulness of space activities should, according to them, be determined solely by the nature of the activity or the vehicle. (iii) The *you-don’t-need-to-know* school who also finds it unnecessary to determine the border between air space and outer space.

<sup>18</sup> Neger & Walter n 14 above at 239; Diederiks-Verschoor n 17 above at 21. See further Diederiks-Verschoor *id* at 18–21 for the different theories that have been advanced in an attempt to determine the boundaries of space. Cheng n 17 above at 299 explains that ‘[i]n absolute terms, this point may be put 94 km from the surface of the earth. Conservatively, the figure may be put at 100 or 110 km.’ He also points out that states may, as they have done with regard to the delimitation of the territorial sea, decide to claim a higher or lower limit, or tacitly or expressly agree on a specific border separating national air space from outer space.

as a result of new technology, states often in practice refer to this boundary in their domestic legislation to distinguish activities and objects which fall under their national air laws from others.<sup>19</sup>

### **SPACE DEBRIS**

To date, no legally binding definition of ‘space debris’ has been formulated.<sup>20</sup> The issue of space debris is also not specifically addressed in the Outer Space Treaty of 1967,<sup>21</sup> (or in any of the other space treaties) as its importance was not recognised at that time.<sup>22</sup> Article 1(d) of the Liability Convention of 1972<sup>23</sup> merely defines a ‘space object’ as including the ‘component parts of a space object as well as its launch vehicle and parts thereof’. This definition is very vague and commentators differ on what debris is and when a particular piece of debris should be regarded as a space object for purposes of the Liability Convention.<sup>24</sup> It is in this regard that it is debated whether the size of a piece of debris should be considered for purposes of its classification as a space object. It could be argued that a piece of fragmented debris or micro-particulate matter can be regarded as neither a space object, nor a component thereof.<sup>25</sup> Due to their velocity, small pieces of space debris could, however, cause significant damage.<sup>26</sup> It is furthermore contested whether an inactive satellite is a space object for purposes of the Liability Convention.<sup>27</sup> The legal status of rockets that have not reached outer space due to launch failures, is also not clear.<sup>28</sup> As will be

---

<sup>19</sup> Neger & Walter n 14 above at 241. South Africa’s Space Affairs Act 84 of 1993 defines *outer space* as ‘the space above the surface of the earth from the height at which it is in practice possible to operate an object in an orbit around the earth’.

<sup>20</sup> Schrogl ‘Space and its sustainable uses’ in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 605; Kim ‘Legal problems concerning space debris and Liability Convention’ 2009 *Proceedings of the International Institute of Space Law – 52<sup>nd</sup> Colloquium on the Law of Outer Space* 215; Viikari n 12 above at 32.

<sup>21</sup> Note 1 above.

<sup>22</sup> Lyall & Larsen *Space law: a treatise* (2009) 303; Viikari n 12 above at 32.

<sup>23</sup> Note 1 above.

<sup>24</sup> Diederiks-Verschoor n 17 above at 131–132; Viikari n 12 above at 69–70.

<sup>25</sup> Diederiks-Verschoor n 17 above at 132; Viikari n 12 above at 70.

<sup>26</sup> Diederiks-Verschoor n 17 above at 132.

<sup>27</sup> In this regard, Diederiks-Verschoor *ibid* states that ‘it is questionable whether a state will be liable for a satellite which has ceased functioning or has disintegrated’. Conversely, Viikari n 12 above at 69–70 is of the view that ‘[t]here seems to be no great difficulty in designating inactive satellites [as] ... space objects’.

<sup>28</sup> Viikari *id* at 70. Mukherjee & Mokkalapati ‘Determining liability for damage caused due to debris in outer space: Portal to a new regime’ 2009 *Proceedings of the International Institute of Space Law – 52<sup>nd</sup> Colloquium on the Law of Outer Space* 285 identify ‘spent stages of rockets, broken off pieces of spaceships or equipment, old unusable satellites and even small flecks of paint’ as examples of space debris.

pointed out below, these uncertainties have serious implications for the liability of states for damage caused by space debris.

Generally the term space debris, as it is also used at the deliberations of the United Nations Committee of the Peaceful Uses of Outer Space<sup>29</sup> (UNCOPUOS),<sup>30</sup> refers to ‘all man-made objects, including fragments and elements thereof, in earth orbit or re-entering the atmosphere, that are non-functional’.<sup>31</sup> This could include anything from small paint flakes to non-functional satellites, old rockets, and abandoned spacecraft.<sup>32</sup> Whenever a spacecraft is launched into orbit, all kinds of material such as bolts, boosters,

<sup>29</sup> The United Nations Committee on the Peaceful Uses of Outer Space was established by the UN General Assembly in 1959 with the mandate to review the scope of international cooperation in peaceful uses of outer space, to devise relevant programmes in this field under the auspices of the UN, to encourage space research and to study legal problems arising from the exploration of outer space. The Committee has two standing subcommittees, namely the Scientific and Technical Subcommittee and the Legal Subcommittee. See <http://www.oosaunvienna.org/oosa/en/COPUOS/copuos.html> (last accessed 7 September 2012).

<sup>30</sup> In its *Technical Report on Space Debris A/AC 105/720* (1999) available at: [http://www.unoosa.org/pdf/reports/ac105/AC105\\_720E.pdf](http://www.unoosa.org/pdf/reports/ac105/AC105_720E.pdf) (last accessed 11 July 2012), the Scientific and Technical Committee of the UNCOPUOS explains that ‘[i]n order to have a common understanding of the term “space debris”, the [Scientific and Technical] Subcommittee at its thirty-second session proposed a definition of the term that it modified at its subsequent sessions to read as follows: “Space debris are all manmade objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized.” However, there is still no consensus or agreement on the definition’ (at par 6). See further Viikari n 12 above at 32–33 for similar definitions developed at the international level by the International Academy of Astronautics, the Inter-Agency Space Debris Coordination Committee and the International Law Association.

<sup>31</sup> Schrogl n 20 above at 605. Diederiks-Verschoor n 17 above at 131 points out that international organisations currently hold the opinion that ‘an object is space debris when all the fuel has been used up and the object can no longer be controlled’. According to Viikari n 12 above at 31–32, ‘[s]pace debris is a general term referring to all tangible man-made materials in space other than functional space objects. Debris thus includes spent satellites themselves, ejected instrument covers, upper stages (orbital transfer stages), fragments thereof, etc., that is objects that originate from what were functional space objects but which no longer serve a useful purpose. The definition also encompasses leaking fuel and coolant droplets, paint flakes and microparticulate matter, as well as tools dropped during space walks and garbage dumped in outer space by manned space missions, for instance. Hence everything launched into outer space has the potential to become space debris. Such items are occasionally also called space refuse, space junk or space trash’.

<sup>32</sup> Schrogl n 20 above at 605; Watson ‘Space debris: five unexpected objects that fell to earth’ *National Geographic Daily News* (September 2011) available at: <http://news.nationalgeographic.com/news/2011/09/110909-nasa-space-debris-uars-sat> (last accessed 20 June 2012).

adapter rings, and insulation, are also released. In 2011, it was estimated that some 6 000 tons of man-made material had already re-entered the earth's atmosphere.<sup>33</sup> The size of these objects ranges from 2,5 centimetres and they may weigh up to a few tons.<sup>34</sup> The latter includes aged satellites (some of which could be the size of a school bus) that merely drift through space when their usefulness comes to an end.<sup>35</sup>

Although it is not the aim of this article to provide a final definition of space debris, it is agreed with Viikari that due to the increasing risks posed by space debris, a practical approach should be followed by 'considering space debris as constituting either a space object or at least a component part of it'.<sup>36</sup>

The damage caused by space debris can take many forms,<sup>37</sup> but one of the biggest risks associated with space debris is the possible collision of objects that are travelling around the earth.<sup>38</sup> This poses a serious threat to spacecraft and astronauts.<sup>39</sup> In 2011, there were already 20 000 objects larger than 10

---

<sup>33</sup> Watson n 32 above.

<sup>34</sup> Kluger 'Space junk keeps fallin' on my head' *Time Science* 10 October 2011 available at: <http://www.time.com/time/health/article/0,8599,2096210,00.html> (last accessed 20 June 2012) reports that 'according to tallies from NASA, NORAD (North American Aerospace Defense Command), the Federal Communications Commissions and other domestic and international agencies, there are currently 17,000 objects measuring 4 in. (10 cm) or greater circling the earth. There are a whopping 200,000 in the 1-in. to 3-in. (2.5 cm to 7.5 cm) range, and millions smaller than an inch. Many of these objects in the largest category are much, much larger than a mere 4 in. (10 cm). Indeed they are spacecraft themselves'.

<sup>35</sup> *Ibid.* See further Viikari n 12 above at 33–36 for a discussion of the sources of space debris. Menon & Krishan 'State responsibility and need of international consensus for debris-free environment' 2007 *Proceedings of the International Institute of Space Law – 50<sup>th</sup> Colloquium on the Law of Outer Space* 275–276 identify the following four classes of space debris depending on its formation: 1. *Fragmentation debris*, which is formed when a man-made object breaks up in outer space; 2. *Operational debris*, which is placed in outer space by humans; 3. *Microparticulate debris*, which consists of particles, gasses and space glow; 4. *Inactive payloads* which cannot be controlled by their controllers.

<sup>36</sup> Viikari n 12 above at 71.

<sup>37</sup> The damage can be as a result of space debris falling on the earth, colliding with other objects in space or by interfering with telecommunications and remote sensing. See Diederiks-Verschoor n 17 above at 131.

<sup>38</sup> Lyall & Larsen n 22 above at 305 explain as follows: 'Even if some debris does not long persist in orbit, it represents a danger for spacecraft. Material in lower orbits travels at least at 7 km per second so the kinetic energy of a collision can be considerable. There is also a risk that one collision will produce many fragments that then triggers others – a "cascade" with the resulting creation of a belt of debris in a particular orbit which could imperil any space object crossing that orbit.'

<sup>39</sup> *Id* at 306; Mukherjee & Mokkaapati n 28 above at 285.

centimetres travelling around the earth. Each of these is tracked and catalogued by the United States Defence Department's Joint Space Operations Centre in California, and states are informed of potential collisions in order to be able to take the necessary precautions, such as altering the orbits of satellites. The possibility of these collisions has risen significantly over the past few years as a result of the rapid increase in space debris.<sup>40</sup> Commercial and state-sponsored launches, as well as the destruction of satellites in space, have the potential to create unlimited volumes of space debris.<sup>41</sup> The destruction of a Chinese weather satellite in 2007 and the subsequent collision between decommissioned American and Russian satellites in 2009, contributed to a further 5 000 to 6 000 pieces of space debris.<sup>42</sup> Even if no further space operations are undertaken, the level of fragmentation of orbital debris will continue to escalate exponentially.<sup>43</sup>

Despite many space objects re-entering the earth's atmosphere in a carefully guided manner, there have been a number of reports (also in recent years) of objects making unguided return trips to earth. A few examples in this regard include the following:<sup>44</sup>

In 1978, the Soviet surveillance Satellite, Cosmos 954, crashed in Northern Canada, spreading radio-active material from the spacecraft's nuclear generator over thousands of square miles. Only 0,1 per cent of the dangerous debris could be recovered.

In 1991, the efforts by Russian engineers to send the Salyut-7 space station into a controlled tumble into the Atlantic Ocean failed, and the 39 916 kilogram station showered metal fragments on the city of Capitan Bermudez in Argentina.

A part of a US Delta II rocket launched in 1996, brushed a woman's shoulder when it fell in Oklahoma,<sup>45</sup> and its 260 kilogram fuel tank hit the

---

<sup>40</sup> Diederiks-Verschoor n 17 above at 131; Lyall & Larsen n 22 above at 306; Mukherjee & Mokkapati n 28 above at 285.

<sup>41</sup> Mukherjee & Mokkapati *id* at 287.

<sup>42</sup> Engelhardt 'Russian space probe may fall into South Atlantic' *CBS News* (13 January 2012) available at: <http://www.cbc.ca/news/technology/story/2012/01/13/sci-russionprobeupdate.html> (last accessed 20 June 2012).

<sup>43</sup> Mukherjee & Mokkapati n 28 above at 286.

<sup>44</sup> Watson n 32 above.

<sup>45</sup> According to Watson *ibid*, this is the only known incident where someone on the earth was hit by space debris.



ground in Texas around the same time, nearly landing in an occupied farmhouse.

The nose of an Ariane 5 rocket washed ashore near Corpus Christi in Texas shortly after it was launched in 2000.

In 2011, a tank from a Russian Zenit-3 rocket was discovered by a hiker in Colorado.

Also in 2011, NASA's decommissioned Upper Atmosphere Research Satellite (UARS) fell back to earth and broke into pieces over a remote ocean area in the Southern hemisphere. It is estimated that twenty-six satellite components totalling some 500 kilograms could have reached the earth's surface.<sup>46</sup>

As recently as January 2012, the unmanned Russian space probe, Phobos-Grunt, one of the heaviest and most toxic space objects ever to hit the earth, crashed into the Pacific Ocean some 1 250 kilometres west of Wellington Island. The space probe weighed 14,9 tons and contained 12 tons of highly toxic fuel. Its predecessor, Mars-96, also crashed in 1996 shortly after it had been launched, causing strong international fears as it carried 200 grams of plutonium. The fragments of the spacecraft were scattered over the border between Chile and Bolivia in the Andes Mountains.<sup>47</sup>

Africa has not escaped falling pieces of space debris. In November 2011, a metallic ball weighing six kilograms fell from the air and landed in the populated Omusati region in Namibia. It is speculated that the metallic ball is part of an unmanned rocket used for satellite launches. It is reported that similar metallic balls have fallen in Southern Africa, Australia, and Latin-America over the past twenty years.<sup>48</sup>

---

<sup>46</sup> See *UARS Re-Entry Overview, Final Update: NASA's UARS Re-enters Earth's Atmosphere* available at: [http://www.nasa.gov/mission\\_pages/uars/index.html](http://www.nasa.gov/mission_pages/uars/index.html) (last accessed 20 June 2012).

<sup>47</sup> See 'Derelict Russian space probe crashes to earth' *Space on msnbc.com* 15 January 2012 available at: [http://www.msnbc.msn.com/id/46005190/ns/technology\\_and\\_science-space/t/derelict-russian-space-probe-crashes-earth/](http://www.msnbc.msn.com/id/46005190/ns/technology_and_science-space/t/derelict-russian-space-probe-crashes-earth/) (last accessed 20 June 2012).

<sup>48</sup> See 'Space ball falls in Namibia' *News 24* (22 December 2011) available at: <http://www.news24.com/SciTech/News/Space-ball-falls-in-Namibia-20111222> (last accessed 2 July 2012); 'Namibia space ball mystery solved' *smh.com.au The Sydney Morning Herald – Technology* (27 December 2011) available at: [NK"http://www.smh.com.au/technology/sci-tech/namibia-space-ball-mystery-solved-20111227-1pb52.html"](http://www.smh.com.au/technology/sci-tech/namibia-space-ball-mystery-solved-20111227-1pb52.html)<http://www.smh.com.au/technology/sci-tech/namibia-space-ball->

Although the chances that falling space debris could hit someone on earth are generally fairly low,<sup>49</sup> the potential environmental hazards, especially from radio-active material or toxic fuels, are obvious. There are, however, currently no binding regulations on space debris under international law.<sup>50</sup> After the conclusion of the space treaties in the 1960s and 1970s, it became apparent that states were no longer willing to adopt further binding obligations regulating space activities, and that international space law could, therefore, only be developed by adopting soft law instruments.<sup>51</sup> As a result of their non-mandatory character, these instruments are generally more easily negotiated by states than is the case with treaties.<sup>52</sup> Hence, soft law<sup>53</sup> documents are currently the main instruments for further developing and defining outer space norms.<sup>54</sup>

At present the mitigation of space debris is a matter of voluntary compliance by states with the space debris mitigation guidelines<sup>55</sup> and national legal rules in this regard.<sup>56</sup> The space debris mitigation guidelines adopted by the Scientific and Technical Subcommittee of the UNCOPUOS were endorsed by the UN General Assembly in 2007<sup>57</sup> as voluntary guidelines reflecting

---

[mystery-solved-20111227-1pb52.html](#) (last accessed 2 July 2012).

<sup>49</sup> Watson n 32 above points out that according to NASA ‘there is little danger of death by space debris. Since the dawn of the Space Age some five decades ago, no human has been killed or even hurt by an artificial object falling from the heavens.’

<sup>50</sup> Schrogl n 20 above at 606.

<sup>51</sup> Tronchetti ‘Soft law’ in Brünner & Soucek (eds) *Outer space in society politics and law* (2011) 626.

<sup>52</sup> *Id* at 625–626.

<sup>53</sup> Dugard n 3 above at 33 describes soft law as ‘imprecise standards, generated by declarations adopted by diplomatic conferences or resolutions of international organizations, that are intended to serve as guidelines to states in their conduct, but which lack the status of “law”’. Tronchetti n 51 above at 624 summarises the role of soft law in the general system of international law as follows: ‘1) it can give guidance on how to interpret and implement existing treaty provisions; 2) it may represent the beginning of a process leading to an international treaty; 3) it may contribute to the formation of customary law; 4) it may be declaratory of existing unwritten rules.’ Klabbers *An introduction to international institutional law* (2002) 202 is however of the opinion that the concept “soft law” should be discarded mainly because it is premised on the jurisprudentially dubious notion that that legal rules may be more or less binding, which is not really supported by international tribunals. Furthermore, the fact that soft law is often conceived as informal standard-setting without any control, makes it a convenient tool for the exercise of pure political power.

<sup>54</sup> Tronchetti n 51 above at 627.

<sup>55</sup> *The Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space* (United Nations Office for Outer Space Affairs 2010) available at: <http://www.iadc-online.org/index.cgi?item=documents> (last accessed 2 July 2012).

<sup>56</sup> Lyall & Larson n 22 above at 301; 309.

<sup>57</sup> GA Res 62/217 of 22 December 2007.

existing practices as developed by a number of national and international organisations. Member states were invited by the Assembly to implement the guidelines through relevant domestic mechanisms.<sup>58</sup> Since their adoption, the space debris mitigation guidelines have steadily been implemented domestically by states such as Russia, Japan, and Germany. The member states of the UNCOPUOS also keep each other informed of their efforts to implement the guidelines at national level.<sup>59</sup>

Notwithstanding arguments that voluntary, legally non-binding guidelines would disadvantage developing countries, and that a legally binding framework should be adopted, or that the guidelines should at least be presented to the General Assembly as a draft resolution,<sup>60</sup> the guidelines were not adopted as a resolution by the General Assembly.<sup>61</sup> It should, however, be pointed out that even if the space debris mitigation guidelines had been adopted as a resolution by the General Assembly, they would still only have had the status of non-binding recommendations.

Schrogl<sup>62</sup> attributes the reluctance of states to adopt binding regulations concerning space debris, in the main to the following two reasons. First, the space powers were unwilling to develop rules jointly with states that were not involved in space activities, and that lacked the technical and engineering knowledge to discuss the issues competently beyond a political level. Secondly, the space powers were hesitant to bind themselves legally, as space mitigation measures would necessarily require certain technical modifications to launchers and spacecraft that could result in additional

---

<sup>58</sup> See Preface of the *Space Debris Mitigation Guidelines* n 55 above at iv. The following guidelines should be considered during the mission planning, design, manufacture and operational phases of spacecraft and launch vehicle orbital stages: Guideline 1: Limit debris released through normal operations; Guideline 2: Minimize the potential risk for break-ups during operational stages; Guideline 3: Limit the probability of accidental collision in orbit; Guideline 4: Avoid intentional destruction and other harmful activities; Guideline 5: Minimize potential for post-mission break-ups resulting from stored energy; Guideline 6: Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-earth orbit (LEO) region after the end of their mission; Guideline 7: Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous earth orbit (GEO) region after the end of their mission. See further the *Space Debris Mitigation Guidelines* *id* at 2–4 for a description of the contents of the individual guidelines.

<sup>59</sup> Tronchetti n 51 above at 632. Also see Sgrosso *International space law* (2011) 138–139 for the measures taken by Japan, the USA, France and Russia to mitigate the production of space debris.

<sup>60</sup> See Lyall & Larson n 22 above at 307; Mukherjee & Mokkapati n 28 above at 287.

<sup>61</sup> Schrogl n 20 above at 605.

<sup>62</sup> *Id* at 606.

costs.<sup>63</sup> Schrogl, however, points out that the creation of the Inter-Agency Space Debris Coordination Committee (IADC) where the current twelve countries<sup>64</sup> with launch and space capabilities can develop sound criteria and measures regarding space debris, as well as the increasing understanding of the high cost related to the loss of space craft due to collisions, has shifted the debate to include calls for the strengthening of the guidelines, and even proposals to embody them in a binding legal instrument.<sup>65</sup> In this regard Viikari<sup>66</sup> argues that there is a need for ‘common international regulation to alleviate debris-related problems’.<sup>67</sup>

It should, however, be pointed out that despite their non-mandatory character, the space debris mitigation guidelines have a moral and political value, as there is an expectation that states will comply with their provisions.<sup>68</sup> Non-compliance may be viewed in a negative light by international partners and thus damage the political reputation of the state.<sup>69</sup> It is even contended by certain commentators that the international community has a duty to act as the issue of space debris concerns present and future generations.<sup>70</sup> It could, therefore, also be argued that soft law guidelines have a legal value as they impact on the international law-making

---

<sup>63</sup> Also see Sgrosso n 59 above at 131.

<sup>64</sup> The current member agencies of the IADC are: ASI (Agenzia Spaziale Italiana), CNES (Centre National d’Études Spatiales), CNSA (China National Space Administration), CSA (Canadian Space Agency), DLR (German Aerospace Center), ESA (European Space Agency), ISRO (Indian Space Research Organisation), JAXA (Japan Aerospace Exploration Agency), NASA (National Aeronautics and Space Administration), NSAU (National Space Agency of Ukraine), ROSCOSMOS (Russian Federal Space Agency), UKSpace (UK Space Agency). See <http://www.iadc-online.org/index.cgi> (last accessed 11 September 2012).

<sup>65</sup> Schrogl n 20 above at 606.

<sup>66</sup> Viikari n 12 above at 116–117.

<sup>67</sup> There are, however, contrasting opinions on the possibility and even suitability of a binding convention to regulate space debris. In this regard Lyall & Larson n 22 above at 307 regard a legally binding instrument dealing with space debris as a welcome, but unlikely, development. Also Sgrosso n 59 above at 146 notes that it is at present ‘rather utopian to think of drafting a specific convention, as States lack will to undertake definitive commitments and probably only few States would ratify it’. Welly ‘Enlightened state-interest – a legal framework for protecting the “common interest of all mankind” from Hardinian tragedy’ 2010 *Journal of Space Law* 312–313 is of the opinion that the space debris problem need not be addressed by overhauling existing space law or even amending the existing treaties. It does also not require a new formal and legally binding treaty on the issue of space debris. According to him enough momentum is gaining with regard to space debris mitigation by states, which makes formal legal mechanisms unnecessary.

<sup>68</sup> Welly *id* at 307; Tronchetti n 51 above at 620.

<sup>69</sup> Welly n 67 above at 307.

<sup>70</sup> Viikari n 12 above at 116–117.

process by providing the premise on which customary international law may develop, and which may eventually lead to the conclusion of a treaty.<sup>71</sup> According to some, the duty to mitigate space debris has already attained the status of customary international law.<sup>72</sup> They argue that the space debris mitigation guidelines reflect the *opinio juris* of the major space-faring nations and that states have in practice acted in accordance with this opinion by voluntarily enacting national laws in conformity with the guidelines.<sup>73</sup>

In addition to the mitigation of the production of space debris, consideration should also be given to the issues of responsibility and liability of states for damage caused by space debris.<sup>74</sup>

## OUTER SPACE ACTIVITIES AND INTERNATIONAL ENVIRONMENTAL LAW

### Common heritage of mankind

Article 1 of the Outer Space Treaty<sup>75</sup> provides 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 or scientific development, and shall be *the province of all mankind*.<sup>76</sup>

The phrase ‘for the benefit and in the interest of all countries’ refers to the international law concept ‘common heritage of mankind’.<sup>77</sup> This concept has

<sup>71</sup> Tronchetti n 51 above at 621; Welly n 67 above at 311.

<sup>72</sup> Gable ‘Rules regarding space debris: Preventing a tragedy of the commons’ 2007 *Proceedings of the International Institute of Space Law – 50<sup>th</sup> Colloquium on the Law of Outer Space* 259–262 argues that the duty to mitigate space debris has already attained the status of customary international law as the requirements of *opinio juris* and state practice have been satisfied. According to her, states have demonstrated their opinion that there is an international legal duty to mitigate space debris by agreeing to international resolutions and guidelines. They have furthermore acted in accordance with this opinion by not only adopting international resolutions and guidelines, but also domestic legislation on the duty to mitigate space debris. Also see Welly n 67 above at 311.

<sup>73</sup> Welly n 67 above at 311–312.

<sup>74</sup> Schrogl n 20 above at 606; Lyall & Larson n 22 above at 307.

<sup>75</sup> Note 1 above.

<sup>76</sup> Own emphasis.

<sup>77</sup> Schmidt ‘International space law and developing countries’ in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 696. Schmidt *id* at 697 lists the following five core principles with regard to the concept *common heritage of mankind*: ‘1. There can be no private or public appropriation, i.e. no one legally owns common heritage spaces; 2. Representatives from all nations must share in the management of the resources contained in such a territorial or conceptual area on behalf of all, because a

been enunciated in a number of UN treaties and refers to the areas of Antarctica, outer space, the high seas and the sea bed. These areas cannot be monopolised by one state or a group of states, but should be used for the benefit and in the interest of all mankind.<sup>78</sup> The use of outer space is thus not confined to the benefit of space-faring nations.<sup>79</sup> Also, if states use outer space in a way that excludes other states from using it by, for example, producing potentially harmful space debris, it would be contrary to the principle of the free exploration and use of outer space.<sup>80</sup>

The extent of the international regulation that is needed to ensure the equitable use of the global commons has been a matter of contention between the developed and the developing nations.<sup>81</sup> Developing states often use the concept of ‘common heritage of mankind’ to contend that the freedom to explore and use outer space, legally obliges space-faring nations to share the benefits of their activities with developing countries, and that this even constitutes an enforceable right for the developing countries.<sup>82</sup> Contrary to these assertions, developed countries deny that the Outer Space Treaty, or any other international law instruments, provide for such an obligation and enforceable right.<sup>83</sup>

The allotment of slots for satellites in the geostationary orbit (GSO)<sup>84</sup> has been a particularly contentious issue between developing and industrialised nations. Because the GSO can only host a limited number of satellites

---

common area is considered to belong to everyone; 3. All nations must actively share with each other the benefits acquired from exploitation of the resources from the common heritage region regardless of the level of participation; 4. The area must be dedicated to peaceful purposes (no weaponry or military installations established in territorial commons area); and 5. The area must be preserved for the benefit of future generations.’

<sup>78</sup> *Id* at 696; Welly n 67 above at 273.

<sup>79</sup> Welly *id* at 278.

<sup>80</sup> Sgrosso n 59 above at 131.

<sup>81</sup> Schmidt n 77 above at 696.

<sup>82</sup> *Id* at 712. Schmidt explains that ‘[t]he basis for the claims of developing countries is mainly found in the common heritage of mankind concept, in which theoretically all of humanity became the sovereign over the international commons’.

<sup>83</sup> *Ibid.*

<sup>84</sup> Schmidt *id* at 701 describes the GSO as ‘a circular orbit that corresponds to national territorial, sea and insular territory directly above the Earth’s equator. A satellite positioned in the GSO appears stationary with respect to a fixed point on the rotating Earth. Commercial communications satellites, broadcast satellites and weather satellites often operate in geostationary orbits, with the intention that the antennas communicating with them do not have to move, but can be pointed at the position in the sky where they stay. The GSO is managed by the Telecommunications Union (ITU) through the ITU’s allocation mechanisms’.

(around 180), developing countries have for some time been concerned that, once they are ready to place their own national satellites in the GSO, all the slots will already be occupied by industrialised states and the space powers.<sup>85</sup> As a result, eight Equatorial countries<sup>86</sup> adopted the Bogota Declaration in 1976,<sup>87</sup> in which the GSO is considered to be a scarce natural resource. The Declaration states that as a result of the increasing importance and value of the GSO, coupled with the development of space technology and the growing need for communication, the Equatorial countries have resolved to proclaim and defend, on behalf of their peoples, their sovereignty over this natural resource.<sup>88</sup>

In qualifying the GSO as a natural resource, the Equatorial states relied on UN General Assembly Resolution 2692 (XXV) entitled Permanent Sovereignty over the Natural Resources of Developing Countries and Expansion of Internal Accumulation for Economic Developments. In addition, they based their argument on article 2 of the Charter on Economic Rights and Duties of States adopted by the UN General Assembly as Resolution 3281 (XXIV), which provides that all states have permanent sovereignty over their natural resources.

According to the Equatorial states, there is ‘no valid or satisfactory definition of outer space’ to indicate that the GSO is included in outer space.<sup>89</sup> This statement again stresses the need to formulate a clear and binding definition of outer space. They, however, acknowledge that the segments of the orbit corresponding to the high seas are beyond the national jurisdiction of states and will thus be considered as the common heritage of mankind to be used and exploited for the benefit of all mankind.<sup>90</sup>

The Bogota Declaration has been criticised widely for contravening article II of the Outer Space Treaty, which clearly determines that ‘outer space is not subject to the national appropriation by claim of sovereignty’, and which (according to the critics) includes the GSO. Hence, the Declaration did not garner much support from non-Equatorial states, other developing states, or

---

<sup>85</sup> *Ibid.*

<sup>86</sup> Brazil, Colombia, Ecuador, Indonesia, Congo, Kenya, Uganda and Zaire.

<sup>87</sup> Full text to be found at: [http://www.jaxa.jp/library/space\\_law/chapter\\_2/2-2-1-2\\_e.html](http://www.jaxa.jp/library/space_law/chapter_2/2-2-1-2_e.html) (last accessed 30 August 2012).

<sup>88</sup> At par 1.

<sup>89</sup> At par 4.

<sup>90</sup> At par 3.

the space powers, and was abandoned.<sup>91</sup> The Equatorial states, however, continue to press for special treatment of the GSO. The view has been expressed in the Legal Subcommittee of the UNCOPUOS that there is a need to establish a *sui generis* legal regime with regard to the GSO as a limited natural resource, in order to provide for the equitable use of the orbit by all states, while taking into account the special needs of the developing and Equatorial states as a result of their geographic position.<sup>92</sup>

At the time of the drafting of the outer space treaties, the space environment was regarded as an empty domain. This resulted in the space-faring nations freely creating orbital debris, without any effective system to manage the common interest of mankind.<sup>93</sup> It is, however, increasingly suggested that the global commons, which would include outer space, should be held and managed in a form of trust for the whole of mankind.<sup>94</sup> Some environmental harm can only be effectively prevented and remedied through a global effort. The mitigation and prevention of space debris is a clear example in this regard.<sup>95</sup>

### Space treaties and the environment

---

<sup>91</sup> Schmidt n 77 above at 704.

<sup>92</sup> *Ibid.*

<sup>93</sup> Welly n 67 above at 279.

<sup>94</sup> Lyall & Larson n 22 above at 280–281. Various constructions such as ‘trusteeship’, ‘guardianship’, ‘custodianship’ and ‘stewardship’ have been suggested with respect to the preservation of certain or all elements of the environment by individual states. See Sand ‘Sovereignty bounded: Public trusteeship for common pool resources’ 2004 *Global Environmental Politics* 53. Baslar *The concept of common heritage of mankind in international law* (1998) 117–155 points out that international spaces and national and cultural resources such as the open sea, Antarctica, the environment and human rights form part of the common heritage of mankind. He suggests the use of the term *stewardship sovereignty* in order to regulate the inherent tension between the notions of sovereignty and common heritage of mankind. In an analysis of the effect of biodiversity on state sovereignty, Scholtz ‘Animal culling: a sustainable approach or anthropocentric atrocity?: Issues of biodiversity and custodial sovereignty’ 2005 *MqJICEL* 21–25 submits the use of the term *custodial sovereignty* in relation to the issue of biodiversity: ‘This notion entails that a state is the trustee of its global environmental resources, and that other states have an expectation that the relevant state will protect these resources. Other states are burdened with the duty to support the custodial state to fulfil its obligations. The custodial state is still entitled to exploit its resources in accordance with its (permanent) sovereignty, but the latter is restricted by the expectations of other states. The sovereignty of the custodial state further enables it to deter unwanted aggression by other states regarding its resources.’ According to Viikari n 12 above at 184 there is no reason why the idea of states as trustees of common resources cannot be applied to the management of space activities as well.

<sup>95</sup> Lyall & Larson n 22 above at 281.



The UN space treaties pay very little attention to environmental issues, as these issues were not high on the agenda of space-faring nations when the treaties were concluded. As was pointed out earlier, the issue of space debris is not even mentioned in any of the space treaties.<sup>96</sup>

Although some of the provisions in the space treaties may be environmentally relevant,<sup>97</sup> the states' obligations with regard to space activities are very general and tend to focus more on the safeguarding of human activities than on environmental concerns.<sup>98</sup> As a result, UN space law is not of much assistance in the environmental management of space activities.<sup>99</sup>

Since many activities in outer space (especially the creation of space debris) carry with them environmental risks, the relevance of international environmental law to space seems obvious.<sup>100</sup> Moreover, article 3 of the Outer Space Treaty determines that states party to the treaty shall carry out their space activities in accordance with international law. This confirms the applicability of international environmental law to outer space.<sup>101</sup> However, this notwithstanding, the principles of international environmental law have not (in practice) been extended to apply to outer space.<sup>102</sup>

In a study on the environmental element in space law, Viikari<sup>103</sup> examines the applicability of the key principles of international environmental law to the space sector.<sup>104</sup> She reaches the conclusion that these principles are formulated in vague terms due to their inherent character of balancing different interests. Consequently, the principles are open to different

---

<sup>96</sup> Viikari n 12 above at 55.

<sup>97</sup> See Viikari *id* at 58–104 for a critical discussion of these provisions.

<sup>98</sup> *Id* at 111.

<sup>99</sup> *Id* at 112.

<sup>100</sup> Leister & Kovudhikulrungsri 'Outer space: of the people, by the people, and for the people' 2009 *Proceedings of the International Institute of Space Law – 53rd Colloquium on the Law of Outer Space* 148. The authors point out that some of the principles developed in international environmental law can also be identified in space law, for example, the principles of international cooperation, prevention of damage, responsibility and damage repair, sustainable development, intergenerational equity and citizen participation.

<sup>101</sup> Viikari n 12 above at 120.

<sup>102</sup> Leister & Kovudhikulrungsri n 100 above at 148.

<sup>103</sup> Viikari n 12 above at 129–203.

<sup>104</sup> These principles are: sustainable development; good neighbourliness and due diligence; the precautionary principle; common but differentiated responsibilities; the polluter-pays principle.

interpretations which complicate their practical implementation.<sup>105</sup> These shortcomings aside, the international environmental principles apply to all areas of the human environment, including outer space, and can, therefore, provide the premise for the development of more detailed rules. They can, at the least, serve as basic rules to revise and develop outer space law from an environmental premise, to address certain deficits in the current space treaties, and to assist with the resolution of problems relating to the interpretation of existing space law.<sup>106</sup> International environmental law should thus be consulted whenever practicable, while taking the special features of space law into account.<sup>107</sup> In this regard, analogies available from other areas such as the sea bed, air law, the high seas, and activities in Antarctica should be turned to for guidance in the implementation of international environmental law in the context of outer space.<sup>108</sup>

#### **RESPONSIBILITY AND LIABILITY OF STATES**

Article VI of the Outer Space Treaty of 1967<sup>109</sup> establishes international responsibility for activities in outer space by determining that:

States Parties to the Treaty shall bear *international responsibility* for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall, require authorization and continued supervision by the appropriate State Party to the Treaty. When activities are carried out in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.<sup>110</sup>

States thus bear the responsibility for their own space activities, as well as for the activities carried out by non-governmental entities that launch a space object from their territories. This provision is significant, as space activities

---

<sup>105</sup> Viikari n 12 above at 204.

<sup>106</sup> *Ibid.*

<sup>107</sup> *Ibid.*

<sup>108</sup> *Id* at 205–206.

<sup>109</sup> Note 1 above.

<sup>110</sup> Own emphasis.

carried out by private entities are increasing rapidly.<sup>111</sup> The activities of non-governmental entities must be authorised and continuously supervised by the relevant state. Although the Liability Convention of 1972 does not specifically echo the contents of article VI of the Outer Space Treaty of 1967 regarding non-governmental entities, it may be argued that the launching state is liable for the activities of private entities – as in nuclear law – since states will only be able to comply with the obligation to use outer space for peaceful purposes if they assume liability for all activities carried out in outer space.<sup>112</sup>

The international liability of a launching state is provided for as follows in article VII of the Outer Space Treaty:

Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is *internationally liable* for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the earth, in air space or outer space, including the Moon and celestial bodies.<sup>113</sup>

The Outer Space Treaty thus makes provision for both the international *responsibility* and the international *liability* of states for outer space activities. There are, however, different scholarly opinions on how these terms should be used, and they are sometimes even used interchangeably.<sup>114</sup>

In international law, *state responsibility* refers to the responsibility of the state for an international wrongful act. It arises upon a breach of an international obligation (objective fault) in instances where the breach is attributable to the state.<sup>115</sup> The domestic law elements for wrongfulness, namely subjective fault (*culpa*) and damage, are thus not required for a state to incur international responsibility.<sup>116</sup> The remedies for an internationally

---

<sup>111</sup> Sgrosso n 59 above at 110. Also see art 1(c) of the Liability Convention for the definition of a 'launching state'.

<sup>112</sup> *Ibid.*

<sup>113</sup> Own emphasis.

<sup>114</sup> Viikari n 12 above at 65.; Van der Dunk 'Liability versus responsibility in space law: misconception or misconstruction?' *Proceedings of the 34<sup>th</sup> Colloquium on the Law of Outer Space – International Institute of Space Law of the International Astronautics Federation* 363.

<sup>115</sup> See art 2 of the Draft Articles on the Responsibility of States for Internationally Wrongful Acts (Report of the International Law Commission, General Assembly Official Records, 56<sup>th</sup> Session, Supplement 10 (A/56/10) 29 (2001)).

<sup>116</sup> Van der Dunk n 114 above..

wrongful act are restitution, compensation, satisfaction, and guarantees of non-repetition.<sup>117</sup>

A state commits an internationally wrongful act when it uses, or allows its territory to be used, in a way that causes harm to the territory of another state, or to the persons or property of that state.<sup>118</sup> In the *Train Smelter Arbitration*<sup>119</sup> case, the Arbitration Tribunal applied this principle in the context of international environmental law by stating that

no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.<sup>120</sup>

In its advisory opinion on the *Legality of the Threat or Use of Nuclear Weapons in Armed Conflict*,<sup>121</sup> the International Court of Justice (ICJ) confirmed the principle of state responsibility in the context of international environmental law and held that

the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn. 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>122</sup>

It consequently appears that a general international duty towards the preservation and conservation of the environment, within *and* outside the areas of national sovereignty of states (thus including outer space), is developing.<sup>123</sup> According to Lyall and Larsen, the reference by the ICJ in the

---

<sup>117</sup> Articles 30; 31; 34–37 of the Draft Articles on State Responsibility for Internationally Wrongful Acts n 115 above. See further Van der Dunk n 116 above at 364; Dugard n 3 above at 402.

<sup>118</sup> Dugard *ibid.*

<sup>119</sup> (1983–1941) 3 RIAA 1905.

<sup>120</sup> At 1965.

<sup>121</sup> *Legality of the Threat or Use of Nuclear Weapons in Armed Conflict* 1996 ICJ Reports 226.

<sup>122</sup> At par 29.

<sup>123</sup> Lyall & Larsen n 22 above at 279. Although it is not generally recognised, Caldwell 'Is world law an emerging reality? Environmental law in a transnational world' 1990 *Colorado Journal of International Law and Policy* 239 suggests that a common law for nations is in effect emerging. According to him the *law of nations* becomes a *law for*

*Nuclear Weapons* case to the harm done to ‘generations unborn’ may just as well include the degradation of the space environment. They point out that terrestrial environmental law is applicable to the entire globe, rather than just within the jurisdiction of states. They, therefore, argue that, since environmental rights and duties extend beyond national territorial restraints, they constitute obligations *erga omnes*,<sup>124</sup> even though the idea of an international *actio popularis* has not yet been fully accepted in international law.<sup>125</sup> In this regard Dugard points out that article 48(1) of the Draft Articles on State Responsibility<sup>126</sup> is based on the idea that a non-injured state may nevertheless invoke the responsibility of a wrongdoing state when the latter violates obligations that protect the collective interests of a group of states or of the international community as a whole.<sup>127</sup>

Viikari,<sup>128</sup> too, submits that obligations of international environmental law may have an *erga omnes* character, especially those relating to the protection of the global environment. She explains that:

This holds true in particular if the *erga omnes* character of obligations is not determined narrowly by whether all states have standing to bring proceedings before an international tribunal in the event of a breach, but on

---

*nations* notably in cases in which prevention rather than remediation is the only safeguard for health and the environment. If the actions of a particular government threaten the environmental integrity of its own or other states, or impair the life-support capability of the earth, such actions, if found to be crimes perpetrated against the environment, may also be crimes against humanity. An example in this regard would be the discharge of crude oil into the Persian Gulf and the torching of oil wells in Kuwait by the government of Iraq under the former dictatorship of Saddam Hussain, which have widely been regarded as criminal. In addition to crimes directly impacting on nature, violence against people, such as scorched earth practices in war and the use of weapons of mass destruction, may be regarded as environmental crimes against humanity (at 237–238).

<sup>124</sup> This concept was first described by the ICJ in *Barcelona Traction, Light and Power Company Pty Ltd* 1970 ICJ Reports 3 when it stated that ‘an essential distinction should be drawn between the obligations of a state towards the international community as a whole, and those arising *vis-à-vis* another state in the field of diplomatic protection. By their very nature the former are the concern of all states. In view of the importance of the rights involved, all States can be held to have a legal interest in their protection; they are obligations *erga omnes*’ (at 32).

<sup>125</sup> Lyall & Larsen n 22 above at 281.

<sup>126</sup> Note 115 above. Article 48(1) determines as follows: ‘Any State other than an injured State is entitled to invoke the responsibility of another State if – (a) the obligation breached is owed to a group of States including that State, and is established for the protection of a collective interest of the group; or (b) the obligation breached is owed to the international community as a whole.’

<sup>127</sup> Dugard n 3 above at 279.

<sup>128</sup> Viikari n 12 above at 140–141.

the basis of a right or ability of the international community to hold an individual state accountable for compliance with the obligations through other institutions, such as the Conference of the Parties set up by the UN Framework Convention on Climate Change in case of climate change issues. Such accountability can be argued to derive from notions such as ‘common concern of mankind’ or that of ‘common heritage of mankind’ as used by the Moon Treaty and the UNCLOS.

Article IX of the Outer Space Treaty places certain environmentally relevant limitations on state parties in conducting their space activities by determining that states must conduct their exploration of outer space, the moon, and other celestial bodies in such a manner that will avoid their harmful contamination, and also adverse changes in the environment of the earth, resulting from the introduction of extraterritorial matter. Although no direct reference is made to space debris, this provision would appear to include the issue of prevention of damage by space debris. However, as this provision is formulated in very generic terms, and because it does not provide any guidance on the meaning of phrases such as ‘harmful contamination’ and ‘adverse changes in the environment’, it is not regarded by states as a mandatory provision that they must abide by.<sup>129</sup>

*Liability*, in turn, relates to the remedying of harm irrespective of whether it has been caused by a violation of an international rule or not.<sup>130</sup> The element of damage is thus an indispensable criterion for international liability.<sup>131</sup> According to Van der Dunk, there is, however, a partial overlap between the terms *responsibility* and *liability* in that an internationally wrongful act by one state can often cause damage to another state, its nationals, or its property.<sup>132</sup> In theory, therefore, states could be held responsible for damage simultaneously under articles VI and VII of the Outer Space Treaty, as well as under the provisions of the Liability Convention.<sup>133</sup>

The Liability Convention provides for more detailed rules where damage was caused by states as a result of their space activities. The Convention

---

<sup>129</sup> Sgrosso n 59 above at 132; Viikari n 12 above at 59–60.

<sup>130</sup> Viikari *id* at 65 fn 40.

<sup>131</sup> Van der Dunk n 116 above at 364.

<sup>132</sup> Van der Dunk *ibid* points out that ‘in cases of transboundary environmental pollution, where the causation of damage or harm through pollution to another state’s territory (and not the actual activity causing the harm) was the quintessence of the violation of an international obligation not to do so’.

<sup>133</sup> *Id* at 367.

does, however, not provide for liability for environmental problems such as pollution. It merely regulates natural liability issues in instances where direct damage is suffered by a state or juridical persons as a result of the space activities of another state.<sup>134</sup> In terms of article I, the term ‘damage’ refers to

loss of life, personal injury or other impairment of health; or loss of property of States or of persons, natural or juridical or property of international intergovernmental organizations ... .

Any damage to the environment itself, whether occurring in outer space or on the earth, in areas outside the national sovereignty of states, will thus be excluded.<sup>135</sup> As long as there is no damage to another state’s property or persons, a polluting state will thus most probably not be liable for environmental losses.<sup>136</sup> It may be argued that ‘impairment of health’ should be interpreted to include damage to ‘environmental health’, as a concept which encompasses both human health and the protection of the environment. There is, however, at present not much support for such an interpretation in the modern space sector.<sup>137</sup>

Article II of the Liability Convention makes provision for absolute liability in the instance of damage caused by a space object ‘on the surface of the Earth or to aircraft in flight’.

Article III of the Liability Convention furthermore determines that:

In the event of damage being caused *elsewhere than on the surface of the Earth* to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its *fault* or the *fault* of persons for whom it is responsible.<sup>138</sup>

The Liability Convention thus makes provision for a two-fold liability regime. In the instance where damage is caused by a space object on the earth, or to an aircraft in flight, the state incurs absolute objective liability, which is not based on fault, but on risk. The existence of damage and the

---

<sup>134</sup> Viikari n 12 above at 69.

<sup>135</sup> *Ibid*; Sgrosso n 59 above at 134.

<sup>136</sup> Viikari n 12 above at 69.

<sup>137</sup> *Id* at 69, fn 53.

<sup>138</sup> Own emphasis.

causal relationship between the damage and the space object establishes liability and entitles the victim to compensation. If the damage is caused in outer space, liability arises if fault is proven on the part of the state or of persons for whom it is responsible.<sup>139</sup>

It has been argued that due to the principle of fault-based liability, the Liability Convention will not apply in most cases involving damage caused by space debris in outer space.<sup>140</sup> Moreover, as a result of the uncertainties with regard to the terms ‘space object’ and ‘space debris’, it is not clear whether damage caused by space debris can even be included under the Liability Convention.<sup>141</sup> If it cannot, ‘the instrument becomes largely meaningless in establishing liability for space activities’.<sup>142</sup> In this regard, Schrogl<sup>143</sup> explains as follows:

Fault cannot be proven due to the lack of a legal definition of space debris related to the notion of ‘space object’, which lacks a concept of prioritisation. Under the current legal regime, it cannot be determined whether a space debris hits a satellite or vice versa, nor can it be determined who had the right of passage on the specific orbit. A progressive legal text will have to answer the question of whether or not the producer of space debris will bear strict liability in the case of a collision (and whether this should already hold for existing space debris or only for debris to be produced in the future).

Even if space debris could be included under the definition of ‘space object’, some major practical difficulties in establishing fault and causality thus still remain. In most instances it would be very difficult to prove that the damage was caused by space debris that is part of a registered space object of a

---

<sup>139</sup> Sgrosso n 59 above at 112.

<sup>140</sup> Schrogl n 20 above at 606.

<sup>141</sup> Viikari n 12 above at 69–70.

<sup>142</sup> *Id* at 70. In 1979 Canada invoked the Liability Convention when the Soviet satellite, Cosmos 954, broke up over Canada and spread radio-active material from the spacecraft’s nuclear generator over thousands of square miles. Canada *inter alia* claimed for the costs to restore the area which could no longer be used due to the nuclear debris. The two states however eventually settled the dispute in terms of a protocol between them. Viikari *id* at 72 points out that although the dispute was eventually not resolved by invoking the Liability Convention, ‘the *Cosmos 954* case provides an interesting precedent in one important respect concerning the interpretation of the Liability Convention: at least in this incident space debris was evidently considered a ‘space object’ as it sufficed, in the light of the initial Canadian claim, to establish liability under the Liability Convention’. This was however the only claim to be brought under the Liability Convention up to present.

<sup>143</sup> Schrogl n 20 above at 606.



particular state, and that there existed fault on the part of the launching state.<sup>144</sup> A mere risk of damage as a result of the particular space activity (even if it is very hazardous) cannot result in liability in this instance.<sup>145</sup>

In terms of article 2 of the Registration Convention of 1975,<sup>146</sup> a space object launched into earth orbit or beyond, must be registered by the launching state in a registry which it must maintain. The state must also inform the UN Secretary-General of the establishment of such a registry which must contain the information listed in article 4 of the Convention. It is, however, not clear whether certain information which may increase the amount of space debris in orbit must be included. This would include information on inactive satellites, failed space missions, satellites with variable orbit parameters, launchers, suborbital rockets and probes, ballistic missiles, as well as fuel and chemical or radio-active payloads.<sup>147</sup>

Because it is difficult to prove fault on the part of the launching state whose space object produced the space debris, some commentators are of the opinion that the state should incur absolute liability in terms of the Liability Convention. A connection between the piece of space debris and the launching state must, however, still be proved. This would be more readily possible in the case of a registered inactive space object. It would, however, be very difficult to prove such a connection where the damage was caused by detached smaller fragments of a space object.<sup>148</sup>

Sgrosso<sup>149</sup> submits that rules of conduct should be adopted to require states to take certain measures to prevent space debris, for example, by removing inactive satellites from the geostationary orbit. She proposes a 'special kind of fault liability' where proof of a state's failure to comply with the preventative measures would automatically constitute proof of a state's fault:

[T]hese preventative measures would fall within the launching State's behavioral standards and reasonable diligence and, should the latter fail to take such measures, it would automatically be at fault.<sup>150</sup>

---

<sup>144</sup> Viikari n 12 above at 71; Kim n 20 above at 215–216.

<sup>145</sup> Viikari n 12 above at 71.

<sup>146</sup> Note 1 above.

<sup>147</sup> Sgrosso n 59 above at 133–134.

<sup>148</sup> *Id* at 134–135.

<sup>149</sup> *Id* at 135.

<sup>150</sup> *Ibid.*

She also proposes that principles for the protection of the space environment from damage caused by space debris, similar to those formulated to regulate the use of nuclear power sources in outer space, must be formulated. These principles should then be adopted as a resolution by the UN General Assembly, as a first step to drafting a future convention. The resolution should also address issues such as the definition of terms in order to clarify the question of liability.<sup>151</sup>

It does, however, not seem that the legal status of the code of conduct and the principles suggested by Sgrosso, differs from that of the existing space debris mitigation guidelines. As was pointed out above, the space debris mitigation guidelines of the UNCOPUOS were merely endorsed by the UN General Assembly as non-mandatory guidelines. Even if the proposed principles for the protection of the space environment were adopted as a resolution of the General Assembly, they would remain non-binding recommendations. It could, however, be argued that if global consensus is reached on the issue of space debris within the General Assembly where all states are represented, states would be more committed in their compliance with the guidelines. This will, however, depend on the political will of the space-faring states to involve non-space-faring states in the formulation of the principles.

#### **DEVELOPING STATES AND THE USE OF OUTER SPACE**

As was pointed out at the onset, the involvement of states in space activities is no longer a mere luxury, but is increasingly becoming a necessity. Although it may be argued that African states are already struggling merely to meet the UN Millennium Development Goals and cannot, therefore, be expected to engage in space activities, space technology can be used in a number of beneficial ways,<sup>152</sup> and involvement in space activities is especially important for their development and human security.<sup>153</sup> This will

---

<sup>151</sup> *Id* at 146. According to Sgrosso *ibid* the resolution should address some key issues: '[F]irst of all, the **definition of the terms** used, so as to clarify the space object-damage-liability connection. The term space object must also include man-made debris. The term **space debris** must refer to debris from active satellites, other operations carried out in outer space, intentional or unintentional explosions, collisions or defunct or "abandoned satellites". The term **environment** must refer to the Earth's environment, within and beyond national jurisdiction, and the space environment. **Damage** must refer to personal injury or damage to property belonging to States, private parties or organizations. It must also refer to damage to the Earth's and space environment.'

<sup>152</sup> Jasentuliyana & Kiran 'Space features and human security' 1997 *Space Policy* 258.

<sup>153</sup> Van Wyk 'Overview of the implementation status of the five United Nations treaties on outer space in African countries' 2008 *African Skies/Cieux Africains* 91-92.

also answer the objectives of NEPAD, which has identified the development of science and technology on the African continent as one of its sectoral priorities.<sup>154</sup> In terms of section 13 of the Constitutive Act of the Africa Union,<sup>155</sup> the Executive Council of the Union shall coordinate and take decisions on policies in certain areas of common interest to member states, including science and technology.<sup>156</sup>

Specifically, the use of satellite technology has the potential to promote a state's development and assist in transforming the socio-economic needs of its citizens.<sup>157</sup> Communication satellites can provide developing states with the opportunity to communicate freely and to access information which is imperative for their economic, social, and technical development.<sup>158</sup> Satellites are used for disaster management through remote sensing in order to promote human safety in the instance of disasters such as, floods, earthquakes, volcanic eruptions, landslides, and wildfires.<sup>159</sup> Space telecommunication systems can also play an important role in promoting education on the African continent by, for example, providing for distance education via satellite, and by giving advice to farmers on the planting of their crops.<sup>160</sup> In the health sector, too, space technology has a significant role to play in areas of tele-medicine (where specialists assist health care workers in remote areas by providing diagnostic and curative assistance), preventative health care, and infant mortality.<sup>161</sup>

These socio-economic benefits have made the development of space programmes attractive to a number of developing states.<sup>162</sup> Several African states have also realised the importance of space technology in achieving their national development goals, as well as the Millennium Development Goals.<sup>163</sup> Modest space programmes have, therefore, been launched which are mainly focused on earth observation for the purpose of environmental and agricultural monitoring in order to serve social and development goals.

---

<sup>154</sup> See [http://www.nepad.org/system/files/framework\\_0.pdf](http://www.nepad.org/system/files/framework_0.pdf) (last accessed 8 September 2012).

<sup>155</sup> Full text to be found in Heyns & Killander (eds) *Compendium of Key Human Rights Documents of the African Union* (4ed 2010) 4–11.

<sup>156</sup> Section 13(j). See further Van Wyk n 153 above at 97.

<sup>157</sup> Schmidt n 77 above at 705.

<sup>158</sup> *Ibid.*

<sup>159</sup> *Ibid*; Jasentuliyana & Kiran n 152 at 258.

<sup>160</sup> Jasentuliyana & Kiran *id* at 261; Schmidt n 77 above at 705.

<sup>161</sup> Jasentuliyana & Kiran n 150 above at 261.

<sup>162</sup> Venet n 4 above at 76.

<sup>163</sup> *Id* at 78; 84.

The main actors in this field are Nigeria, South Africa and Algeria. Nigeria has already launched a number of satellites on foreign launchers.<sup>164</sup> After launching a government-owned earth observation satellite in 2009, South Africa established a national space agency<sup>165</sup> in 2010 to implement South Africa's space policy<sup>166</sup> which is focused on capacity-building, the development of space applications, and international space cooperation. South Africa has also created the South African National Space, Science and Technology Strategy. Algeria has a national space agency, and has constructed a centre for the development of satellites.<sup>167</sup> Other states in North Africa, including Tunisia, Morocco, and Egypt (the fourth state to launch a satellite in Africa) also have space agencies or space application centres.<sup>168</sup> Angola has shown an interest in space technology and concluded a contract for a communications satellite with Russia in 2009.<sup>169</sup> A number of African states, including South Africa, have also enacted their own domestic space legislation.<sup>170</sup>

On a regional level, the African Leadership Conference on Space Science and Technology for Sustainable Development was established by South Africa, Algeria, Kenya, and Nigeria to discuss space-related issues. Between 2005 and 2011, four conferences have been held and their recommendations have been shared with non-African member states of the UNCOPUOS.<sup>171</sup> A declaration of intent on the African Management and Environmental Constellation was signed by South Africa, Nigeria, and Algeria in 2008. The data accumulated by earth observation satellites in the lower earth orbit will be shared by these three states.<sup>172</sup> On an international level, South Africa has shown that it has a role to play in the international space arena. It served as co-chair of the Group on Earth Observations in 2005, and it chaired the Committee of Earth Observation Satellites in 2008. In 2009, the European Union-South Africa Space Dialogue was established. In May 2012, an independent advisory committee decided that the world's largest and most

---

<sup>164</sup> *Id* at 85.

<sup>165</sup> See <http://www.sansa.org.za/> (last accessed 8 September 2012).

<sup>166</sup> Full text available at: <http://www.oosa.unvienna.org/pdf/spacelaw/national/safrica/nat-policyE.pdf> (last accessed 8 September 2012).

<sup>167</sup> Venet n 4 above at 85.

<sup>168</sup> Neger & Soucek n 8 above at 173; Van Wyk n 153 above at 96–97.

<sup>169</sup> Venet n 4 above at 85.

<sup>170</sup> Other countries with national policies and legislation on outer space are, for example, Morocco, Tunisia, Nigeria and Algeria. See Van Wyk n 153 above at 95.

<sup>171</sup> Balogh 'Institutional aspects' in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 212.

<sup>172</sup> Venet n 4 above at 88.

advanced radio telescope, the Square Kilometre Array (SKA) will be constructed on sites in South Africa (with the majority of transmitters being sited here), Australia, and New Zealand. The telescope will be used to explore deep space in order to study the origins of the universe and detect weak signals indicating possible extraterrestrial life.<sup>173</sup> These opportunities for international cooperation have the potential of increasing the space capacity of developing states in Africa.<sup>174</sup>

As African states realise the socio-economic and human security benefits of space applications and thus become increasingly involved in space activities, the issue of space debris will inevitably also become a greater concern for these states. The consequences of damage as a result of satellites being involved in accidents with space debris will be especially serious for the developing states which have limited resources.<sup>175</sup> There is also a possibility of environmental damage on the territories of the developing states as a result of falling space debris. It is, therefore, imperative that more African states (including states not involved in space activities) become parties to and comply with the space treaties. They should further increase their representation in the UNCOPUOS in order to have stronger bargaining

---

<sup>173</sup> See Holgate 'SA wins lion's share of super-telescope' *The South African.com – news for global South Africans* available at: <http://www.thesouthafrican.com/news/sa-wins-lions-share-of-super-telescope.htm> (last accessed 14 September 2012); Wickham & Webb 'Giant radio telescope gets split location' *Reuters* at <http://www.reuters.com/article/2012/05/25/uk-science-telescope-idUSLNE84O02520120525> (last accessed 14 September 2012); Lucibella 'Radio telescope boosts South Africa's science credentials' *APS physics* available at: <http://www.aps.org/publications/apsnews/201207/telescope.cfm> (last accessed 14 September 2012).

<sup>174</sup> Cheli 'Cooperation in space' in Brünner & Soucek (eds) *Outer space in society, politics and law* (2011) 184. Also see the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996) which determines that '[a]ll States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis. In this context, particular attention should be given to the benefit and the interests of developing countries and countries with incipient space programmes stemming from such international cooperation conducted with countries with more advanced space capabilities' (art 3).

<sup>175</sup> Prasad 'Common but differentiated responsibility – a principle to maintain space environment with respect to space debris' 2007 *International Institute of Space Law Proceedings of the 50<sup>th</sup> Colloquium on the Law of Outer Space* 290.

power and influence in this Committee, by presenting a united African position on space issues.<sup>176</sup>

One of the issues that will need to be negotiated between developing and developed states, is the responsibility for current and future levels of space debris. As the current levels of space debris are proportionate to the number of space launches to date, a greater responsibility for the maintenance of the environment should be assigned to the space powers that have carried out these launches.<sup>177</sup> This is in accordance with the environmental law principle of ‘common but differentiated responsibilities’ that is enunciated in a number of international environmental law instruments.<sup>178</sup> In terms of this principle, which is based on the idea of international equity, environmental degradation has its origin mainly in industrialised countries and they should, therefore, be primarily responsible for eradicating environmental pollution. These countries usually also have greater capacity to respond to environmental problems and they should, therefore, assist developing countries in accessing relevant resources and technologies to achieve sustainable development.<sup>179</sup> As a result of the difference in the social, economic, and ecological circumstances of states, the environmental standards applied to industrialised and developing countries cannot be the same, hence the need for a differentiated approach.<sup>180</sup>

---

<sup>176</sup> Of the current seventy-one member states of the UNCOPUOS, sixteen states are African. These states are: Algeria, Benin, Burkina Faso, Cameroon, Chad, Egypt, Kenya, Libya, Morocco, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, and Tunisia. See *United Nations Committee on the Peaceful Uses of Outer Space: Members* available at: <http://www.oosa.unvienna.org/oosa/en/COPUOS/members.html> (last accessed 7 September 2012). Also see Van Wyk n 153 above at 93.

<sup>177</sup> Prasad n 175 above at 290.

<sup>178</sup> See, for example, principle 7 of the Rio Declaration on Environment and Development of 1992 which determines that ‘[s]tates shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command’. In terms of art 3(1) of the United Nations Framework Convention on Climate Change of 1992, ‘[t]he Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capacities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof’. See further Mukherjee & Mokkalpati n 28 above at 294–295.

<sup>179</sup> Viikari n 12 above at 179.

<sup>180</sup> Mukherjee & Mokkalpati n 28 above at 294; Viikari n 12 above at 179.

In the context of outer space, non-space-faring nations insist that the space-faring nations (thus mainly industrialised countries) that have caused (and continue to cause) the current levels of space pollution, should bear the main responsibility to improve the situation, so as to guarantee the possibility of future space activity (including that of developing states). Space-faring nations are obviously in a better position to take the necessary action in this regard.<sup>181</sup>

Although the principle of ‘common but differentiated responsibilities’ is not included in any of the outer space treaties, Viikari submits that the space sector might be more receptive to the principle in future in view of the general movement towards creating multilateral accountability.<sup>182</sup> She suggests the creation of a space fund as an expression of the ideals of common but differentiated responsibilities. The fund can be used for the benefit of future generations. Such a fund is in conformity with the notion, referred to earlier, that states are the trustees of mankind’s common resources.<sup>183</sup> Sgrosso also refers to suggestions that an international fund should be created to compensate victims who have suffered damages caused by unidentified space debris. States would then have to pay an amount of money into the fund before carrying out a space launch. The amount would depend on the size, mass, and potential harmfulness of the space object to be launched. She, however, doubts whether this idea is feasible, as it would be very difficult to determine the amount to be paid. Developing states that would be required to participate in the fund when they commence with space activities, may object to this on the basis that the harmful situation has already been created by industrialised countries carrying out earlier space launches.<sup>184</sup>

In order to limit the future creation of space debris, Prasad suggests that launch quota caps be established for space-faring states. These states will then be awarded ‘debris credits’ if they implement the space debris

---

<sup>181</sup> Viikari *id* at 182–183; Mukherjee & Mokkapati n 28 above at 174 note that the view was also expressed at the UNCOPUOS meeting in February 2007 that the states largely responsible for creating space debris should contribute to space debris mitigation efforts in a more significant manner than other states.

<sup>182</sup> Mukherjee & Mokkapati *id* at 295 is similarly of the opinion that the principle of ‘common but differentiated responsibilities’ can be extended to apply to the environmental problems caused by space debris by drafting a convention on the management and liability of space debris.

<sup>183</sup> Viikari n 12 above at 183–184.

<sup>184</sup> Sgrosso n 59 above at 136.

mitigation guidelines. States with advanced space programmes would also be allowed to buy 'debris credits' from other states. Developing states that plan to develop future space capabilities can be given fixed quotas that will lapse after a certain period, should they not realise their planned space missions. These states can, however, sell their 'debris credits' to developed states, thereby acquiring the means to develop their own space capabilities. He also proposes the creation of a trust fund which will be used to compensate victims of damage resulting from space debris.<sup>185</sup>

It is clear that none of the above suggestions provides an ideal solution to the current and future space debris problem. As was pointed out earlier, space-faring-states are reluctant to participate in space debris mitigation measures that would have negative financial implications for them. It is, therefore, doubtful whether states will be willing to contribute to the proposed trust fund. There is also a possibility that developing states will merely sell their debris credits to industrialised states, without really using the funds generated to develop their own space capabilities.

## **CONCLUSION**

Space debris is a global problem with serious implications for the current world population and for future generations. As a result of the high levels of debris already in orbit, fragmentation will continue to escalate exponentially as collisions between pieces of space debris and between space debris and space objects occur. It is, therefore, imperative that preventative measures are undertaken by the international community of states and, moreover, that clear legal rules regarding the responsibility and liability for environmental damage resulting from space debris are adopted.

It should be apparent from the above exposition that the current space treaties are to a large extent outdated and do not deal adequately with the space debris problem. This is further exacerbated by the fact that the outer space legal framework is very fragmented – consisting of treaties, UN principles, guidelines, intergovernmental agreements, and domestic legislation.

It is, therefore, imperative that a legal instrument that will be binding on member states is adopted. It is submitted that, although soft law instruments have certain advantages in the sense that states would appear to agree more

---

<sup>185</sup> Prasad n 175 above at 291.



readily to their adoption, a consolidated and binding legal instrument needs to be negotiated between states to regulate all aspects of the use of outer space. In this regard, the United Nations Convention on the Law of the Sea<sup>186</sup> could serve as a valuable example.

In view of the increasing commercial use of space (including plans to commence with space tourism in the near future) and the uncertainties relating to the military use of outer space, an international dialogue on the use of outer space must be initiated as soon as possible. This dialogue should include both the developed and the developing states, especially as the environmental risks involved in the use of outer space affect all states, irrespective of the level of their development. Further, as environmental obligations are increasingly regarded as obligations *erga omnes*, it is necessary for the entire international community to be involved in this process as all states have a legal interest in the protection of environmental rights.

Some of the most important issues that will need to be addressed specifically in the context of space debris, include the definitions of notions such as ‘outer space’, ‘space debris’, and ‘space object’. Clarity will also need to be sought on the use and application of the terms ‘liability’ and ‘responsibility’ in the context of environmental damage resulting from outer space activities.

If the space debris problem is not attended to urgently, it could significantly hamper the future exploration and use of space, and consequently have a negative impact on the developmental and human security needs of developing states in particular. As Garrett Hardin cautioned as early as the 1960s:

Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.<sup>187</sup>

---

<sup>186</sup> United Nations Convention on the Law of the Sea (1833 UNTS 396 (1982)).

<sup>187</sup> Hardin ‘The tragedy of the commons’ 1968 *Science* 1245.