

## BUILDING BLOCK 10

---

### **Avoidance and mitigation of potentially harmful impacts resulting from space resource activities**

#### 1. Text

**Taking into account the current state of technology, the international framework should provide that States and international organizations responsible for space resource activities shall adopt appropriate measures with the aim of avoiding and mitigating potentially harmful impacts, including:**

- a) Risks to the safety of persons, the environment or property;**
- b) Damage to persons, the environment or property;**
- c) Adverse changes in the environment of the Earth, taking into account internationally agreed planetary protection policies;**
- d) Harmful contamination of celestial bodies, taking into account internationally agreed planetary protection policies;**
- e) Harmful contamination of outer space;**
- f) Harmful effects of the creation of space debris;**
- g) Harmful interference with other on-going space activities, including other space resource activities;**
- h) Changes to designated and internationally endorsed outer space natural or cultural heritage sites;**
- i) Adverse changes to designated and internationally endorsed outer space sites of scientific interest.**

#### 2. Explanation

According to Prof. Marchisio, any outer space activities should be carried out with a high standard of care and due diligence. These concerns are at the level of international space law addressed by Article IX of the OST setting forth the legal basis for the environmental protection of outer space.<sup>1</sup> First, state parties shall avoid harmful contamination of outer space, second, state parties shall avoid adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter.

Due to their technical complexity, space resource activities undoubtedly pose a significant risk of harm and should be perceived as ultra-hazardous. In this context, wording of Building Block 10 implies that the obligations imposed by the OST are not sufficient. Therefore, taking into account the current state of technology, the international framework should provide that states

---

<sup>1</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 176.

and international organizations responsible for space resource activities shall adopt appropriate measures with the aim of avoiding and mitigating potentially harmful impacts.

As a legal consequence of the OST, states bear international responsibility for national activities, irrespective of whether they are carried out by governmental or non-governmental entities. In this context, states shall authorize activities of non-governmental entities in outer space and ensure that these activities are carried out in conformity with international space law, particularly Article IX of the OST. However, both content of an authorization and consequent supervision are left to the discretion of states. Article VI of the OST is therefore understood as the basis for national space legislation.<sup>2</sup>

Since non-governmental entities are not bound by the OST, Building Block 10 aims to adequately equip national authorities with effective tools in order to address potentially harmful impacts resulting from space resource activities carried out by non-governmental entities at the national level.

In addition, Building Block 10 includes a non-exhaustive list of examples of potentially harmful impacts. First, the list includes impacts already addressed by the Outer Space Treaty in its Article IX<sup>3</sup> (*harmful contamination of outer space and celestial bodies; adverse changes in the environment of the Earth; potentially harmful interference with activities in the peaceful exploration and use of outer space*). Second, the list includes also newly added examples of impacts likely to be caused by space resource activities (*risks to the safety of persons, the environment or property; damage to persons, the environment or property; harmful effects of the creation of space debris; changes to designated and internationally endorsed outer space natural or cultural heritage sites; adverse changes to designated and internationally endorsed outer space sites of scientific interest*).

### 3. Legal Basis

Whereas Article IX of the OST and Article 7 of the Moon Agreement require state parties only conduct exploration of outer space so as to avoid its harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial

---

<sup>2</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 120.

<sup>3</sup> As well as in and the Moon Agreement (Article 7)



matter, Building Block 10 should be understood as a "lex specialis" broadening the original scope of Article IX and addressing specific character of space resource activities.

Article IX:

*In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. **States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.** If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.*

The Moon Agreement, Article 7 provides:

*In exploring and using the Moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the Earth through the introduction of extra-terrestrial matter or otherwise.*

#### 4. Alternatives Discussed



This report is supported by the Technological Agency of the Czech Republic. Particularly through a scientific grant TACR TL01000181: "A multidisciplinary analysis of planetary defense from asteroids as the key national policy ensuring further flourishing and prosperity of humankind both on Earth and in Space."

Mitigation of harmful impact of outer space activities has been addressed by a single building block since the first meeting in April 2016, however, numerous changes of its wording as well as its scope were made during the drafting process. Even the title of this building block has changed several times, “*Prevention and mitigation of harmful impact of outer space activities*” was the title adopted during the first meeting in April 2016, “*Prevention abatement of harmful impacts of outer space activities*” was the result of the second meeting in November 2016, and “*Avoidance of harmful impacts resulting from space resource activities*” was agreed at the meeting in April 2017. The final version of Building Block 10 was accorded in April 2019.

With regard to the scope of this building block, especially its list of examples, it originally addressed only *changes to designated and internationally endorsed outer space heritage sites; harmful contamination of celestial bodies; and adverse changes in the environment of the Earth*. Revised building blocks following the November 2016 meeting included additional examples: *adverse changes to sites of scientific interest; damage to persons, the environment or property; and mitigate space debris*. As a result of the April 2017 meeting following examples were added: *risk to the safety of persons, the environment or property; adverse changes in the natural condition of celestial bodies; and harmful interference with the normal operations of other on-going space activities*.

Until November 2018, the building block required “adoption of a precautionary approach with the aim of avoiding harmful impacts,” however, during the final stage of the drafting process the reference to the precautionary approach was removed. Outer space natural or cultural heritage sites and outer space sites of scientific interest were often discussed during the meetings. Although there are currently no endorsed sites and there is no mechanism to endorse such sites internationally, this example of harmful impact has been included in the final version of Building Block 10 accorded in April 2019.

## BUILDING BLOCK 11

---

### **Technical standards for, prior review of, and safety zones around space resource activities**

#### 1. Text

**1. The international framework should provide that States and international organizations shall require the conduct of a review prior to a decision to proceed with a space resource activity to ascertain that such an activity is carried out in a safe manner to avoid harmful impacts.**

**2. The international framework should:**

- a) Encourage the development of procedures to ensure that equipment, operational procedures and processes applied in space resource activities avoid harmful impacts;**
- b) Encourage the development of a methodology to assess that equipment, operational procedures and processes applied in space resource activities meet common technical standards (conformity assessment);**
- c) Encourage operators to develop technical standards for equipment, operational procedures and processes applied in space resource activities (standardization).**

**3. Taking into account the principle of non-appropriation under Article II OST, the international framework should permit States and international organizations responsible for space resource activities to establish a safety zone, or other area-based safety measure, around an area identified for a space resource activity as necessary to assure safety and to avoid any harmful interference with that space resource activity. Such safety measure shall not impede the free access, in accordance with international law, to any area of outer space of personnel, vehicles and equipment of another operator. In accordance with the area-based safety measure, a State or international organization may restrict access for a limited period of time, provided that timely public notice has been given setting out the reasons for such restriction.**

**4. The international framework should provide that appropriate international consultations are undertaken in case of possible overlap of safety zones or conflicts with the freedom of access recognized by international law.**

#### 2. Explanation

Building Block 11 implicitly acknowledges that space resource activities pose a significant risk to the long-term sustainability of outer space. These concerns are at the level of international space law addressed by Article IX of the OST setting forth the legal basis for the environmental

protection of outer space.<sup>4</sup> In particular, state parties shall avoid harmful contamination of outer space and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter. However, space resource activities are likely to be carried out also by non-governmental entities and these are not directly bound by the OST. International space law does not impose any legal obligations on non-governmental entities, because international responsibility for national activities, irrespective of whether they are carried out by governmental or non-governmental entities, is borne by states (Article VI of the OST). The OST only provides for that states shall authorize and continuously supervise activities of non-governmental entities in outer space for assuring that national activities are carried out in conformity with the provisions set forth in the OST, particularly its Article IX. An authorization conditions are left, to great extent, to the discretion of states and Article VI is therefore widely seen as the basis for national space law.<sup>5</sup>

There is no doubt that a review prior to a decision to proceed with a space resource activity to ascertain that such an activity is carried out in a safe manner to avoid harmful impacts can significantly strengthen authorization proceedings under national law and contribute overall safety of space resource activities.

However, paragraph 1 of Building Block 11 is not only a requirement concerning procedure. It explicitly provides that a prior review should ascertain that *an activity is carried out in a safe manner to avoid harmful impacts*. This provision goes clearly beyond the standards included in Article IX of the OST.<sup>6</sup> To summarize, Building Block 11 requires the conduct of a review prior to a decision to proceed with a space resource activity and provides higher level of protection.

Paragraph 2 of Building Block 11 seeks to effectively eliminate potential harmful impacts of space resource activities by enhancing transparency and international cooperation. In particular, the international framework should encourage the development of procedures to ensure that equipment, operational procedures and processes avoid harmful impacts, as well as the development of a methodology to assess that equipment, procedures and processes meet

---

<sup>4</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 176

<sup>5</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 120.

<sup>6</sup> Article IX stipulates that state parties shall avoid harmful contamination of outer space, and adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter.

common technical standards. In addition, the international framework should support development of technical standards for equipment, procedures and processes. In fact, common technical standards (standardization) are understood to be important accelerators of the exploration and utilization of outer space contributing to the long-term sustainability of outer space.

Paragraph 3 introduces another instrument designed to assure safety and to avoid potentially harmful impacts of space resource activities. Safety zone is an area adjacent to the area identified for a space resource activity with a special regime, not specified by Building Block 11. These zones are to be established by states and international organizations responsible for space resource activities. However, any decision to establish a safety zone should cautiously balance the need to ensure safety and the principle of non-appropriation as well as the freedom of access to all areas of celestial bodies, both enshrined in the OST. The last sentence of paragraph 3 addresses the most restrictive measure – a restricted access. Bearing in mind principles of international space law, state or international organization may restrict access only for a limited period of time, state's decision should be publicly notified, and reasons should be transparently set out.

A lack of international coordination and information sharing between states and international organizations may lead to the overlap of possible safety zones. For these purposes Building Block 11 paragraph 4 emphasises that appropriate international consultations should be undertaken. International consultations should also be available to settle potential disputes arising out of a conflict with the freedom of access to all areas of celestial bodies.

### 3. Legal Basis

Pursuant to Article VI of the OST states parties shall bear international responsibility for national activities in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the OST. In addition, activities of non-governmental entities in outer space should be authorized and continuously supervised by the appropriate state party to the OST.

*States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national*



*activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.*

Pursuant to Article IX of the OST, states parties shall conduct exploration of outer space so as to avoid harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter.

*In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. **States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.** If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.*

#### 4. Alternatives Discussed





Since the first face-to-face meeting in 2016, one of the building blocks has always been dealing with safety of space resource activities. In fact, until April 2017 the building block was even titled “Safety of space resource activities”. The scope of the building block was dramatically extended in 2017 when paragraph dealing with technical standards was added. The fourth paragraph addressing possible overlap of safety zones or conflicts with the freedom of access was added in 2019.

Significant attention has been given to safety zones. During the meetings, there were many discussions as to the compatibility of safety zones with the principles of international space law, particularly the non-appropriation principle and the freedom of access to all areas of celestial bodies. *Thus*, the building block explicitly requires these principles to be taken into consideration. The final version of Building Block 10 was accorded in April 2019.



## BUILDING BLOCK 12

---

### Monitoring and redressing harmful impacts resulting from space resource activities

#### 1. Text

- 1. The international framework should provide that States and international organizations shall ensure monitoring of any harmful impacts resulting from space resource activities for which they are responsible.**
- 2. If a harmful impact resulting from a space resource activity occurs, or is reasonably expected to occur, the international framework should provide that the State or international organization responsible for the space resource activity shall implement measures to respond to such harmful impact (response measures) and consider whether the space resource activity should be adjusted or terminated (adaptive management).**

#### 2. Explanation

Building Block 12 aims to reduce risks resulting from space resource activities and to promote long-term sustainability of outer space. Due to potentially harmful impacts resulting from space resource activities, states and international organizations shall ensure effective monitoring of those activities.

Pursuant to Article VI of the OST, states shall bear international responsibility for national activities, irrespective of whether they are carried out by governmental or non-governmental entities. In this context, states shall authorize activities of non-governmental entities in outer space and ensure that the activity is carried out in conformity with international space law. Since the content of an authorization as well as consequent supervision are left to the discretion of states, Article VI of the OST is widely seen as the basis for national space legislation.<sup>7</sup>

By the same token, the international framework should provide that states and international organizations shall monitor any harmful impacts resulting from space resource activities for which they are responsible. *Thus*, paragraph 1 of Building Block 12 specifies an already existing international obligation to supervise space activities by addressing exclusively space resource activities. Due to their hazardous nature, any harmful impacts should be monitored, pursuant to paragraph 1 of Building Block 12.

---

<sup>7</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 120.

What is more, if a harmful impact resulting from a space resource activity occurs, or is reasonably expected to occur, the international framework should provide that the state or international organization responsible for the space resource activity shall implement measures to respond to such harmful impact, as envisaged by paragraph 2. In order to fulfil their international obligations, states and international organizations should adopt robust and effective national space legislation providing them with necessary means for receiving information (to effectively monitor), intervention and punishment in case of non-conformity. Building Block 12 emphasises response measures and adaptive management.

By imposing an obligation to avoid harmful contamination and adverse changes in the environment of the Earth, Article IX of the OST provides only a limited protection. Therefore, the reference to “any harmful impacts resulting from space resource activities” together with an obligation to respond should be considered as an “added value” of Building Block 12 compared to the provisions of the OST. Building Block 12 provides better level of protection against harmful impacts resulting from space resource activities and can significantly contribute to the long-term sustainability of outer space.

### 3. Legal Basis

Pursuant to Article VI of the OST,<sup>8</sup> activities of non-governmental entities shall require authorization and continuing supervision in order to assure their conformity with the provisions set forth in the OST:

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

---

<sup>8</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 610 UNTS 205, 1967.

Pursuant to Article IX of the OST, state parties shall conduct exploration of outer space so as to avoid harmful contamination and also adverse changes in the environment of the Earth:

*(...) States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.(...).*

#### 4. Alternatives Discussed

This building block was originally dedicated only to monitoring and inspection of space resource activities. It also provided that states and international organizations should report on the space resource activities authorized by them. However, an obligation to report was removed in 2016. In April 2017 inspection of space resource activities as an autonomous building block emerged, first named *Inspection of space resource activities*, and then, based on discussions developed during the face-to-face meeting of September 2017, titled as *Visits relating to space resource activities*.

Since April 2017, this building block has required to respond to harmful impacts resulting from outer space activities. The final version of Building Block 12 was accorded in April 2019.

## BUILDING BLOCK 16

---

### Liability in case of damage resulting from space resource activities

#### 1. Text

- 1. The international framework should provide for the applicability of Articles VI and VII OST and the LIAB to damage resulting from space resource activities.**
- 2. The international framework should encourage initiatives of operators to provide, individually or collectively, compensation for damage resulting from their space resource activities.**

#### 2. Explanation

Building Block 16 deals with the liability in case of damage resulting from space resource activities. Pursuant to the first paragraph, the international framework should provide for the applicability of Articles VI and VII of the OST and to the Convention on International Liability for Damage Caused by Space Objects (“LIAB”). Whereas Article VI provides for the international responsibility of state parties for their national space activities, irrespective of whether there are carried out by governmental or non-governmental entities, Article VII denotes the link between a state’s international responsibility and its international liability. The rules of liability under the OST are further elaborated in a separate instrument of international law – the LIAB.

Due to an inherently ultrahazardous nature of space resource activities and potential damage of unthinkable proportions resulting from those activities, the international framework should be based on the OST rules on state responsibility and liability further elaborated in the LIAB. It is generally understood that there are good principled reasons for allocating the burden of risk on a launching state. First, state party is usually well placed to provide compensation. Second, state to state liability under Article VII of the OST is unlimited in time, amount and location.<sup>9</sup>

As a result of state responsibility and liability, states and international organizations are likely to address damage resulting from space resource activities in their national law. In addition, the international legal framework should encourage parallel initiatives of operators to provide compensation resulting from their activities, as envisaged by paragraph 2.

#### 3. Legal Basis

---

<sup>9</sup> Cologne Commentary on Space Law: Volume 1, Outer Space Treaty – 2009 – Carl Heymanns Verlag, Cologne – ISBN 978-3-452-27185-3, page 130.

Building Block 16 explicitly refers to Article VI of the OST<sup>10</sup> establishing international responsibility:

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

Article VII of the OST dealing with international liability for damage<sup>11</sup>:

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

and the Convention on International Liability for Damage Caused by Space Objects:

Article II

*A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft flight.*

Article III

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

#### 4. Alternatives Discussed

---

<sup>10</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 610 UNTS 205, 1967.

<sup>11</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 610 UNTS 205, 1967.

Liability in case of damage resulting from space resource activities has been considered important from the very beginning of the drafting process. The original draft (2016) recognized that additional detailed arrangements may become necessary as a result of more extensive space resource activities, however this reference to detailed arrangements was removed after the first face-to-face meeting. Since September 2017 the wording of Building Block 16 has remained unchanged.

