SPACE DEBRIS IN THE PERSPECTIVE OF SUSTAINABLE DEVELOPMENT

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ABSTRACT

This article analyses the issue of extension of the concept of sustainable development to the domain of outer space. It focuses on integration of environmental values into the anthropocentric system of space law in order to address current problems induced by proliferation of space debris threatening long-term sustainability of space. The paper argues that in the light of sustainable development States have to ensure safe and sustainable use of outer space in the long-term. The article highlights that the concept of sustainable development is quite well tailored to the domain of outer space, and its adoption would resemble a natural evolution of the existing legal system rather than a revolutionary change. Furthermore it argues that introduction of values carried by sustainable development could be a solution for some systemic problems of space law, especially its part applicable to the protection of space against space debris.

1 INTRODUCTION

Our ability to safely use outer space in the long term is not guaranteed [1]. A *laissez-faire* approach to the exploitation and exploration of outer space has much contributed to the proliferation of space debris in the last decades. The international recognition of the problematic issue of rising number of space debris and its harmful effect on human space operations came along with the 1999 Technical Report on Space Debris issued by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) [2]. While the security of space assets has significantly lowered due to the risk of collision with space debris, our reliance on outer space has increased. The Space Millennium Declaration highlighted the great contribution of space-based systems to the human development [3]. Today States to a great extent depend on space systems in ensuring their strategic security [4] and commercial activities that have been derived from the space sector constitute an important part of the world economy [5].

Long-term sustainability of outer space activities involving protection of space systems is therefore essential for human wellbeing. There also is an environmental approach to the issue, which focuses on the protection of space environment. These two approaches are not incompatible: safety of space systems requires less polluted outer space [6]. The protection of space-based systems in the near-Earth region and the protection of the space environment correspond with each other in terms of the desired result: either from anthropocentric or environmental perspective, international endeavours aim for less space debris on orbits. At the same time, neither of these approaches even in its 'pure version' would yield sustainable effects. Purely anthropocentric approach, focused on the safeguarding of space systems, would ignore the needs of the outer space environment *per se*. For example the pollution of outer space with aluminium slag and aluminium oxide dust generated as combustion products by motors integrated in spacecraft can be potentially dangerous for the environment of outer space [7] and its harmful impact on life on the Earth cannot be excluded. On the other hand, preservation of outer space in its pristine state, for its own sake and for future generations ignores the needs of the present generations [8].

In June 2011, the UNCOPUOS adopted terms of reference and methods of work of the Working Group on the Long-term Sustainability of Outer Space Activities, in which it suggested extension of the concept of sustainable development to the domain of outer space as a topic for examination [9]. Indeed, in the light of the discussion so far, the extension of the concept of sustainable development to the domain of outer space would reconcile the economic, developmental and environmental concerns. Moreover, such adoption offers a solution to some systemic problems of the international legal order concerned with the protection of the space environment. It could enhance the current legal regime and contribute to achieving systemic harmony within the binding regime

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of space law applicable to the protection of outer space. Finally, it would contribute to better integration of the space law into the broader system of international law concerned with environment and human development.

The second section of this article focuses on the conceptualisation of sustainable development and its status in international law. Section three addresses the current international legal framework regulating activities in outer space and identifies the legal problems with respect to the protection of outer space against space debris. The fourth section of the paper will touch on the extension of the concept of sustainable development to the domain of outer space: first it analyses applicability of the concept to space law, the rationale behind the applicability and finally it provides some examples of impact the extension of sustainable development can have on the norms of space law. The final section concludes.

2 THE CONCEPT OF SUSTAINABLE DEVELOPMENT

2.1 Milestones in conceptualisation of sustainable development

Sustainable development emerged as a concept in international politics and law in order to reconcile economic, social and environmental needs. Environmental degradation and poverty were the major factors behind its evolution. The UN Conference on the Human Environment, held in Stockholm in 1972, created considerable momentum for conceptualisation of the theoretical framework of sustainable development. For the first time it was defined in the report 'Our common future' of the 1978 World Commission on Environment and Development (also known as the Brundtland Commission). It stated that sustainable development is 'a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' This definition introduced the core element of the concept: the intergenerational equity.

The concept of sustainable development was set out in more detail in the 1992 Rio Declaration on Environment and Development. While Stockholm Conference and Brundtland Commission were politically important for conceptualisation of sustainable development, it is the Rio Conference that consolidated its meaning and gave impetus for developments in scope of international law [10]. With the Rio Declaration emerged the system of values that integrates economic, environmental and social aspects of human development, namely sustainable development in its current shape. The United Nations General Assembly (UNGA) referred to the Rio Declaration as 'containing fundamental principles for the achievement of sustainable development, based on a new and equitable global partnership' [11]. In contrast to the Stockholm Declaration, which inclined towards environmental concerns, the Rio Declaration openly states in its Principle 1 that 'human beings are at the centre of concerns for sustainable development'. The Rio Declaration, therefore, sealed the anthropocentric character of the concept of sustainable development. The subsequent conferences in Johannesburg (2002) and Rio+20 Conference (2012) further confirmed the significance of sustainable development for the world.

2.2 Main substantive elements of sustainable development

The key substantive elements of sustainable development are set up in the Rio Declaration. They are important because the process of the application of sustainable development to outer space would necessarily focus on these particular elements. Principles 2-8 introduce, *inter alia*, sustainable utilisation of natural resources, the integration of environmental protection and economic development, the right to development, the inter- and intra-generational equity, poverty eradication, international cooperation for environmental protection and principle of common but differentiated responsibilities. While none of these concepts is new, the Rio Declaration organises them in more systematic way [12].

2.3 The status of sustainable development in general international law

The legal status of sustainable development is not clearly established in international law. The Rio Declaration, despite providing a legal basis for the concept, evades its legal qualification. On the other hand, the world-wide acceptance of the Declaration, coupled with the obligatory language of its principles has furnished this legal instrument with a capacity to impact on law-making processes [13].

The International Court of Justice (ICJ, Court) approached the issue of defining the legal status of sustainable development in the Case Concerning the Gabčikovo-Nagymaros Project [14]. In the judgement

the ICJ invoked '*the concept* of sustainable development' stating that it reconciles economic development with protection of the environment [15]. The reliance of the Court on the concept of sustainable development has attributed sustainable development with a legal function. Notwithstanding the judgement, the separate opinion of Vice-President of the Court Judge Weeramantry describes sustainable development as 'more than just a concept' and as 'a principle with normative value'[16]. In the Pulp Mills case [17] the ICJ further contributed to the legal evolution of the concept of sustainable development. However, like in the Gabčikovo-Nagymaros case, the Court was unwilling to affirm sustainable development as a legal norm. It refers to sustainable development as an 'objective' [18]. The separate opinion of Judge Cançado Trindade, however, describes sustainable development as one of the principles of international environmental law [19].

Notwithstanding the lack of clear status in international law, sustainable development is well grounded in international law and has been influencing the political and legal systems on national, regional and international levels [20]. Many governments have accepted sustainable development as a guiding principle in policy making [21]. It presently enjoys widespread endorsement by international institutions, governments, businesses, and civil society. Many subsequent international treaties concerned with environmental issues relied on the Rio Declaration and referred to its principles. On the regional level, the European Union created one of the most explicit legal commitments to a sustainable future upon the adoption of the 2009 Treaty of Lisbon. In Article 2.3 the Treaty states that the European Union 'shall work for the sustainable development of Europe.' The concept of sustainable development does have a significant capacity of normative impact on law-making processes. It is amply supported by practice of States and international organizations, which justifies its elevation into pantheon of international law [22].

3 THE CURRENT INTERNATIONAL LEGAL FRAMEWORK REGULATING ACTIVITIES IN OUTER SPACE

3.1 Corpus juris spatialis

Space law is a complex mixture of international and domestic laws that govern a wide spectrum of activities concerned with use and exploitation of outer space [23]. Space law is 'particulate law', developed to deal with practical problems of use and exploration of outer space [24]. It consists of international binding treaty regime, declarations and guidelines, industry guidelines, regional and national laws and arrangements. A core of the system constitutes legal instruments created within the UNCOPUOS [25] during the 'golden age' of space lawmaking [26]. Within the frame of the UNCOPUOS, a number of general multilateral treaties dealing exclusively with outer space and space activities were adopted [27].

The Outer Space Treaty (OST) is regarded as the *Magna Carta* of outer space that enshrines fundamental principles relating to use and exploration of outer space. It serves as a foundation for the other four major international conventions, i.e. the Rescue Agreement [28], the Liability Convention [29], the Registration Convention [30] and the Moon Agreement [31]. These five treaties are regarded by most as the controlling authority for human activities in outer space. Apart from these binding per their nature instruments, *corpus juris spatialis* includes five declarations on principles adopted by the UNGA: the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space [32], Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982) [33], Principles Relating to Remote Sensing of the Earth from Outer Space (1986) [34], Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992) [35] and Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996) [36]. The last instrument developed within the UNCOPUOS is the Space Debris Mitigation Guidelines (2007) [37]. It was adopted in response to the problem of space debris and represents a set of practical rules focused on mitigating debris, which 'should be considered for the mission planning, design, manufacture and operational (launch, mission and disposal) phases of spacecraft and launch vehicle orbital stages'[38]. The guidelines were created as non-binding norms. However it has been suggested that they are undergoing a process of transformation into binding rules, and are close to gaining binding status as customary rules [39].

3.2 Multilateral regulatory initiatives advancing the issue of sustainability of outer space

There are also various multilateral ongoing initiatives with the prospect to contribute to the long-term sustainability of outer space. The European Union developed the International Code of Conduct for Outer Space Activities (adopted in 2008), which approaches the issue of sustainability of outer space from more holistic perspective integrating civil and military uses of space. Another initiative is the Russian-Chinese draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (submitted in 2008), concerned with weaponization of outer space. Within the structure of the UNCOPUOS was established a Working Group on Long-Term Sustainability of Space Activities concerned with peaceful uses of outer space (20010). There is also the UNGA Group of Governmental Experts (established in 2010) working on the transparency and confidence building in outer space. All these initiatives show that the issue of long-term sustainability of outer space is internationally recognised as vital for human development.

3.3 Problems within the legal regime with respect to the protection of outer space

The environmental issues relating to outer space have to be addressed in order to put use of outer space on the sustainable track. The necessity to enhance outer space's legal environmental regime stems from the fact that the provisions of the current binding legal regime for outer space are just not definite enough to handle the complex nature of these issues. The treaties were created during the Cold War era and they reflect the problems of the time and therefore pay little attention to the possible environmental problems. Nowadays, rapid commercialisation of outer space and the growing number of space stakeholders call for clearer rules and a system capable of providing guidance on sustainable use of outer space, particularly for the growing number of private entities in the space sector.

Out of all the norms embedded in the five aforementioned treaties, the most relevant with respect to the protection of outer space are found in the OST. Its Article IX is central for any legal debate on the protection of the outer space environment. Yet, its indefinite wording allows for formulating opinions excluding its applicability to the environmental issues concerning outer space.

The applicability of the treaties to the environmental protection of outer space, including space debris, is disputable since the treaties had been created before the environmental problems materialised. The treaties do not refer at any point to space debris. Nevertheless, although the negotiating parties did not specifically take environmental issues into account, their intentions were to use general, framing provisions capable of encompassing future developments [40]. It should also be noted that '[a] treaty, as a source of international law, can be used as an instrument of anticipatory legal regulation of future types of activities or future situations which do not exist at the moment of the conclusion of a treaty' [41], unless there are specific provisions indicating otherwise.

4 EXTENSION OF THE CONCEPT OF SUSTAINABLE DEVELOPMENT TO THE DOMAIN OF OUTER SPACE

4.1 Legal applicability of sustainable development to the domain of outer space

The concept of sustainable development has never been explicitly extended to outer space. On the other hand, outer space has never been excluded from its scope. In fact, Principle 2 of the Rio Declaration stipulates that States bear the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of areas beyond the limits of national jurisdiction. Pursuant to Articles I and II of the OST, outer space constitutes an area beyond the national jurisdiction (even though national airspace limits are not yet clearly defined). It belongs to the so-called 'global commons' and its legal status is characterised as 'the province of all mankind' (Article I), which cannot be subject to national appropriation (Article II). Two years after the Rio Declaration, the International Law Association explicitly proclaimed that the duty to protect the areas beyond the national jurisdiction should be extended to Earth orbital space [42].

Moreover, Article III of the OST provides that 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space [...] in accordance with international law, including the Charter of The United Nations'. The Article integrates norms of space law into the system of standards of general international law, part of which constitutes sustainable development. Also the Vienna Convention on the Law of Treaties in Article 31(3)(c) emphasises the unity of international

law providing that norms should not be considered in isolation of any relevant rules of international law. It obliges States to 'look afresh' on treaty norms [43]. Finally, in the Gabčikovo-Nagymaros case the Court expressed the view that 'current standards [such as sustainable development] must be taken into consideration' in interpretation of treaties.

4.2 Rationale behind extension of the concept of sustainable development to the domain of outer space

First of all, the concept of sustainable development is not extrinsic to the regime of outer space; therefore its adoption would resemble a natural evolution of the system rather than a revolutionary change. In fact, the OST foreshadows the concept of sustainable development. In Article I it provides that outer space shall be free for exploration by all States on a basis of equality without discrimination of any kind. The Article can be seen as a precursor to the concepts of inter- and intra-generational equity in space law. Being anthropocentric in its nature, just like space law is, sustainable development would not introduce any radical paradigm shift towards environmental values, but would require that States take into account environmental aspects while planning a launch of a satellite or space mission. The key substantive elements of sustainable development, i.e. sustainable utilisation of natural resources, the integration of environmental protection and economic development, the right to development and pursuit of the inter- and intra-generational equity, can be translated into the needs of the space sector. The necessity for the integration of environmental values into the economic-growth-oriented norms in a time of rapid commercialisation of outer space is crucial for the long-term sustainability of outer space and can be enabled by the extension of the logic of sustainable development to outer space. With respect to The Space Debris Mitigation Guidelines, the logic of sustainable development would require to transfer them into the binding norms in order to yield sustainable effects.

Another argument in favour of the application of sustainable development to outer space is that it has great potential to 'cure' some systemic problems of the space law regime. These problems are partially due to the aforementioned generality and ambiguity of the space law norms with respect to the protection of outer space. One of the problems is increasing discrepancy between the legal regulation and reality, which without refreshment of the norms can hinder the usefulness of the treaty instruments with respect to the protection of outer space. The divergence is also noticeable between the general international law and space law. This separation of space law from internationally accepted standards is becoming more and more difficult to justify on legal grounds. Finally, the discord arises within the treaties' regimes themselves. For example, on one hand the purpose of the OST is to enable use of space, but on the other one the treaty itself neglects the proliferation of space debris, which threatens safe use of outer space.

The extension of sustainable development to the domain of outer space would involve application of norms and principles that have their origin outside the space law system. With respect to the across-aerial adoption of norms and standards arising in other subject matter-areas, P. Sands states that these norms compete with the existing ones [44]. It does not seem to be the case in regard to sustainable development. The separate opinion of Judge Weeramantry in the Gabčikovo-Nagymaros case points to the reconciliation and harmonisation functions of sustainable development in order to avoid 'a state of normative anarchy' [45]. The extension of sustainable development to the domain of outer space has great potential to 'update' its legal regime and introduce systemic harmony into space law.

Against this backdrop, the concept of sustainable development seems well suited to tackle the aforementioned systemic problems and issues of generality of space law norms. The sustainable development carries obligation to rethink the norms which yield unsustainable effects and requires their reinterpretation in line with logic of sustainable development. D. Tladi states that sustainable development could function in this respect as a principle of interpretation [46]. V. Lowe adds that sustainable development, *de facto*, functions as an interstitial norm operating in the interstices of primary norms when they overlap or conflict. The effect of such norms is that upon the application they modify the boundaries of primary norms of international law [47]. Sustainable development, thus, would serve as a tool enabling reinterpretation of space law norms in the light of values it promotes.

4.3 Examples of reinterpretation of norms upon application of logic of sustainable development

The following reinterpretations of few norms of the Outer Space Treaty will serve as example of the possible effect of the extension of the concept of sustainable development to the domain of outer space.

Article I of the OST contains the principle of freedom of exploration. It reads that 'outer space […] shall be free for exploration and use by all States'. Sustainable development would integrate environmental values into the process of space exploration obliging States to take precautionary steps in order to mitigate risks associated with space debris.

Article I also enshrines the principle of equality. It provides that 'the exploration and use of outer space […] shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development'. In the light of sustainable development, space debris mitigation can be regarded as a precondition for guaranteeing equal opportunities in exploration and use of outer space by future generations and by underdeveloped States, which presently do not posses adequate technology.

The applicability of the concept of sustainable development to the principle of due regard to the corresponding interests of other States (Article IX of the OST) would have to integrate environmentally responsible behaviour. With respect to space debris it would mean compliance with the existing standards on space debris mitigation, namely The Space Debris Mitigation Guidelines.

The concept of sustainable development would also have a great effect on the notion of 'harmful contamination' – a crucial concept for the protection of outer space – set out in Article IX OST. It would require inclusion of space debris within the scope of 'contamination'. This would be necessary in order to ensure long-term sustainability of space. It has to be pointed out that the reinterpretation of 'harmful contamination' in the light of sustainable development would not prohibit creation of space debris because at the moment any launch involves release of certain amount of space debris. Sustainable development is not to inhibit any alternation to the environment resulting from human economic development; instead it calls for minimising or preventing the risk associated with *harmful* creation of space debris. J. Mey states that 'upon humankind's entry into outer space, contamination is something that has to be accepted. It is the qualification as "harmful" that sets certain uses of outer space legally apart'. Such interpretation is well in line with the concept of sustainable development, which would seek compromise between the freedom of exploration and environmental protection [48].

As illustrated, the above interpretations would not be extrinsic to the existing system of space law. They would rather bring some clarity and precision into the space law treaty regime with respect to the environmental protection of outer space.

5 Conclusions

The international legal regime for outer space will have to finally embrace reality and respond to it. Its existence in a 'legal bubble' in separation from the current international standards, such as the concept of sustainable development, cannot be justified on legal grounds any longer. The integration is necessary since our interests in outer space, at least in the area of Earth orbits, are closely linked to our interests on the Earth. Despite the differences, space law represents an extension of our hitherto legal system into the domain of outer space [49]. Since a viable law system presupposes continuous law-making activity [50] the development of space law is inevitable. The extension of the concept of sustainable development to the domain of outer space would help to keep the system viable, coherent and integrated into general international law. Its adoption would resemble a progress of the existing legal system rather than a radical change.

Nevertheless, the extension of the concept of sustainable development to space law is problematic from political perspective. It would require States to reconcile many contradictory interests. The reservations made by the US upon adoption of the Rio Declaration are a good indication where the problems can arise [51].

While the world's attention remains captured by the economic crisis, the importance of protection of the outer space environment can be easily overlooked. A structural integration of issues related to space into international legal regime through the concept of sustainable development would help to 'keep an eye' on the issue of sustainability of outer space.

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2. UNCOPUOS (1999). *A Technical Report on Space Debris*, UN Doc. A/AC.105/720.
3. UNGA (1999). Space Millennium: Vienna Declaration on Space and Human Development, in: *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space,* UN Doc. A/CONF.184/6, p6.
4. The Space Council has recognised the space sector as 'a strategic asset contributing to the independence, security and prosperity of Europe'. See Council of the European Union (2007). 4th Space Council Resolution on the European Space Policy, Section I, found at: <http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/intm/94166.pdf>; The US government highlights that space system and technology development contribute significantly to the 'most critical national security interests'. See National Space Policy of the United States of America (2010), p13. found at: <http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf>
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6. Williamson, M. (2010). A pragmatic Approach to the 'Harmful Contamination' Concept in Art. IX of the Outer Space Treaty. In *5th Eilene M. Galloway Symposium on Critical Issues in Space Law. Art. IX of the Outer Space Treaty and Peaceful Purposes: Issues and Implementation,* Washington D.C., p7.
7. ESA (2005). *Position Paper on S pace Debris Mitigation: Implementing Zero Debris Creation Zones,* ESA Publications Division, p13.
8. Space environmentalism also creates more radical attitudes: 'Outer space, a source of wonder and inspiration for centuries, deserves to be preserved in its original pristine state, for its own sake and for future generations to enjoy.' Wells, Jr., R. N. (1996). *Law, Values, and the Environment*, The Scarecrow Press. Huebert and Block, in contrast, find the concept 'not only philosophically ill-founded, but also economically and pragmatically unjustified'. Huebert J.H. & Block W. (2007). Space Environmentalism, Property Rights, and the Law, *The University of Memphis Law Review* **37**, 281, p282.
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11. A/RES/48/190.
12. Boyle, A. & Freestone D., eds. (2001). *International Law and Sustainable Development: Past Achievements and Future Challenges*. Oxford University Press: New York, p9.
13. Ibidem, p3-4.
14. ICJ, Case Concerning the Gabčikovo-Nagymaros Project (*Hungary v. Slovakia*), Reports, 1997, p.7.
15. Ibidem, para.140.
16. Judge Weeramantry, Separate opinion in the Gabčikovo-Nagymaros Project case (*Hungary v Slovakia*), Reports 1997, para.88, p95.
17. ICJ, Case Concerning Pulp Mills on the River Uruguay (*Argentina v. Uruguay*), Reports 2010, p.14.
18. ICJ, Case Concerning Pulp Mills on the River Uruguay (*Argentina v. Uruguay*), Reports 2010, p.14, para.177.
19. Cançado Trindade, Separate opinion in the Pulp Mills on the River Uruguay (*Argentina v. Uruguay*), Reports 2010, p14, para 6. See also para.132 *et seq*.

20. See, for example: ICJ, Advisory Opinion on the Use by a State of Nucler Weapons in Armed Conflict, Reports 1996, 226; ICJ, Fisheries Jurisdiction (*UK vs. Icel and*), Reports 1974, p.31, para. 72; ICJ, Fisheries Jurisdiction (Germany vs. Iceland), Reports 1974, p200, para. 64, PCA, Arbitration Regarding the Iron Rhine Railway (*Belgium v The Netherlands*), 2005; Seabed Disputes Chamber of the International Tribunal for the Law of the Sea, Advisory Opinion on the Responsibilities of States Sponsoring Persons and Entities with Respect to Activities in the Area, 2011.
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28. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (London, Moscow, Washington, D.C., 22 April 1968; in force 3 December 1968).
29. Convention on International Liability for Damages Caused by Space Objects (London, Moscow, Washington , D.C., 29 March 1972; in force 1 September 1972).
30. Convention on Registration of Objects Launched into Outer Space (New York, 14 January 1975; in force 15 September 1976).
31. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (New York, 18 December 1979; in force 11 July 1984).
32. Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (UNGA 1962 (XVIII), 1963).
33. UN Doc. A/RES/37/92.
34. UN Doc. A/RES/41/65.
35. UN Doc. A/RES/47/49.
36. UN Doc. A/RES/51/122.
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