Comparative Analysis of the Precautionary Principle with the Principle of Due Diligence for Commercial Space Actors toward Space Debris Remediation

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Keywords: Due diligence, precautionary principle, scientific uncertainty, best efforts, outer space activities, corporate social responsibility.

Abbreviations
ILA- International Law Association;
ILC- International Law Commission;
UN OOSA- United Nations Office for Outer Space Affairs;
NASA- National Aeronautics and Space Administration

A basic introduction to the due diligence principle and the precautionary principle, and their relevance in the regulation of space debris remediation (mitigation):

Before commencing why we need to apply the precautionary principle and due diligence toward space debris remediation or mitigation we should focus on the definition of space debris mitigation. Unfortunately, the Space Debris Mitigation Guidelines of the UN COPUOS have not identified a uniform definition. Basically, from the spirit of Guidelines 6, we can understand space debris mitigation as "making determinations regarding potential solutions for removing objects" from outer space.

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We should emphasize why the application of the "precautionary" principle and "due diligence" principles are needed in commercial outer space activities. In general, we need to apply these principles to find out a fair balance between state liability and corporate liability of private space actors. Application of these principles also would help to develop the conception of a "duty to prompt and adequate compensation" in case of transboundary harm in outer space affairs. As outer space activity is distinctive in nature, and commercial activities in outer space have become a new trend, the application of precautionary principle and due diligence measures stimulate to browse differences and similarities in terms of application in international space law.

One of the essential pillars of the contemporary international system is the principle of sovereign equality, which indicates that each state has a due diligence obligation to respect and safeguard the rights of other states, particularly by preventing transboundary deterioration of the environment (transboundary environmental harm).[1] At that point, if a state must prevent transboundary harm and due diligence obligation, it can be difficult to implement this duty without principles of environmental law, such as the precautionary principle. The reason for selecting the precautionary principle in space debris mitigation mechanism is imminent because this field has not been scientifically researched at a high level compared to other common heritage areas of the world. Notwithstanding that scientific uncertainty should not be a reason to relinquish or deny the due diligence obligation of the state to do acts in space debris remediation. Due diligence and the precautionary principle in certain cases scholarly or professional have been indicated as an obligation, approach or principle so far. Hence, we accept due diligence as a principle for this essay.

In international environmental law duties of states are divided into main 2 groups: a) obligations of conduct (due diligence), and b) obligations of result that the precautionary principle included alongside polluter pays principle and duty to prevent.[2] While taking into account that the precautionary principle is one of the prevalent and significant principles of international environmental law, this principle should be recognized through binding international norms rather than recommendatory guidelines. For example, Guidelines for the Long-term Sustainability of Outer Space Activities (2018) (hereinafter: "LTS Guidelines") recalled this principle, while stating that (Safety of space operations: Guidelines B1): States and international

1 Declaration of the United Nations Conference on the Human Environment (16 June 1972) A/Conf.48/14/Rev.1 (1972) 11 ILM 1416 ('Stockholm Declaration'), principle 21; and Rio Declaration on Environment and Development (14 June 1992) A/CONF.151/ 26 (vol I) (1992) 31 ILM 874, principle 2.

2 Thomas W. Merrill, Golden Rules for Transboundary Pollution, 46 Duke L.J. 931, 980 (1997), and Franz Xaver Perrez, The Relationship Between "Permanent Sovereignty" and the Obligation Not to Cause Transboundary Environmental Damage, 26 Envtl. L. 1187, 1201 (1996).

intergovernmental organizations should exchange, *voluntarily*, and/or make readily available regularly updated contact information on their designated entities authorized to engage in exchanges of appropriate information on on-orbit spacecraft operations, conjunction assessments and the monitoring of objects and events in outer space and adopting *precautionary* and response measures".

However, the precautionary measures established in the conventional internationalenvironmental law are not endorsed by states and private parties at all. There is no doubt that usually, private space actors are willing to employ these principles unless it is required by national laws rather than international norms. Henceforth, whether these principles should be recognizedand regulated through customary law norms, or soft law norms in case of lack of a binding treaty is another question at stake.

There are certain distinctions which are ultimately necessary to apply in commercial space activities. First of all, there must be scientific uncertainty and belief in the likelihood of harmto the environment and humanity. There may emerge a discussion on whether an exchange of information should be based on a "voluntary basis" unlike environmental law. Security in outer space is different from other common heritage areas of mankind. National interests, unfortunately, in certain cases inhibit the application of the precautionary principle and due diligence in commercial space actors. The reasoning of such a statement is elucidated in thebelow statements.

In this manuscript, the need forthe application of both principles and how to apply them in commercial space activities are discussed and assessed from points of the theoretical background of international environmental law. Personal analytical opinions and suggestions concerning the application of precautionary principles and due diligence measures are characterized and described as well. While considering due diligence as an "objective and international standard of behaviour"[3] "regime of responsibility for breach of due diligence obligations can be based on fault-based responsibility and objectiveresponsibility.[4] Why do we need to apply theprecautionary principle anddue diligence principles?!

In conventional environmental law, the relationship and distinction between the due diligence principle and precautionary principles are disputed, and it has been claimed that the precautionary principle is derived from due diligence. The other challenging issue ahead of the international space law community is how to enable or how facilitate the application ofprecautionary principle and due diligence principles in private business activities?! As

3 Pisillo Mazzeschi, Forms of International Responsibility for Environmental Harm, supra note 2, at 16, and Alice Ollino, Due diligence obligations in International law, Cambridge University Press (2022), page 122.

4 Robert P. Barnidge, Jr. The Due Diligence Principle Under International Law, International Community Law Review 8: 81–121, 2006.

previously noted, each state tries to preserve its national interests and sovereignty incommercial space activities.
States also have a general obligation to collaborate cooperatively to solve international challenges, including global environmental issues including climate change. Treaty provisions relating to the conservation and preservation of environmental and cultural resources may oblige nations to mitigate climate change to the extent that this is necessary to avoid the anticipated effects of climate change on these resources.[5] Nobody can guarantee whether new space exploration operations in outer space might cause a climate change on the Earth, therefore, due diligence obligation and precautionary principle connect by default. The Workshop on Climate Change Impacts and Adaptation: NASA Mission and Infrastructure by Kennedy Space Center, between 28–30 July 2009 debated certain questions ahead of NASA which indeed are actual for all commercial space actors:

(1) understand current and future climate change risks;
(2) create an inventory of vulnerable institutional capabilities and assets; and
(3) develop the next steps so flexible adaptation strategies can be constructed and implemented.[6]

Therefore, it is an onerous step to "compel" sovereign states to organize space debris remediation or mitigation under the due diligence conception of space law. Nevertheless, several large and mega constellations have outnumbered, and they pose danger to other satellites in terms of collision danger. Liability of not only private space actors but also state actors for space debris remediation or mitigation has still not been recognized so far. Unfortunately, there is no duty to do a space debris remediation. On the other hand, an open question would be who will be responsible for funding space debris remediation or mitigation process that is generated from private space activities.
We need space debris remediation, as it is one of the challenges before small and medium space agencies, and has a significant role in terms of collision avoidance. First of all, there is no direct responsibility in international space law for space debris remediation or mitigation. *Should state actors and private space bodies share responsibility for funding space debris?* This

5 UN Charter (n 61) art 56 (read alongside arts 1(3), 55); United Nations Convention on the Law of the Sea (10 December 1982, in force 16 November 1994) 1833 UNTS 3, art 197; Rio Declaration (n 63) principle 7; ILC, 'Atmosphere' (n 63) guideline 3, Convention on Biological Diversity (5 June 1992, in force 29 December 1993) 1760 UNTS 79, art 6.

6 Third International Workshop on Mars Polar Energy Balance and the CO2 Cycle; Seattle, Washington, 21–24 July 2009, Eos, Vol. 90, No. 40, 6 October 2009.

question encourages the international space community to think over and elucidate the necessity for the application of precautionary principles and due diligence principles in commercial space activities. *In my view, the duty for application of precautionary principle should be part of the due diligence approach or principle in international space law, and the reason for my personal opinion is explained below.*

I should also accentuate that risk management policy and international cooperation are indispensable elements of the precautionary principle. Private space actors alongside state institutions should seek for development of international cooperation regarding the development of risk management policies.

From a practical point of view, we should note that the precautionary principle and risk management of private institution under this principle is highly recommended not only on-board and ground network operations that likely may cause harm to danger. It should also be highlighted that the concept of best effort embodied in the concept of due diligence by international law experts has been particularly applicable to the action of the states themselves. Indeed, if states are obliged to do their best measures to prevent environmental damage caused by private actors, it would be pointless if they refuse to do their best effort to prevent environmental damage caused by themselves. Therefore, the concept of due diligence applies equally to public and private actions.[7]

The duty of states should be examined in light of Articles VI of the Outer Space Treaty (OST). In this case, the obligation of states to cooperate should be replaced by the obligation of private actors in international spheres. Presumably, a belief in the necessity for space debris mitigation and remediation can be established when there is lack of scientific certainty is disclosed through due diligence measures. Before being scientifically certain, we should engage in measures which make us scholarly unsure.

Relationship between Due diligence and Precautionary principles:

According to environmental theorists, the precautionary principle lays the groundwork for urgent international legal action to address human behaviour that is likely to harm the environment.[8] On the other hand, due diligence refers to duties requiring a specific behaviour from the State that are evaluated in terms of their effectiveness, international norms, and the specific condition of the State. They differ from behaviour obligations in that they require the State's best efforts and involve a greater degree of flexibility. Most crucially, for due diligence responsibilities to be successful, the State

7 Tony Cabus, Due diligence and High Seas, First published 2022 by Routledge, page 10.

8 Frank Cross, "Paradoxical Perils of the Precautionary Principle", (1996) 53 Washington and Lee Law Review, pp. 851-925, p. 861.

must exercise some level of supervision over private operations.[9]
The *prevention of harm theory* connects due diligence with other principles such as the *precautionary principle*, which is sometimes limited as an environmental law principle and sometimes seen as a general principle of international law with various sectorial applications. Unpredictability about the cause-effect relationship between an activity and harm must not be used to postpone taking environmental protection measures when the risk of harm is considerable. When a danger becomes unacceptable and the reduction of that risk becomes economically and socially justifiable, it must be addressed by an appropriate governmental policy.[10]
It has been claimed that for three reasons, the precautionary principle has had a vital impact on the development of international environmental law:

(1) It has evolved into a policy-making framework that is concerned with environmental protection;
(2) This paradigm fosters the concept of justice and equality in environmental management by urging policymakers to focus on the consequences of their actions;
(3) Adoption of the precautionary principle can generate new legal rules concerning causality and burden shifting that reflect a revaluation of natural resources.[11]

To my best analysis, while referring to and comparing the influence of the precautionary principle to space law we can encounter fundamental similarities and differences. Firstly, the precautionary principle and due diligence obligation may require states to adopt rules and policy guidelines that enable them to hold liable private space actors for their wrongdoings. Such confidence also urges private space actors to add the imminence of environmental impact assessment in their corporate social responsibility.
Additionally, concentration on the consequences of actions while prioritizing causalities and burden shifting also makes duty to do risk assessment and risk management measures. Subsequently, risk assessment and risk management before doing certain actions should be considered due diligence measures for commercial space parties. Due diligence is defined as the "obligation to deploy adequate means, to exert the best possible efforts, to do the utmost, to achieve this result." establishes the standard of conduct for such duties.

9 Heike Krieger, Anne Peters, Leonhard Kreuzer, Due Diligence in the International Legal Order, Oxford University Press 2020, page 234.
10 Haseeb Ansari, Abdul; Wartini, Sri, Journal of International Trade Law and Policy vol. 13 iss. 1 (2014).
11 Ibid.

Depending on circumstances, due diligence may have diverse normative features and purposes.[12]

International climate change law has significantly developed because of technological development and due to plenty of damage to the climate. Therefore, to mitigate climate change certain due diligence measures are applied. Presumably, due diligence measures deployed and corroborated by climate change experts can be used in the context of space debris mitigation and remediation processes, and certainly, there is a technical similarity between climate change and space debris mitigation.

The primary rule's legal interest protection may also broaden the extent of a state's duty to act with reasonable diligence. For example, assume a due diligence obligation is established to preserve or ensure a fundamental interest to the worldwide community. *The primary rule's legal interest protection can additionally broaden the extent of a state's duty to act with reasonable diligence.* For example, suppose a due diligence obligation is imposed to preserve or ensure a fundamental interest in the international community. *The precautionary principle applies in situations when dangers are potential, uncertain, and neither known nor quantifiable by probability.*[13]

From the experience of international public law, it has been claimed that the concept of due diligence is applied to two kinds of duties. It is useful when international legislation is aimed at private actors in conjunction with States, and its objectives are nearly impossible to attain in every situation.[14] Both of these forms of responsibilities can be found in maritime law. There is no doubt that as the role of private actors has been enhancing in the outer space industry likewise the maritime industry, we can take an example of precedent principles and interpretations and apply them in outer space law. The protection of outer space is one of the critical components of international space law, and presumably, it is inherently composed of desired goals translated into responsibilities of conduct rather than obligations of result similar to maritime law.

We should accentuate that *knowledge of risk* concerning certain activities as a notion is also part of due diligence obligations and precautionary principles.

Due diligence tries to minimise the State's culpability for the actions of private parties. While it was unreasonable to hold the State responsible for all private actors' acts inside its jurisdiction or control, it also appeared unfair to hold the State unaccountable for all activities taking place within its territory

12 Anne Peters/Heike Krieger/Leonard Kreuzer, 'Due Diligence in the International Legal Order: Dissecting the Leitmotif of Current Accountability Debates', chapter 1 of this book, section 4.

13 Alice Ollino, "Due diligence obligations in International law", Cambridge University Press (2022), page 162

14 Ibid 6, page 21.

or authority. Due diligence, in this context, offers an alternative accommodation by requiring the State to use its best efforts to prevent wrongful acts within its jurisdiction and control. As a result, states may be held accountable for inappropriate conduct by companies.[15] However, jurisdiction and control of the state are not restrained to territorial sovereignty in certain international acts and states still be responsible for the environmentally hazardous activities of their citizens.

A Brief Reference to Due Diligence and Precautionary Principle in International Law

We should compare the application of the precautionary principle and due diligence from the perspectives of *obligation to prevent* and *due diligence obligations*. State parties and commercial actors should understand why and how space debris mitigation rules and policy is a recommended measure, or even more mandatory in specific cases.

Probably, the obligation of due diligence in atmospheric circumstances would be a more appropriate precedent to apply toward space debris mitigation.

The International Law Association (ILA) and the International Law Commission (ILC) have both attempted to clarify general international law on climate change, but their judgments have remained disproportionately vague. The ILC's Draft Guidelines on the Protection of the Atmosphere, for example, specify that states have "the obligation to protect the atmosphere by exercising due diligence." They mention 'due diligence in taking suitable measures,' but do not specify the duty. In this way, while taking into account that outer space is beyond the principle of state sovereignty, several states and scholars claim that the duty to protect the environment is restrained to state borders and sovereignty. However, the International Law Association proclaimed that the duty to protect areas beyond national jurisdiction should be extended to Earth's orbital space.[16]

Need for both principles (approaches) simultaneously?!:

- They may encourage the concept of justice and equality in the management of commercial space activities and heed at environmental sides by pushing policymakers and business entities to focus on the consequences of their actions;
- Their adoption in commercial agreements establishes new legal and economic regimes concerning causality and burden shifting that reflect a revaluation of natural resources during space exploration.

The LTS Guidelines and Space Debris Mitigation Guidelines have recognized non-binding legal regimes for precautionary measures. There is uncertainty

15 Alexander Kees, "Responsibility of States for Private Actors" (Oxford: Max Planck Encyclopedias of International Law, 2011), page 25.

16 Final Report to the Sixty-sixth ILA Conference, Buenos Aires, 1994.

about the relationship between the two approaches. Due diligence and precautionary principles should be combined to safeguard the environment and prevent environmental degradation, moreover, such a combination may help boost the transfer of technologies and capacity-building measures between developed and emerging spacefaring nations. Sustainability of outer space activities and *environmental impact assessment* are our main targets when we apply these approaches. Stephen Dovers stated that, since sustainability is an interconnected and multifaceted agenda, the precautionary principle should not be applied in isolation from other principles, as normally, the topic of precaution focuses on immediate environmental hazards.[17] Brunee claimed that: 'due diligence provides a bridge between the duty to prevent environmental harm and the proposition that, even in the absence of "full scientific certainty", states must take precautionary measures to "prevent environmental obligation concerning 'prevention of harm' unifies these two principles in a single character.[18] While prioritizing primary requirements above subsidiary obligations, it is straightforward to conclude that an obligation of due diligence entails preventing severe transboundary harm or, at the very least, minimizing risks. As a result, rather than defining the criteria for a breach of due diligence and the consequences of such a breach, the Draft Articles on Prevention give substance to the due diligence responsibility to prevent transboundary harm.[19]

Due diligence responsibilities are a subtype of conduct obligations. The distinction is slight, but the emphasis on best effort and flexibility distinguishes due diligence. Cooperation duties, for example, may not be considered due diligence responsibilities unless they necessitate the application of "*best efforts*" and urge to use flexible measures.

While scrutinizing the application of due diligence and precautionary principles, we can see that the notion of We should accentuate that similar to the marine environment, in outer space activities comprised of relative duties that cannot be met in every circumstance. As a result, due diligence is highly essential for *high-risk activities* because it is designed to respond to such scenarios. Furthermore, conducting and monitoring high-risk activities poses a technological and logistical difficulty for states. As a result, technologically sophisticated countries have greater capacities than emerging countries. As a result, severe results commitments would result in unjust situations. On the one hand, rigorous responsibilities would be fulfilled exclusively by rich countries, leaving developing countries with the alternative of a high risk of

17 Elizabeth Fisher, Judith Jones and René Schomberg, Implementing the Precautionary Principle: Perspectives and Prospects, published by Edward Elgar, 2006, 336 pp.

18 ILA, Study Group on Due Diligence, Second Report 2016 (n. 12), 19; ITLOS, Responsibilities and Obligations in the Area Opinion (n. 6), para. 230.

19 Draft Articles on Prevention, commentary Art. 3, para. 11.

failure or non- participation.[20]

While referring to the Rio Declaration, Principles 15, "threats of serious or irreversible damage", and the "lack of full scientific certainty" shall not be a reason to delay or prevent environmental harm even if there is specific scientific evidence about anticipated hazards. Indeed, following the standard no-harm argumentation, diligent efforts should only address "significant" harm or recognised hazards.

Several national laws establish the application of the precautionary principle in joint decisions, which can be considered a diligent measure while making resolutions concerning environmental protection. For instance, the Intergovernmental Agreement on the Environment (IGAB) of Australia[21] requires that public and commercial actions be bound by the precautionary principle. Adopting the precautionary principle, public and private actions should be directed by: (i) rigorous examination to avoid serious or irreversible environmental damage wherever possible; and (ii) an assessment of the risk-weighted implications of various options.[22]

Role of opinio juris norms. Which measures of the SDMG can be accepted (believed) as part of due diligence and precautionary principles?

The evidence of the widespread application of states and its recognition as law *(opinio juris)* in future can be identified as a customary international law after gradual practice by state actors and by prominent. However, conducting a full examination of state practice and acceptance as law is not always feasible.[23]

Customary international law is composed of two components: first, a consistent and universal practice among nations, and second, a consideration on the part of those states that their practice conforms with international law. The ICJ and the Permanent Court, for example, have specified the definition of positive evidence for explicit confidence in actual state practice in three important cases, as required by statute. However, current international practice slightly detains recognition of both due diligence and precautionary principle not only in customary international law but as well as on international soft law norms.

Perhaps, the Guideline 6 of the Space Debris Mitigation Guidelines designated due consideration to the fact that removing space objects should be done in a such manner that does not pose a danger to human life.

20 Ibid 11 and ibid 6, page 139.

21 Intergovernmental Agreement on the Environment: An Agreement made on the 1st day of May 1992, https://faolex.fao.org/docs/pdf/aus1300 6.pdf.

22 Ibid 6, page 143.

23 North Sea Continental Shelf (Germany/ Denmark, Germany/ Netherlands), Judgment (20 February 1969), [1969] ICJ Rep 3, para. 77; Military and Paramilitary Activities in and against Nicaragua (Nicaragua v US), Judgment on Merits (27 June 1986), [1986] ICJ Rep 132, ¶207; ILC, 'Customary International Law' (n 137), conclusion 2.

Nevertheless, the necessity of due diligence obligations concerning space debris removal, even in cases of lack of scientific evidence should be prominently covered in these guidelines in future.

Conclusion

While concluding the highlighted role of the due diligence principle and precautionary principle toward space debris mitigation or remediation we should focus on how to expound the significance of these principles. Notwithstanding that it is difficult to make a soft law agreement or binding international agreement in outer space affairs, we can rely on current other international binding norms in environmental and climate change areas, as well as soft law norms adopted by UN COPUOS. A combination of due diligence and precautionary principles should take part in risk management and corporate social responsibility policies of commercial space actors.
At the meeting on "Determining Priorities for Future Mars Polar Research",[24] participants agreed that NASA should:

> "(1) develop a science working group on climate change to provide information to operational managers at NASA;
> (2) work to build intercenter coordination and collaboration with other institutions in the regions where NASA centres are located;
> and (3) focus on incorporating available scientific research into each centre's strategic long-term planning process".

The private space actors regardless of their capital investments and should employ precautionary principles through their science working groups, and emphasizing the significance of such groups should be part of their Corporate social responsibility. Presumably, technical regulations generated by such groups can overturn soft law norms in the future or *opinio juris norms*. Perhaps, international cooperation between transnational corporations and emerging spacefaring nations also should be part of this policy.
Corporate social responsibility should be recognized through international binding or non- binding law norms to make sure that sustainable business values of commercial space actors reflect a precautionary approach (principle) and due diligence standard.
Environmental impact, integration of adverse findings into their business operations, communicating results, and providing effective compensation mechanisms for victims.[25]
The essential purpose of application of both due diligence obligations and precautionary principle in corporate social responsibility of private space

24 Ibid 3.
25 UN Guiding Principles on Business and Human Rights, Principles 11-22.

actors is to bring into light the significance of the "*duty of care*" in the context of space debris mitigation. Each private space actor acting on behalf of State should share a liability in spite of that there is not a direct duty regarding space debris mitigation or remediation. Presumably, if the damage was foreseeable, the fact that a private party may have had a more immediate role in the circumstances leading to the harm than the State would not prevent the emergence of a duty of care.

This may be the case if the State is familiar with the affiliated corporation's activities and the health and environmental risks they may pose, and the parent has sufficient control over the affiliate's activities to influence how (and to what standards) those activities are carried out.

Thus, a precautionary principle should be part of corporate social responsibility, which requires investigating and implementing preventive measures even though scientific evidence concerning the perilous impacts of mega-constellations currently are insufficient. Nevertheless, it is almost impossible to understand and elucidate the significance of space debris mitigation without applying both principles or approaches in practice. Apparently, it is because of the nature of activities in outer space. Either state bodies, or private space actors should act within the legal framework that reflects both groups of obligations in order to disallow more space debris and to do acts after the termination of the life of spacecraft in outer space.

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