

Major Federal Actions Significantly Affecting the Quality of the Space Environment: Applying NEPA to Federal and Federally Authorized Outer Space Activities

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*The United States' landmark environmental law, the National Environmental Policy Act ("NEPA"), requires U.S. federal agencies to consider the environmental impacts of "major federal actions significantly affecting the quality of the human environment." The major agencies involved in space activities or regulation generally limit their environmental reviews of space activities, with only some consideration of terrestrial and space environmental impacts. This review argues that NEPA and existing case law supports the proposition that the "human environment" includes the "outer space environment." It reviews the historical role of space in human culture, emerging commercial and scientific uses of space, and the potential impacts of NewSpace activities on both the terrestrial and space environments. By examining statutory language and legislative intent, this review finds that current agency practices are likely not compliant with NEPA, particularly as they relate to not considering terrestrial environmental impacts from federally-authorized space activities. Current case law on NEPA extraterritoriality, particularly *EDF v. Massey*, further supports the application of NEPA to the space environment. U.S. spacecraft fall under the exclusive jurisdiction of the U.S., mitigating concerns about the presumption against extraterritoriality. As NEPA is only a process statute, including space environments are unlikely to hinder exploration or use of space while informing the public about the full environmental impacts of human space activities, consistent with NEPA's original purpose.*

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I. INTRODUCTION

Two major events in 2019 reignited concerns about the impacts of human activities on the outer space environment. The first event was the Space Exploration Technologies (“SpaceX”) launch of its planned satellite megaconstellation, Starlink. This led to broad concerns about light pollution and radio astronomy interference, from both the general public and professional astronomers.¹ Between Starlink and megaconstellations planned by other private companies, the total number of orbital satellites could greatly increase. The second major event occurred in mid-2019, when the SpaceIL mission suffered a crash landing on the moon. Unknown to SpaceIL or the Federal Aviation Administration (“FAA”), the lander contained illicit cargo of human DNA, as well as miniature animals capable of surviving in extreme environments called tardigrades. The cargo was placed on the spacecraft by the company Arch

¹ Ramon J. Ryan, Note, *The Fault In Our Stars: Challenging the FCC’s Treatment of Commercial Satellites as Categorically Excluded From Review Under the National Environmental Policy Act*, 22 VAND. J. ENT. & TECH. L. 923-25 (May 2020).

Foundation.² Though the survivability of tardigrades on the lunar surface is unlikely, this raises serious questions about the mission authorization process, space environmental governance, and planetary protection.³

While both controversies were foreseeable, the federal agencies responsible for mission authorization, the FAA and the Federal Communications Commission (“FCC”) for SpaceX and FAA for SpaceIL, did not conduct a National Environmental Policy Act (“NEPA”) review of the space activities of either mission. NEPA is required for any “major federal actions which significantly affect the quality of the human environment.”⁴ Excluding these missions from NEPA reviews raises questions about agency interpretations of statutory requirements, as well as the definition of the human environment.⁵

This article evaluates whether NEPA should apply to major federal actions that significantly affect the outer space environment. First, we review the physical and legal characteristics of outer space, describe humanity’s historic and planned use of space, and identify potential space environmental impacts. Second, we analyze the statutory language and legislative history of NEPA, identifying evidence that outer space constitutes part of the “human environment.” Third, we evaluate the existing international and national governance framework for space missions, particularly how NEPA is being applied by federal agencies. Fourth, we review court cases related to the extraterritorial application of NEPA, especially the DC Circuit case *Massey vs. EDF* which extended NEPA’s requirements to federal agency actions in Antarctica, as well as other cases in the global commons.⁶

Although multiple factors led to the emergence of the environmental movement in the late 1960s and early 1970s, one picture played an outsized role as a catalyst. In December 1968, a photo from Apollo 8 called “Earth Rise,” captured the cosmic and isolated nature of spaceship Earth.⁷ In 1969, while NEPA was being debated in the halls of Congress, one of the most important events in human history happened: a crewed mission landed on the Moon and were deemed the first explorers of a celestial body beyond the Earth. This event was noted in the NEPA hearings by multiple representatives as potential derivatives for the human environment: space. Less than six months later, Congress passed NEPA to incorporate environmental planning and values into federal government

² Christopher D. Johnson, et al., *The curious case of the transgressing tardigrades (part 1)*, THE SPACE REVIEW (Aug. 29, 2019), <https://www.thespacereview.com/article/3783/1>.

³ Christopher D. Johnson, et al., *The curious case of the transgressing tardigrades (part 3)*, THE SPACE REVIEW (Sep. 16, 2019), <https://www.thespacereview.com/article/3794/1>.

⁴ 42 U.S.C. § 4321 (1970).

⁵ See generally 42 U.S.C. § 4321 (1970).

⁶ *Env’t. Def. Fund, Inc. v. Massey*, 986 F.2d 528 (1993).

⁷ Marc Hudson, *Earth Day at 50 – what the environmental holiday means today*, THE CONVERSATION (April 22, 2020), <https://theconversation.com/earth-day-at-50-what-the-environmental-holiday-means-today-136415>.

operations.⁸ Over the next several years, multiple pieces of environmental legislation were passed.⁹

Even though the moon landing helped catalyze profound environmental reform, environmental law has yet to extend to the final frontier. Since the Apollo missions, human activities have been limited to the Low Earth Orbit (“LEO”). A handful of robotic missions have visited the Earth’s moon, asteroids, and other planets.¹⁰ Originally, all space missions were funded and performed by governments.¹¹ The relatively small scale of space activities limited the impacts of human activities on the space environment.

Recent advances in technology and the commercialization of space activities are poised to rapidly change humanity’s relationship with the space environment. While commercial satellites have provided telecommunication services for decades, falling costs are opening up new government and commercial activities.¹² These “NewSpace” activities include megaconstellations for internet and navigation, orbital tourism, space mining, space manufacturing, satellite servicing, and space nuclear power, among others.¹³ Notably, non-government entities are now looking to visit, explore, and potentially exploit or inhabit celestial bodies like the Moon, asteroids, and Mars.¹⁴

While imperfect, the environmental law regime has made major progress in identifying, preventing, mitigating, and hypothesizing harmful environmental impacts on Earth. In particular, NEPA has radically transformed how the federal government considers environmental impacts in its decision making. Over almost five decades of litigation and agency action, NEPA has become a key procedural tool for the federal government to identify and manage the environmental impacts of its actions, or for private citizens, to hold the government to account if it fails to do so. Notably, private sector activity authorized by the federal government generally falls under NEPA’s umbrella.¹⁵

Most existing federal agency interpretations hold that NEPA’s Environmental Impact Statement (“EIS”) requirement only applies to the Earth environment.¹⁶

⁸ See generally 42 U.S.C. § 4321 (1970).

⁹ See generally 33 U.S.C. § 1251 *et seq.*; 42 U.S.C. §§6901-6992k; 42 U.S.C. § 9601 *et seq.*; 16 U.S.C. § 1531 *et seq.*

¹⁰ See generally ROD PYLE, INTERPLANETARY ROBOTS: TRUE STORIES OF SPACE EXPLORATION (2019).

¹¹ Elliot Holokauahi Pulham, *The New Space Age*, 1 NEW SPACE III (2013).

¹² Jeff Matthews, The decline of commercial space launch costs (<https://www2.deloitte.com/us/en/pages/public-sector/articles/commercial-space-launch-cost.html>) (last visited April 18, 2021).

¹³ Pulham, *supra* note 10.

¹⁴ See GENERALLY NAMRATA GOSWAMI AND PETER A. GARRETSON, SCRAMBLE FOR THE SKIES: THE GREAT POWER COMPETITION TO CONTROL THE RESOURCES OF OUTER SPACE (2020).

¹⁵ COUNCIL ON ENV’T QUALITY EXEC. OFFICE OF THE PRESIDENT, *A Citizen’s Guide to the NEPA: Having Your Voice Heard* (2007) at 4.

¹⁶ See generally Daria Diaz, *Trashing the Final Frontier: An Examination of Space Debris from a Legal Perspective*, 6 TUL. ENV’T. L.J. 369 (1993) (on file with author).

Although federal space missions and commercial launches licensed by the federal government conduct NEPA analyses for the impact of rocket launches on the terrestrial environment, their analyses generally do not extend into outer space.¹⁷ Neither the FAA, responsible for authorizing satellite launches, nor the FCC, responsible for licensing use of radio spectrum and hence orbital satellite navigation, consider light pollution, radio pollution, space debris, or other space environmental impacts in their NEPA analyses for satellite launches or operation.¹⁸ The FCC has a NEPA categorical exclusion for satellite activities, which means that FAA is not required to complete an EIS for licensing such activities.¹⁹ Due to the FAA treating payload review separately from its NEPA requirements, the FAA did not evaluate the impacts of the SpaceIL mission to the Moon and did not have procedures in place to discover the illicit tardigrade and human DNA cargo.²⁰

To date, no court cases have challenged whether outer space should be considered in NEPA analyses. Gerrard and Barber describe the situation best:

“However, no court has had to confront the question of whether the “environment” protected by NEPA includes outer space. The notion of the environment encompasses our environs and our surroundings, and the idea of and proximity and of potential impact (however indirect) upon ourselves is implicit. Though NEPA was enacted the same year that man first walked on the moon, it does not appear that NEPA’s framers considered whether the new law would apply to activities in space.”²¹

Nevertheless, several court cases and many law reviews have examined the extraterritorial application of NEPA’s requirements to places outside the United States (U.S.), such as the global commons or federal activities in other countries.²² When it comes to outer space activities and NEPA there is a critical distinction between activities: those that occur in the outer space environment that impact the earth environment (such as satellite light pollution or sample return) and those

¹⁷ *Final Environmental Assessment and Finding of No Significant Impact for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station*, FEDERAL AVIATION ADMINISTRATION (July 2020), https://www.faa.gov/space/environmental/nepa_docs/media/SpaceX_Falcon_Program_Final_EA_and_FONSI.pdf.

¹⁸ Michael R. Migaud, et al., *Developing an Adaptive Space Governance Framework*, 55 SPACE POLICY (2021); Ryan, *supra* note 1.

¹⁹ Ryan, *supra* note 1.

²⁰ Christopher D. Johnson, et al., *The curious case of the transgressing tardigrades (part 2)*, THE SPACE REVIEW (Sep. 3, 2019), <https://www.thespacereview.com/article/3786/1>.

²¹ Michael B. Gerrard and Anna W. Barber, *Asteroids and Comets: U.S. and International Law and the Lowest-Probability, Highest Consequence Risk*, 6 NYU ENV’T. L.J. 4 (1997).

²² See generally Thomas E. Digan, *NEPA and the Presumption against Extraterritorial Application: The Foreign Policy Exclusion*, 11 J. CONTEMP. HEALTH L. & POL’Y 165 (1995); *The Extraterritorial Scope of NEPA’s Environmental Impact Statement Requirement*, 74 MICH. L. REV. 349 (1975); David Heywood, *NEPA and Indirect Effects of Foreign Activity: Limiting Principles from the Presumption Against Extraterritoriality and Transnational Lawmaking*, 2013 BYU L. REV. 691 (2014).

occurring in the space environment that impact the space environment (such as orbital debris or landing lifeforms on the Moon).

II. OUTER SPACE AS A HUMAN ENVIRONMENT

Humanity has utilized and relied upon the space environment for as long as history has been recorded. Historically, the sun, the Moon, stars, planets, comets, and other astronomical phenomena played key roles in religion, science, time-keeping, history, and navigation, among providing other cultural and aesthetic values. Scientific observations of celestial bodies have been key to unlocking advances in physics. The direct and physical human use of space began in 1957 with the launch of the Sputnik satellite, followed shortly after by animal and human astronauts.²³ As space technology matured, human uses of space increased greatly. During the Cold War, space played a central role for military applications and, through the space race, international prestige.²⁴ In 1969, the Apollo 11 lander brought humans to the Moon, representing the first direct human use of a celestial body.²⁵

Since Apollo 11, more humans have visited the Moon, and landers, rovers, and orbiters have been introduced to the Moon and to other planets and celestial bodies. The number of nations participating in space has grown, as has the participation of private and commercial actors. Today, space is used for commercial, scientific, and military purposes.²⁶ In particular, outer space has become indispensable for everyday navigation (particularly GPS) and telecommunications, both civilian and military. However, the years to come are promising for human space exploration, both scientific and non-scientific, and the uses of space may soon expand to economic sectors such as tourism, mining, and others.²⁷ As human uses of space, including human presence, expand rapidly, employing a proactive policy for the use and development of the space environment is critical to avoid unintended affects.

A. *What constitutes the space environment?*

As an initial factual matter, there is no definition of what constitutes outer space under international or U.S. law.²⁸ This is one of the greatest ambiguities in space law, as the lack of a single, clearly-defined point in space that marks the end of

²³ See generally Michael J. Neufield, *SPACEFLIGHT: A CONCISE HISTORY* (2018).

²⁴ *Id.*

²⁵ *Id.*

²⁶ Alex Gilbert and Morgan Bazilian, *The Geostrategic Importance of Outer Space Resources: Is space mining the final frontier?* THE NATIONAL INTEREST (May 15, 2020), <https://nationalinterest.org/feature/geostrategic-importance-outer-space-resources-154746>.

²⁷ *Id.*

²⁸ Hao Lieu & Fabio Tronchetti, *Regulating Near-Space Activities: Using the Precedent of the Exclusive Economic Zone as a Model?* 50 OCEAN DEV. & INT'L L. 91 (2019); John A. Vosburgh, *Where Does Outer Space Begin?*, 56 A.B.A. J. 134, 134 (1970).

Earth's airspace is critical for determining where national jurisdiction ends and international jurisdiction begins.²⁹

Today, references to the “space environment,” in technical settings, typically describe conditions that reside roughly 100 kilometers above the surface of the earth, otherwise known as the Karman line.³⁰ The Karman line is derived from the altitude at which orbital velocity, as opposed to lift, is needed to maintain altitude.³¹ While NASA uses the Karman line as its marker for the awarding of astronaut wings, the Air Force recently moved their astronaut wings down to 50 miles.³² Above this line are factors that are often characteristic of space conditions, such as unfiltered solar radiation and winds, presence of a vacuum, extremely cold temperatures, meteoroids, magnetic fields, and space debris.³³³⁴

Other definitions could place “outer space” significantly higher than the Karman line. Outer space, in these assumptions, could be characterized as the region beyond the influence of the Earth's atmosphere, which extends as far as 6,200 miles. The upper layers of the atmosphere include the mesosphere (~31-53 miles), thermosphere (~50-620 miles), and the exosphere (which extends from the thermosphere up to ~6,200 miles).³⁵

Another definition could consider outer space as lying beyond the Earth's magnetosphere, the magnetic fields from Earth's core which protects the planet from cosmic radiation.³⁶ The magnetosphere can extend as little as 40,000 miles from the Earth on the dayside and as much as 4.0 million miles on the nightside.³⁷ Earth's gravity could also be plausible boundary, which exerts so much force on the Moon that it is tidally locked to Earth at its distance of greater than 200,000 miles.³⁸ Though incredibly small, the Earth exerts gravitation force on all solar system objects.³⁹

²⁹ *Id.* at 3.

³⁰ Jonathan C. McDowell, *The edge of space: Revisiting the Karman Line*, 151 ACTA ASTRONAUTICA 668 (Oct. 2018).

³¹ *Id.*

³² Bhavya, Lal & Emily Nightingale, *Where is Space? And Why Does That Matter?* EMBRY-RIDDLE AERONAUTICAL UNIVERSITY (Nov. 5, 2014) Space Traffic Management Conference 16 <https://commons.erau.edu/stm/2014/wednesday/16>.

³³ McDowell *supra* note 29.

³⁴ Finckenor, Miria M. & Kim K. de Groh, *The International Space Station (ISS) Researcher's Guide: Space Environmental Effects*, NASA (2015). https://www.nasa.gov/sites/default/files/files/NP-2015-03-015-JSC_Space_Environment-ISS-Mini-Book-2015-508.pdf.

³⁵ JOHN MARSHALL & R. ALAN PLUMB, *ATMOSPHERE, OCEAN, AND CLIMATE DYNAMICS: AN INTRODUCTORY TEXT* (2008).

³⁶ Diagram of Earth's magnetic Field, NASA <https://www.jpl.nasa.gov/nmp/st5/SCIENCE/magnetosphere2.html> (last visited April 18, 2021).

³⁷ *Id.*

³⁸ Puthalath Koroth Raghuprasad, *Synchronous, Nonsynchronous and Negative Rotations: How Spin and Gravity Orchestrate Planetary Motions*, 12 APPLIED PHYSICS RESEARCH 1, 1-4 (2020).

³⁹ *Id.*

These ambiguous definitions raise the challenge of whether or not to include certain regions of human activity or other celestial bodies in the definition of “outer space” and the space environment.⁴⁰ Areas that lie beyond the Karman line, where humanity has explored (with human crew or robotically) have also been historically referred to as a “space environment.” Despite ambiguities in definitions of Earth’s physical characteristics, common locations in space are denoted by use and distance.

LEO, which constitutes everything up to 2,000 kilometers (km) from the surface, is the primary location for most existing human space objects. Notably, all human space missions, except Apollo, occurred in LEO. LEO is also home to the International Space Station which has had a continual human presence since 2000.⁴¹ Robotic commercial, scientific, government, and other private space activities occur in other locations such as:

- Geosynchronous Earth orbit (estimated 35,786km above the equator, referred to as GEO)
- High earth orbit (altitudes above GEO, referred to as HEO)
- Cislunar space (locations within the Moon’s orbit, including Earth),
- Deep space (loosely defined, typically beyond cislunar space)

For the purposes of this paper, we refer to space as meaning locations beyond the 100-mile Karman line, unless otherwise specified.

B. New Uses of Space Could Require Reevaluation of NEPA

Regardless of the definition of outer space and the space environment, the historical and current uses of the space environment by humans (to include other solar system bodies) are longstanding and irrefutable. Recent proposals for outer space activities include actions that once seemed relegated to the realm of science fiction including:

- Government and commercial crewed missions to the Moon and Mars, including permanent stations
- Orbital and space tourism
- Space mining of the Moon and asteroids
- In-orbit and in-situ manufacturing
- Space nuclear power to support all the above activities
- Space-based solar power for delivery to Earth

These advances are exciting and can bring significant social, economic, and scientific benefits. However, some motivations for these advances are harmful or excessive: a clear example is a recent proposal to use the night sky for advertising

⁴⁰ Juan Davalos, *International Standards in Regulating Space Travel: Clarifying Ambiguities in the Commercial Era of Outer Space*, 30 EMORY INT’L L. REV. 597, 609 (2016).

⁴¹ *NASA Counts Down to Twenty Years of Continuous Human Presence on International Space Station*, NASA (Oct. 31, 2019). <https://www.nasa.gov/feature/nasa-counts-down-to-twenty-years-of-continuous-human-presence-on-international-space-station>.

products to Earth from satellites.⁴² The ushering in of a new technological and scientific age in space must be accompanied by a reevaluation of the legal landscape surrounding the space environment, including necessary progressive and long-term-minded revisions. As discussed in Section 3, one of the original components of NEPA was to proactively consider environmental impacts before a project occurred, so that negative effects could be identified and mitigated.

For purposes of NEPA, human impacts on the space environment can generally be divided into two non-exclusive categories: space activities in outer space that impact the Earth environment and space activities which impact the space environment. As this paper focuses on whether NEPA should apply to outer space activities, we consider this distinction but do not analyze whether NEPA would require analysis of a specific environmental impact (i.e. light pollution from spacecraft). The focus is on the threshold issue of whether and when outer space activities trigger the Environmental Assessment process.

However, there is a third category worth noting that is implicated by this analysis – environmental effects on Earth that impact outer space activities. The most worrisome of these is the use of 5G whose transmission bands are expected to reduce the accuracy of satellite-based hurricane forecasting.⁴³ In this specific case, the causal chain passes through space (via earth observation) but has real impacts for people who may be hurt or suffer losses due to reduced weather forecasting accuracy.

C. *Human pollution of outer space*

While humans use space for various activities, the space landscape is altered because of scientific and now commercial practices. Chief among these changes is space debris, which consists of decommissioned satellites, debris from rocket launches, and debris from previous space collisions.⁴⁴ Space debris is considered one of the primary threats to U.S. interests in LEO and GEO.⁴⁵ More recently, the increase in satellites raises concerns about how they will affect Earth-based astronomy. One analysis found that light from megaconstellations could ruin 1/3 of the images from a major new telescope.⁴⁶ Light pollution from satellites can

⁴² Holly Brockwell, *The great ad-space race: the history of space advertising*, TECHRADAR (Mar. 30, 2019), <https://www.techradar.com/news/the-great-ad-space-race-the-history-of-space-advertising>.

⁴³ Marguerite Reardon, *5G networks could wreak havoc on weather forecasting, officials warn*, CNET (May 17, 2019, 9:16 AM), <https://www.cnet.com/news/officials-warn-5g-networks-could-wreak-havoc-on-weather-forecasting/>.

⁴⁴ Steven A. Hildreth and Allison Arnold, CONGRESSIONAL RESEARCH SERV., THREATS TO U.S. NATIONAL SECURITY INTERESTS IN SPACE: ORBITAL DEBRIS MITIGATION AND REMOVAL, (January 8, 2014).

⁴⁵ *Id.* at 1, 13.

⁴⁶ Daniel Clery, *Satellite megaconstellations menace giant survey telescope*, 367 SCIENCE 965 (2020).

impact aesthetic and cultural uses of the sky, such as wilderness, while radio interference from satellites can impact radio astronomy.

Other examples of human pollution of space include, but are not limited to: radiological risks from space nuclear systems (public panic from the Cassini launch), toxic debris wastes from space propellants, space debris and space waste, biological and other contamination of celestial bodies that can harm forms of in-situ resource utilization, light pollution from satellites, and impacts to wilderness solitude.⁴⁷

Past missions have led to human-made spacecraft visiting other worlds with potential contaminants.⁴⁸ It is impossible to fully decontaminate spacecraft, machinery, and technology of all microbial life without damaging the spacecraft and technologies themselves. We have left bags of human feces, golf balls, human DNA samples, and even tardigrades on the lunar surface.⁴⁹ Neither rover nor tardigrades hold any sort of immediate threat for contaminating a certain area. Nevertheless, the possibility for irreversible contamination and pollution that prevents other uses of a celestial body is ever present. With a coming surge in human space activity, proactive evaluation of potential impacts through expanding NEPA processes to space can identify potential pollution before it occurs, leading to more options for mitigation and management.

III. NEPA'S STATUTORY TEXT AND LEGISLATIVE HISTORY

To determine whether Congress intended outer space to be considered part of the environment for purposes of NEPA, we turn to an analysis of statutory language and legislative history. While elements of the law existed in various legislative proposals during the 1960s, the proposed legislation that would eventually become NEPA has a brief legislative history. Both the House and Senate bills were proposed in early 1969, with hearings in both chambers in mid-1969. The Senate bill passed in July, while the House bill passed in September, with a conference committee in December.⁵⁰ The conference bill passed Congress in December 1969 and was signed into law by President Nixon in January 1970.⁵¹

⁴⁷ David Grinspoon, *Cassini's Environmental Triumph*, THE ATLANTIC (September 14, 2017), <https://www.theatlantic.com/science/archive/2017/09/cassini-protests-environmentalism/539865/>; Troy Farah, *Light pollution from satellites will get worse. But how much?* ASTRONOMY (June 14, 2019), <https://astronomy.com/news/2019/06/light-pollution-from-satellites-will-get-worse-but-how-much>.

⁴⁸ Monica Vidaurri, Alia Wofford, Jonathan Brande, Gabriel Black-Planas, Shawn Domagal-Goldman, Jacob Haqq-Misra, *Absolute Prioritization of Planetary Protection, Safety, and Avoiding Imperialism in All Future Science Missions: A Policy Perspective*, 51 SPACE POLICY (November 2019).

⁴⁹ Meghan Bartels, *The Weirdest Things Apollo Astronauts Left on the Moon*, SPACE.COM (July 21, 2019), <https://www.space.com/weird-stuff-apollo-astronauts-left-moon.html>.

⁵⁰ Linda Luther, *The National Environmental Policy Act: Background and Implementation*, CONGRESSIONAL RESEARCH SERVICE (2008).

⁵¹ *Id.* at 6.

Notably, the version that originally passed the House did not include the action forcing provision that would lead to EISs (Section 102(2)(C)); the section was incorporated during conference.⁵² There was limited legislative discussion of the EIS process itself.

As an initial matter, Congress was concerned with identifying and managing the ongoing negative environmental impacts known at the time. With the space age barely a decade old, identified environmental problems were generally limited to those on Earth. Key concerns raised were human interactions with air, water, wildlife, and resource management, to name but a few. Often called the Magna Carta of environmental law, the National Environmental Policy Act of 1969 was the foundational law for the U.S.’ environmental governance regime.⁵³

A. *Statutory Text and Procedural Requirements*

The statute itself is relatively short with most of the text focusing on the creation of an executive body for environmental management, the Council on Environmental Quality (“CEQ”). However, the central action-forcing provision of NEPA has turned out to be Section 102(2)(C):

“The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall— . . .

“(C)include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

- (i)the environmental impact of the proposed action,
- (ii)any adverse environmental effects which cannot be avoided should the proposal be implemented,
- (iii)alternatives to the proposed action,
- (iv)the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity, and
- (v)any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.”⁵⁴

This provision requires “all agencies of the Federal government” to prepare “a detailed statement” on “major Federal actions significantly affecting the quality of the human environment.”⁵⁵ Subsequently, the analysis required in Section

⁵² *Id.* at 5.

⁵³ 42 U.S.C. § 4321 (1970).

⁵⁴ 42 U.S.C. § 4332 (1970).

⁵⁵ *Id.*

102(2)(C) has become known as an environmental impact statement (“EIS”).⁵⁶ When determining whether a major federal action requires an EIS, federal agencies must perform an environmental analysis (“EA”).⁵⁷ If the action does not significantly affect the environment, the agency issues a finding of no significant impact (“FONSI”) while significant affects require preparation of an EIS.⁵⁸ A full EIS must consider each of the factors outlined in 102(2)(C)(i) to 102(2)(C)(v).⁵⁹ The process, including EAs, FONSI, and EISs, can allow persons to sue Federal agencies if the procedural requirements under the Administrative Procedures Act are not followed.⁶⁰ Importantly, courts have found that the EIS requirement is a procedural requirement, not a substantive one; agencies are required to perform the analysis but are not obligated to pursue any specific action identified in the analysis.⁶¹

In applying the EIS process to the outer space environment, an analysis must determine that there is (1) a “major Federal action” that (2) “significantly affects the quality” of the (3) “human environment.”⁶² The question of including outer space as an environmental domain is primarily concerned with the third component of NEPA. Rocket launches by federal agencies are generally considered to be major Federal actions that trigger an EA process, as demonstrated by agency practice by DOD or NASA.⁶³ Similarly, the licensing of a private rocket launch is “considered a major federal action subject to environmental review under NEPA.”⁶⁴ If a rocket launch, or licensing thereof, is considered major enough to trigger an EA for its impacts on Earth, it could be warranted that an EA could be necessary to consider the impacts of a rocket and an operating spacecraft once they reach outer space. The second provision, “significantly affects the quality” determines whether an EA and FONSI are sufficient or whether a full EIS is required. Although this factor would be influenced by quality issues in outer space, the threshold is whether outer space is part of the human environment.

From a strict textual perspective, for purposes of Section 102(2)(C), NEPA’s EA/EIS process applies to outer space activities if outer space is considered part of the “human environment.” The statute defines neither “environment” nor “human environment.” A plain text reading of environment would mean that the

⁵⁶ DAVID B. FIRESTONE AND FRANK C. REED, ENVIRONMENTAL LAW FOR NON-LAWYERS (4th ed. 2008).

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Calvert Cliffs’ Coordinating Committee, Inc. v. United States Atomic Energy Commission*, 449 F.2d 1109 (D.C. Cir. 1971).

⁶² Firestone and Reed *supra* note 54.

⁶³ *Final Constellation Programmatic Environmental Impact Statement*, NASA (January 2008). https://www.nasa.gov/pdf/207909main_Cx_PEIS_final.pdf; also see section 4.b.

⁶⁴ FAA *supra* note 10.

human environment is that which surrounds humans. That would include all of the Earth as well as outer space, or at least the portions in which humans are present. Historically this would include the Moon, LEO, and may include much of the solar system in the future. Although the CEQ's implementing regulations are only statutory interpretations, its definition of the "human environment" is inclusive:

“(m) *Human environment* means comprehensively the natural and physical environment and the relationship of present and future generations of Americans with that environment.”⁶⁵

The language provided is broad and encompassing – it includes all of the natural and physical environment and can evolve as the relationship of future Americans with the environmental changes following technological and scientific advancements.

B. Underlying definitions within the statute

As Section 102(2)(C) contains limited information on determining what constitutes the “human environment,” we expand our textual analysis to determine whether there is an indication of legislative intent on this question within the rest of the statute.

The preamble to NEPA, titled the “Congressional Declaration of Purpose,” supports a more expansive view of environment.⁶⁶ It does not contain language that limits the idea of environment to the world or Earth. Nor does it contain language that limits the purpose of the statute only to the national environment. In announcing a goal “to enrich understanding of the ecological systems and natural resources important to the Nation,” the statute uses the more expansive “Nation” instead of more restrictive “United States.”⁶⁷ Natural resources are of primary concern to the nation and outer space resources are an integral part of this. Their status as national resources of interest to the U.S. is underscored by recent legislative and administrative actions.⁶⁸ In such a context, NEPA's declaration of purpose would indicate a desire to enrich the understanding of space resources.

⁶⁵ Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 137, 43304 (July 16, 2020); Note that this Updated regulation changed the definition of human environment to narrowly focus on Americans.

⁶⁶ “The purposes of this chapter are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.” 42 U.S.C. § 4321 (1970).

⁶⁷ *People of Enewetak v. Laird*, 353 F. Supp. 811 (D. Haw. 1973).

⁶⁸ Pub. L. 114-90 (2015); Alex Gilbert and Morgan D. Bazilian, *We Need a Space Resources Institute*, SCIENTIFIC AMERICAN (April 19, 2019), <https://blogs.scientificamerican.com/observations/we-need-a-space-resources-institute/>.

The annual report, that ended in 2000, required that the CEQ includes the following: “the status and condition of the major natural, man-made, or altered environmental classes of the Nation, including, but not limited to, the air, the aquatic, including marine, estuarine, and fresh water, and the terrestrial environment, land, range, urban, suburban, and rural environment.”⁶⁹ Again, while this section describes different types of environmental classes, it includes the phrase “but not limited to” which could include outer space. Though the report is no longer required, its text can indicate legislative intent at the time the bill was passed.

Section 102(2)(F) requires federal agencies to “recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the U.S., lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind’s world environment.”⁷⁰

This provision largely deals with international environmental coordination. While it specifies concerns about the “world environment,” it uses the more expansive term “world” instead of more limiting “Earth.” While considered synonyms, textually “Earth” refers to the planet specifically while “world” has many broader meanings including all human and social interaction. This broader use of language here resembles that of the District Court in *People of Enewetak v. Laird*, which focused on the use of the broad word “Nation” as opposed to more narrow “United States.”⁷¹

Finally, we look at NEPA’s “Congressional Declaration of a National Environmental Policy.”⁷² This section contains broad terms that support a wide-ranging definition of the human environment. In particular, the phrase “recognizing the profound impact of man’s activity on the interrelations of all components of the natural environment” can be reasonably understood to include outer space as a component of the natural environment. The phrase “man and nature can exist in productive harmony” uses the expansive term “nature.” Finally, the listing of profound influences includes “industrial expansion, resource exploitation, new and expanding technological advances.” The first two are

⁶⁹ 42 U.S.C. § 4341 (1970).

⁷⁰ 42 U.S.C. § 4332(f) (1970).

⁷¹ *People of Enewetak v. Laird*, 353 F. Supp. 811 (D. Haw. 1973).

⁷² “(a) The Congress, recognizing the profound impact of man’s activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.” 42 U.S.C. § 4331(a).

directly related to planned activities in outer space, which are increasingly driven by commercial concerns. The last is important as it evidences Congressional concern about how changes in technology could impact the natural environment.

In sum, the statutory text indicates a desire to understand and manage the relationship between humanity and the total environment. The statute does not explicitly define the environment, neither limiting it to Earth nor expanding it to outer space. Rather, the focus is on the interactions between humans and the environment in which they exist.

C. *Identifying legislative intent through legislative history*

While legislative history regarding EISs specifically is limited, reviewing NEPA's legislative history in terms of broader purposes supports the argument that outer space should be considered part of the human environment. We examined the following sources of legislative history to interrogate underlying intent:

- Congressional hearings on NEPA and its precursor bills
- Senate, House, and Conference Committee reports⁷³
- White paper on the environment, reporting on a Congressional Colloquium that formed the basis of the bill⁷⁴
- The first NEPA oversight hearing in the House in late 1970⁷⁵

The White Paper on the environment provides several important statements regarding the international application of NEPA.⁷⁶ It includes a witness explicitly identifying stratospheric contamination as an international environmental problem.⁷⁷ On international relations, the White Paper summarized it thusly: “[a]lthough the influence of the U.S. policy will be limited outside of its own

⁷³ S. REP. NO. 91-296 (1969); H.R. REP. NO. 91-378 (1969); H.R. Rep. No. 91-765 (1969) (Conf. Rep.).

⁷⁴ 90 REP. NO. 20-218. *Congressional White Paper on A National Policy for the Environment* (1968).

⁷⁵ *Administration of the National Environmental Policy Act, Hearings Before the Subcomm. on Fisheries and Wildlife Conservation of the House Comm. on Merchant Marine and Fisheries, 91st Cong., 2d Sess., pt. 1-2 (1970)* (Statement and accompanying memorandum of C. Herter., Special Assistant to the Secretary of State for Environmental Affairs).

⁷⁶ See 90 Rep. No. 20-218, *supra* note 72 at 7 (“Dr. Ripley summarized the feeling of the colloquium: to speak about environmental quality without at least referring to the fact of the international components and consequences of even our activity as Americans and considering our own acreage and our own problems with the environment, appears to me to be somewhat shortsighted (p. 74).”).

⁷⁷ *Id.* (“Dr. Roberts questioned whether these and similar ongoing cooperation efforts were fully adequate, and proposed that a broader international scheme of cooperative “bench mark” observations be made. As an example he described the neglected area of stratospheric contamination.”).

borders, the global character of ecological relationships must be the guide for domestic activities. Ecological considerations should be infused into all international relations.”⁷⁸ Further, the White Paper noted the importance of managing new technologies: “[d]ecisions to make new technological applications must include consideration of unintended, unanticipated, and unwanted consequences.”⁷⁹

Beyond Committee Reports and the White Paper, outer space also appears frequently in NEPA’s hearings.⁸⁰ NEPA’s debate and passage occurred during the Apollo program, including the July 1969 Apollo 11 mission that landed humans on the moon. Generally, outer space was mentioned in three contexts: in terms of providing perspective for human activities on Earth, in terms of NASA as a model for CEQ, and as an element of potential environmental impacts. During hearings, members of Congress and witnesses discussed how the technology needs of spacecraft mimic those of Earth, leading to the concept of “spaceship Earth.”⁸² Both also discussed how the technological development and research done in the space program should inform the bill’s work to establish the CEQ as an advisory and data gathering body. The potential environmental impact of space activities on Earth’s resources was specifically highlighted due to concerns about rocket launches’ impact on the climate and the need for rare earth metals for spacecraft. Further, the benefits of spacecraft missions to environmental science were also mentioned.

There are three specific pieces of legislative history that stand out as indicating Congress considered outer space as part of the environment. First, and weakest, was during hearings on the precursor Resources and Conservation Act of 1961 before the Senate Committee on Interior and Insular Affairs.⁸³ In a hearing, a Senate witness reviewed definitions of national resources, noting “(t)herefore, I think we are obliged to consider even outer space now a resource of our Nation.”⁸⁴ Given this is witness testimony for a precursor bill, the weight of this statement is very limited, but its early appearance is indicative of space’s consideration throughout NEPA’s debate.

Second, and most definitive, is a report prepared for the Senate Committee by their legislative counsel and an outside specialist that specifically identifies the “outer space environment.”⁸⁵ This report was commissioned by the main Senate NEPA sponsor and Senate advocate, Senator Jackson. He submitted it into the

⁷⁸ *Id.* at 15.

⁷⁹ *Id.* at 16.

⁸⁰ *Hearing before the S. Comm. On Interior and Insular Aff.*, 90th Cong. (1968).

⁸¹ *Hearing before the H.e SubComm. On Sci., Rsch., and Dev.t.*, 90th Cong. (1968).

⁸² *Id.* at 331.

⁸³ *Bills to Declare a National Policy on Conservation, Dev.t, and Utilization of Natural Resources, and For Other Purposes: Hearing before S. Comm. On Interior and Insular Aff.*, 87th Cong. (1961).

⁸⁴ *Id.* at 165.

⁸⁵ S. REP. NO. 96-999 (1968), at 106, as reprinted in 115 CONG. REC. 26,069, 29,072 (1969).

Congressional record at multiple points. It identifies the “outer space environment” in the section “National Policy and International Cooperation”:

“The United States, as the greatest user of natural resources and manipulator of nature in all history, has a large and obvious stake in the protection and wise management of man-environment relationships everywhere. Its international interests in the oceanic, polar, and outer space environments are clear. Effective international environmental control would, under most foreseeable contingencies, be in the interest of the United States, and could hardly be prejudicial to the legitimate interests of any nation. American interests and American leadership would, however, be greatly strengthened if the Nation’s commitment to a sound environmental policy at home were clear.”⁸⁶

While this paragraph is focused on the relationship between domestic policy and international cooperation, it clearly includes the outer space environment alongside oceanic and polar environments. It specifically does so by invoking U.S. interests in “man-environment relationships everywhere,” relevant for interpretations of NEPA’s “human environment.”⁸⁷

In a statement included with the report, Senator Jackson’s language focused on broad policy related to the environment, specifically noting “it needs to be recognized that the declaration of a national environmental policy will not alone necessarily better or enhance the total man-environment relationship.”⁸⁸ As with NEPA itself, Senator Jackson’s language here and in other parts of the legislative history promotes a broad conception of the environment, including its international character.⁸⁹ Further, Senator Jackson’s goals for NEPA include “giving the Federal Government an environmental problem anticipatory capacity.”⁹⁰ Considering the current, relatively pristine state of most of the space environment, an anticipatory capacity is relevant for federal government actions.

The third major occurrence is not a piece of direct legislative history. In 1970, following the bill’s passage, the State Department issued a memorandum determining to what extent NEPA’s EIS requirement would apply to areas beyond

⁸⁶ *Id.* at 106.

⁸⁷ *Id.*

⁸⁸ *Id.* at 90.

⁸⁹ “The aim of my bill is to provide a continuing and thorough consideration of our Nation’s overall progress in meeting national and international problems of environmental management which are critically important to the well-being of this country.”

Bills to Authorize the Secretary of the Interior to Conduct Investigations, Studies, Surveys, and Research Relating to the Nation’s Ecological Systems, Natural Resources, and Env’tl. Quality, and to Establish a Council on Env’tl. Quality; Hearing before S. Comm. On Interior and Insular Aff., 91st Cong. 26 (1969) (on file with author).

⁹⁰ *Id.* at 28.

the borders of the U.S.⁹¹ The memo found that although the EIS requirement would not apply to federal actions within foreign territory, it would apply to the high seas, Antarctica, and outer space.⁹² This memo was specifically cited in a foreign policy analysis related to NEPA by the DC Circuit Court of Appeals in *Environmental Defense Fund vs Massey*.⁹³

As the *Massey* court notes, the State Department memo itself is not a source of legislative history.⁹⁴ However, comments related to it made by key NEPA Congressional cosponsors following passage can be used to gauge legislative intent. In late 1970, the first oversight hearing on NEPA's administration in the Fisheries and Wildlife Committee, the House committee responsible for passing NEPA, specifically examined the memo and its application to outer space.⁹⁵ In questioning the Department of State's counsel, three Representatives specifically clarified the Department of State's interpretation of NEPA's application to outer space: Congressman Everett,⁹⁶ Congressman Dellenback,⁹⁷ and Congressman Dingell.⁹⁸

Congressman Dellenbeck's initial line of questioning of State's representatives focused on the role of the State Department in assisting NASA's NEPA analysis

⁹¹ *Administration of the National Environmental Policy Act, Hearings Before the Subcomm. On Fisheries and Wildlife Conservation of the H. Comm. On Merchant Marine and Fisheries, 91st Cong., 2d Sess., pt. 2, at 546 (1970).*

⁹² *Id.*

⁹³ *Massey*, 986 F.2d at 528.

⁹⁴ *Id.*

⁹⁵ *Administration of the National Environmental Policy Act, Hearings Before the Subcomm. on Fisheries and Wildlife Conservation of the House Comm. on Merchant Marine and Fisheries, 91st Cong., 2d Sess., pt. 1, at 1121 (1970)(Statement of C. Herter Jr., Special Assistant to the Secretary of State for Environmental Affairs).*

⁹⁶ *Id.* at 1127. "Mr. EVERETT. Mr. Herter, in your statement you have interpreted the National Environmental Policy Act as not applying to the jurisdiction of other countries. You also indicate that it does apply to the high seas, Antarctica and one other area.

Mr. HERTER Space.

Mr. EVERETT. And space."

⁹⁷ *Id.* at 1129. "Mr. DELLENBACK. Thank you, Mr. Chairman. Do I understand correctly, Mr. Herter, from what you implied to counsel earlier, and I didn't find it as such in your statement but I assume you made the comment, that you would feel that while the provisions do not apply to foreign jurisdictions it would apply to the high seas and to space. Is that correct?

Mr. HERTER. That is correct. This is counsel's interpretation. If it is not within the national jurisdiction of some other country, it would be subject to an environmental impact statement."

⁹⁸ *Id.* at 1139. "Mr. DINGELL. Mr. Herter, you have indicated in your statement and in the supporting memorandums that it is your feeling that the provisions of 102(2) (C) do not apply to actions in the State Department abroad. You have, however, subsequently somewhat qualified that by indicating that where actions of the State Department or State Department agencies or matters that are brought to the attention of the State Department dealing with areas which are clearly not under the jurisdiction of any one nation such as, for example, in outer space or in international waters, that then it would be your view that the provisions of 102(2) (C) and the rest of the Environmental Policy Act do have a bearing. Am I correct in my interpretation of this?

Mr. HERTER. This is correct.

Mr. DINGELL. And they then do apply."

for activities in outer space.⁹⁹ Upon learning that the State Department did not intend to prepare an EIS for NASA's proposed space shot but would comment on a NASA EIS if requested to do so. Congressman Dellenbeck requested the Committee inquire with NASA about whether such an EIS was underway. He made this comment that directly implicated space as an environment covered by NEPA: "May I make that suggestion, Mr. Chairman? Because we are, of course, in the very early stages of what happens so far as the environment is space is concerned. What Mr. Herter has said this morning opened the line of inquiry up in my mind when he made clear that the statute which was passed would apply, as he put it, to all areas where foreign jurisdiction did not enter to preclude our being involved."¹⁰⁰

While the Congressman is asking to what extent NEPA's EIS requirement applies to space, it is important to read the hearing transcript in light of the legislative history of the EIS provision (102(2)(C)). The original House version of NEPA, that passed the Fisheries Committee and the whole House, did not have the provision. It was only added following the House and Senate conference. Accordingly, while Congressman Dellenbeck's line of questioning is about the extent to which 102(2)(C) would apply to federal actions abroad, the premise of his question includes space as part of the environment.

Further, the hearing must be interpreted in context of its purpose. The goal of the hearing was for the House committee responsible for NEPA to understand its implementation and determine if NEPA required any amendments.¹⁰¹ In asking whether the State Department thought any amendments were necessary, Congressman Dellenbeck specifically identified his interpretation of NEPA's EIS application to space, while also including areas outside of the U.S., including space, as part of the "total environment" and "worldwide environment."¹⁰² He also

⁹⁹ *Id.* at 1130. "Mr. DELLENBACK. How about the space shot that is coming up? Has the State Department made an environmental impact statement in connection with that proposed shot?"

Mr. HERTER. I can't answer that statement, I don't know.

Mr. SALMON. No, sir, we have not prepared such a statement.

Mr. DELLENBACK. Have you been called upon to make such an estimate?

Mr. HERTER. No, sir.

Mr. DELLENBACK. Do you feel, if called upon, that the Department of State should comment on a space shot?

Mr. SALMON. No, sir, I feel this would be the responsibility of the action agency, NASA, in this case.

Mr. DELLENBACK. Under the terms of the statute the agency which is primarily involved in a project also calls upon sister agencies which have any expertise in the field to make comments thereon. I would assume under those circumstances that what expertise does exist in a few of the international issues involved as far as space is concerned."

¹⁰⁰ *Id.* at 1130-31.

¹⁰¹ *Id.*

¹⁰² *Id.* at 1133. "Do you see any possible impact on these areas outside the Continental United States, in space, on the high seas, where we ought to be amending NEPA? Is there anything that is not covered that ought to be covered in the present statute? That is part of the reason for these hearings that we are having, that we don't have to find out that which is, but we are really seeking to see whether departments like yours have any comments about that "which ought to be." The problems of pollution

agreed with State's interpretation that NEPA would apply to U.S. citizens in space.¹⁰³ The testimony of the Department of State, the agency most aware of foreign policy concerns, supports the notion that EISs would apply to areas outside of the jurisdiction of other countries, including space, led to the House committee not attempting to amend NEPA to include an extraterritoriality clause. To put another way, immediately following the passage of NEPA, this hearing indicates that the relevant House Committee believed that the EIS requirement covered the high seas, Antarctica, and outer space and did not believe it needed to amend the statute. Only later, more than a decade after NEPA was passed, did Congress propose to amend NEPA regarding extraterritorial application, after Courts struggled applying NEPA to foreign sovereign territory.¹⁰⁴

Beyond the immediate legislative history of NEPA, it is worth noting that subsequent legislative action augments the argument that Congress intended NEPA to apply broadly to areas outside of national jurisdiction. In the 1970s, Congress debated and passed the Deep Seabed Hard Mineral Resources Act which regulated the extraction of deep-sea minerals in international waters beyond U.S. territorial jurisdiction and EEZs.¹⁰⁵ This act specifically noted that Congress considered licensing of deep sea mineral production beyond U.S. territorial jurisdiction as a major federal action for purposes of NEPA.¹⁰⁶ The legislative history of that act indicates that the explicit conclusion of NEPA EIS requirements was to (1) require a programmatic review, (2) enact a specific time limit for NEPA review, and (3) explicitly state the intent of Congress. The statute thus specifically notes that, "The issuance of, but not the certification of an application for, any license or permit under this subchapter shall be deemed to be a major Federal action significantly affecting the quality of the human environment for purposes of section 4332 of title 42." On the last point, multiple Congressmembers, who voted for the original NEPA bill, indicated during hearings that they believed NEPA as originally passed already applied to international waters and that they did not think the explicit statement was necessary.

IV. OUTER SPACE IN INTERNATIONAL LAW AND EXECUTIVE IMPLEMENTATION OF NEPA

Before examining relevant case law, we next provide an overview of international space law as well as agency implementation of NEPA for their activities. International space law is important as NEPA case law on

have a profound effect on our total environment. As you have soundly said, this means worldwide environment. What should we be doing that might be beneficial? Have you any suggestions along this line?"

¹⁰³ *Id.* at 1133-34. "You say that the NEPA requirements would apply to U.S. citizens who were in space or on the high seas"

¹⁰⁴ S. 1278, 102d Cong. § 1(b)(1) (2019).

¹⁰⁵ 30 U.S.C. § 1401.

¹⁰⁶ 30 U.S.C. § 1419.

extraterritoriality demonstrates judicial consideration of whether NEPA compliance interferes with foreign policy.¹⁰⁷

A. *International Law Framework for Outer Space Activities*

From a certain point of view, “space law IS international law.”¹⁰⁸ The space age began in 1957 with the launch of Sputnik, less than fifteen years after the United Nations was formed. Beginning in 1967, with the U.S. and Soviet Union in the midst of a space race, the international community negotiated and signed five treaties that create the international governance framework for outer space activities:

- The Outer Space Treaty (“OST”)¹⁰⁹
- The Liability Convention¹¹⁰
- The Registration Convention¹¹¹
- The Rescue Agreement¹¹²
- The Moon Treaty¹¹³

Of these, the U.S. is a signatory to the first four and only the first two contain provisions that are directly relevant to environmental protection in outer space.

The OST provides the foundational framework for outer space activities. It defines the principles of “launching state” and “space object,” requires state authorization and oversight of government and private space activities, forbids “harmful contamination” of outer space, provides consultation for potential “harmful interference” with space activities, and it establishes the initial space liability framework.¹¹⁴ Although the comparison is imprecise, the concept of a launching state is similar to flagging in maritime law, with said state retaining exclusive jurisdiction over a launched space object. The liability convention builds upon the OST’s provisions to create a liability framework of strict liability for damages to Earth from a nation’s space objects and at fault liability for

¹⁰⁷ *Massey*, 986 F.2d at 534.

¹⁰⁸ Scot W. Anderson et al., *The Development of Natural Resources in Outer Space*, 37 JOURNAL OF ENERGY AND NAT. RES. L. 227 (2019).

¹⁰⁹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 12, 1967, 610 U.N.T.S. 205. [hereinafter Outer Space Treaty].

¹¹⁰ Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187..

¹¹¹ Convention on Registration of Objects Launched into Outer Space, Nov. 12, 1974, 1023 U.N.T.S. 15.

¹¹² Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 672 U.N.T.S. 199.

¹¹³ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 3.

¹¹⁴ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, art. 8 and 9, Jan. 27, 1967, 610 U.N.T.S. 205.

damages in space to from one nation's space objects to another nation's space objects.¹¹⁵

One key feature of the outer space international law framework is that by defining the exploration and use of outer space as “the province of all mankind,” it functionally makes outer space a global common. While not explicitly defined or outlined in global treaties, international law generally holds that there are four major global commons: the oceans, Antarctica, the atmosphere, and outer space.¹¹⁶ Despite ambiguity on what a global common entails, the most important characteristic is that it belongs to no nation, making management an international concern. In part, this is why the U.S.’ treatment of outer space as a place within the environment, specifically under NEPA, is so important. If the U.S. determines that space is under the umbrella term “environment”, then it sets a precedent for other countries to make environmental considerations in their future space activities. Historically, the passage of NEPA formed the basis for other nation’s adopting environmental disclosures laws and even led to a treaty on environmental impact analyses.¹¹⁷ Expanding NEPA to outer space could provide precedent for other nations to similarly follow suit.

Although the U.S. developed its initial legal framework for outer space activities before ratifying the major treaties, its current framework is consistent with the international framework. There are three primary types of space activities in the U.S.: civil (scientific), military, and commercial. Civil space activities, largely scientific, are directly managed by the National Aeronautics and Space Administration (“NASA”).¹¹⁸ Military activities are handled by Department of Defense (“DOD”) and the intelligence community.¹¹⁹ Commercial activities are primarily licensed and regulated by two federal agencies.¹²⁰ The FAA oversees the authorization of launches and reentries in U.S. airspace.¹²¹ The FCC regulates the use of the electromagnetic spectrum by space objects, in conjunction with the International Telecommunications Union.¹²² As space objects require the electromagnetic spectrum to communicate with earth via radio, the FCC effectively regulates the orbits and activities of privately-operated U.S. space objects.¹²³ Notably, this includes responsibility for regulating space debris.

¹¹⁵ Convention on International Liability for Damage Caused by Space Objects, art. 4, Mar. 29, 1972, 961 U.N.T.S. 187.

¹¹⁶ Isabel Feichtner and Surabhi Ranganathan, *International Law and Economic Exploitation in the Global Commons: Introduction*, 30 *European Journal of International Law* 541 (July 2019).

¹¹⁷ Convention on Environmental Impact Assessment in a Transboundary Context (1991) United Nations.

¹¹⁸ Pub. L. 85-568 (1958).

¹¹⁹ *Space Law: The Law of Outer Space*, GEORGETOWN LAW LIBRARY (2020) <https://guides.ll.georgetown.edu/c.php?g=1037047&p=7762102> (last visited Apr. 20, 2021).

¹²⁰ NOAA also regulates Earth observation, which is beyond the scope of this article

¹²¹ *Id.*

¹²² *Id.*

¹²³ Ryan, *supra* note 1 at 930-31.

Agencies and Departments involved in space activities coordinate with other federal agencies in their regulatory duties, as appropriate.

B. Federal Executive implementation of NEPA EIS Requirements for Outer Space Activities

When evaluating whether a federal action invokes NEPA requirements, an agency must assess each aspect of the project. An agency must determine if there is (1) a major federal action that (2) significantly affects the quality of (3) the human environment. When it comes to government (NASA and DOD) and agency-authorized space activities (FAA), the act of launching a rocket has been determined to be a major federal action that also meets prongs (2) and (3). Beyond launches, however, there is no clear consensus on whether space activities constitute major federal actions.

Initial federal agency action or inaction led to a flurry of administrative interpretations and litigation on many aspects of federal EISs. As discussed in Section 3, the question of whether NEPA applied beyond U.S. borders emerged almost immediately, leading to early cases described in Section 5. Although the State Department initially concluded that NEPA applies to the oceans, Antarctica, and outer space, agency interpretation varied, including between the State Department and CEQ over application to foreign sovereigns. A contemporary (1978) Environmental Law Reporter article on forthcoming CEQ guidance described extraterritoriality concerns as follows:

“The geographic scope of the controversy has been carefully drawn. There is little disagreement that if a federal activity abroad also affects the United States or the “global commons” (that area such as outer space or the oceans not within another nation’s sovereignty), then preparation of an EIS under § 102(2)(C) of NEPA is required.”¹²⁴

In order to standardize federal implementation of NEPA in regards to extraterritoriality, President Jimmy Carter issued Executive Order 12114—Environmental effects abroad of major federal actions.¹²⁵ Notably, the order is “based on independent authority.”¹²⁶ Nonetheless, it “represents the United States government’s exclusive and complete determination of the procedural and other actions to be taken by Federal agencies to further the purpose of the National Environmental Policy Act, with respect to the environment outside the United States, its territories and possessions.”¹²⁷

In effect, the EO is written this way so that the executive branch does not acknowledge NEPA requirements for actions outside of the U.S., but creates a

¹²⁴ *Forthcoming CEQ Regulations to Determine Whether NEPA Applies to Environmental Impacts Limited to Foreign Countries*, 8 ELR 10, 111, 10,011 (1978). <https://elr.info/sites/default/files/articles/8.10111.htm>

¹²⁵ Exec. Order No. 12114, 3 CFR 356 (1979).

¹²⁶ *Id.* at Section 1.

¹²⁷ *Id.*

separate executive agency requirement for an EIS, EA, or similar equivalent document in certain circumstances that would also satisfy 102(c) under judicial review. Most relevant for purposes of the space environment, Section 2-3(a) of the Order requires preparation of a relevant analysis for “major Federal actions significantly affecting the environment of the global commons outside the jurisdiction of any nation (e.g., the ocean or Antarctica).”¹²⁸ The EO does not otherwise define “global commons.” Although less relevant, Section 2-3(d) may also apply to federal actions in the outer space environment to the degree that the U.S. obligations against “harmful contamination” under the Outer Space Treaty protect “natural or ecological resources of global importance,” such as space resources like water or minerals.¹²⁹ The EO contains additional provisions regarding environmental impacts in foreign sovereigns which are more limited in their applicability (but, in a space context, could apply to the degree that a U.S. space object impacts the environment of a foreign country).¹³⁰

EO 12114 remains the primary executive branch governing document regarding extraterritorial environmental analyses. However, U.S. government space agencies generally assume that both NEPA and EO 12114 do not apply to space.¹³¹ As noted by the report, this interpretation has generally led to the exclusion of NEPA evaluations of space debris, although some agencies occasionally choose to do so nonetheless. Interpretations excluding outer space are based on EO 12114’s 2-3(a) requirement relating to “the global commons outside the jurisdiction of any nation (e.g. the ocean or Antarctica).” Even though *exempli gratia* means for example, the agencies interpret “(e.g. the ocean or Antarctica)” as restricting EO12114 only to the ocean and Antarctica and excluding space.¹³²

A review of agency level regulations and actual EISs related to space activities reveals a mix of rules and practices regarding the inclusion of space environmental impacts in NEPA analyses. NASA does not consider space debris as part of a NEPA analysis.¹³³ In the mid-2000s, the Space Frontier Foundation asked NASA to consider lunar environmental impacts in its Programmatic EIS for the Constellation program.¹³⁴ NASA’s response indicates its exclusion of outer space impacts: “NASA takes the position that the potential environmental impacts

¹²⁸ *Id.* at Section 2-3(a).

¹²⁹

Id. at Section 2-3(d).

¹³⁰ *Id.* at Section 2-3 (a).

¹³¹ The National Science and Technology Council, *Interagency Report on Orbital Debris* (1995) at 45, <https://ntrs.nasa.gov/citations/20000011871>.

¹³² *Id.*

¹³³ Diaz, *supra* note 15 at 379.

¹³⁴ Space Frontier Foundation, *RE: Public Comment on the Draft Constellation Programmatic Environmental Impact Statement (PEIS)* (2007). <http://www.spaceref.com/news/viewpr.html?pid=23670>

in outer space, including the Moon, are beyond the scope of NEPA analysis.”¹³⁵ In 1986, the FCC issued a categorical exclusion for its licensing of radio uses by satellites.¹³⁶ Past FAA guidance indicated that environmental analysis should include atmospheric impacts in the troposphere, stratosphere, and ionosphere (the last of which is generally considered outer space).¹³⁷ Although DOD NEPA regulations do not mention the outer space environment, their EIAs occasionally include elements of the space environment, such as orbital space debris.¹³⁸ However, as far as the authors could tell, no federal EIAs or EAs consider the potential of light pollution from space objects impacting Earth-based astronomy. Conversely, per Ramon Ryan, light pollution could be considered as a potential environmental impact under NEPA, especially as it impacts astronomical observers on the Earth and in multiple locations the U.S.¹³⁹

V. EXTRATERRITORIALITY OF NEPA’S EIS REQUIREMENTS AND JUDICIAL PRECEDENT

With limited legislative text, the scope and breadth of NEPA requirements have largely been determined by the courts through litigation. Critically, the EIS requirement dictated by NEPA is a procedural requirement, not a substantive requirement. It requires federal agencies identify and disclose potential impacts but does not require the federal agency to choose any particular course of action.¹⁴⁰

Having established that (1) outer space is a human environment and (2) the statutory text and legislative intent of NEPA are vague but suggest outer space may be covered under NEPA, this section reviews a primary legal question: would applying NEPA’s EIS requirement to U.S. and U.S.-authorized activities in outer space violate the presumption against extraterritoriality? Both Supreme Court precedent on extraterritoriality generally, and on extraterritorial application of NEPA specifically, informs our analysis.

¹³⁵ NASA, *supra* note 34 at B-51.

¹³⁶ Ryan, *supra* note 1.

¹³⁷ FAA, *Guidelines for Compliance with the National Environmental Policy Act and Related Environmental Statutes for the Licensing of Commercial Launches and Launch Sites* (February 2001). https://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/media/epa5dks.pdf

¹³⁸ *Environmental Assessment Draft Final Vulcan Centaur Program Operations and Launch on Cape Canaveral Air Force Station*, at 36 (May 2019). https://www.patrick.af.mil/Portals/14/Draft%20Environmental%20Assessment%20Vulcan%20Centaur%20Program%2C%20ULA%2C%20CCAFS_1.pdf

¹³⁹ Ryan, *supra* note 1.

¹⁴⁰ *Calvert Cliffs’ Coordinating Committee, Inc. v. United States Atomic Energy Commission*, 449 F.2d 1109 (D.C. Cir. 1971).

A. *The Presumption Against Extraterritoriality*

In American law, there is a general presumption against applying U.S. laws extraterritorially. As described in *EEOC v. Aramco*, the presumption is a “longstanding principle of American law ‘that legislation of Congress, unless a contrary intent appears, is meant to apply only within the territorial jurisdiction of the United States.’”¹⁴¹ Most recently, the Supreme Court reaffirmed the presumption in 2010 in *Morrison et. al. v. National Australia Bank*.¹⁴² Recent revisions to NEPA regulations codify this ruling by noting that major federal actions do not include: “(i) Extraterritorial activities or decisions, which means agency activities or decisions with effects entirely outside of the jurisdiction of the United States.”¹⁴³ Notably, these regulations use “jurisdiction” instead of “territorial jurisdiction.”

As discussed in Sections 3 and 4, the relevance of NEPA’s EIS requirement to territories beyond U.S. national jurisdiction has been a policy and legal question since NEPA was first enacted. The statutory text of NEPA regarding EISs does not explicitly say they apply extraterritorially. Before and after Executive Order 12114, multiple district and appellate cases have grappled with the extraterritorial intent of the law, across differing levels of jurisdictions, global commons, and cross-border issues. The facts and evaluations in each of these cases provide evidence for how future courts may rule about the applicability of NEPA to outer space.

B. *NEPA Case Law on Extraterritorial Application pre-Massey*

Many District and Circuit court cases have examined instances in which federal actions or federally-authorized actions outside of the border of the U.S. require an EIS analysis. These cases occur both before and after Executive Order 12114. They generally fall into a spectrum depending on the environmental impact examined as well as the legal jurisdictional status of the territory involved. While there have been no Supreme Court cases specifically on the extraterritorial application of NEPA, we review both district and circuit court rulings. The Court of Appeals for the Second Circuit’s rulings are likely to be most binding on agency actions and are often informed by district court rulings on NEPA extraterritoriality.

In *Wilderness Society v. Morton*, 463 F.2d 1261 (D.C. Cir. 1972), the D.C. Circuit Court was faced with the question whether a non-resident Canadian citizen and Canadian environmental group could be parties to a challenge to a NEPA review being conducted by the Department of Interior. Ultimately, the court allowed Canadian citizen groups to intervene, as the pipeline considered

¹⁴¹ *EEOC v. Arabian American Oil Co.*, 499 U.S. 244 (1991).

¹⁴² *Morrison v. National Australia Bank*, 561 U.S. 247 (2010).

¹⁴³ Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 137, 43337 (July 16, 2020).

alternatives that went through both Canada and the U.S. This was the first extraterritorial case and allowed a foreign party to represent their interests.

In *People of Enewetak v. Laird*, 353 F. Supp. 811 (D. Haw. 1973), the District Court of Hawaii found that NEPA applied to the federal actions in the Trust Territory of the Pacific Islands. The court concluded that “NEPA is not restricted to United States territory delimited by the fifty states,” in part based on Congressional use of the expansive term “Nation” as opposed to more expansive “United States.”¹⁴⁴ The unique status of the territory as a trust led to its inclusion within NEPA requirements as it was subject to U.S. jurisdiction.

In *Sierra Club v. Adams*, 578 F.2d 389 (D.C. Cir. 1978), the Circuit Court determined that the Department of Transportation’s EIS related to participation in foreign highway construction was sufficient, overturning a District Court injunction. In coming to this conclusion, the Court had to grapple with issues related to Sierra Club’s standing. Specifically, the Court agreed with both Sierra Club and the Government that Sierra Club had standing to raise concerns that actions related to the foreign highway project would lead to the spread of invasive aftosa into the U.S.¹⁴⁵ The Court then determined that because Sierra Club had standing based on that concern, they could argue on the basis of public interests on issues related to the EIS’ evaluation of impact of the project on indigenous populations. For present purposes, the case is significant as the Court considered the adequacy of an EIS for a major federal action (sponsoring the highway project) occurring in a foreign country that may have had significant effects on the environment in the U.S. (via aftosa spread) and in the foreign country (via indigenous populations).¹⁴⁶ However, the Court noted that the issue of “purely local concerns (Indians and alternate routes)” in a foreign country was assumed in this case because the government already considered them and did not reach a decision about whether such evaluations were required.¹⁴⁷

In *Natural Resources Defense Council v. Nuclear Regulatory Commission*, 647 F.2d 1345 (D.C. Cir. 1981), the D.C. Circuit examined whether NEPA applied to export controls to the Philippines. The Court distinguished the case from *Wilderness Society v. Morton* because it involved (1) the direct applicability of NEPA to a foreign environment as opposed to the procedural matter of including Canadian claimants, (2) the matter could directly affect the foreign policy relationship of the U.S. and the Philippines, and (3) the agency involved would not have ongoing control over the project after the export. Unlike *Sierra Club v. Adams*, the court did not find that there was a potential environmental impact on the U.S.¹⁴⁸ Thus, the Court saw its task as examining whether NEPA applied to

¹⁴⁴ *People of Enewetak v. Laird*, 353 F. Supp. 816 (1973).

¹⁴⁵ *Sierra Club v. Adams*, 578 F.2d 389 (D.C. Cir. 1978).

¹⁴⁶ *Id.* at 391.

¹⁴⁷ *Id.* at note 14.

¹⁴⁸ *Natural Resources Defense Council v. Nuclear Regulatory Commission*, 647 F.2d 1369 (D.C. Cir. 1981).

whether an export license that had foreign impacts only in the territory of a foreign country, which the U.S. federal government for which would have no ongoing control or responsibility. The Court found that NEPA does not apply to NRC export license decisions. However, and notably, the Court limited its holding to nuclear export licensing decisions.¹⁴⁹ This was in part due to foreign policy considerations related to nuclear power, with the Court citing the foreign policy consideration described in NEPA.¹⁵⁰

In *Greenpeace USA v. Stone*, 748 F. Supp. 749 (D. HI. 1990), the District Court of Hawaii examined whether NEPA required an EIS for the removal of chemical weapons from Germany, their destruction at a U.S. facility in the Johnson Atoll, and associated oceanic transport. The court segmented the analysis into whether NEPA was required for Federal actions within Germany and separately whether it mattered for transport on the oceans.¹⁵¹ Considering a Presidential agreement with Germany and a Congressional mandate to move and destroy the munitions, the court found NEPA should not apply to the Federal actions *within* Germany as that invoked foreign policy considerations and would interfere with Germany's sovereignty.¹⁵²

Next, the Court considered the application of NEPA to the Global Commons. In examining the Army's publication of a Global Commons Environmental Assessment ("GCEA") under Executive Order 12114, the Court found that the Army did not violate NEPA by not including the GCEA in the same EIS as the Army conducted for the destruction of the munitions.¹⁵³ Its reasoning was based on two factors: the oceanic transport was connected to the munitions movements within Germany and thus implicated the same foreign policy considerations and the Army's preparation of a GCEA was, in effect, an environmental assessment that met NEPA's requirements. On the question of the interaction between EO 12114 and NEPA the court stated: "The court cannot conclude, as defendants would suggest, that Executive Order 12114 preempts application of NEPA to all federal agency actions taken outside the United States. Such an application of an Executive Order would be inappropriate and not supported by law."¹⁵⁴ Thus, the ruling found that while EO 12114 could satisfy NEPA, it did not necessarily replace NEPA's requirements.

¹⁴⁹ *Id.* at 1366. "I find only that NEPA does not apply to NRC nuclear export licensing decisions — and not necessarily that the EIS requirement is inapplicable to some other kind of major federal action abroad."

¹⁵⁰ 42 U.S.C. § 4332 (F).

¹⁵¹ *Greenpeace USA v. Stone*, 748 F. Supp. 757 (D. HI. 1990). "The crux of this issue... is whether NEPA applies extraterritorially to the circumstances at hand."

¹⁵² *Id.* at 761. Note however that the court emphasized "that this decision is limited to the specific and unique facts which are presented here. In other circumstances, NEPA may require a federal agency to prepare an EIS for action taken abroad, especially where United States agency's action abroad has direct environmental impacts within this country, or where there has clearly been a total lack of environmental assessment by the federal agency or foreign country involved."

¹⁵³ *Id.* at 763.

¹⁵⁴ *Id.* at 762.

C. *Environmental Defense Fund vs Massey: NEPA for the Global Common*

The most renowned case for whether NEPA applies to outer space is the D.C. Circuit Court’s ruling in *Environmental Defense Fund vs. Massey*.¹⁵⁵ In that case, the Environmental Defense Fund (“EDF”) filed a lawsuit alleging that the National Science Foundation (“NSF”) did not comply with NEPA because it did not conduct an EA or EIS when deciding to incinerate food wastes at McMurdo Station in Antarctica. NSF contended that it was not required to do an EIS due to the location of the operations in Antarctica. The District Court agreed that NEPA did not apply to Antarctica because it did not contain express legislative intent, citing the precedent regarding the presumption against extraterritoriality in *EEOC v. Aramco*.¹⁵⁶ On appeal, the Circuit Court reversed:

“We reverse the district court’s decision, and hold that the presumption against the extraterritorial application of statutes described in *Aramco* does not apply where the conduct regulated by the statute occurs primarily, if not exclusively, in the United States, and the alleged extraterritorial effect of the statute will be felt in Antarctica — a continent without a sovereign, and an area over which the United States has a great measure of legislative control.”¹⁵⁷

EDF challenged NSF’s plans to build an incinerator on the basis that NSF failed to fully consider the environmental consequences as required by NEPA. NSF neither conducted a NEPA analysis nor conducted a GCEA as required by EO 12114. In reviewing whether NSF was required to conduct a NEPA analysis, the Court analyzed the presumption against extraterritoriality, NEPA’s legislative history, the unique legal status of Antarctica, and relevant foreign policy considerations.

In reviewing the presumption against extraterritoriality, the Court noted the primary purpose of the presumption, as defined in *Aramco*, as protecting “against the unintended clashes between our laws and those of other nations which could result in international discord.”¹⁵⁸ It describes three general types of cases where the presumption does not apply: Congress clearly intended the relevant statute to apply to foreign nations, where not extending a statute to a foreign setting has adverse effects in the U.S., and when the conduct regulated occurs within the U.S.¹⁵⁹

After reviewing the facts presented before it, the Court concluded that the case did not present an issue of extraterritoriality, finding “powerful evidence of the statute’s domestic nature” coming from the fact it “would never require enforcement in a foreign forum or involve ‘choice of law’ dilemmas.”¹⁶⁰ This

¹⁵⁵ *Environmental Defense Fund, Inc. v. Massey*, 986 F.2d 528 (1993).

¹⁵⁶ *Env’tl. Def. Fund, Inc. v. Massey*, 772 F. Supp. 1296 (D.C. Cir. 1991).

¹⁵⁷ *Env’tl. Def. Fund, Inc. v. Massey*, 986 F.2d 528,529 (D.C. Cir. 1993).

¹⁵⁸ *Id.* at 530.

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

distinguished it from *Aramco*, where there were issues related to overseas enforcement, and *Smith v. United States*, where conduct in Antarctica presented a choice of law problem. Rather, the Court promulgated what has become known as the ‘headquarters theory.’¹⁶¹ NEPA is a statute intended to govern the decision-making of the U.S. Government and its conduct that occurs almost exclusively within U.S. territory, even though the resulting actions occur outside of the U.S. In effect, Congress intended NEPA to make the federal government consider the environment; in those cases where the domestic NEPA law would cause issues by being applied to U.S. government activities in foreign countries, the foreign policy exemption of NEPA applies, not the presumption against extraterritoriality.

After presenting this conclusion, whose reasoning was not based on the specific facts related to Antarctica, the Court presented an extended analysis into the legal status of Antarctica. Among other factors, the Court noted: that Antarctica “has never been, and is not now, subject to the sovereign rule of any nation,” that the Antarctic Treaty has led to it being considered a “global common,” and in regards to U.S. activities on the continent, the U.S. controls all air transportation, conducts search and rescue operations, and exercise exclusive legislative control of McMurdo Station and other U.S. research bases.¹⁶² Further, citing *Sierra Club v. Adams* and *People of Enewetak v. Laird*, the Court found that when “the U.S. has some real measure of legislative control over the region at issue, the presumption against extraterritoriality is much weaker.”¹⁶³ This fact-based analysis only supported the Court’s conclusion “that this case does not implicate the presumption against extraterritoriality.”¹⁶⁴

For present purposes, it is worth noting that the ruling specifically identifies outer space. Twice, the Court notes that Antarctica is frequently analogized to outer space, due to its status as a global common, citing *Beattie v. United States*.¹⁶⁵ More definitively, the Court cited the State Department Memo prepared for the 1970 oversight hearing (see Section 2.b.) as indicating that “the global commons, including Antarctica, do not present the challenges inherent in relations between sovereign nations.”¹⁶⁶ The quote from the memo identified three areas: the high seas, outer space, and Antarctica.

The Court also considered arguments by NSF that applying to NEPA to Antarctica, where there are issues related to foreign policy and international

¹⁶¹ Laura Carla Battle, *A Transnational Perspective on Extending NEPA: The Convention on Environmental Impact Assessment in a Transboundary Context*, 5 DUKE ENVTL. L. & POL’Y F. 1, at 13 (1995).

¹⁶² *Massey*, 986 F.2d at 534.

¹⁶³ *Id.* at 533.

¹⁶⁴ *Id.*

¹⁶⁵ *Beattie* had a section dedicated to this analogy, stating that like outer space Antarctica was not a “foreign country,” that treatment of outer space objects and persons under the OST resembles Antarctica’s legal status, and noting the role of the Antarctic treaty as serving as a basis for the OST; see *Beattie v. U.S.*, 756 F.2d 91 (D.C. Cir.1984).

¹⁶⁶ *Massey*, 986 F.2d at 534.

negotiations, could be problematic. The Court rejected this argument, finding that the NSF's ability to conduct activities related to U.S. foreign policy in Antarctica, such as treaty negotiations, would not be impeded by NEPA injunctions.¹⁶⁷ Distinguishing the case from *NRDC v. NRC*, the Court determined that while foreign policy interests must outweigh the benefits of the EIS requirement in order for NEPA not to apply, compliance in NEPA would not hamper NSF's cooperation with foreign governments.

Critically, the Court included limiting language at the end of the ruling.¹⁶⁸ While the language notes that the Court's ruling only holds that the presumption against extraterritoriality does not apply to NSF in Antarctica, the preceding sentence indicates that the limitation is meant to limit the case from NEPA cases involving actual foreign sovereigns.

D. *Subsequent case law*

Since *EDF v. Massey*, there has been limited case law dealing explicitly with the extraterritorial application of NEPA to areas beyond national jurisdiction. Two district court cases provide some indication of where courts could rule when it comes to oceans.

In *National Resources Defense Council vs. United States Department of the Navy*, No CV-01-07781 Slip op. At 21 (C.D. Cal. Sept. 19, 2002), the District Court for the Central District of California found that, while the Navy's testing program at issue were not major federal actions, NEPA applies to any environmental impacts within the Exclusive Economic Zone (EEZ) of the U.S. While considered international waters, the U.S. was found to have "substantial, if not exclusive legislative control of the EEZ," due to its ability to manage natural resources in the area.

Meanwhile, in *Center for Biological Diversity v. National Science Foundation*, the District Court for the Northern District of California found that the NSF needed to prepare a NEPA review for a project in Mexico's EEZ as the area was part of the high seas.¹⁶⁹

E. *Application of NEPA to the Atmosphere*

In the last several decades, Federal courts have grappled with the application of NEPA to major federal actions involving greenhouse gas ("GHG")

¹⁶⁷ *Id.* at 534-35.

¹⁶⁸ *Id.* at 537. "We find it important to note, however, that we do not decide today how NEPA might apply to actions in a case involving an actual foreign sovereign or how other U.S. statutes might apply to Antarctica. We only hold that the alleged failure of NSF to comply with NEPA before resuming incineration in Antarctica does not implicate the presumption against extraterritoriality."

¹⁶⁹ Lois J. Schiffer, *The National Environmental Policy Act Today, with an Emphasis on its Application Across U.S. Borders*, 14 DUKE ENVIRONMENTAL LAW & POLICY FORUM 325-345 (Spring 2004).

emissions.¹⁷⁰ The extraterritorial nature of GHG emissions are complex because actions that occur within and outside of the U.S. cause climate damages both within and outside of the U.S. Such cases thus raise legal questions about how to treat instances where U.S.-based federal actions impact foreign environments and where foreign-based consequences resulting from federal actions impact the environment within the U.S. Case law in this area is relevant as it deals with how NEPA addresses environmental impacts in the global common of the atmosphere, with similar issues to the space-earth, space-space, and earth-space-earth environmental impacts we describe in Section 2.

Although questions about GHG emissions and NEPA arose as early as 1986 as demonstrated by *City of Los Angeles v. National Highway Traffic Safety Administration*, the amount and pace of litigation increased sharply since the Supreme Court's decision in *Massachusetts v. EPA* and EPA's subsequent Endangerment Finding.¹⁷¹ Ultimately, to minimize litigation risk, the CEQ under the Obama Administration issued guidance on how to incorporate greenhouse gas emissions in NEPA analyses in 2016.¹⁷² In 2017, the Trump Administration withdrew the guidance with Executive Order 13783.¹⁷³ It has since proposed new guidance that, while providing less review and depth than the Obama administration, nonetheless requires agencies to quantify direct and foreseeable indirect greenhouse gas emissions from major federal actions.¹⁷⁴ One report found that during the 2017-2018 that agencies typically quantified direct and indirect greenhouse gas emissions for NEPA reviews of fossil fuel projects.¹⁷⁵

In effect, current jurisprudence holds that major federal actions that cause domestic GHG emissions with domestic and global climate impacts via the atmosphere must be considered under NEPA. However, agency obligations are less clear regarding major federal actions that cause GHG emissions abroad, yet

¹⁷⁰ Amy L. Stein, *Climate Change Under NEPA: Avoiding Cursory Consideration of Greenhouse Gases*, 81 U. COLO. L. REV. 473 (2010).

¹⁷¹ *City of L.Angeles v. Nat'l Highway Traffic Safety Admin.*, 912 F.2d 478 (1990); *Mass. v. EPA*, 549 U.S. 497 (2007); See Michael Burger and Jessica Wentz, *Downstream and Upstream Greenhouse Emissions: The Proper Scope of NEPA Review*, 41 HARVARD ENV.L.R. 41 (2017); see also Michael Burger and Jessica Wentz, *Evaluating the Effects of Fossil Fuel Supply Projects on Greenhouse Gas Emissions and Climate Change under NEPA*, 44 WM. & MARY ENVTL. L. & POL'Y REV. 423 (2020).

¹⁷² COUNCIL ON ENVTL. QUALITY, FINAL GUIDANCE FOR FEDERAL DEPARTMENTS AND AGENCIES ON CONSIDERATION OF GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE IN NEPA REVIEWS (2016), <https://perma.cc/QP7E-7PUM>.

¹⁷³ Exec. Order No 13783, 82 Fed. Reg. 16093 (Mar. 28, 2017).

¹⁷⁴ COUNCIL ON ENVTL. QUALITY, Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions, 84 Fed. Reg. 30097 (Jun. 26, 2019).

¹⁷⁵ MADELEINE SIEGEL AND ALEXANDER LOZNAK, SABIN CENTER FOR CLIMATE CHANGE LAW, SURVEY OF GREENHOUSE GAS CONSIDERATIONS IN FEDERAL ENVIRONMENTAL IMPACT STATEMENTS AND ENVIRONMENTAL ASSESSMENTS FOR FOSSIL FUEL-RELATED PROJECTS (Nov. 2019), at 2-3,, https://climate.law.columbia.edu/sites/default/files/content/docs/2019.11.12%20NEPA%20Survey%20Report%20Final%20%28Loznak%20and%20Siegel%29_FINAL.pdf.

impact the U.S. and global environment via the atmosphere. The closest cases involve federal authorization of liquefied natural gas exports, which lead to GHG emissions in foreign countries. In *Sierra Club v. FERC*, the D.C. Circuit found that FERC did not have to consider climate as that was a statutory responsibility of the DOE when it came specifically to export authorizations.¹⁷⁶ Subsequently, in *Sierra Club v. Department of Energy*, the D.C. Circuit found that DOE met the requirements of NEPA by providing an analysis of the potential GHG emissions in foreign countries resulting from exports.¹⁷⁷ While this case implies that major federal actions in the U.S. that cause an environmental effect in a foreign country should be considered, it does not explicitly state that DOE needed to do so (as it had already done so) and it does not address GHG impacts in areas beyond national jurisdiction.

F. *Applying Case Law to Outer Space as a Global Commons*

Although not definitive, existing case law strongly indicates that future courts may rule that NEPA applies to outer space. As an initial matter, existing case law at the District and Circuit levels has progressively extended NEPA's analysis of environmental impacts into three of the four global commons: Antarctica, the High Seas, and the atmosphere. EO 12114 only specifically identifies the first two. In evaluating whether NEPA applies to space, a court would first conduct a similar analysis as Sections 3 and 4, evaluating the statutory text, legislative history, and implementation. As long as a court finds that outer space is indeed part of the human environment for purposes of the statute, the court would then need to consider whether expanding NEPA to outer space would violate the presumption against extraterritoriality. This sub-section explores how NEPA jurisprudence on extraterritoriality would inform such a decision. It draws upon the examples of space activities developed in Section 2 to explore nuance amongst cases.¹⁷⁸

As described in *Massey*, NEPA cases concerning extraterritoriality fall along a spectrum in terms of how much jurisdiction the federal government has and how much foreign governments have. Each case could indicate how a court would rule in applying NEPA to outer space. The holding in *People of Enewetak* extended NEPA from the 50 states to the Pacific Trust Territories. The Court's reasoning, based on the word "Nation" instead of the United States, broadened NEPA's analysis beyond narrow territorial jurisdiction. As the U.S. retains exclusive

¹⁷⁶ *Sierra Club v. FERC*, 827 F.3d 36, 40-50 (2016).

¹⁷⁷ *Sierra Club v. Dep't of Energy*, No. 15-1489 (D.C. Cir. Aug. 15, 2017).

¹⁷⁸ Recall the examples were (1) U.S. space launch, space activity subject to U.S. jurisdiction, has environmental impact on Earth like light pollution, potentially including impact in the U.S.; (2) U.S. space launch, space activity subject to U.S. jurisdiction, has impact on space environment only; (3) Federal or federally authorized activity, impacts space activity like Earth observation, impacts environmental outcomes on Earth.

jurisdiction over its space objects, this holding would support an application of NEPA to anything within U.S. jurisdiction.

The next tranche of cases deals with NEPA's applications to the global commons. When evaluating the High Seas, the D.C. Circuit Court found that an EO12114 analysis would satisfy NEPA in *Greenpeace* and applied NEPA to NSF in Antarctica in *Massey*. Subsequently, District Courts extended NEPA to the U.S.' EEZ in *NRDC vs. Navy* and to foreign EEZs (which are still international waters) in *Center for Biological Diversity vs. NSF*. In evaluating impacts on the atmosphere, Circuit and District Courts generally require analysis of the global impacts of greenhouse gas emissions. Notably, the D.C. Circuit Court in *Sierra Club vs. DOE* did not say that an analysis of greenhouse gas emissions in a foreign country resulting from U.S. approved exports required a NEPA analysis because one was already done, which the court found sufficient. Accordingly, Circuit and District Courts have now either ruled that a NEPA analysis is necessary or ruled an existing analysis is sufficient to satisfy NEPA for three of the four global commons. Although there is not precedent at the Supreme Court level, the consistency of rulings in the global commons indicates that courts would likely apply NEPA to outer space. Unlike cases involving actual foreign sovereigns, the U.S. has substantial if not exclusive legislative control over federal or federally-authorized activities in each of these areas. These cases would strongly support applying NEPA to the first and second space environment scenarios described in section 2.

Massey, in particular, strongly indicates that NEPA applies to global commons, despite dicta saying it does not apply when foreign sovereigns are involved. Just as *Massey* analogized Antarctica to the outer space environment, the factors it considered in determining the presumption against extraterritoriality does not apply to Antarctica equally apply to outer space. As with Antarctica, the U.S. does not lack some "real measure of legislative control" over outer space:

- The U.S. retains national jurisdiction of U.S.-launched space objects, including spacecraft, by international law and statute;
- Such vehicles are regulated for transportation to and from U.S. territory;
- The U.S. retains strict or at fault liability for its space objects under international law;
- U.S. citizens launched from the U.S. are U.S. astronauts under international law;
- The use of wireless spectrum by space objects is regulated;
- Other activities are likely to be regulated.

Recent legislative action only underscores this control. In 2015, the U.S. passed the Commercial Space Launch Competitiveness Act.¹⁷⁹ Among other actions, the Act granted jurisdiction to U.S. courts to regulate conduct by U.S.-launched space

¹⁷⁹ U.S. Commercial Space Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).

objects and codified property rights for U.S. citizens for resources extracted in outer space. The legal reasoning in *Massey*, especially the “headquarters theory,” applies just the same to outer space as it does to Antarctica. NEPA regulates activities of the federal government. It applies to *all* federal agencies and requires them to look at their impacts on the environment. The activities supporting and enabling space activities, including regulation of private activities, all occur within the territorial jurisdiction of the U.S. With this reasoning, the presumption against extraterritoriality does not apply to outer space because outer space activities and their regulation are of a domestic nature. As with *Massey*, outer space activities do not implicate foreign sovereign jurisdiction nor do they present a choice of law problem.

Even the court cases dealing specifically with NEPA’s activities in a foreign country tend to indicate that NEPA should apply to outer space, at least under certain conditions. In *Wilderness Society v. Morton*, the Court allowed foreign parties to intervene in a NEPA case, indicating that foreign groups could have standing to challenge agencies not applying NEPA to outer space. In *Sierra Clubs v. Adams*, the Sierra Club was granted standing because of the potential environmental impacts of a project in a foreign country on the U.S. As with *Sierra Club vs. DOE*, NEPA considerations were evaluated as U.S. authorized activities that implicated foreign countries could have environmental impacts on the U.S. Such cases would strongly support applying NEPA to the first scenario described in section 2, where a federal or federally-authorized space activity had environmental impacts on the U.S. Across the three criteria (federal/federally authorized, location of activity, environmental impact in the U.S.), the only difference is that the location of the activity is not within a foreign sovereign, but a global common, which does not clearly implicate the presumption. The least supportive cases involving foreign sovereigns are *Greenpeace vs. Stone* and *NRDC vs. Navy*. Both courts based their decision to not apply NEPA to actions within the territorial jurisdiction of Germany and Philippines on foreign policy concerns (underscoring that the tailored foreign policy exclusion to NEPA found within the statute is generally used to deny NEPA’s application as opposed to presumption). However, the Court in *NRDC vs. Navy* specifically based its ruling on the fact that there would be no direct environmental impact on the U.S., further indicating that cases where there are environmental impacts on the U.S., like light pollution from satellites, courts may be less likely to implicate the foreign policy exclusion or the presumption.

The strongest argument against applying NEPA to outer space because of the presumption against extraterritoriality is that 1993’s *Massey* was decided well before the Supreme Court’s 2008 holding in *Morrison* reiterated the importance of the presumption. While the D.C. Circuit specifically distinguished *Massey* from *Aramco* by holding NEPA is a domestic law focused on regulating the federal government, the restatement in *Morrison* is stronger. In evaluating whether a securities law applied extraterritoriality, a unanimous Supreme Court ruled that it

does not. In the ruling, Justice Scalia reiterated the presumption, citing *Aramco, Blackmer v. United States*, and *Sale v. Haitian Centers Council, Inc.*¹⁸⁰ Declaring that, “when a statute gives no clear indication of an extraterritorial application, it has none,” Justice Scalia noted, “we apply the presumption in all cases, preserving a stable background against which Congress can legislate with predictable effects.” When applying the presumption, the court developed a “focus” test, to determine whether the focus of legislation was primarily domestic or could apply extraterritorially. This test was formalized in 2016’s *RJR Nabisco, Inc., v. European Community*, which adopted a two-step framework “that looks for a clear indication of geographic scope and, in absence of one, applies Morrison’s ‘focus’ test.”¹⁸¹ Combining these two cases, a skeptic would argue that NEPA does not have a clear indication of geographic scope, other than “Nation” and “United States.” NEPA does not clearly state “this law applies extraterritorially” nor in the global commons. In applying the focus test, a skeptic would then argue that the focus of NEPA was to ensure that agencies evaluated their environmental impacts within the borders of the U.S.

The argument for *Morrison* and *RJR Nabisco, Inc.* limiting NEPA’s application to outer space can be rebutted in several ways. First, applying the Morrison “focus” test to NEPA reveals that while Congressional intent is ambiguous on whether outer space is part of the human environment, it is not ambiguous about the purpose of the statute evaluating the federal government’s impact on the environment. Section 102 of NEPA requires that “the policies, regulations, and public laws of the United States” and “all agencies of the Federal Government” comply with the requirements of NEPA “to the fullest extent possible.”¹⁸² There is no textual support for the environment being delimited by the fifty states and territorial jurisdiction nor for federal agency activities outside of the territorial jurisdiction of the U.S. being excluded. Specifically, Section 102(f) requires federal agencies to “recognize the worldwide and long-range character of environmental problems.” Second, further supporting such an interpretation of the “focus” test, reconciling *Morrison* and *Massey* is straightforward. *Massey* found that NEPA is primarily a statute of a domestic nature, which would not implicate the presumption against extraterritoriality under *Morrison*. Third, even if a Court decides that applying NEPA abroad could implicate the presumption, there is sufficient text to overcome a conclusion that Congress only intended the law to constrain domestic territorial activities of the federal government. Although many have mistaken *Morrison* to say Congress must explicitly state the law applies

¹⁸⁰ *Morrison v. National Australia Bank*, 561 U.S. 247 (2010).

¹⁸¹ *RJR Nabisco Inc. v. European Cmty.*, 136 S. Ct. 2090 (2016); William S. Dodge, *The New Presumption Against Extraterritoriality*, 133 HARV. L. REV. 1582, 1585-86 (2020).

¹⁸² 42 U.S.C. § 4321 et seq. (1969). “[T]he Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall.”

extraterritorially, Justice Scalia specifically acknowledges that there is no clear statement rule requiring Congress explicitly say “this law applies abroad.” Rather, the ruling notes that “assuredly context can be consulted as well” to determine Congressional intent. NEPA’s text requiring broad action across the federal government indicates the context that NEPA should apply to all federal activities. All federal activities would include actions abroad and in the global commons such as space.

More broadly, the history of the presumption against extraterritoriality makes its application to conduct of the federal government doubtful. The presumption against extraterritoriality is a long-standing principle of American law but its justification and application has changed considerably. William Dodge describes its “evolution from a rule based on international law, to a canon of comity, to an approach for determining legislative intent.”¹⁸³ Initial applications of the presumption in the 19th century could be characterized as a presumption against “extra-jurisdictionality” as opposed to extraterritoriality, driven by limits of international law on national law.¹⁸⁴ In 1909’s *American Banana Co. v. United Fruit Co.*, the foundations of the modern doctrine, the Supreme Court ruled the Sherman Act did not extend to activities in foreign countries, primarily due to the canon of comity (or interference with laws of another nation).¹⁸⁵ The presumption was applied irregularly until *Aramco* and *Morrison*.¹⁸⁶

Most Supreme Court cases considering the presumption involve the application of a U.S. law regulating private conduct outside of the territory of the U.S. They generally do not involve regulation of activities in the global commons where the U.S. has clear jurisdiction, such as on a U.S. flagged maritime vessel. Notably, in *American Banana Co.*, the Court specifically stated: “No doubt in regions subject to no sovereign, like the high seas, or to no law that civilized countries would recognize as adequate, such countries may treat some relations between their citizens as governed by their own law.”¹⁸⁷ Nor do presumption cases generally involve Congressional mandates for activities of the federal government itself. The two cases most analogous to outer space and the presumption were *Smith v. United States* and *Lujan v. Defenders of Wildlife*.¹⁸⁸ *Smith* involved an action against the U.S. under the Federal Tort Claims Act for a death in Antarctica. The Supreme Court held that the law did not apply in Antarctica because of a statutory bar on waiving sovereign immunity for claims arising in a “foreign country,” which the Court determined included Antarctica, as well as concerns about bizarre results related to that applying that specific statute in a global common. NEPA

¹⁸³ Dodge *supra* note 177 at 1589.

¹⁸⁴ John H. Knox, *A Presumption Against Extrajurisdictionality*, 104 AM. J. INT’L L. 351, 361–78 (2010).

¹⁸⁵ *American Banana Co. v. United Fruit Co.*, 213 U.S. 347, 356–58 (1909).

¹⁸⁶ See generally Dodge *supra* note 177.

¹⁸⁷ *American Banana Co.*, 213 U.S. at 355–56.

¹⁸⁸ *Smith v. U.S.*, 507 U.S. 197 (1993); *Lujan v. Def. of Wildlife*, 504 U.S. 555 (1992).

does not have similar language to provide such a limitation. In *Lujan*, the Supreme Court was faced with the question of determining how the Endangered Species Act applied abroad. The case was dismissed on standing but Justice Stevens indicated he would have ruled against the law's international application, despite it relating to agency conduct. This may be the most powerful argument against the headquarters theory for NEPA. However, the concurrence is not precedential and it is also based on specific statutory constructions within the Endangered Species Act (which has clearly defined domestic and international requirements throughout).

Beyond the argument that NEPA does not apply to outer space due to the presumption against extraterritoriality, the next strongest argument against its application are concerns related to foreign policy and national security. The basis for these arguments would be similar to those made by NSF regarding Antarctica in *Massey*. Space is a multi-national domain with bilateral and multilateral foreign policy agreements and considerations. Further, there may be concerns that applying NEPA to outer space would impact national security by limiting DOD or intelligence community activities. However, in such cases, NEPA would apply but would be limited on a case-by-case basis by a foreign policy or national security exclusion. As indicated in *Massey*, courts have found that "the government may avoid the EIS requirement where U.S. foreign policy interests outweigh the benefits derived from preparing an EIS."¹⁸⁹ Generally, analyzing the unique status of outer space and international law indicates that NEPA is more likely to be complementary than conflicting in foreign affairs. In an area with active foreign policy negotiations, like space debris, imposing a requirement to conduct a NEPA analysis for individual launches or activities would not impede US negotiators' efforts to find solutions. Rather, the information provided by NEPA analyses would assist both US and foreign negotiators to more fully understand how to regulate space debris. In such cases, NEPA provides a basis for more informed regulation of the space environment, consistent with NEPA's original intent as a disclosure and anticipatory statute.

In other areas of future space activities, complying with NEPA helps meet the international obligations of the U.S. The Outer Space Treaty features several requirements directly related to the space environment, such as Section IV (avoiding harmful contamination) and Section VI (consideration of harmful interference). Federal agency compliance with NEPA, whether for US government actions or private actions licensed by the Federal government, would contribute to both of these obligations. More broadly, a NEPA EA or EIS would contribute to the U.S. international obligations under Section VI to authorize and oversee its nationally authorized activities.

¹⁸⁹ *Massey*, 986 F.2d at 535.

VI. CONCLUSION AND RECOMMENDATIONS

In summary, this review has found that outer space is likely to be considered part of the human environment for purposes of NEPA's EIS requirements. The statutory text of the bill does not explicitly mention outer space but neither does it preclude. Rather, courts have consistently found that activities outside of the borders of the U.S. may be subject to NEPA to the degree that are Federal government actions and do not impede on foreign policy concerns.

Critically, by excluding the outer space environment from NEPA EIS analyses, federal agencies are missing key terrestrial environmental impacts from space activities. Mega-satellite constellations are causing light pollution that impacts Earth astronomy, increasing use of radio spectrum is impacting radio astronomers, allocation of 5G bands is reducing the accuracy of terrestrial weather forecasts, and the possibility of terrestrial biotic contamination from space activities remains unconsidered. Each of these are distinct environmental impacts that occur in the U.S., and elsewhere on Earth, resulting from US or US-authorized activities that occur in outer space.

Beyond the environmental impacts on Earth from space activities, human activities in the space environment are increasingly impacting human activities there. Ignoring the question of whether NEPA applies to outer space, the Executive, Congress, and the general public should consider whether NEPA should apply to outer space. There are three major pathways that could lead to NEPA being applied:

An administration modifies EO 12114 to specifically include outer space as part of global commons.

Congress passes a law clarifying that NEPA applies.

US or foreign citizens with standing bring lawsuits against specific agency decision to not analyze outer space impacts with likely space environmental impact.

Although standing is likely to be a major challenge for any legal challenge, this review indicates that key space constituencies may be able to demonstrate standing. This includes visual astronomers, radio astronomers, those impacted by weather forecasts such as hurricanes, and astrobiologists interested in preventing contamination of space environments.

The key Senate Co-sponsor of NEPA, Senator Jackson, described NEPA's purpose as providing an "environmental problem anticipatory capacity."¹⁹⁰ Applying NEPA to outer space provides exactly that anticipatory capacity to space environmental impacts that could impact future operations in space and, perhaps more importantly, have negative impacts on Earth.

¹⁹⁰ *Bills to Authorize the Secretary of the Interior to Conduct Investigations, Studies, Surveys, and Research Relating to the Nation's Ecological Systems, Natural Resources, and Environmental Quality, and to Establish a Council on Environmental Quality; Hearing before Senate Comm. On Interior and Insular Affairs*, 91 Cong. 63 (1969).

