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The Assessment of "Harmful Interference" Conflicts in Outer Space Activities According to International Tort Law Standards; and Selecting the Appropriate Dispute Settlement Method for Small Satellite Operators

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Keywords: ITU regulations, civil liability; harmful interference; dispute settlement methods; commercial space actors.

Abbreviations
HI – harmful interference
ILC – International Law Commission
ITU – the International Telecommunication Union
LTS Guidelines – Guidelines for the Long-term Sustainability of Outer Space Activities
RR – Radio Regulations

1. Introduction

The major objective and gist of this manuscript are: 1) to corroborate the evaluation of radio frequency spectrum as shared natural resources from the

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perspectives of international environmental law; 2) to elucidate a necessity for recognition of a civil liability regime due to breach of duties in radio frequency spectrum management from perspectives of tort law; 3) to suggest more flexible and economically efficient method for HI dispute settlement.

We should take into account that LTS Guidelines adopted by UN COPUOS in 2019 also reiterated radio frequencies, including geostationary satellite orbits as 'limited natural resources'. These Guidelines stipulate that radio frequencies be used rationally, efficiently and economically, in accordance with the provisions of the RR as an obligation, to ensure equal access to these orbits and frequencies operation without HI by all countries, taking into account the special needs of developing countries and the geographic location of certain countries.[1]

We should also accentuate that the ITU Member States and international intergovernmental organisations should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth when using the spectrum, in accordance with the ITU RR and the ITU Radiocommunication Sector (ITU-R) Recommendations.

Although, ITU RR are imperative for the ITU-Member States. For instance, in Azerbaijan ITU RR are endorsed by law and are part of Azerbaijan domestic legislation. On the other hand, the LTS Guidelines A4(5)[2] does not necessarily recognize the implementation of the RR procedures as a mandatory duty for ITU Member States and international organizations. Unfortunately, the wording of "private corporate institutions" or "commercial space actors" lacking in the LTS Guidelines A4(5). The rhetorical question appears, why observing the implementation of RR procedures be a duty for commercial space actors if it is not fully obligatory ahead of the states itself? Presumably, the nomination of commercial private space actors would give us a presumption that compliance with ITU procedures should be a part of the corporate social responsibility of private space actors, although it is not recognized as a compulsory duty in international instruments.

Practically and substantially, the Liability Convention 1972 is irrelevant to HI disputes. According to its Article 1(a) the term "damage" embraces the concept of "loss of life, personal injury, or other impairment" to the health of the property of States or persons. Therefore, we should look for a more effective liability regime in case of HI that is generated due to wrongful actions, and such a dispute settlement method should not be quasi-judicial.

Article 56 of the ITU Constitution stipulates to settle disputes over the interpretation or application of the Constitution, the Convention, or the Administrative Regulations through consultation, negotiations, diplomatic

1 LTS Guidelines, Guideline A.4 (2).
2 Ibid.

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channels, or under the procedures established by bilateral or multilateral treaties concluded between the ITU Member States. *However, what if a violator satellite operator (SO) denies HI and refuses to collaborate to cease HI during consultation and negotiation?*

Nevertheless, the "Optional Protocol on the Compulsory Settlement of Disputes relating to the Constitution of the ITU" has not been deployed so far due to political and economic reasons. As of today, 64 Member States signed this Protocol.[3]

In this way, we suggest continuing to develop the conception approaching radio frequency spectrum disputes, and liability from perspectives of natural resources or shared resources that have been established in various fields of international law. While debating and discussing liability for HI, the gist of this manuscript is to develop a corporate liability on the basis of international law. *The right to prompt and adequate compensation* in HI cases for commercial space actors is also a major objective of this manuscript.

Evidently, discussions on the common nature of the resources have focused on how to make it possible for all States to use the resources simultaneously and in the future due to the limited availability of some heavily used resources, such as geostationary orbit and the radio spectrum.[4] Although, nowadays even non-GSO altitudes become very congested.

2. Analysis of HI as a Breach of Duty – Is HI a Violation of the International Obligation of the State?

Nowadays, there is no uniform functioning international responsibility scheme for remedying transboundary damage. A question of how state responsibility related to transboundary pollution and other dangerous human activities such as space exploration previously has been scholarly investigated so far, notwithstanding that, states have relentlessly maintained their sovereignty over natural resources and have continuously resisted articulating a coherent doctrine of state responsibility for environmental degradation.

In conventional tort law, 1) the duty to the claimant; 2) careless omission; 3) a causal link between the breach of duty and the damage or other loss; 4) damage or loss could reasonably be expected to result from the breach of duty are essential parts. When the right to use the property or lawful possession is violated, the following conditions must exist: a) damage should be legally recognized; b) the victim must be deprived of possession right; c) infringement should cover physical damage; d) disposition of the right must interrupt its use and other disturbance of the right's exercise.

3 https://www.itu.int/online/mm/scripts/gensel25?agrmtid=0000925245.

4 Katherine Gorove and Elena Kamenetskaya, "Tensions in the Development of the Law of Outer Space," in Damrosch, Beyond Confrontation, pp. 234 and 238.

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For example, when telecommunication satellite operators provide additional power link margin, they may be operationally or technically constrained by intersystem coordination requirements. As a result, if the satellite emits too much power, it may interfere with other satellites, terrestrial communications networks, or highly sensitive instruments such as radio telescopes. Thus, elements of tortious liability are apparent in this example, despite that there might not be physical damage. Despite that the spectrum has not been recognized by the Outer Space Treaty (OST) and Liability Convention in an expressive manner, it is time to develop the conception of property in international space law for the sake of commercial telecommunication satellite

Governmental organisations typically compensate for property loss, including harm to natural resources and the environment, through negotiation and based on out-of-just criteria. The rationale is straightforward: determining the degree of such damage entails a lot of unidentified factors.[5] Usually, breaches of civil duties generated from contractual and non-contractual obligations are solved through national laws and domestic courts.

Because of the variety in national tort laws, it would be difficult for commercial satellite operators to look for assessment of HI, as damage to property caused by non-contractual obligations. On the other hand, the past experiences of national governments' approach can raise the question of how far natural resources can be classified as "goods" for compensation.[6] For example, under Dutch court practice in order to an action in tort must fall within one of the legally protected interests that requires the court to consider whether the plaintiff truly has a particular interest under civil law; generally, the plaintiff must demonstrate property damage or personal injury.[7]

2.1. The Elements of "Careless Omission" and the Duty to Cease HI in ITU RR

There are certain provisions which indicate the elements of careless omission of the violator, and duty to cease HI upon receiving notification from the injured party. For example: RR:

> "7.8 In a case of HI involving the application of the provisions of Article 15, Section VI, except when there is *an obligation to eliminate HI* under the provisions of this Chapter, administrations are urged to exercise the utmost goodwill and mutual cooperation taking into account all the relevant technical and operational factors of the case".

5 Fred J. Rutgers, "Sea-Bird Protection Under Dutch Tort Law: The Judgment of the Rotterdam District Court of 15 March 1991" in Kroner, Transnational Environmental Liability, p. 82.

6 Xue Hanqin, "Transboundary Damage in International Law", Cambridge University Press, 2003.

7 Ibid. 4.

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According to our best analysis, a basic linguistic and judicial analysis of this clause gives us a clear presumption that a duty to obviate HI is recognized without excuse, however, a duty to negotiate in case of HI applications has not been established as an obligation, and avoiding consultations has not been sanctioned as well. Section VI of RR Article 15 stimulated "utmost goodwill" and "mutual assistance" in radio interference dispute settlement cases, and it entitles administrations to present a particular request for assistance in cases when bilateral measures might have been unsuccessful.[8]
There are other certain norms of the ITU RR which require careful coordination, and concise requirements which help us to measure a degree of care:

> "8.3 Any frequency assignment recorded in Master Register with a favourable finding under No. 11.31 shall have *the right to international recognition*. For such an assignment, this right means that other administrations shall take it into account when making their assignments, to avoid HI. In addition, frequency assignments in frequency bands subject to coordination or a plan *shall have a status* derived from the application of the procedures relating to the coordination or associated with the plan;
> 8.5 If HI station whose assignment is by No. 11.31 is caused by the use of a frequency assignment which is not in conformity with No. 11.31, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference."

We should also take into account that ITU also demand to do examination which may enable us to find out a causal link between acts of the wrongdoing party and HI, for instance: "in ITU proceedings very often referred to as first-come-first-served.[9] If you are a newcomer, you have to coordinate your frequencies with the first coming Member States. According to RR 11.38 when the examination by the ITU with respect to a favourable finding, the assignment shall be recorded in the Master Register."[10]
When the finding is unfavourable, the notice is returned to the notifying administration, however, RR11.41 gives the opportunity to the Member States to resume their filing. The administration is responsible for the station

8 "Radio Interference, ttps://www.itu.int/en/mediacentre/backgrounders/Pages/radio-interference.aspx>, last accessed 09.09.2023.
9 Report of the Director on the activities of the Radiocommunication Sector https://www.itu.int/md/R23-WRC23-C-0004/en last accessed 13.09.2023.
10 Report of the Director on the activities of the Radiocommunication Sector https://www.itu.int/md/R23-WRC23-C-0004/en last accessed 13.09.2023.

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using the frequency assignment recorded under RR11.41 and if there arises any interference regarding the frequency they recorded their notices under RR11.41, they need to immediately eliminate this HI. The Administrations involved shall cooperate in the elimination of HI and may request the assistance of the ITU Radiocommunications Bureau (BR), and shall exchange relevant technical and operational information required to resolve the issue.
Regarding RR 11.42A, should any administration involved in the matter inform BR that all efforts to resolve the HI have failed, BR shall immediately inform other involved administrations and prepare a report, together with all necessary supporting documents, for the next meeting of the Radio Regulations Board (RRB) for its consideration and any required action (including the possible cancellation of the assignment recorded under RR11.41), as appropriate. BR shall thereafter implement the decision of RRB and inform the administrations concerned. It is vital to finalize satellite coordination issues according to the RR. It is a scary issue that, nowadays thousands of NGSO satellites operate without completing coordination.
The ITU also has a Space Radio Monitoring System for HI for which an administration is seeking the assistance of BR under RR Article 15 or 13.2, as well as in cases of reported interference arising from coordination issues (RR Article 11, No. 11.41).[11]
The Satellite Interference Reporting and Resolution System (SIRRS) online application was developed by BR for formal submissions of reports and subsequent exchanges of information concerning cases of HI affecting space services.[12]

> **Article 15- Interferences:**
> § 8 Administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks, but excluding equipment used for industrial, scientific and medical applications, does not cause harmful interference to a radiocommunication service and, in particular, to a radio navigation or any other safety service operating in accordance with the provisions of these Regulations 1.
> § 9 Administrations shall take all practicable and necessary steps to ensure that radiation from equipment used for industrial, scientific and medical applications is minimal and that, outside the bands designated for use by this equipment, radiation from such equipment is at a level that does not cause HI to a radiocommunication service and, in particular, to a radio navigation or any other safety service operating in accordance with the provisions of these Regulations 1; § 10 1) Before authorizing

11 https://www.itu.int/en/ITU-R/space/Pages/ITU - Space-RadioMonitoring.aspx.
12 SIRRS (Satellite Interference Reporting and Resolution System), https://www.itu.int/ITU-R/space/sirrs, last accessed 13.09.2023.

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tests and experiments in any station, each administration, in order to HI, shall prescribe the taking of all possible precautions such as the choice of frequency and of time and the reduction or, in all cases where this is possible, the suppression of radiation. Any HI resulting from tests and experiments shall be eliminated with the least possible delay.

2.2. Whether a HI is a Breach of International Obligation

While analyzing HI as a breach of duty, we should evaluate a state's responsibility and state liability at the first stage according to the spirit of international law. We should also look for various types of liability, such as objective liability; strict liability; and fault liability. The fault itself is composed of a *breach of conduct required by obligation* and *the conduct in negligence*. Attempts to distinguish liability from responsibility by its "objective" nature, nevertheless, may confuse while numerous international obligations can be infringed without negligence (*culpa lato sensu)*, and the corresponding responsibility is equally objective.[13]

Additionally, we should take into account that Article 56 of the ITU Constitution is dedicated to solving disputes between ITU Member States according to ITU rules. All in all, quasi- judicial dispute settlement is part of dispute settlement under Article 56, moreover, there is no any procedural provision concerning the burden of proof and procedural rules about measuring the extent of the infringement. In the meantime, commercial satellite operators are interested in effective substantial and procedural rules about demanding appropriate compensation. Presumably, practice of ILC with regard to the right to adequate and prompt compensation in case of transboundary harm would be the best model law for HI disputes between commercial parties.

Besides that, in order to make an appropriate demand for compensation for harm, first, the aggrieved State's international rights must have been infringed by the responsible state, next, under the presumption that every right of a State corresponds to an obligation of a State, only the party to whom the international obligation is owed has the right to assert the new legal connection generated by the source State's internationally unlawful act under the principles of State responsibility.[14] There are three types of radio interferences in accordance with the RR:

a) permissible interference (see No. 1.167);
b) acceptable interference (see No. 1.168);
c) harmful interference (see No. 1.169).[15]

13 L.F.E.Goldie, "Concepts of Strict and Absolute Liability in Terms of Relative Exposure to Risk", Netherlands Yearbook of International Law, 1985, p. 194.

14 Reparation for Injuries Suffered in the Service of the United Nations, Advisory Opinion of 11 April 1949, ICJ Reports (1949), p. 174, at pp. 181-182.

15 https://www.itu.int/en/mediacentre/backgrounders/Pages/radio-interference.aspx.

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The other fundamental challenge is to determine whether a HI should be evaluated as intentional or accidental. Therefore, we would like to propose that HI can be evaluated on the basis of transboundary harm if components of fault liability or strict liability exist in wrongful actions. In this respect, there is a need to conduct wide scholarly research about strict liability or fault liability in HI actions and to determine the existence of negligence and intention.

2.3. The Necessity for Application of Due Diligence in HI Disputes

The principle of due diligence with regard to a State's obligations mainly pertains to a government's ability to demonstrate authority and supervision over activities happening on its territory.[16] Regarding transboundary damage, the doctrine advocates for "good government" behaviour that reflects responsibility for its international obligation to take reasonable precautions to avoid causing those effects or refrain from individuals on its territory from causing such consequences.[17]

Due diligence is a reasonable care should be assessed by the minimal standard of behaviour that in the course of execution of a certain activity when it is conducted under normal circumstances.[18] An evolving collection of procedural norms on the behaviour of States typically serves as a benchmark for measuring the minimum level of behaviour when it comes to transboundary damage resulting from economic and technological activities.[19] In this regard, we should emphasize procedural duties that are considered components of due diligence that scholarly examined and initiated by arbitral tribunals should be scientifically addressed to the assessment of HI disputes. Henceforth, these procedural duties employed in case of transboundary damage should be researched in the context of HI which indeed substantially are relevant in the context of commercial space activities:

- the duty assessment of harm;
- the duty of notification and the right to be notified;
- the duty of consultation and negotiation. Meanwhile, it is claimed by certain researchers that the issue of substantive rights and obligations of States in relation to the exploitation of shared natural resources

16 Pierre Dupuy, "Due Diligence in the International Law of Liability," in OECD, Legal Aspects of Transfrontier Pollution (Paris, OECD, 1977), p. 369.

17 Ibid.

18 Commentary on Article 7 of the Draft Articles on the Law of the Non-Navigational Uses of International Watercourses, Report of the ILC on the Work of its Forty-Sixth session, May 2--July 22, 1994, GAOR, Forty-Ninth Session, Supp. No. 10 (A/49/10), p. 195, at p. 237.

19 Ibid. 9, page 165.

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has remained unresolved so far.[20] According to our research, in the case of radio frequency interferences, concordance of procedural duties with the substantive rights and duties of States is one of the unclarified areas.

3. Analysis of Damage That Occurred Due to HI According to Principles of Transboundary Damage to Natural Resources

In the context of environmental law, the concept of property harm is evolving substantially in national legal practice, particularly in developed spacefaring countries. To begin with, property damage is no longer restricted to physical harm to the item pursuant to assessment. This can be a decline in its economic utility or value without causing physical damage to the item. Second, damage to specific aspects of the natural environment for which rights or interests are difficult to establish (e.g., seabirds) has been recognised as qualifying under certain conditions.[21] The concept of shared resources, the doctrine of due diligence, and the concept of significant damage have been increasingly adopted as guidelines for the concurrent use of limited natural resources by more than one State in various legal instruments. This reflects a wider trend towards international norms for natural resource management and environmental protection. Specific international agreements governing the actions that may cause transboundary damage have progressively regulated tasks such *as harm assessment, notification, consultation, and collaboration, providing a degree of precision and objectivity to preventative standards.*
These duties are primarily concerned with procedural rules to prevent damage, and failing to comply with any of these duties does not necessarily imply accountability *for subsequent damage, particularly* damage caused by no fault of the source State. *Whether radio frequency regulation procedures should be included in primary or secondary obligations is a debated question.*
We can refer to UN documents, draft conventions and scholarly endorsed views that adopted so far. The primary obligation will be the major focus in deciding whether specific conduct attributable to a State constitutes a breach of its international responsibilities, namely, prevention rules such as the responsibilities to notify, consult, and collaborate, as well as liability rules,

20 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.

21 Hu, Xuyu, "The doctrine of liability fixation of state responsibility in the convention on transboundary pollution damage", International Environmental Agreements: Politics, Law and Economics vol. 20 iss. 1, January 2020, and Colin de la Rue, "Environmental Damage Assessment," in Kroner, Transnational Environmental Liability, p. 68.

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must be resolved according to customary or conventional international law.[22] Thus, whether HI is a transboundary harm (damage) – yet is not accepted by scholars. However, any dispute on the spectrum, in the end, has multi-million value, either as investments into a satellite project or loss of income due to HI to the radio frequencies.

Because, the conventional view is that transboundary damage is those that directly or indirectly involve natural resources, such as land, water, air, or the environment in general. In other words, there must be a physical link between the activity and the damage it causes.[23] Therefore, *there is a need to modify and revise views about radio frequency interference that is naturally transmitted from antennas*.

On the other hand, there is no legal baseline for state responsibility in case of HI disputes that are generated by commercial space actors. State responsibility ensures the successful completion of a state's international commitments, however, until there is a breach of any of preventive duties, or as provided for under the basic principles, rules of state responsibility will not apply.[24] In order to pervade a state responsibility, a new civil liability regime is inevitable and an essential factor for boosting commercial relations among spacefaring nations.

International civil liability treaties differ from customary standards of international environmental law because international instruments operate through domestic laws and organizations, and they are concealed as uniform tort law in order to protect national interests.[25] Possibility for being imposed on *private parties* rather than on states is one of key basements of international civil treaties.

There are commonly certain reasons why civil liability schemes for local or international damage are acceptable.[26] Victims, regardless of being governmental authorities or not decide to take action against violators, and the complexity of environmental conflicts is diminished by civil liability, and

22 Pring George. "International Environmental Law and Policy for the 21st Century", Martinus Nijhoff Publishers, 2013, page 265-282.

23 Para. 1 of the Commentaries to the Articles on Responsibility of States for Internationally Wrongful Acts: Report of the ILC Fifty-Third Session, April 23--June 1 and July 2--August 10, 2001, GAOR, Fifty-Sixth Session, Supplement No. 10 (A/56/10), p. 59; Crawford, Articles on State Responsibility, p. 74.

24 Para. 2 of the Commentaries to Chapter III of Part One of the ILC's Draft Articles on Responsibility of States for Internationally Wrongful Acts, A/56/10, p. 123; Crawford, *Articles on State Responsibility*, p. 124.

25 M Dupuy and JE Viñuales, International Environmental Law, 2nd edn (Cambridge, Cambridge University Press, 2018) 322.

26 Rebecca M. Bratspies, Russell A. Miller, Transboundary Harm in International Law: Lessons from the Trail Smelter Arbitration, Cambridge University Press 2006.

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state accountability or responsibility needs to be steered as well.[27] Furthermore, civil liability transfers responsibility to the one who caused the harm that was caused, and this is significant because, rather than state conduct, transboundary environmental damage frequently results from private conduct governed by state regulation. Nevertheless, civil liability frameworks share the risk associated with activities that could endanger the environment and incorporate at least a percentage of the costs of damage.[28] Scholars have interpreted past state-based conceptions of treaty performance to show that private parties can use environmental treaties as a source of private standards, even if those treaties do not directly bind them.[29]

4. Recognition of HI as a "Harm" and "Property" According to International Standards

Environmental harm in certain cases is related to 'use value' as well. Natural resources as they are commonly understood can be included in the use value of the environment. The definition of value states that it is "simply the worth of natural resources to the people who use them." Natural resources that are owned by the public typically have use values that are close to how market valuation evaluates damages to private resources.[30]

Market valuation is one of the reasons that may nominate the electromagnetic spectrum to be considered as a property. This is perhaps the most fundamental and widely accepted part of damage assessment, and it is confirmed by important rulings like the Trail Smelter Arbitration.

It is based on tort and nuisance laws in common law systems. When private property is damaged, compensation is given for the value that the market places on the property's loss or decline. Using the difference between the projected value of the products of the land (i.e., crops and wood, respectively), had the harm not occurred, and the actual value of the products of the land,

27 C.Voigt, 'International Responsibility and Liability' in L Rajamani and J Peel (eds), *The Oxford Handbook of International Environmental Law*, 2nd edn (Oxford, Oxford University Press, 2021).

28 Bergkamp, Liability and Environment: Private and Public Law Aspects of Civil Liability for Environmental Harm in an International Context (The Hague, Kluwer Law International, 2001).

29 G Singh Nijar, 'Civil Liability in the Supplementary Protocol' in Shibata, International Liability Regime for Biodiversity Damage (2014).

30 Frank B. Cross, Natural Resources Damage Valuation, 42 Vand. L. Rev. 269 281 (1989), and Natural Resource Damage Assessments, supra note 85, § 11.83(c)(1)(i): "Use value is the value of the resources to the public attributable to the direct use of the services provided by the natural resources."

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the Tribunal recognized the harm to both cropland and privately-owned forest. This is a straightforward example from the Trail Smelter Arbitration.[31] All in all, commercial satellite operators should have a right to demand prompt and adequate compensation in accordance with the market value of transponder beams, as transponder beams malfunctioned because of the impact of HI.

5. Assessment of the Right to Prompt and Adequate Compensation with Respect to HI

While taking into account that state responsibility collides with state sovereignty in environmental disputes, analysis of the right to prompt and adequate compensation should be upgraded in accordance with a new civil liability treaty. Besides HI, commercial space actors may encounter onerous hampers that derive from environmental damages, such as space debris and so on. Therefore, a newly developed civil liability regime that can be formed on the basis of international environmental principles may be considered a discreet opportunity. It would be another reticent method if new civil liability regimes concentrate on corporate social responsibility or corporate accountability of private space companies. While targeting both states or private facility operators international civil liability regimes may impose strict liability on the defendant.

It is also a well-known fact that States typically prefer to compensate for environmental harm through "lump-sum settlements and voluntary payments", however, a sufficiently standardized approach is needed to prove the state of origin's culpability under international law.[32]

The Liability Convention is not particularly useful for considering state liability for transboundary pollution in general, and the Liability Convention's parties did not anticipate that private parties would participate in outer space activities alongside governments as extensively as they do nowadays.[33] It is worth noting that through civil liability treaties, states recognise that accountability is vital to the implementation of international environmental law and that victims of transboundary

31 Benoit Jacqmotte, "Definition and Assessment of the Concept of Harm in a Regime of Transboundary Harm Prevention", Austrian Review of International & European Law, 3: 233- 265, 1998.

32 Boyle and Redgewell (n 23) 227-228; Plakokefalos, 'Liability' (2017) 1059; E Orlando,' Public and Private in the International Law of Environmental Liability' in F Lenzerini and AF Vrdoljak (eds), *International Law for Common Goods: Normative Perspectives on Human Rights, Culture and Nature* (Oxford, Hart, 2014) 414-415.

33 Guillaume Laganière, "Liability for Transboundary Pollution at the Intersection of Public and Private International Law", Hart Publishing, 2022, page 31.

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contamination must have compensation even if it does not come from states themselves.[34]

Another would refer to the lack of consistency in the adjudication of private environmental issues and the potential for conflict among surrounding states to condemn civil liability as a mechanism for environmental protection.[35] Although the systemic repercussions of tort law are controversial, transboundary pollution liability regimes are acceptable and not wholly redundant when compared to ex- ante treatment of transboundary pollution. Despite compelling justifications and abundant treaty-making, civil liability treaties rarely achieve their goals since many of them are simply not in force.[36]

The duty of states to ensure that victims of transboundary damage receive prompt and adequate compensation has been academically scrutinized. The gist of this scholarly claimed duty is that states are not required to pay compensation (which is what state liability entails), but if they do not do so willingly, they need to establish procedural regulations to ensure that victims can file claims before their domestic courts.[37] This duty has been adopted in diversified spheres of international environmental norms, for instance, both the Basel Liability Protocol and the Kiev Liability Protocol acknowledge "the need to provide for third party liability and environmental liability in order to ensure adequate and prompt compensation is available" in relation to the transboundary movement and disposal of hazardous waste and industrial accidents on transboundary waters.[38] Besides civil liability treaties, this conception has been introduced in several conventions and protocols as well, such as the 1990 Protocol for the Protection of the Marine Environment. Indeed, the obligation to provide prompt and adequate compensation stems from international investment law. It mirrors a compensation requirement known as the Hull Formula – timely, adequate, and effective recompense for a state's legitimate expropriation of foreign property.[39] The duty to ensure prompt and adequate compensation has not acquired the level of precise recognition, as the ILC Principles on Loss Allocation do not adhere to a strict interpretation of this formula, yet, it is to "the availability of compensation for environmental damage".[40]

In this regard, for the purposes of HI disputes, the availability of prompt and adequate compensation may be considered as well. We would like to suggest developing this conception as an approach by UN COPUOS and by ITU in

34 Ibid. page 34.
35 Ibid. page 37.
36 Ibid. page 39.
37 Ibid. page 44.
38 Kiev Liability Protocol (n 95) preamble, para 5; Basel Liability Protocol (n 94) preamble, para 5.
39 Ibid. page 49.
40 Ibid. page 52.

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the future. Perhaps, a duty to ensure prompt and adequate compensation as a notion is beneficial for commercial space actors in every case of business activities.

The specific need for new dispute settlement methods in HI disputes is because of the different roles of the ITU. As in Article 1(11) of the ITU Constitution, the role of this organization clearly is interpreted:

- impact the allocation of radio-frequency spectrum bands, the allocation of radio frequencies, and the registration of radio-frequency assignments, as well as any associated orbital positions in the geostationary satellite orbit or any associated characteristics of satellites in other orbits, in order to avoid HI between radio stations from different countries.;[41]
- coordination of activities for eliminating HI between radio stations from different countries and to improve the utilization of radio frequency spectrum for radiocommunication services, as well as geostationary and other satellite orbits.

Apparently, the ITU is not authorized to calculate the loss of income for telecommunication satellites and to impose a duty on the violator to compensate damages in case of HI cases. Meanwhile, the establishment of new regulations and laws for the effective and fair use of the Geostationary Ring does not always comply with the ITU's goals for the 'rational, efficient, and economical use' of this essential orbit, as stated in Article 44(2) of its Constitution.[42] The ITU RRB has certain authority to deter HI violators.[43] In this way, it is important to share information on each satellite position in order to calculate the minimum gap between satellites, which has been described as "mutual due diligence to guarantee secure transit of each other's principal resources."[44]

6. Conclusion and Suggested Dispute Settlement in HI Disputes

Assessment and judgment of HI through lightweight and reasonable measures are most problematic for recently emerged small satellite operators. Because of shortcomings in international law, victims of HI are obliged to sue tortfeasor satellite operators by domestic courts based on both national and international law norms. Nevertheless, HI has not been widely recognized as 'harm' to persons or property yet. Therefore, there is an ultimate need to

41 Martha Mejía-Kaiser, "The Geostationary Ring: Law and Practice" Brill NV, 2020, page 126.
42 Ibid. page 130.
43 Lyall & Larsen, Space Law (2009), *supra* 3, 227-229.
44 Ibid. 29, page 130, and Hope, Commercial Systems Due Diligence, *supra* 46, 125-127.

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investigate how far it is possible to assess HI within principles of tort law, and what kind of international alternative dispute settlement methods are more efficient and advantageous. Most parties are willing to appeal to an international institution rather than domestic courts, nevertheless, the claimant should ensure that HI can be interpreted and justified as negligence and sometimes as wilful misconduct even if it is disputed through non-binding alternative dispute settlement techniques.

Unfortunately, few scholarly work has been dedicated to analysis of the HI based on conventional tort law principles. Nevertheless, presumably a multi-door courthouse practice or commission based on the calculation of compensation would be a more suitable option to solve disputes between international parties. The role of ITU as a mediator is undeniable in this case.

In this paper, none of the options for dispute settlement is stigmatized, it is only the personal opinion of the authors to obtain a fair resolution in HI disputes. Similar to the opinion of several experts, the dispute settlement should also concentrate on three areas within its unbiased and fair procedures: 1) how the experts are chosen; 2) how they are consulted, and 3) how the panel uses their inputs to reach its findings.[45] Perhaps, mediation-annexed arbitration should be binding after conducting negotiations, and when consultations fail due to the fault of one of the parties. While analyzing the binding character of the dispute settlement in space issues, Frans von der Dunk and Gerardine M. Goh usually refer to The Outer Space Treaty's Article XI, which calls for appropriate international discussions in situations involving possible adverse interference with operations of other States – OST Parties, outlines the consultation mechanism.[46] Following this clause, the State conducting the activity "shall undertake" consultations before moving forward if it believes that its activities or those of its citizens may result in such interference. The inclusion of the declarative word "shall" probably lends credence to the idea that this is a legally obligatory requirement, and nevertheless, there is no consolidated practical instance that indicates obedience to this rule.[47] Therefore, there is a need to reexamine international customary laws and soft law norms simultaneously and to suggest new more accessible, and more flexible arbitration and mediation methods for transnational parties.

Moreover, Gerardine M. Goh also proposed the application of the "Claims Compensation Commission" and the establishment of the "Multi-door courthouse" instead of international arbitration, moreover, such types of

45 Duncan French, Matthew Saul and Nigel D White "International Law and Dispute Settlement New Problems and Techniques", Oxford 2010.

46 Gérardine Meishan Goh, "Dispute Settlement in International Space Law: A Multi-Door Courthouse for Outer Space", Leiden 2007.

47 "Handbook of Space Law" by Frans von der Dunk and Fabio Tronchetti (Edward Elgar Pub 2015).

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commissions can be replaced by the "mediator" as well.[48] All experts acknowledge that various actors with distinct sizes and negotiating capabilities are involved in space activities. Therefore, to guarantee that conflicts are resolved justly, fairly, and in line with the law, a mandatory dispute resolution process is inevitable.

To sum up, another key issue is what type of international organization should be responsible for the establishment of the abovementioned dispute settlement methods. The UN COPUOS and the ITU may create and supervise such commission in case of request by parties. Consultations and negotiations between parties should refer to binding procedural rules if a "Claims Compensation Commission" or a "Multi-door Courthouse" is capable of setting up effective rules that facilitate fair compensation.

We would like to draw attention to the peculiar points of HI that induces research questions besides the examination of strict and fault liability. As a corporate liability for HI can be evaluated based on transboundary damage, certain research gaps should be investigated and examined on the basis of various research methods. This research needed essential questions are:

- Comparative analysis of standard of conduct (standard of care) by states and private space actors;
- Analysis of procedural duties, such as a duty to assess harms;
- Analysis of private space actors as duty holders with respect to the elimination of HI;
- Analysis of the due regard principle of the OST in HI of radio frequency cases;
- Causation, Standard of Liability and Defences in HI disputes;
- Analysis of possibility of application of due diligence obligations and duty to prevent in HI disputes;
- Analysis of mediation annexed alternative commercial arbitral in HI disputes in accordance with the tort law standards between private space actors.

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