Navigating the Cosmos: The Role of ADR in Managing Cross-Border Environmental Disputes Arising from Outer Space Debris

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Abstract

Outer Space Activities is capturing global attention & has been sparking significant debates. One of such activity is the gradual yet persistent accretion of space debris making it the current focal point of cross border environmental dispute point. Various countries have started inviting private investors to not only invest in their ventures but also be an independent participant in the current space race. As a result, LEO has become an orbital graveyard, making future space-based operations and exploration a risk to people and property on Earth as well as in the space. One of the many reasons for the transition of LEO into a graveyard is the deliberate destruction of the Chinese Fengyun-1C spacecraft in 2007 and also the inadvertent collision of an American & Russian spacecraft in 2009 which alone has increased the orbital debris population by approximately 70%. The effect of such space collisions and debris on our environment is neglected by the governments. There is close to 6,000 tons of space waste in the low Earth orbit and no international space law is being enforced to clean up the debris, which will also be a costly affair. From another point of view, can there be a law that could be binding to all the participants of these space activities? Would a convention work? Will all major participating countries be willing to sign such a convention let alone actually follow the terms & conditions?

ADR would also be playing a vital role in increasing the efficiency and flexibility of reconstruction thereby increasing the likelihood of effective reconstructing output for viable entities. ADR can be the ultimate solution for constructing a better effective way of dealing with the Jurisdictional issues caused due to environmental threat caused by the space debris.

Key Words

Space Debris, Space Law, LEO, Outer Space.

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In this paper we will understand the environmental effect of Space Debris, for which we first need to understand that the outer space debris means man-made defunct items that float in the Earth's orbit. These items can be of any size, from small left behind fragments of machinery to an obsolete satellite.[1] Space debris can be artificial which means man-made like pieces of machinery left from a collision or during space missions or rocket stages or released parts during maintenance of satellites[2]. Space debris can also be natural, like fragments of meteoroids thrown to our orbit (Earth's) and can be as small as a dust particle or a big boulder.[3] With more than 60 years of space activities we have more than 6050 launches resulting in 56450 objects traced in the orbit out of which only 28160 are regularly traced by the US Space Surveillance Network, only a small fraction of about 4000 satellites are active intact ones.[4]As per the Satellite Industry Report 2021, an increase of 74% in global revenue was from the satellite industry.[5] Making the year 2021 a record breaking year for the space industry, witnessing the most active satellites in orbit (over 5000); the most successful orbital missions (134); the most space tourist flights (6); the most people in weightless space at the same time (19); the most Space-X rocket launches (31); and the launch of the world's most powerful space telescope (James Webb Space Telescope)[6]. As we move towards more successful satellite launches, we are also increasing the amount of space debris. As per a new study there is almost 10% chance of someone being killed as a result of falling space junk in the coming decades.[7] The rapidly increasing dependence and availability of space assets globally has led to space debris accumulation issues increasing.[8] The Earth currently has around 6718 active satellites orbiting[01January,2023].The European Space Agency has reported and tracked 31,870 pieces of space debris through space surveillance networks as of August 2022[9], however these networks are only able to track objects that are larger than 10cm floating in the LEO[LOW EARTH ORBIT] .[10] However, statistical models have estimated an approximate of around 131 million pieces of space debris that are not being traced, which are smaller than 1 cm but poses threat to current and future space-crafts.[11]

Even a small particles, as small as 1cm is of high risk as it is typically moving at 7.5km/sec or more than 17,000mph in the LEO, which is ten times faster than a bullet, however if we are in the orbit too, we will be moving at the same speed and the debris maybe coming towards us from a different direction making the relative speed twice as fast.[A] major part of future new debris can be from collisions in the orbit; these explosions are caused by old rocket bodies and remaining gases and liquids.[12]Some of these explosions are deliberate in order to destroy satellites; so far four such big collisions have been recorded.[13] In a recent incident reported by

Nasa the metal object that crashed into a home in Naples, Florida was a part of the International Space Station(ISS).[14]In another incident in California, a mysterious golden streak in the sky was witnessed which was from a Chinese rocket.[15]

Legal Frameworks Governing the Outer Space

Outer Space is a new domain and so is outer space law, the term has no uniform definition yet. However, the United Kingdom has distinguished between airspace and outer space by marking it as the highest point, at which an aircraft can fly.[16] The Aeronautique International agrees it to be at an altitude of 100km at the Karman Line, however the United States says it to be at a boundary of 80km.[17] In order to manage the legal intricacies of the development of the space industry , COPOUS – Committee on the Peaceful Uses of Outer Space a governing body was introduced by the United Nations.[18] In order to settle and assist inter-governmental discussions UNOOSA- United Nations Office for Outer Space was created which laid down the scope and extent of space law.[19]

Our governments and experts have come together and formed many treaties and signed agreements and conventions in order to mitigate and support the space industry.

The United States of America integrated the international space law through acts such as the Space Act of 2015[20] and the Commercial Space Launch Act, [21]which focus on encouraging private sector growth through a simplified method of licensing and also by promoting commercial activities in the space. As the Space Act 2015 allows US citizens to sell or own extracted resources from celestial bodies which is a great way of fostering innovation while keeping in line with the international laws. The United Kingdom provides a comprehensive framework for regulating and licensing of space activities with the Outer Space Act 1986.[22] India has introduced IN- SPACe(Indian National Space Promotion and Authorisation Centre) on June 20th 2020, as an independent nodal to promote private space activities.[23]It also has drafted policies like the Space Activities bill 2017, which aims to regulate commercial activities and aligning domestic efforts with international commitments.[24]

ISRO has also released the Indian Space Policy 2023, it unveils that the government is encouraging privatization and access of private sector to launch its own satellites.[25] The Australian Space Launches & Returns Act 2018 has updated the requirement to include risk assessments and compliance with environmental standards.[26] The Australian Space Activities Act 1998 has made it mandatory to have insurance coverage of AUD750 million for damages.[27] The French Space Operations Act 2008 has included provisions for environmental and technical standards to ensure its compliance with international laws.[28] They have (France)

also included the mitigation of debris as a key criterion in their licensing process to align with the global sustainability efforts.[29] Now let's understand the impact of our space activities on the health of our planet.

The Environmental Impact

Talking about the environmental impact of the space industry, it has been an important player in the battle against climate change. Space science has enabled us an opportunity to explore and foster a better understanding of Earth and communication through satellite has allowed for a much more efficient use of its resources.[30] However this industry seems to be under a spell of unprecedented investment spree, by sending more and more objects into the space by decimating the value of space through this expansion and increasing the environmental risk.[31]The climate crisis and satellite constellations coming together to impact every aspect of our lives as well as threatening our night sky is only making the situation worse.[32]

It has been established that largely unregulated swarms of satellites in the low Earth orbit (LEO) are directly impacting on ground-based astronomy. It has also been determined that the decreasing density of the upper atmosphere is due to climate change which is further worsening the space debris issue, and creating an environment of debris cloaking the Earth.[33]

Earth's thermosphere is home to thousands of LEO satellites which include the International Space Station, and though it hosts these satellites, it also naturally pulls them back down to Earth over time.[34] It is the rate at which the Earth's atmosphere sends it back down, which is determined by the density of the atmosphere and how fast it changes.[35] **The** climate change effect extends beyond the surface of the Earth, to all the levels of the atmosphere. Climate change which is induced by humans leads to global warming at the ground level but moving up around 15-1500 km in the upper atmosphere these greenhouse gases (increased and concentrated) cause global cooling.[36]The temperature drop in this upper atmosphere causes it to shrink which impacts the thermosphere (90-500km above ground) by reducing its air density[37]. Over the past six decades, nearly 11,000 satellites have been launched out of which 7,000 remain in space.[38] This number could increase to hundreds of thousands by the end of this decade as private companies like Elon Musk's Starlink and Amazon join China and other nation-states in building mega-constellations in Low Earth Orbit (LEO).[39] These new constellations will further boast thousands of satellites, with an expected life of 5 to 10 years leading to huge space debris which could clutter their own orbit, endangering anything that passes by them.[40] Satellites re-entering from mega constellations lead to deposition of hazardous levels of alumina in the upper atmosphere making solar radiation even more harmful[41].Back in 1961,

a few collisions were reported out of which one was of a Russian satellite that contained nuclear batteries with radioactive material which could have caused dangerous contamination if returned to Earth.[42]We need to act immediately to avoid an environmental crisis in the space which is hampering all our efforts of slowing down climate change here on Earth.[43]Such events point out the need for stringent international regulations and more robust debris mitigation strategies.[44]

Literature Review

LEGAL INSTRUMENTS:

- THE OUTER SPACE TREATY (1967)
- INDIAN SPACE RESEARCH ORGANISATION ACT (1969)
- THE SPACE LIABILITY CONVENTION (1972)
- INDIAN NATIONAL SPACE PROMOTION AND AUTHORIZATION CENTRE (IN-SPACE-E)
- The SPACE ACT 2015
- SPACE ACTIVITIES BILL 2017
- INDIAN SPACE POLICY 2023
- SPACE LAUNCHES & RETURNS ACT 2018(Australia)
- AUSTRALIAN SPACE ACTIVITIES ACT 1998
- SPACE OPERATIONS ACT 2008

CONVENTIONS & AGREEMENTS

- The Moon Agreement
- The Rescue Agreement-
- The Registration Convention
- The Liability Convention
- The International Space Station Intergovernmental Agreement 29th January 1998 14
- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (1963)[45]
- Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite (1974)[46]
- Agreement Relating to the International Telecommunications Satellite Organization (1971)[47]
- Agreement on the Establishment of the INTERSPUTNIK International System and Organization of Space Communications (1971)[48]
- Convention for the Establishment of a European Space Agency(1975)[49]

- Agreement on Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes(INTERCOSMOS) (1976)[50]

Methodology Through this research we outline a systematic approach to explore and analyze what role ADR (Alternate Dispute Resolution) plays in managing cross-border environmental disputes due to space debris in the outer space. This study is a combination of empirical and doctrinal research in order to achieve legal, technical and practical coverage of the topic.

Research Question

1. Challenges posed by the outer space debris and how effective existing international frameworks are in addressing cross-border disputes raised from it?
2. Potential ADR mechanism in resolving space debris related dispute and can ADR be a part of international as well as domestic government space systems?

SCOPE This article focuses on the role of ADR in managing disputes that arise from space debris.

THE WAY OUT

ADR – The way out for cross-border disputes

The New York State Unified court system defines alternate dispute resolution as Alternative dispute resolution (ADR) as the different ways people can resolve disputes without a trial. Common ADR processes include mediation, arbitration, and neutral evaluation.51As the name suggests it is an alternate way of resolving issues outside the court, these are confidential processes but less formal ones. There are different types of ADR but one thing that is common is that they all have the potential to resolve issues outside the court.52 In order to avoid the catastrophe our governments and leaders need to look towards more sustainable solutions.53 In order to manage the burgeoning challenges of space traffic and orbital debris or space waste we need much more equipped space regulations.54 There is a need for a much stricter penalties and controls; the IAASS (International Association for Advancement of Space Safety) addresses the need for a robust space debris mitigation guideline which would include responsible disposal of spacecraft.55 When we talk about the ADR mechanism on the international level, Arbitration is what will get us through. Here is why!

The Space Industry has been developing at a much faster rate than any of its supporting legal framework can actually support.[56] To understand why Arbitration can be the answer to all our worries we need to monitor the international trends closely, which shows a pattern of how it has been the most preferred mode of settlements internationally. When two nations get involved in any kind of dispute,

domestic litigation can never get them through, as we have seen in many of the maritime litigation cases. Where jurisdictional issue comes up as one of the main reasons for falling out of the failure of national courts to solve such issues, it is however the international courts that come to the rescue. The intervention of international courts may be a positive result but the number of years it takes is something that raises the question, how can it be resolved faster. International Arbitration is your answer, as it is for a fact that in space disputes parties from various jurisdictions will get involved hence arbitration will be the best mode of dealing with it.

With different nations being involved arbitration can provide them with flexibility to choose what procedural rules and seat of arbitration they wish to choose, making it so much easier for both the parties to actually go through it.

Thus, offering a dispute resolution mechanism that can adapt to the space industry and its needs. A panel of arbitrators considered to have expertise in this area can be put together to form a panel which has been suggested by the PCA Optional Rules for Arbitration of Disputes Relating to Outer Space Activities. These procedural rules also provide for the establishment of a panel of scientific and technical experts, who can actually understand it better than any other judge. Though the PCJ- Permanent Court of Justice has provided us with arbitration rules in 2011, Dubai however has actually worked upon it and so should we all, Dubai International Finance Centre (DIFC) has launched a court for space.[57] They have trained judges in the field of space to cater to the rising demands of a specialist forum in order to resolve space disputes.[58] However, a setback that private parties here face is the establishment of jurisdiction of these specialist forums.

Even after such major efforts, one of the major issues is yet to be eliminated, which can be achieved through the means of arbitration. As Arbitration gives the option to both the parties to choose their seat of arbitration, allowing them to mutually agree to a certain set of rules that both parties will abide by. The investor-state dispute settlement framework (ISDS) may also play a vital role in solving the cross-border jurisdictional issues. The shift to ADR for outer space-related issues such as environmental threats due to space debris and jurisdictional issues can be sought; it will also help in constructing better and manageable contracts between future parties and would be easier for them to negotiate and work together.

Conclusion (Further Thoughts)

We are in desperate need of regulations for space sustainability. Talking at a multilateral level all the countries that have larger footprints in the space must

come together to agree on some standard, limiting the number of satellites in one orbital shell and so on.[59] The current regulations for the space need to be well-equipped to handle the challenges of space traffic and orbital debris management.[60] The need and necessity to impose more stricter penalties and controls for any non-compliance is required, IAASS (The Association for the Advancement of Space Safety) has advocated to provide a robust space debris mitigation guideline. [61]

These guidelines will include the prevention of in-orbit explosions along with the responsible disposal of spacecraft.[62] There have been initiatives like the ClearSpace-1 mission which aims at active removal of debris thereby highlighting the emerging cleaning up space sector.[63] We also need to increase the investment in the analytical tools and data for a better understanding of the underlying science. We also need to detach sustainability from national security so that the countries can share the whereabouts of their satellites without disclosing the purpose.[64] Regulations that are put in place for the purpose of space debris and space activities should be worked upon more frequently and should be updated as new technologies emerge.[65] Globally, the most critical long-term sustainable solution is to give a mandate and resources to address space sustainability issues to the United Nations Agency, as it has proven its worth and capabilities ensuring equitable and rational use of spectrum.[66]

Localizing the International Space Law: A Domestic Perspective

The framework for space law such as treaties conventions and agreements has a direct connection with its implementation at the national level. The effectiveness of these treaties is equally proportionate to the adaptation and integration of international obligations into the domestic legal systems. With respect to the national space activities, states have a heavy burden of responsibility for space-specific treaties and exposure to liability[67]. States however try to mitigate their exposure and discharge their responsibility by actively authorizing or denying permits for space activities and by making it necessary for the non-governmental entities have insurance for their activities which would cover the government.[68] When we talk about the term national activity in outer space, it gives rise to the possibility of overlapping licensing regimes, meaning an aspiring space entrepreneur from Australia, who wants to have a satellite launched in the United Kingdoms will require a licence from two jurisdictions.[69]

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