THEORIZING COSMIC ENVIRONMENTAL LAW

by

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To make this journey, we'll need imagination, but imagination alone is not enough, because the reality of nature is far more wondrous than anything we can imagine.

- Cosmos: A Spacetime Odyssey (2014)

Table of Contents

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Abstract

Research and planning, *inter alia*, with regard to space resource mining, terraforming and colonization of celestial bodies is actively being pursued to realize the human-centric benefits, leading to a space race amongst nation-states. The current duration in the space age is quite akin to where the humanity once stood in the history – where land masses were to be claimed and appropriated, the race for resources led to colonization followed by industrial revolution and then by globalization. Today, consequently, humanity stands in an epoch of Anthropocene, where human beings have collectively become a geological force adversely altering the natural ecosystem of the only habitable planet by creating a global climate and environmental impact.

Assessing the space race and the trends in the space age, it appears that the history is about to repeat itself, now in the domain of outer space, and an alarming question surfaces as to whether humanity could possibly become a cosmic force, bringing upon itself cosmic environmental harm or an outer space equivalent of Anthropocene.

Against this backdrop, this thesis attempts to theorize cosmic environmental laws based on an understanding that the outer space, much like the Earth, is an interdependent natural system with prevailing cosmic order, disruption of which could possibly pose significant threats to the natural *in situ* conditions of the outer space and also to the closely linked habitability on and of the planet Earth. Further, this thesis challenges the prevailing anthropocentric value system of the human civilization, which is solely responsible for the onset of Anthropocene and makes a persuasive plea for a paradigm shift to cosmocentrism for a true coexistence of humanity with the nature, the cosmos. Accordingly, establishing the notion of cosmic order, arguing for the adoption of cosmocentrism, this thesis critiques from a cosmocentric perspective, the principles established in the international environmental law, particularly as in the international space law, towards the theorization of cosmic environmental laws.

Résumé

La recherche et la planification, notamment en ce qui concerne l'exploitation minière des ressources de l'espace, la terraformation et la colonisation des corps célestes est activement recherché pour réaliser le et axés sur les avantages sociaux, conduisant à une course à l'espace entre les Etats-nations. La durée actuellement dans l'ère de l'espace est assez semblable à l'humanité où s'élevait autrefois dans l'histoire - où les masses terrestres devaient être réclamé et ouverts, la course pour les ressources ont conduit à la colonisation suivie de la révolution industrielle puis par la mondialisation. Aujourd'hui, par conséquent, l'humanité se trouve dans une époque de l'anthropocène, où des êtres humains ont collectivement devenir une force géologique modifier négativement l'écosystème naturel de la seule planète habitable en créant un climat mondial et l'impact sur l'environnement.

L'évaluation de la course à l'espace et l'évolution de l'ère spatiale, il semble que l'histoire est sur le point de se répéter, maintenant dans le domaine de l'espace, et un rythme alarmant des surfaces question de savoir si l'humanité pourrait devenir une force cosmique, portant sur lui-même ou un dommage à l'environnement cosmique l'espace équivalent d'anthropocène.

Dans ce contexte, cette thèse tente de théoriser les lois de l'environnement cosmique basé sur la compréhension que l'espace extra-atmosphérique, tout comme la Terre, est un système naturel d'interdépendance avec l'ordre cosmique qui prévaut, la perturbation de ce qui pourrait représenter un danger pour le naturel dans des conditions in situ de l'espace extra-atmosphérique et également à l'habitabilité étroitement liés sur et de la planète Terre. En outre, cette thèse conteste la valeur anthropocentrique dominante de la civilisation humaine, qui est seul responsable de l'apparition de l'anthropocène et fait un plaidoyer convaincant pour un changement de paradigme pour cosmocentrism pour une véritable coexistence de l'humanité avec la nature, le cosmos.

En conséquence, l'établissement de la notion d'ordre cosmique, plaidant pour l'adoption d'cosmocentrism, cette thèse critiques d'un cosmocentric point de vue, les principes établis dans le droit international de l'environnement, d'autant plus que dans le droit international de l'espace, vers la théorisation cosmique de lois sur l'environnement.

Introduction

Weltanschauung – the world view, is significantly dominated by the western philosophies which advocate anthropocentric understanding of the world we live in, and generations after generations in the human history have internalized anthropocentrism. Today, anthropocentrism influences almost everything in the world - the ethics, politics and even the moral status of self and the others.[1] Anthropocentrism or human-centrism essentially is an egoistic mindset or world view which perceives humankind as the central and the most important entity of the universe[2] and hierarchically places itself at the top in the natural world, with natural resources existing only to serve humankind.[3] However, this view in my opinion is quite recent on a philosophical timeline and is mostly a product of western philosophies of the then industrial and rapidly developing anthropic world. The ancient eastern thoughts, particularly so in the Chinese philosophy and the Indian philosophy are quite symbiotic with the nature and the cosmos,[4] reflecting *ecocentrism* and even *cosmocentrism*.[5] Predominantly, the eastern philosophies consider humankind to be only a miniscule part of this giant cosmos, accordingly giving intrinsic value to the nature and the natural order.

This debate would be elaborately discussed and analyzed in the following chapters, however, it is against this tussling backdrop of *anthropocentrism* vs. *cosmocentrism*, the central hypothesis and the main arguments of the present thesis are based upon. The main objective is not to suggest specific new environmental laws applicable to the outer space environment, but

[1] Rob Boddice, "Introduction: The End of Anthropocentrism" in Rob Boddice, ed, *Anthropocentrism: humans, animals, environments* (Leiden: Brill, 2011) at 1.
[2] *Merriam-Webster*, Merriam-Webster.com, *sub verbo* "anthropocentric", online: <https://www.merriam-webster.com/dictionary/anthropocentric>
[3] Julia Corbett, *Communicating Nature – How We Create and Understand Environmental Messages* (Washington, US: Island Press, 2006) at 27.
[4] The term *cosmos* is being used in this thesis instead of the term *universe*, as the former confirms more to the central idea of this thesis – an orderly harmonious systematic universe. Also, reference to outer space herein, by using *cosmos* is given more holistic meaning in light of the universe vs. multiverse debate.
[5] *Ibid,* at 51.

to lay the foundation for cosmic environmentalism upon which the cosmic environmental laws and regulations can be thought to be founded upon with a robust philosophy and jurisprudence that is discussed herein. In order to facilitate the argumentation, it is hypothesized that the cosmos is a natural system in a state of harmony bearing a natural (cosmic) order which needs to be preserved in light of the growing exploitative human activities in outer space.

Accordingly, the thesis focuses on building arguments based in cosmologies, environmental philosophy and ethics, later followed by legal analysis of the current applicable international law, including and more specifically as contained in the 1967 Outer Space Treaty.[6] Also, as an informed decision, it is not the objective or scope of this thesis to enter the domain of theology and present arguments from clashes of distinct theologies. However, more than often cosmologies and nature-ethics are closely tied to religion in various parts of the world and thus, the theological ideas would be lightly and cautiously touched upon in the spirit of the discussion.

A pertinent and obvious question surfaces as to what are the phenomena in the cosmic environment that must not be disrupted or more directly, what constitutes a cosmic environmental harm. While it is impossible to comprehend and list all the natural phenomena of the cosmic system and even the modern-day science is far too limited in understanding the grandiose and complexity of the cosmic system. It would be an intelligent estimate to suggest that the form factor of how we understand environment for Earth is significantly different from that of the cosmic system. Perhaps, the environmental factors for consideration in a cosmic system are gravity, electromagnetism, solar radiation, contamination of the natural environment of other celestial bodies, the interdependency and the interconnectedness of celestial bodies, planetary motions and sustainability of orbital spots, to name a few. The

[6] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, article V (entered into force 10 October 1967). [Outer Space Treaty].

definition of the term environment even on and for Earth has been often criticized,[7] however the attempt here is to understand the term in a holistic fashion and is best put as the interrelatedness of all environmental components from a ecocentric or cosmocentric perspective.[8]

The argumentative flow of the thesis starts by analyzing the foundational question of whether there exists natural (cosmic) order in the outer space as opposed to a state of chaos. It is in understanding the existence of cosmic order that the root of cosmic environmentalism is based upon and analyzed herein. If there exists a cosmic harmony, order and balance it would logically appear so, that the same can and may be disrupted by growing human actions in outer space. In this case, a simple analogy can be drawn between the cosmic order and the now disrupted, Earth's environmental or ecological harmony. It is, thus, intended to construct an argument in favor of cosmic order based upon cosmological theories from different parts of the world which support the notion of cosmic order.

Accordingly, the **Chapter 1 – Chaos vs. Cosmos: In Quest of a Cosmic Order**, in its first part analyzes the debate on whether outer space is in the state of chaos or cosmos. Thereby, in order to lay the foundation and idea of cosmic order, the chapter then discusses one of the oldest known cosmologies, the Hindu Cosmology, which is widely acknowledged to be parallel to the modern day scientific theories pertaining to cosmology. Having discussed, in depth the cosmological ideas in the Hindu literature, the chapter then proceeds to analyze the cosmological ideas from the Chinese philosophy particularly from the teachings of Daoism and how traditionally the concept of cyclical universe as in the Dao philosophy suggests the notion of cosmic order. The chapter in later half analyzes western philosophies by focusing on origins

[7] As stated in R. McCorquodale & M. Dixon*, Cases and Materials on International Law*, 4th edition (Oxford: OUP, 2003) at 454.
[8] Sonja Ann Jozef Boelaert – Suominen, "International Environmental Law and Naval War: The Effect of Marine Safety and Pollution Conventions During International Armed Conflict" (December 2000) Newport Paper Number Fifteen, Centre for Naval Studies, at 9.

of Cosmic Order in the ancient Greek thoughts, the Pythagoras and the Stoic school, followed by an analysis of the seminal writings of Plato and Aristotle with regard to cosmic order and harmony, to substantiate the argument of cosmic order.

Chapter 2 – The Gaian Narrative in the epoch of Anthropocene: *A Corollary*, elaborates on environmental philosophy and ethics and further analyzes the need for a paradigm shift from anthropocentrism to cosmocentrism in order to be able to comprehend, connect and truly coexist with the nature and the cosmos. In order to coherently argue the existence of a cosmic order and the need for its protection, corollary is drawn between the Earth's environmental narrative and the current duration in the space age. The current geological epoch is marked as Anthropocene, where humankind has itself become a geophysical force adversely impacting the environment at a global scale. On the other hand, this very moment in the space age can be seen as beginning of the *era of exploitation* of outer space resources, with an overwhelming question posed for the future, could there be an equivalent of Anthropocene epoch in the outer space, where humanity gains the ability to create an adverse cosmic impact.

Having discussed the Earth's environmental narrative up until Anthropocene, the chapter elaborates on how could the humanity have avoided the grievous onslaught on the nature by replacing anthropocentric value paradigm with ecocentrism and elaborates two ways of adopting ecocentrism, first, through the deep ecology perspective and second, through the Gaia hypothesis which scientifically argues that the planet Earth is a living organism, self-regulating complex environmental processes maintaining precise harmony (order) to maintain and sustain the life on Earth. Having analyzed these two perspectives, the chapter extends the idea of 'self-regulating natural system' (interpreted as a living organism) to the outer space to argue a shift in value system to cosmocentrism.

Chapter 3 - Theorizing Cosmocentric Space Environmental Law, identifies the deep rooted anthropocentric value system and the ill-founded environmental provisions in the Outer

Space Treaty and the Moon Agreement[9] and critiques the existing legal paradigm from a cosmocentric perspective. Further, understanding that in the absence of a robust environmental paradigm for the outer space, it is definite that certain environmental principles from the international environmental law would be exported to regulate human activities in outer space, and thus, critical analysis of such environmental concepts and principles from a cosmocentric perspective is attempted towards the conclusion of adopting a cosmocentric value paradigm by identifying gateways towards establishing a cosmocentric space environmental law.

Chapter 4 – Conclusion and Suggestions puts in context all the analysis from cosmologies, environmental philosophy and international law to conclude and purport the significance of understanding the cosmos as a natural system with a natural cosmic order and harmony which must be preserved from exploitative human activities in outer space. Further, it is suggested that for truly coexisting with the nature and the cosmos, the shift in the paradigm of values is long due and it is perfect time, at least in the space age, to imbibe value system of a cosmocentric world against the anthropocentric value system.

[9] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 18 December 1979, 1363 UNTS 3, Article 11 (entered into force 11 July 1984). [Moon Agreement] As of 1 January 2017, there are 17 States Parties and 4 signatories to the Moon Agreement.

CHAPTER 1 -
Chaos vs. Cosmos: In Quest of a Cosmic Order

"What absurd assumptions are required to deduce all this harmony from blind mechanism of matter set in motion by chance!"[10]

- Jean-Jacques Rousseau

Introduction

The above quote by Rousseau comes from one of his seminal writings, *Emile*, and though, the reference in the quote was rather pointed to presence of a higher intelligence responsible for cosmic design, nonetheless it best encapsulates the notion of harmony and orderliness in the universe. The questions on origin and nature of the cosmos have been central to humankind since time immemorial and cosmologies have evolved significantly over the time proposing distinct models of understanding the universe. Later, science validated or invalidated various theories based on substantive proofs obtained through scientific methods. However, nature (or state) of universe is one such topic that has been challenged and theorized time and again over the centuries. Even today, the question whether the universe is in the state of chaos or cosmos (order) is a debatable topic and the position appears to be unsettled even in the scientific community.

The earliest attempts at reasoning the origins of the world or the universe started with contributing the creation of the universe to God(s) and soon thereafter at the onset of the age of enlightenment, human beings started reasoning the origin, nature and particularly structure of the universe by proposing models to explain how the universe works. Shortly thereafter, with the evolution of ideas and cosmological theories, mechanical or clockwork models of the universe got mainstreamed leading to the Newtonian understanding of the universe which

[10] Jean-Jacques Rousseau, *Emile* (New York: Dover Publications, 2013) at 286.

prescribed an ordered and mechanical universe where much like a machine - small parts work for the whole system and actions have predictable outcomes.[11] This clockwork universe flourished greatly and has had a profound scientific impact on the society we live in.[12]

Today, while the Newtonian clockwork universe still remains extremely relevant and has been the root cause of plethora of scientific knowledge and many modern technologies, a paradigm shift is underway where the notion of ordered and predictable universe is being replaced with a notion of chaos.[13] This gradual shift in the perception of universe being in a state of cosmos to chaos, is extremely important, both scientifically and philosophically. Therefore, prior to envisaging and starting a detailed discussion on cosmic environmentalism it is pertinent that the state and nature of the universe or outer space be elaborately discussed and it is best suited for the objective of this research that the cosmologies which support the notion of cosmic order be discussed only after a brief general discussion on chaos *vs.* cosmos debate, as follows.

1.1. State of Universe - Chaos vs. Cosmos

The concept of ordered universe was mainstreamed by ancient Greek thinkers who predominantly believed in a complex, harmonious and ordered universe, termed *cosmos*.[14] The term *cosmos* refers to the deep interconnectedness of all the things and it was often used as a term opposite to *chaos*.[15] It was in fact Pythagoras, a Greek philosopher and a mathematician, who first used the word *cosmos* to denote "a well-ordered and harmonious universe, a world amenable to human understanding."[16] Today, in the age of advanced sciences it is irrefutable that the universe is governed by the laws of the nature and science has made it possible to even

[11] *Ibid.*
[12] Patrick L. Baker, "Chaos, Order and Sociological Theory" (1993) 63:2 Sociological Inquiry 123 at 124.
[13] Toby J. Tetenbaum, "Shifting Paradigms: From Newton to Chaos" (1998) 26:4 Organizational Dynamics 21 at 24. [Tetenbaum]
[14] Paul G. Kuntz, "Introduction" in ed. Paul G. Kuntz, *The Concept of Order* (Washington: Washington Press, 1968) at xii.
[15] Carl Sagan, *Cosmos* (New York: Random House, 1980) at 16. [Sagan, 1980]
[16] *Ibid* at 114.

identify some of these laws which are constant and universal in the grand canvas of cosmos.[17] Numerous leading cosmologists, including Carl Sagan agree that "the order of the Universe is not an assumption; it's an observed fact."[18] or as Brian Green puts it "symmetry underlies the laws of the universe..".[19]

On the other hand, this notion of universal order has also been questioned and criticized as a "preconception imposed on the Universe by fallible scientists and their social milieu."[20] Accordingly and in sheer contrast, the notion of chaos suggests that the universe is nothing but random, wild and almost everything available to the perception of humankind is accidental and by chance in the universe. As for Charles Peirce,[21] disorder was an objective chance (tychism) which was a "doctrine that absolute chance is a factor in the universe"[22] and that the disorder gradually developed order in the universe, which is continuously increasing.[23]

Interestingly, while order has stimulated wide interest in numerous disciplines, disorder or chaos until recently, has been a topic which has ignited, comparatively, slight interest.[24] What specifically then is disorder? Disorder in itself, is hard to define, as the relationship of order and disorder is often binary, and one is understood invariably in the absence of the other. Accordingly, disorder or chaos is what is in the absence of order or cosmos and vice-versa.

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[17] John T. Roberts, *The Law-Governed Universe* (Oxford: OUP, Oxford Scholarship Online, 2009) at 1.1, online: <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199557707.001.0001/acprof-780199557707-chapter-1>

[18] *Ibid.*

[19] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality* (New York: Borzoi Book, 2004) at 220. [Greene]

[20] Carl Sagan, *The Demon-Haunted World, Science as A Candle in the Dark* (London: Headline Book Publishing, 1996) at 260. [Sagan, 1996]

[21] Charles Sanders Peirce was an American philosopher, logician, mathematician, and scientist who is sometimes known as "the father of pragmatism." He was educated as a chemist and employed as a scientist for 30 years. Robert Burch, "Charles Sanders Peirce" in *The Stanford Encyclopedia of Philosophy,* winter 2014 edition by Edward N. Zalta (Stanford, California: Metaphysics Research Lab, Stanford University) online: <https://plato.stanford.edu/archives/win2014/entries/peirce/>

[22] C. Hartshorne, P. Weiss and A.W. Burk, eds, *Collected Papers of Charles Sanders Peirce* (Cambridge: Harvard University Press, 1935-58) Vol. VI, par. 201. [Hartshorne et al.]

[23] *Ibid* at Vol. I para 411; Vol VIII, para 317.

[24] James K. Feibleman, "Disorder" in ed. Paul G. Kuntz, *The Concept of Order* (Washington: Washington Press, 1968) at 3. [Feibleman].

The above notion of chaos and cosmos being antimonies, or order being the opposite of disorder is significantly and continuously changing in the modern-day context. The Greek notion that the order governs the universe in absence of (or replacing) chaos, was well accepted across centuries through theologies to enlightenment era and even to the scientific times of Newtonian mechanical laws of the nature. However, recently with the advancement of science and mathematics, particularly in the field of studying dynamic systems, a paradigm shift was triggered with the introduction of *chaos theory* where Newtonian understanding of an ordered and predictable universe or the clockwork universe was replaced with the idea of natural systems, like universe, being chaotic.[25]

Earlier, chaos and order were understood as antinomies but today they are being perceived as "two phases of the same phenomenon".[26] It is impossible, for the scope of this project, to analyze in detail the implications of chaos theory on the broadly accepted Newtonian understanding of the universe. In brief and very simply put, it prescribes that in any (dynamic) system a slight (or small) change in the initial conditions can have a significant impact on the overall consequence of the whole system,[27] and this basically takes away the predictability and knowable order from the Newton's clockwork universe. However, the term *chaos*, in chaos theory can appear to be misleading as it does not represent disarray, randomness or sheer disorder, but represents *deterministic disorder*. It rather represents "a complex, unpredictable and orderly disorder in which patterns of behaviour unfold in *irregular but similar* forms".[28] It is growlingly becoming popular, both in natural sciences and social sciences, to perceive universe chaotic in view of chaos theory, thereby meaning a universe which is deterministic,

[25] Ziauddin Sardar & Iwona Abrams, *Introducing Chaos* (Cambridge: Icon Books, 1999) at 98. [Ziauddin]; Robert Pool, "Chaos Theory: How Big an Advance?" (1989) 245:4913 American Association for Advancement of Science 26 at 26.
[26] Patrick L. Baker, *supra* note 12 at 123.
[27] Stephen Kellert, *In the Wake of Chaos: Unpredictable Order in Dynamical Systems* (Chicago: University of Chicago Press, 1993) at 12.
[28] Tetenbaum, *supra* note 13 at 24.

obeys fundamental laws of physics and simultaneously is "capable of disorder, complexity and unpredictability."[29]

Particularly, in the context of natural systems, like that of the universe, Feibleman identifies two theories which closely relate and seem applicable to the universe and these are – *entropy* and *evolution*. *Entropy* is the second law of thermodynamics which states that for "an isolated system the direction of development in time is from order to disorder".[30] On the other hand the theory of *evolution* as propounded by Darwin, primarily states that the direction of development in nature (living organisms) is from simple to complex and from disorder to order.[31] It is a scientific fact that the universe is not stagnant or *as is* and is in fact developing, rather expanding.[32] Both the theories have been repeatedly applied towards understanding the nature of universe and they support conflicting ideas respectively. While Feibleman admits that both the theories in their absolute form apply only to isolated systems, and on applying these to universe concludes that, *order* is applicable not to the entire universe but to a certain defined part of it, like life, which evolves from disorder to order in an otherwise disordered universe. He further concludes, that at macroscopic level, as in the grandiose of universe, the difference between order and disorder dilutes to unison and "perfect chaos has a uniformity about it that renders it perilously close to order"[33] further validating the *deterministic chaos* as discussed in the chaos theory.

[29] Ziauddin, *supra* note 25 at 6.
[30] Feibleman, *supra* note 24 at 6.
[31] Feibleman, *supra* note 24 at 6.
[32] Edwin Hubble made the observations in 1925 and was the first to prove that the universe is expanding. It is now popularly termed as Hubble's Law. See generally, Films on Demand Canada, "Hubble's Expanding Universe" (2002) online: <https://goo.gl/JWSVYm>. [Hubble's Expanding Universe]
[33] Feibleman, *supra* note 24 at 10.

Therefore, in view of above we are nothing but afloat a cosmic ocean which is working out variables to achieve stability, harmony and a state of order[34] and it is this very "ordered and admirable character of the universe [that] was called Cosmos."[35]

Understanding that the cosmic order or cosmos, is a scientifically observed fact,[36] consequentially sets the debate on what does this order mean practically, is it the law of the nature, symmetry, universalism or plain simple absence of dominant randomness. Simple answer is order is all and each of that. To understand better, philosophers and scientist have different expression for defining order but often mean the same thing. For scientific community cosmic order is best understood (as Newtonian understanding) as a *mechanist cosmic order*, with verifiable universal application of scientific phenomena such as electromagnetism, chemical elements, laws of quantum mechanics, the motion of galaxies adhering to laws of motion and gravity and so on and so forth.[37] While, for philosophers, like Aristotle and Plato, the notion of cosmic order translates to teleological considerations giving nature and cosmos an intrinsic moral value of its own,[38] not necessarily always from a theistic perspective, but at times even just in the sense of nature as a force and law in itself, as was systematically argued by many of the ancient civilizations like the Ionians, Hindus and Chinese.[39]

In order to work towards establishing an understanding of cosmic environmentalism and setting the stage of perceiving cosmos as a natural system, it is of utmost importance that such an epistēmē and its epistemology be holistic and includes the scientific mechanist cosmic order as well as the cosmic order bearing intrinsic value as derived from philosophies. It is only then

[34] The term *cosmic ocean* is being used in the meaning as was popularized by Carl Sagan in his book Cosmos, *supra* note 15.
[35] Sagan, 1980, *supra* note 15 at 107.
[36] Sagan, 1996, *supra* note 20 at 260.
[37] *Ibid*.
[38] See generally, Ernan McMullin, "Cosmic Order in Plato and Aristotle" in ed. Paul G. Kuntz, *The Concept of Order* (Washington: Washington Press, 1968) 63-76. [McMullin]
[39] Sagan, 1996, *supra* note 20 at 292. Sagan quotes Lucretius on ancient Ionians - "'Nature free at once and rid of her haughty lords is seen to do all things spontaneously of herself without the meddling of the gods."

a true environmentalism, which stands on both science and value based system, can be developed.

If we were to understand cosmic environment in such a holistic fashion, it would appear in complete sync with the experiential learning that we have had from the environmental narrative of the Earth, where the intrinsic value given to the nature and the cosmos by the early (eastern) societies were denigrated by an industrial society in the garb of (western idea of) development only to later arrive at and confirm the very same non-western values of nature preservation through modern sciences.[40] Therefore, to permeate a holistic view, rather a cosmocentric view of the universe which perceives it as a natural system bearing cosmic order, interdependency, harmony and balance, appears in favor of the humankind for not repeating the mistakes in the domain of outer space that it committed on the planet Earth.

With this background and understanding of a universe existing in a state of cosmos and to substantiate the argument of existence of a cosmic order or harmony, below, I discuss few of the most advanced, recognized and relevant cosmological ideas that prevailed in different parts of the world at different point in time.

1.2. Cosmos in the Hindu Cosmology

The Hindu cosmology was developed over centuries and is considered one of the extremely complex and detailed ancient cosmological theory. The manner it is narrated in the scriptures offers multiplicity of components and detailed and intricate concepts from a religious, philosophical and scientific perspective.[41] The Hindu cosmology as Bhattacharjee suggests, is like modern day scientific discovery which is an outcome of numerous investigators working over the years and writings of whom, if read separately, do not convey the same sense or achievement, as the complete holistic discovery containing each of those investigators' work

[40] Brian Arthur in Ziauddin, *supra* note 25 at 167.
[41] Siva Sadhan Bhattacharjee, *The Hindu Theory of Cosmology – An Introduction to the Hindu View of Man and His Universe* (Calcutta: Bani Prakashani, 1978) at 1-2. [Bhattacharjee]

would.[42] The motivation and intention behind the formation of Hindu cosmological theories and that of modern science are quite similar as they both are in quest of explanation of the basic observable universe.[43] Bhattacharjee writes that the development of Hindu cosmology is quite akin to modern science where "there were false starts, faltering steps, and missteps as well, but ultimately all those yielded a single picture of the creation of the universe".[44] This Hindu picture of the universe, today is widely acknowledged and is considered very similar to modern scientific thinking on many accounts.

In fact, renowned cosmologist, Carl Sagan was particularly drawn to the Indian cyclic cosmology[45] and noted the following with regard to Hindu cosmological theory:

> "The Hindu religion is the only one of the world's great faiths dedicated to the idea that the Cosmos itself undergoes an immense, indeed an infinite, number of deaths and rebirths. It is the only religion in which the time scales correspond, no doubt by accident, to those of modern scientific cosmology."[46]

Furthermore, numerous scholars have often noted the importance of Hindu cosmology with respect to interpreting modern science.[47] In fact, Watson notes that Hindu scriptures "if properly interpreted, it [Hindu Cosmology and Vedanta] can offer a viable alternative to modern science as an explanatory system of the ultimate nature of the cosmos."[48]

As with any great and detailed knowledge system, the Hindu cosmology also comes with numerous concepts and plethora of literature attempting to interpret the cosmos. Therefore, it is unfortunately beyond the scope of this thesis to account for all the concepts that the Hindu Vedic scriptures have to offer, however, the attempt here is to present a general overview of

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[42] *Ibid*.
[43] Ian Watson, "Hindu Cosmology and Modern Science - Some Remarks" in ed. Harry Oldmeadow, *Light from the East: Easter Wisdom for the Modern Wests* (Canada: World Wisdom, 2007) at 273.
[44] *Ibid* at 2. [Watson]
[45] Dick Teresi, *Lost Discoveries: The Ancient Roots of Modern Science – from the Babylonians to the Maya* (New York: Simon & Schuster, 2002) at 174. [Teresi]
[46] Sagan, 1980, *supra* note 15 at 157.
[47] Teresi, *supra* note 45.
[48] Watson, *supra* note 43 at 273.

how the Hindu cosmology perceived the universe – the *Brahmanda*, its creation and more importantly its nature or state of existence.

However, relevant to the central argument of this thesis, in the following analysis, primary focus would be on the concept of natural order or cosmic order as prescribed in the Hindu cosmology, and is termed as *Ṛta*[49] in the *Ṛg Veda Saṁhitā* (c.1500–1200 BCE), the earliest and most authoritative of the Vedic texts.[50]

1.2.1. The *Brahmanda* - The universe

The *Ṛg Veda Saṁhitā* is an old Hindu scripture dating back to c. 1500-1200 BCE and describes there was nothing before the creation of universe and later an Embryo (the *Hiranyagarbha*) served as the starting point and the cause of the universe.[51] It is stated that the birth (*Vaak*) of the universe started with the great water pervading the universe that developed a cosmic egg (*Brahmanda*) which "remained afloat on the primordial fluid",[52] then appeared a 'being' or 'lord of creatures' (*Prajā-pati*) who performed *"creative fervor"*[53] (*Tapah*) which generated heat and then he ejected the stars[54] and accordingly the world eventually got created from this eternal pre-existing matter.[55] However, the whole creation as narrated above is said to be a projection/manifestation or "a dream of the god who after hundred Brahma years, dissolves himself into a dreamless sleep",[56] and nothing material. This dream of the god and dissolution of himself into a dreamless sleep is interpreted to mean a cyclical universe which undergoes

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[49] Pronounced "Reeta".
[50] Barbara A. Holdrege, "*Dharma"* in eds. Sushil Mittal & Gene R. Thurby, *The Hindu World* (Canada: Routledge, 2004) at 215. [Holdrege]; The term Vedic text refers to *Vedas* meaning – *" [Vedas] are a large body of knowledge texts originating in the ancient Indian subcontinent. Composed in Vedic Sanskrit, the texts constitute the oldest layer of Sanskrit literature and the oldest scriptures of Hinduism."* (Source: Wikipedia).
[51] Bhattacharjee, *supra* note 41 at 50-56; R.K. Lahri, "The Hindu View on Cosmogony" online: <https://goo.gl/zAwKTr>. [Lahri]
[52] Bhattacharjee, *supra* note 41 at 52.
[53] *Ibid*, explanation in footnote 2 at 62.
[54] *Ibid* at 53.
[55] Narendra Nath Bhattacharyya, *History of Indian Cosmogonical Ideas* (New Delhi: Munshiram Manoharlal, 1971) at 19.
[56] Sagan, 1980, *supra* note 15 at 157; One Brahma day and night total up to 8.64 billion years long as per the interpretation of Vedic scriptures.

infinite number of deaths and rebirths.[57] According to Mircea Eliade, during each Brahma day (4.32 billion years long) the god projects the universe and as (the night falls) he tires into a deep sleep, the universe vanishes and dissolves into god's deep sleep and once again the god starts to dream or project a new universe, representing a cycle of creation and dissolution.[58] Interestingly, India is a land of many gods, and it is in fact stated that the universe being the projection or dream of a god is not necessarily the only universe, there could be different gods projecting their own universes, opening the possibility of multiverse notions.[59]

This Hindu idea of the creation of the universe from nothing; universe expanding gradually and then dissolving into nothing is astonishingly parallel to modern day conception of the universe. The modern science conceptualizes the origin of the universe by attributing it to the Big Bang which roots from nothing;[60] the state of universe is proved to be expanding [61] and it is likely that the expansion is not indefinite and is only to be followed by contraction at some point,[62] termed as the Big Crunch.[63]

It is this idea of cyclical universe that triggers the notion of a cosmic rhythm (*Ṛtam*)[64] and harmony and the creation to dissolution of the Hindu cosmos appears orderly. The concept of cosmic order, as well, is exhaustively detailed in the Vedic scriptures and now having understood the origin of cosmos as per the Hindu theory, I must turn to analyze the concept of cosmic order in Hindu theories, pursuant to the central argument of the thesis.

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[57] *Ibid*.
[58] The Encyclopedia of Religion, ed. Mircea Eliade (New York: Macmillan, 1987), 4:110.
[59] Teresi, *supra* note 45 at 175.
[60] Teresi, *ibid* at 176 notes "Metaphorically, the [egg is the infant universe, which suddenly hatches to give birth to all forms of the universe. The big bang."
[61] Hubble's Expanding Universe, *supra* note 32.
[62] Sagan, 1980, *supra* note 15 at 157;
[63] For 'big crunch' or 'contracting universe', see generally, George Ellis, Roy Maartens & Malcolm MacCallum, *Relativistic Cosmology* (Cambridge: Cambridge University Press, 2012); "The Big Crunch is one possible scenario for the ultimate fate of the universe, in which the metric expansion of space eventually reverses and the universe re-collapses, ultimately causing the cosmic scale factor to reach zero or causing a reformation of the universe starting with another big bang. Sudden singularities and crunch or rip singularities at late times occur only for hypothetical matter with implausible physical properties" (Source: Wikipedia).
[64] The Sanskrit word ' Rtam' and the English word 'Rhythm' apparently connote a similar idea at some level. Rtam is the rhythmic order of the 'uni-verse'. It is the orderly way in which the world regulates itself.

1.2.2. The *Ṛta* – The cosmic order

The *Ṛta* (*reeta or rita*) in the Hindu Vedic scriptures is prescribed as the cosmic law which "pervades and transcends" the universe.[65] In this sense, every phenomenon in the universe is subjected to this law which regulates the cosmos in its entirety. Chakravarthy notes that, *Ṛta* is the order or power which aligns everything, even the "dynamic and the changing phenomena" of the universe to bring universe to a stable and harmonious state or condition.[66] He further states that the *Ṛta* is the only constant force that is "one unchanging and unchangeable primal force" in between the perpetually changing processes of the universe.[67] Accordingly, the *Ṛta* is the force behind all the mysteries of the unexplained phenomena of the universe, it is also the law or the order that governs all the transitions and it is *Ṛta* that "pervades all the things in the cosmos".[68] Interestingly, as per the Vedic scriptures even the gods are bound by *Ṛta* and not only should they obey and respect it but they are the ultimate guardians of this cosmic law that govern everything in the universe and beyond.[69]

Ṛta, the cosmic order is rather a system which interconnects orders of reality – the natural order (*adhibhuta*), the divine order (*adhidaiva*), the human order (*adhyatma*) and the sacrificial order (*adhiyajna*). The cosmic order, *Ṛta*, "ensures the integrated functioning of the natural order, divine order, human order and sacrificial order."[70] In terms of the regulation of natural order, *Ṛta* governs the movements of the planets, stars and all celestial bodies, "the rhythms of the sea and the cycles of the day and night."[71] It even operates on the environmental phenomenon of the Earth like the change of seasons, rains, energy etc. On the divine front the *Ṛta* empowers the guardians of the cosmic order to perform their duties, and on the human

[65] G.N. Chakravarthy, *The Concept of Cosmic Harmony in the Rg Veda* (Mysore: Prasaranga, Bangalore Press, 1966) at 37. [Chakravarthy]
[66] *Ibid*.
[67] *Ibid*.
[68] *Ibid.*
[69] Chakravarthy, *supra* note 65 at 38.
[70] Holdrege, *supra* note 50 at 215.
[71] *Ibid.*

order it regulates the moral conduct of the human beings. Lastly, *Ṛta* on sacrificial order "determines the ordered course of the sacrificial rituals" which is essential for the preservation of cosmic order or the cosmos.[72]

Ṛta though prescribed as the order of the whole i.e. of the natural, divine, moral and sacrificial spheres, it is of utmost importance in terms of the natural order alone. While the texts interpreting *Ṛta* strongly advise against interpreting it in isolation of any other order. I would discuss only the meaning of *Ṛta* in terms of natural and human order as it is beyond the scope of this research to delve into importance of *Ṛta* in the spheres other than that of nature and human, owing to the embedded theistic notion in the other two.

William Mahony in his interpretation of the *Ṛta* stated that the cosmic order was "understood as the universal principle of balance…[which aids to the] smooth running of the cosmos as a whole".[73] It appears from the interpretation of *Ṛta* by numerous scholars that there exists a principle of orderliness and law which according to Hindu scriptures binds the fabric of cosmos and in Mahony's words ensures the smooth running of the cosmos. This cosmic order though appears metaphysical but is given so much importance in Hindu scriptures, culture and religion that it was interlinked with *dharma* - the duty of every being. The term *dharma* is mentioned in the Vedas as "upholding of the *Ṛta"*.[74] In truer interpretations, *dharma* is the "continuous maintaining of the social and cosmic order and norm..".[75]

However, today the meaning of the term *dharma* has undergone a significant transformation and in the contemporary India, *dharma* is synonymously used to mean 'religion'. This reflects the importance, higher degree and the instilled intrinsic value, the Hindu cosmology and the society (knowingly or unknowingly), holds for the cosmic order.

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[72] *Ibid.*
[73] William K. Mahony, *The Artful Universe: An Introduction to Vedic Religious Imagination* (New York: State University of New York Press, 1997) at 48.
[74] Holdrege, *supra* note 50 at 216.
[75] *Ibid* at 216 quoting Halbfass, 1988 at 315-16.

1.2.3. *Dharma* – The duty to maintain cosmic order

As already discussed, the duty to maintain and uphold the *Ṛta* (cosmic order) is termed as *dharma*. It is extremely pertinent that the concept of *dharma* as in connection with the *Ṛta* be studied and analyzed more carefully as it bears crucial importance in understanding the nature as understood in ancient times and the corollary can be directly drawn with contemporary environmentalism.

The preservation of cosmic order, well-being of the universe and the achievement and sustenance of cosmic harmony is not only the duty of Gods but equally of the humankind.[76] The role of the humankind in order to maintain the cosmic order (*Ṛta*) is to sacrifice and pray for the four or more closely associated gods with the term *dharma.* It is this *dharma* – the duty of maintaining *Ṛta* that is in itself an inviolable law (a *Ṛta*).[77] However, the concept *dharma* is closely associated with specifically few gods, named, the *Yajña* (*Agni*: the god of fire), the *Mitrá*[78] (the Sun), the *Varuna*[79] (the water, and celestial ocean) and the *Soma*[80] (simultaneously meaning the moon or the god of the plants). Today, this can be interpreted to mean nature and the interdependency of each of these on one another and other laws of the nature is extremely relevant. Now, having interpreted the Hindu scriptures, if we analyze the cosmic order (*Ṛta*) and the duty to uphold it (*dharma - of gods and human*) which is closely tied to the natural phenomena (four gods), it becomes clear that it is through satisfying the nature (four gods) that

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[76] Chakravarthy, *supra* note 65

[77] In this sense *dharma* is synonymous to the Chinese concept of *Tao*, which will be later discussed in the following section

[78] *Dictionary of Hindu Lore and Legend* (London, UK: Thames & Hudson, 2002) *sub verbo* "mitra" – "is the equivalent of the Iranian sun god Mithra, whose cult became very popular in the Roman empire at the beginning of the common era."

[79] *Dictionary of Hindu Lore and Legend* (London, UK: Thames & Hudson, 2002) *sub verbo* "varuna". Defined as - "[God with]…the responsibility for maintaining the universal order also extended to the holy sacrificial rules and the seasonal rhythms of agriculture. In this, [varuna] shared his duty with Agni, Indra and Mitra. Later, rita was mainly associated with ethics, which also fell under Varuna's control.... He is the overlord of the waters and his vahana is the makara. He is associated with rain, water and fertility, and his generative powers are equated to that of the stallion, his favourite sacrificial animal."

[80] *Dictionary of Hindu Lore and Legend* (London, UK: Thames & Hudson, 2002) *sub verbo* "soma" – "is another name of the Moon, in his aspect as god of medicinal herbs."

the cosmic order (*Ṛta*) can be maintained and adhered to, which in turn itself is the *dharma* and the *law* (duty and order).

When we superimpose the Hindu cosmological concept of *Ṛta* (cosmic order) and the duty (*dharma)* to maintain and protect it, on the central hypothesis of this thesis - of universe being in the state of harmony, bearing a cosmic order which needs to be preserved in light of establishing cosmic environmentalism, the latter becomes a substantive argument based in Hindu cosmology, which is known to be parallel to numerous modern scientific theories and thus, validates the hypothesis.

1.3. Cosmos in the Chinese (Daoist) Cosmology

The Daoism (or Taoism) is a religious and philosophical tradition that represents the (ideal) "way of life", and is closely associated with the philosophy of *Confucianism*.[81] The western popular perception of Daoism is closely lined with naturalistic or mystical religions[82] and its religious purpose was to "lead the way", to transform (*hua*) people and lead them to respect gods impersonating Dao (the way) as against falling into the vulgar (*su*) or illicit (*yin*) cults.[83] The philosophical Daoism is credited majorly to two writings namely, first, *Daode Jing* (Book of Dao and Virtue) which is credited to philosopher Laozi and second, is *Zhuangzi.* Both, constitute as seminal work in the Daoism philosophy and were written and complied over centuries with inputs from numerous (at times, anonymous) writers.[84]

Both the writings, the *Daode Jing* and *Zhuangzi* represent the "nature of dao (way) and related concepts that were central to the ethical disputes of Ancient China."[85] For a reasonable

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[81] "Confucianism, also known as Ruism, is described as tradition, a philosophy, a religion, a humanistic or rationalistic religion, a way of governing, or simply a way of life" in Xinxhong Yao, *An Introduction to Confucianism* (New York: Cambridge University Press, 2000).
[82] Chad Hasen, "Daoism" in *Stanford Encyclopedia of Philosophy* by Edward N. Zalta (California: Metaphysics Research Lab, Stanford University, 2017) online: <https://plato.stanford.edu/archives/spr2017/entries/daoism/>. [Hasen].
[83] Fabrizio Pregadi, "An Introduction to Taoism", The Golden Elixir, online: <http://www.goldenelixir.com/taoism/taoism_intro_1.html> [Pregadi].
[84] Hasen, *supra* note 82.
[85] *Ibid.*

duration in the history the western world was perplexed with the question whether Daoists writings are religious or philosophical. The Dao philosophy and the Daoists' have rather distanced themselves from such questions, and instead primarily have focused on the questions concerning "nature of reality, increasing their longevity, ordering life morally, practicing rulership, and regulating consciousness and diet."[86]

Daoism though largely perceived as confucianism is not really the same, while Daoism flourished in a society which was predominantly a confucian society it did not share the passion for learning, instead for Daoists' the goal was to unlearn and "reach a more natural state of mind",[87] nonetheless they appreciate the confucian thought of "social awareness and cosmic harmony".[88]

Having introduced Daoism briefly, I must now turn to the ideas in Daoism that are very relevant in quest of a cosmic order, upon which cosmic environmentalism can be established. Particularly, the philosophy under the *Daode Jing* is directly relevant to the central argument and hypothesis of this thesis as it envisages a natural order, a cosmic harmony and perhaps more than any other philosophy, it places higher degree of intrinsic value in the nature. However, at the same time it is beyond the scope of this thesis to be able to comprehensively analyze and elaborate the Daoist philosophy, but below I present excerpts from the philosophy which connect and serve the argumentation of this thesis, i.e. the cosmogony (origin and nature) and the cosmic order in cosmos.

1.3.1. The origin and nature of cosmos under Daoism

Daode Jing's description of the Dao (the way) implies an inherent cosmic power which is the reason for creation of the universe and the organic nature of the cosmic laws where "things

[86] *Ibid.*
[87] Livia Kohn, *Introducing Daoism* (USA: Journal of Buddhist Ethics Online Books, 2008) at 12. [Kohn]
[88] *Ibid*.

develop naturally….[they] grow and [then] decline".[89] The natural motion of the cosmos is depicted as expanding and then eventually contracting, a *cyclical universe* – where *yang* is the cosmic expansion, and *yin* is the contraction.[90] The conception of cosmos in Daoism is rather organic and it perceives it as a vital living organism, which created itself and the notion of singularity and unity prevails with it. Such self-creation was spontaneous regeneration from the "primal empty-potency lodged within all organic forms of life."[91]

On creation and coming into being, the *Daode Jing* states that the creation and development of the world happened in several stages over, perhaps, thousands of years. It is stated that "at the root of creation, Dao rested in chaos"[92] which eventually evolved into a cosmic unity that is "full of creative potential"[93] and is *the Great Ultimate,* termed as *Taiji*. It is then *Taiji* which advanced *the two*, the two energies – *yin* and *yang* which merged symbiotically in harmony and stability to fully develop the universe or cosmos.[94] Therefore, in the whole process of creation of the cosmos, it emerged from nothing to the singular and one unity, the Great Ultimate (*Taiji*) which with its creative potential lead to the emergence of binary energies *yin* and *yang*, which stabilize and harmonize all that is, all that there ever will be. The process of striking harmony and balance performed by the *Yin* and *Yang* further lead to emergence of five essential elements namely, wood (lesser yang), fire (greater yang), metal (lesser yin), water (greater yin) and the earth (central) phase.[95]

It is astonishing how the Daoist cosmos closely resembles the Hindu cosmos and in turn parallels many of the modern scientific theories. Like Hindu cosmos, the Daoist cosmos comes out of nothing – a concept parallel to the Big Bang theory; the concept of *Ṛta* as the inviolable

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[89] *Ibid* at 20.
[90] N.J. Girardot, James Miller & Liu Xiaogan, "Introduction" in eds. N.J. Girardot, James Miller & Liu Xiaogan, *Daoism and Ecology: Ways within a Cosmic Landscape* (USA: Harvard University Press, 2001) at xlviii. [Girardot et al].
[91] *Ibid.*
[92] Kohn, *supra* note 87 at 22.
[93] *Ibid.*
[94] *Ibid.*
[95] *Ibid* at 81.

ultimate cosmic order can be closely compared with the value system of Dao; like the Hindu cosmos, the Daoist cosmos evolves and is cyclical and eventually declines – a concept parallel to Big Crunch; like Hindu cosmos, the Daoist cosmos attains a cosmic harmony and order and lastly, like Hindu cosmos, the Daoist cosmos closely interlinks five elements of the nature and places an intrinsic value in the same.

However, relevant to the central argument of this thesis, in the following part, I would now, briefly attempt to analyze the concept of natural order or cosmic order as is understood in the Daoist Cosmology.

1.3.2. *Dao and Yin & Yang* - The cosmic order

Unlike the Hindu cosmos where *Ṛta* is the inviolable cosmic order that must be respected by all beings, in the Daoist cosmos, the balance and harmony of *Yin* and *Yang* is the fundamental notion of harmony represented by a binary relationship where each continuously strive, and together they "perform a cosmic dance"[96] to develop all the matter that exists and also in the process create and maintain harmony. However, the notion of inviolability of a cosmic order surfaces rather in the interpretation of the *Dao* itself. It is in this sense, Daoist cosmos is different than Hindu cosmos as *Ṛta* (cosmic order) is separate from the forces of creation - the cosmic egg, embryo and the being (the Brahmand, Hiranyagarbha and the Prajapati). But in the Daoist cosmos the inviolability is rooted in *the way*, the Dao, the creator itself. Cooper notes that "[there is obligation]….in Taoism, [for] a natural co-operation with the harmony of the universe. The fundamental law and order of the Tao governs the whole cosmos, and to this man must conform if he is to fulfill his potential and play his part in maintaining cosmic harmony."[97] Also, as opposed to the strict deterrent suggestion of inviolability of *Ṛta,* the Dao is rather suggestive and takes into consideration the fallibility of

[96] Jean C. Cooper, *An Illustrated Introduction to Taoism: The Wisdom of the Sages* (Indiana: World Wisdom Inc., 2010) at 14.
[97] *Ibid.*

a man and suggests to attain and conform ""naturally", by instinct" to the *Dao* as it is the "man [who] chooses to maintain or destroy the balance"[98]

Again, when we superimpose the Hindu cosmological concept of *Ṛta* (cosmic order), and the duty (*dharma)* to maintain and protect it over the Daoist cosmological concept of harmony in *Yin & Yang* coupled with the cosmic order in the *Dao,* a picture of universe being in the state of harmony, bearing a cosmic order emerges and also the underlying importance of preserving it surfaces in the light of establishing cosmic environmentalism. The argumentation substantiates and hypothesis proves right in light of the two highly advanced eastern cosmologies, which are also known to be parallel to numerous modern scientific theories. I must now explore the notion of cosmic order in the western philosophies, particularly the cosmological theories.

1.4. Greek thinkers on cosmic order

Ionians are known to be the earliest group of Greek thinkers who are credited for the first scientific revolution, which started somewhere between 600 BC and 450 BC, and triggered a paradigm shift towards understanding the world or the universe 'rationally'.[99] Ionians were natural philosophers, for whom Gods still had an important place but Gods were not credited with natural phenomena. Ionians understood the world as cosmos - "a structure of matter and forces bound together by law-like connections into a harmonious whole."[100] The revolution triggered by Ionian philosophy lead to the development of the now popular notion of Greek *cosmos*. The Greek thinkers, generally, were predominantly obsessed with the idea of ordered, harmonious and beautiful cosmos and the Greek idea of order was not a single concept but

[98] *Ibid* at 16.
[99] Helge S. Kragh, *Conceptions of Cosmos – From Myths to the Accelerating Universe: A history of Cosmology* (Oxford: Oxford University Press, 2007) at 13. [Kragh]
[100] *Ibid.*

evolved and differed over the time,[101] resulting into plethora of philosophical ideas on cosmos. For example, the Stoic school of philosophy believed in a non-linear, cyclical universe where destruction followed formation, expansion followed contraction and this cyclical universe was a thermal phenomenon.[102] Stoics believed, that *pnuema* – the breath of life, prevailed throughout the cosmos and organized (ordered) humans and the cosmos. Similarly, Pythagoras (570 to 490 BC) also greatly influenced the idea of harmonic universe and though there is no evidence of his written ideas, his philosophical school and the Pythagoreans laid great stress on the mathematization of cosmology and thought of nature as mathematically organized.[103]

It is beyond the scope of this research to analyze each of such philosophical school or idea of cosmic order therefore, for practical purposes, I would restrain the discussion on Greek idea of cosmic order to mainly two, most important, thinkers, namely - Plato and Aristotle who indirectly influenced the most significant Newtonian clockwork universe. Both of their works are extremely complex and lengthy, thus, my attempt below is to present the crux of their notion of cosmic order, briefly.

1.4.1. Plato's *Timaeus* on Cosmic Order

Plato, (428 to 348 BC) a Greek philosopher, extensively wrote on the origin and nature of the cosmos in his latest and only cosmological work *Timaeus,* in which he elaborated his impression of an ordered and beautiful cosmos. In the first part of the *Timaeus*, the origin of the universe is explained and he proposes that a divine craftsman (Demiurge, a God or a Mind)[104] is responsible for bringing a mathematical order to a preexisting chaos of things. The Demiurge is merely following a plan (archetypical) and is bringing to order specifically four

[101] Ernan McMullin, "Cosmic Order in Plato and Aristotle" in ed. Paul G. Kuntz, *The Concept of Order* (Washington: Washington Press, 1968) at 63. [McMullin].
[102] Kragh, *supra* note 99 at 19.
[103] Hartley B. Alexander, "Plato's Conception of the Cosmos" (1918) 28:1 The Monist - Oxford Journals 1 at 2.
[104] Plato's reference to Demiurge varies, at paragraph 47E Demiurge is Mind and at 53B its God - in Francis Macdonald Cornford, *Plato's Cosmology: The "Timaeus" of Plato Translated with a Running Commentary* (London: Routledge & Kegan Paul, 1956) at 160 & 197. [Francis Macdonald]

elements – earth, water, air and fire, forming the body of the *cosmos*, which is a being – an intelligent creature containing "all intelligible living creatures".[105] Accordingly, Plato's universe was not by chance, but an intelligent design a "product of rational, purposive, and beneficent agency" crafted by the Demiurge with "deliberate intent of intellect (*nous*)".[106] However, for the purpose of discussion here, I would not discuss the debate on whether Demiurge meant god or pure reason and I would deflect from a theistic idea of the origin of the universe (if at all Plato meant God) but rather elaborate more on how Plato theorized the idea of cosmic order, that prevails in the universe. The notion of order was central to Plato's work and all throughout he was in search for intelligibility in things.[107]

Plato, categorized two kind of worlds – a world of form (objects of reason) and a world of sense (objects of sense or changing objects). The world of form, (Forms) which is outside the world of sense, he prescribes is "always the same, uncreated and indestructible"[108] while the world of sense is merely an image, of the Forms (commonly compared to how we see our image in a mirror) that are "created, always in motion, becoming in place and again vanishing out of place."[109] Plato starts his discussion with two central questions – firstly, how the natural objects, the objects of sense, have come to be or have existed as they are, secondly, he asks how these objects, once they have come to be, undergo change by themselves. He further inquiries and asserts that a kind of law or *order* has to govern such changes, in both instances of creation and of change which "subsequently discloses itself in the activity of the created objects."[110] However at the same time, in the second part of *Timaeus*, he acknowledges the fact

[105] Plato's *Timaeus* in *ibid* at 34 para 30B-C.
[106] Donald Zeyl, "Plato's *Timaeus*" in *The Stanford Encyclopedia of Philosophy,* winter 2014 edition by Edward N. Zalta (California: Metaphysics Research Lab, Stanford University, 2014) online: <https://plato.stanford.edu/entries/plato-timaeus/>
[107] See generally, Francis Macdonald, *supra* note 104 and McMullin, *supra* note 101.
[108] Plato's *Timaeus* in Francis Macdonald, *supra* note 104 at 192 para 51E.
[109] Plato's *Timaeus* in Francis Macdonald, *supra* note 104 at 192 para 52A.
[110] McMullin, *supra* note 101 at 64-65.

that the world is not entirely ordered and questions the source of disorder in the sensible world.[111]

Plato, goes a step further and questions, where do the objects of sense exist and what allows and brings the change in their form. To this and here, he answers or rather proposes a kind of space, he calls *receptacle*, where all the objects of sense exist, change and multiply - popularly known as the matrix of becoming or the mother. It is also this *receptacle* where, in this physical space, the Demiurge is crafting the universe and putting things into order, which are otherwise disordered and in doing so he gives a mind (intelligence) and *soul* (life principles) to these things. Plato prescribes that there is no mind without soul and soul is the "master and ruler of the body", so created.[112] It is the motions of the soul that control the orderly motion of in the entire universe and ensure that the world is a *cosmos*.[113] This implies a notion that objects of sense in the receptacle are inherently deflective and lack intelligibility.[114] Plato, thus, credits Demiurge as the father and *receptacle* as the mother, who together intelligently design the orderly cosmos.[115] Since, it was Demiurge's goal to create, as far as possible, a perfect world, however, according to Plato, *necessity* or a variable cause[116] is a factor at play inside and in the very nature of receptacle which somehow attempts to limit the perfection or complete orderliness in the world. Therefore, for Plato chaos or disorder is the necessity on which the Demiurge, the intelligence, works to produce an intelligent living creature, the cosmos, striving to achieve a cosmic order.[117]

From the above brief on Plato's cosmos and his notion of order as intelligibility, it is clear that the process of arriving at cosmic order was central to his creation of the cosmos and to the

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[111] *Ibid.*
[112] Thomas K. Johansen, "From Plato's *Timaeus* to Aristotle's *De caelo*: The Case of the Missing World Soul" in eds. Alan C. Bowen and Christian Wildberg, *New Perspectives on Aristotle's De caelo* (Leiden: Brill Publications, 2009) at 13. [Johansen]
[113] *Ibid,* referring *Timaeus* para 40a4 – b2.
[114] Francis Macdonald Cornford, *supra* note 104 at 177.
[115] Plato's Timaeus paragraph 50D in Francis Macdonald Cornford, *supra* note 104.
[116] Plato's Timaeus paragraph 47E in Francis Macdonald Cornford, *supra* note 104.
[117] McMullin, *supra* note 101 at 71.

nature of it. This cosmic order when viewed in the context of our broader discussion of maintaining the order and harmony with regards to developing a cosmocentric environmental ethic, or more generally setting the stage for cosmic environmentalism, it appears, that much like Eastern philosophies, a process of chaos to cosmos is always underway and the grand system (receptacle, the intelligence and the soul) is striving to achieve harmony and symmetry for an ordered cosmos.

Moving forward with our quest of cosmic order, is another Greek thinker, Aristotle. Plato's *Timaeus* greatly influenced Aristotle in developing his cosmological theory, and though, on various accounts he disagreed with Platonic understanding of the universe but nevertheless, Aristotle also elaborates on prevailing order and it is important that I briefly present the crux of his notion of it. Hence, now, I turn to attempt briefly the cosmological ideas as conceived by Aristotle.

1.4.2. Aristotle on Cosmic Order

Aristotle, (384-322 BC) is considered one of the most influential Greek philosopher, whose work has influenced philosophies over the centuries and is still keenly read as relevant and with "non-antiquarian interest".[118] He was a student at Plato's philosophical school and thus, naturally was influenced by many of Plato's philosophical ideas. However, given his scientific inclination or reasoning, he rejected and contrarily opined against many fundamental notions that were central to Plato's philosophical accounts.[119] There are about 200 or more accounted treatises by Aristotle, which are equally complex, elaborately detailed and extremely difficult to comprehend, specifically so for the purpose of this research on his idea of cosmic order. His accounts usually run into series of books and his ideas are haphazardly spread all over, and to

[118] Christopher Shields, "Aristotle" in *Stanford Encyclopedia of Philosophy* by Edward N. Zalta (California: Metaphysics Research Lab, Stanford University, 2016) online: < https://plato.stanford.edu/entries/aristotle/> [Christopher]
[119] See generally, Johansen, *supra* note 112.

analyze one particular notion, such as of cosmic order, in abstract, is extremely difficult and unjust. Therefore, having discussed Plato briefly, my attempt here is to first identify what Aristotle borrowed in understanding from Plato and how his philosophy differed from his predecessor and teacher, Plato and in doing so, I would embed Aristotle's cosmological ideas inherently.

As we discussed, Plato in his creation myth or philosophy describes world of form (Forms), world of sense (objects of sense), the Demiurge (intelligence), the receptacle (space embedded with necessity or disorder) and the soul as central concepts to produce an ordered cosmos. However, this is not the same for Aristotle because, *firstly*, he debunks the notion of Form existing outside of the world of sense and argues that the forms are vested within the beings or objects of sense themselves and argues that every object of sense or sensible being "is an instance of some particular form, and that this form is perfectly realized in that being."[120] Thereby, he vests the intelligibility of Forms within the sensible objects or beings and not perceives it as something outside of them. *Secondly*, now having merged Forms and sensible objects, Aristotle in his accounts does not mention a craftsman - a Demiurge, and he perceives, what he calls natures, as *pre-existing*. *Nature(s)*, according to him is an inner principle of change and being at rest, and these are basically sensible objects which have always been, or have existed, but are changeable. *Thirdly*, in addition to four Platonic elements (fire, air, earth and water), Aristotle adds *aether* – the matter of heavenly bodies. *Fourthly*, Aristotle also does not mention existence of soul, meaning thereby unlike Plato's cosmos where soul governs the orderly motion of the body of cosmos, for Aristotle soul is replaced with nature and "motion of each of the five bodies to their proper place is natural… that each moves towards that place in order to occupy it."[121] Accordingly, Aristotle then prescribes three kind of motions to each

[120] McMullin, *supra* note 101 at 71.
[121] Johansen, *supra* note 112 at 13.

of such bodies, depending on their nature, upward motion to fire and air, downward motion to earth and water and a circular or (around) motion to the *aether*.[122] In short, Aristotle rips apart the psychological cosmos of Plato where Demiurge and soul ordered things, and replaces it with nature of things and their motion.[123]

On the point of order, Helen S. Lang, in his interpretation of Aristotle, states that, for Aristotle, the Nature itself is the cause of prevailing order and this order is dependent and generated by two things – the *place* and the *inclination of element(s)*.[124] For Aristotle, the *place* is where the things are, meaning where they are situated spatially and without this place to exist, motion in things is impossible. The *inclination of elements* is the intrinsic nature of an element to be moved in certain way and in turn get ordered in a certain fashion, therefore it is the *place* and the *inclination of elements* that impart the cosmos its order.

To understand better, Lang, who best encapsulates and explains the relationship of the place and the inclination of elements, writes:

> "Place is the first limit of the containing body and renders the cosmos orderly in respect to direction; thus the cosmos exhibits "up," "down," "left," "right," "front," and "back" immediately and intrinsically in itself. Second, inclination constitutes the very nature of each element as an intrinsic source of being moved toward its proper place, e.g., up for fire and down for earth; consequently, elemental motion is never random or irregular because, in the absence of hindrance, each element cannot fail to be moved toward (and to rest in) its proper place."[125]

Therefore, it is not only the *place* which guides directionally the order, but also the intrinsic nature of elements themselves which moves or incline them in a certain way to get placed

[122] *Ibid* at 12 referring to Aristotle's *De caelo* para 268b26 – 269a6.
[123] *Ibid* at 13.
[124] Helen S. Lang, *The Order of Nature in Aristotle's Physics: Place and the Elements* (Cambridge: Cambridge University Press, 2007) at 265. [Lang]
[125] Lang, *supra* note 124 at 265.

orderly, and form the ordered cosmos. Disorder on the other hand, again is different for Aristotle when compared to Plato. In *Timaeus*, disorder (necessity) is defect of the matter or the lack of intelligibility rooted in the *receptacle*, but for Aristotle disorder is chance and spontaneity, a contextual embedded behaviour of the nature and also more importantly a stage prior to order, as for him to be natural is to be orderly.[126] Aristotle, in this way borrowed the notion of form and objects from Plato and merged it into a being or object governed at all times by nature and in opinion of many scholars paved the way towards establishing a mechanical universe, which later was mainstreamed by Newtonians.

Now, having discussed Aristotle's work on the origin and nature of the universe, it becomes clear that he viewed nature as the bearer and a mechanism of generating cosmic order which again, appears in sync with our broader discussion on perceiving universe as harmonious and an ordered natural system and concludes the very brief glance into the idea of Greek cosmos.

1.5. Conclusion

The above discussion (Section 1.1 to 1.4) elaborates, in my conscious attempt, numerous complex ideas, in a simplified way, that have evolved in different branches of knowledge, in different parts of the world and at different point in time. Now, having discussed the debate on nature of universe to be in a state of chaos or cosmos by elaborating on definitional aspects of the term *cosmos* and *chaos,* by indulging in, to some extent, the growingly accepted *chaos theory* and by analyzing the applicability of theory of *evolution* and *entropy* on universe, it becomes an apparent position that the grand natural system, that we call universe, is in fact in its grandiosity ordered and harmonious.

Furthermore, having discussed the concept of cosmic order as laid down in the Hindu cosmology, it appears that not only it is well elaborated but in fact, there exists a clear prescription of a duty (*Dharma*) not to violate it as well. In similar fashion, the discussion on

[126] See generally, Lang, *supra* note 124; McMullin, *supra* note 101 at 75.

the Daoist cosmology also surfaces the deeply embedded notion of harmony generated due to the binary of *Yin and Yang* and though this harmony is acceptedly violable by human kind, it must not be. Lastly, in the Greek cosmology, particularly as in the works of Plato and Aristotle, the concept of cosmic order has been thoroughly elaborated by both thinkers and though they arrive at the notion of cosmic order utilizing different teleological approaches, it is undeniable that cosmic order for both the thinkers held a crucial and inviolable position.

Therefore, it is conclusive from the discussion that the notion of *cosmic order* is ubiquitous and can substantially serve as groundwork for structuring cosmic environmentalism. In the following chapter, I would elaborate on the need to preserve this cosmic order by suggesting a paradigm shift from anthropocentrism to cosmocentrism.

CHAPTER 2 -

The Gaian Narrative in the epoch of Anthropocene:

A Corollary

"*Over most of history, threats have come from nature - disease, earthquakes, floods, and so forth. But the worst now come from us. We've entered a geological era called the Anthropocene.*"[127]

- Martin Rees

Introduction

This moment in the space age is quite akin to where the great human civilization, that we know today, once stood. The space age undisputedly began with the launch of the first ever manmade satellite, Sputnik 1, by the Soviet Union on October 4, 1957.[128] From then to now, humankind has largely ventured, only into *exploration* of outer space and we are about to enter a new period of space age, the space age of exploitation of *in situ* natural resources, terraforming of other planets and possibly even human settlement in outer space. While space exploration is viewed as a great accomplishment of humankind, credited to and for scientific advancements, but moving forward with the growing interest in the exploitation of space-based natural resources or even human settlement in outer space, there is little but one problem and perhaps we should pause here, in this moment, and reflect on what is about to happen. Are we experiencing *déjà vu*? Perhaps not yet, but soon.

As stated, this moment in space age is akin to our past, here on Earth, where land masses were claimed and appropriated, the race for resources led to colonization followed by industrial revolution, then by globalization and consequentially to the dreadful reality we live in today,

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[127] Martin Rees, "Address to the 25th Anniversary UKELA Conference 2013" (Speech delivered at the UKELA's Annual Conferece at Cambridge University celebrating 25th Anniversary, UK, 2013) online: <http://www.ukela.org/content/page/3939/e-law%20september%202013.pdf>

[128] See generally, Steven J. Dick, "Introduction" in ed. Steven J. Dick *Remembering Space Age* (Washington, DC: NASA, 2008).

in the epoch of *Anthropocene* where collective human actions have altered,[129] perhaps irreversibly, the ecology and the environment of the only known habitable planet, Earth.[130] Until recently, we have witnessed space race rooted in national prestige, scientific advancements, military and strategic advancements and even in international cooperation. However, within this decade a new space race has been triggered, a race towards space-based natural resources and reason for which can be accounted wholly or at least partly to the United States of America's new legislation which entitles private companies to commercial rights in extracted space-based resources.[131]

In my view, even if speculative, this race for space-based resources could eventually unfold and repeat our Earthly environmental history and lay it out in front of our eyes once again, now in the domain of outer space, only to regret and take retrospective corrective measures for the (catastrophic) damage it could possibly bring. Therefore, it is my attempt in this chapter to revisit the Earthly narrative of *how we got to now* and paradigmatically *what could have avoided* the evidently crept in, developmental and environmental, tragedy we suffer on Earth today. In addressing these questions, I would, where necessary, draw a corollary to *where are we headed,* in terms of the new domain of outer space and the need for a paradigm shift in growing exploration and exploitation of outer space.

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[129] The term *Anthropocene* was first mooted by atmospheric chemist and Nobel Prize winner Paul Crutzen and refers to a geological timescale, an epoch next to Holocene, where human beings have collectively become a geological force, a force of nature, in themselves, in turn altering the ecology and environment. See generally, Paul J. Crutzen, "The Anthropocene" in eds Eckart Ehlers & Thomas Krafft, *Earth System Science in the Anthropocene* (Berlin: Springer-Verlag Berlin Heidelberg, 2006). [Crutzen]; Clive Hamilton, Christophe Bonneuil & Francois Gemenne, eds., *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in A New Epoch* (Oxon: Routledge, 2015). [Clive et al].

[130] IPCC Core Writing Team, *Climate Change 2014: Synthesis Report - Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,* ed by R.K. Pachauri & L.A. Meyer (Geneva: IPCC, 2015) at 17. In Summary for Policy Makers states - "Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and ***irreversible impacts*** for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks." [emphasized].

[131] *U.S. Commercial Space Launch Competitiveness Act* (H.R. 2262), online: <https://www.congress.gov/bill/114th-congress/house-bill/2262/text>. [US CSLCA]

This entails a discussion also on the ethics of our development and on how we have perceived nature (on Earth) as something external to humanity and as something only to be exploited to serve anthropocentric ends. The much-needed paradigm shift from anthropocentrism to eco-centrism, and in view of our broader discussion on cosmic environmentalism, to cosmocentrism, would be elaborated upon while giving special consideration to the Gaia hypothesis which prescribes, scientifically, that the Earth is a living organism or a natural system regulating complex processes to maintain a habitable environment or say, a natural order, and in this way connecting the discussion to Chapter 1 and leading the discussion to Chapter 3 on theorization of cosmocentric space environmental law.

2.1. *How we got to now – Holocene to Anthropocene*

The Holocene marks the end of Pleistocene – the ice-age, and the beginning of a geological epoch that began approximately 10 to 12 thousand years ago and ended in latter half of 20th century, as declared recently in the year 2016.[132] At the onset of Holocene, it took about 2000 years to stabilize the global temperature and for the longest time after this, the global temperature and climate was persistent until recently human actions triggered the global climate-change measurably.[133]

The Anthropocene on the other hand refers to the geological epoch where human activity has had a significant impact on the environment at a global scale and human kind is viewed as a (geophysical) force of nature with the ability to alter the natural system globally. The International Commission on Stratigraphy formed an Anthropocene Working Group to enquire on the existence and beginning of anthropocene epoch and it recently declared the beginning of the Anthropocene epoch and dated its commencement approximately in the latter half of 20th

[132] Crutzen, *supra* note 129 at 13.
[133] Clive Hamilton, Chritophe Bonneuil and Francois Gemenne, "Thinking Anthropocene" in eds. Clive et all, *supra* note 129 at 1.

century.[134] However, in view of some of the most qualified scholars who popularized and advocated the existence of Anthropocene, taking a more holistic approach, propose the commencement to be somewhere in the latter half of the 18th century, "when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane".[135]

In retrospect, what specifically has led to the now prevailing climate change and environmental degradation is an interesting journey from the time of some of the very first bench marks of human evolution, such as the making of first stone tools, to the present of a highly complex urban civilization with modern technology. To make a historical enquiry into each of such development is far too lengthy for the scope of this research, and therefore I would discuss the major benchmarks and admittedly draw heavily from the writings of particularly, two nature scientists, Dr. Will Steffen and Nobel Laureate Dr. Paul C. Crutzen (and their colleagues), who while mainstreaming studies on anthropocene have exhaustively traced each of such important events of the past.[136]

2.1.1. Stone, Fire & Agriculture

At the earliest stage, perhaps in the ice-age, the *homo erectus*[137] lacked the ability to bring any change to the chemical composition of the atmosphere on a local, regional or a global scale. The story of first human force can be traced to a stage when humankind gained the ability to make tools and weapons out of stone to kill animals, followed by a "crucial breakthrough" to

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[134] University of Leicester, Press Release, "Media note: Anthropocene Working Group (AWG)" (29 Aug 2016), online: <http://www2.le.ac.uk/offices/press/press-releases/2016/august/media-note-anthropocene-working-group-awg>

[135] Crutzen, *supra* note 129 at 16; Paul J. Crutzen, "Geology of Mankind" (2002) 415 Nature 23 at 23. [Paul Crutzen]

[136] For a more detailed study on anthropogenic changes to the environment, see generally, William L. Thomas, ed., *Man's Role in Changing the Face of the Earth* (Chicago: University of Chicago Press, 1956).

[137] "Homo Erectus: an extinct large-brained hominid of the genus Homo (H. erectus) that is known from fossil remains in Africa, Europe, and Asia, is estimated to have flourished from 1.6 million years ago to 250,000 years ago, is thought to be the first hominid to master fire and inhabit caves, and is believed to be the immediate ancestor of modern man" *Merriam-Webster*, Merriam-Webster.com, *sub verbo* "homo erectus", online: <https://www.merriam-webster.com/dictionary/Homo%20erectus>

generate and manipulate fire.[138] This achievement led human kind to be a dominant species which could hunt with stone weapons and scare the animals with fire and be a survivor in otherwise harsh & wild realities. Some evolution scientists even note that in consequence to these achievements was the development of brain owing to protein rich diets that the hunter humans could now fetch, which could have led to the development of speech.[139]

With the passage of time and human evolution, human kind began to cultivate lands and this for the first time ever triggered man-made deforestation, where forests were cleared for agriculture purposes, however only manually or with the help of animals. Steffen et al. state that, particularly two agricultural events had significant impact on the atmosphere, first, "the clearing of forests and conversion of land to cropping about 8000 years ago and [second] the development of irrigated rice cultivation about 5000 years ago— [both of which] emitted enough CO_2 and methane (CH_4) (CH_4), respectively, to the atmosphere to prevent the initiation of the next ice age."[140] Though these developments did contribute towards today's environmental challenges, but in the field of nature science such developments are disputed and doubted as the start of Anthropocene.[141]

2.1.2. Industrial Revolution & the Steam Engine

The beginning of Anthropocene, as argued by Dr. Crutzen, is the advent of the Industrial Revolution and it also "coincides with James Watt's invention of the steam engine in 1782".[142] The industrial revolution began in the Great Britain sometime around 1700s and the then human society witnessed a major transformation, from an agrarian dominant society to an industry dominant society. Steffen et al. state that industrial revolution, in view of environment,

[138] Will Steffen, Jacques Grinevald, Paul Crutzen & John McNeill, "The Anthropocene: conceptual and historical perspectives" (2011) 369 Philosophical Transactions of The Royal Society A 842 at 846 [Steffen et al] citing Pyne, *World fire: the culture of fire on Earth* (Seattle, WA: University of Washington Press, 1997).
[139] *Ibid.*
[140] Steffen et al, *ibid* at 847.
[141] *Ibid.*
[142] Crutzen, *supra* note 129 at 16.

can be perceived as one of the most significant yardstick in all of human history, which transformed social, political and economic structures of the society for the longest time. Particularly, crucial and rather more significant "feature" of this time was the growing need for energy, which could not be met with the then conventional sources and due to this, almost as if, the industrial boom was facing a "bottleneck".[143]

This hurdle in the full-scale realization of the potential of industrial revolution was solved with the discovery and exploitation of the fossil fuels which were abundant and soon became easily accessible, leading to an exponential rise in the consumption of energy by human kind.[144] Additionally, the invention of steam engine enabled mechanical automation for manual work increasing the efficiency and also paving way for, inventions and many new activities.[145]As the availability of energy rose, so did its consumption with significantly growing human population. Human activities and related development witnessed an all-time high and consequentially a "rapid increase in the conversion of natural ecosystems, primarily forests, into cropland and grazing areas owing to mechanized clearing technologies".[146] Thereby, activities in the early period of industrial revolution had a significant environmental impact and the rise in the greenhouse gases, or the carbon footprint, was highest for the first-time in centuries.[147]

In the latter half of industrial revolution, in the 1800 AD, due to the mechanized land clearing systems, industry centric civilizations and concentrated city-like urban settlements, there was a significant improvement in life expectancy due to increased food supply, improved health sciences, sanitation and capability to purify industrially polluted water from water-borne

[143] Steffen et al, *supra* note 138 at 848.
[144] *Ibid.* "Human energy use rose sharply. In general, those industrial societies used four or five times as much energy as their agrarian predecessors, who in turn used three or four times as much as our hunting and gathering forebears".
[145] Steffen, Crutzen & McNeill, "The Anthropocene: Are humans Now Overwhelming the Great Forces of Nature?" (2007) 36:8 Ambio by Royal Swedish Academy of Sciences 614 at 616. [McNeill et al]
[146] *Ibid* at 848.
[147] Will Steffen et al, "The Anthropocene: From Global Change to Planetary Stewardship" (2011) 40:7 Ambio by Royal Swedish Academy of Sciences 739 at 741. [Will et al]

diseases.[148] As life expectancy improved, the population was growing multifold and so did the need for resources only to be met with rapid and unrestrained consumption of fossil fuels.

2.1.3. The Great Acceleration

In the 20th century, by the time World War I and World War II concluded, human actions had already dented the environment considerably and "clearly discernible beyond" the pristine of Holocene.[149] Nature scientists and environmental historians mark the phase from 1945 to 2000 and beyond as the *Great Acceleration*.[150] The great acceleration refers to the time period starting in 1945 and is proposed by many to be continuing till today and is considered the one of the most suitable marker for the beginning or maturity of the current epoch of Anthropocene.[151] In this duration, human activities are witnessed to be at an all-time high and gradually, what once were local activities, have now become global activities and the whole humanity, collectively seems to be working in a pattern which is degrading the environment or the Earth systems at an exponential rate.[152] Dr. Crutzen notes that within a short span and only in few generations, we are "exhausting the fossil fuels that were generated over several hundred million years, resulting in large emissions of air pollutants"[153]destabilizing the Earth systems and our consumption of fossil fuels today is "300,000 times the rate it accumulates."[154]

In fact, in year 2009 a group of nature scientists worked on a framework of planetary boundaries and proposed that if human induced environmental degradation passes identified tipping points or the planetary boundaries, it would alter the Earth system irreversibly and bring an abrupt adverse planetary change. They identified nine Earth systems with tipping points or

[148] M. Scheffer, S.R. Carpenter, J.A. Foley, C. Folke, & B.H. Walker, "Catastrophic Shifts in Ecosystems" (2001) 413 Nature 591 at 593. [Scheffer]
[149] Steffen et al, *supra* note 138 at 849.
[150] Will Steffen et al, "The Trajectory of the Anthropocene: The Great Acceleration" (2015) 2:1 The Anthropocene Review 81 at 81. [Will et al.]
[151] Steffen et al, *supra* note 138 at 847; McNeill et al, *supra* note 145 at 617; Crutzen, *supra* note 129 at 16.
[152] Refer Figure I in Will et al., *supra* note 150 at 84.
[153] Crutzen, *supra* note 129 at 14.
[154] Jonathan Williams & Paul J Crutzen, "Perspectives on our planet in the Anthropocene" (2013) 10 Environ Chem 269 at 273.

planetary boundaries, of which three in particularly – the climate change, biodiversity loss and biogeochemical flows, appear to have crossed the tipping points and others are in imminent danger of being crossed.[155]

Thus, the great acceleration can be viewed as a period where the human force is witnessed to be most brutal towards nature, as one can not only witness the damage it is doing to the nature, but more importantly in this period we can witness the change in nature ethics at social, cultural and political level. This was or is the time where race to exploit resources has known no boundaries and anthropocentrism has completely taken over whatever little ecological or environmental ethics existed in the past, and as McNeill et al put it:

> "The Great Acceleration took place in an *intellectual, cultural, political, and legal context* in which the growing impacts upon the Earth System counted for very little in the calculations and decisions made in the world's ministries, boardrooms, laboratories, farmhouses, village huts, and, for that matter, bedrooms. This context was not new, but it too was a necessary condition for the Great Acceleration."[156] [emphasized]

Thus, the Great Acceleration was not only affecting the Earth system, but it can be viewed rather as a paradigm shift operating at political, social, cultural, intellectual and even personal level. Within two centuries, 1800 to 2000 AD, faster in the period of great acceleration, the world population increased from one billion to six billion, consequentially, increasing the use of energy by 40 times and economic production by 50 times.[157] Until as recently till the 2001,[158] scientists being overly cautious and lacking confidence, did not declare or could not

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[155] See generally, J Rockström Will Steffen et al., "A Safe Operating Space for Humanity" (2009) 461:7263 Nature 472; Late this work was revised in 2015 by Will Steffen, J Rockström et al. "Planetary boundaries: Guiding Human Development on a Changing Planet" (2015) 347:6223 Science 736. [Rockström et al]

[156] McNeill et al, *supra* note 145 at 618.

[157] Steffen et al, *supra* note 138 at 848 citing J.R. McNeill, *Something New Under the Sun: An Environmental History of The Twentieth Century World* (London, UK: W.W. Norton, 2000).

[158] It was first widely accepted in the third assessment report of the Intergovernmental Panel on Climate Change in 2001 that Earth's surface is warming and is likely result of anthropogenic green-house gases. - J. T. Houghton et al, eds., *Climate change 2001: the scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, Cambridge University Press, 2001).

mainstream that there was an alarming situation of global warming and that it was indeed human induced, in spite of clear evidence revealing rise in carbon dioxide levels, from 311 ppm in 1950 to 369 ppm in year 2000.[159]

The beginning of 21st century led to the rise of environmental consciousness due to compelling scientific evidences that were surfacing from everywhere around the globe and also due to the localization of severe environmental degradation reflecting a global pattern. Post year 2000, the fact that humans influence the Earth system at global scale and have been doing so roughly since past two centuries acted as a bubble burst and across planet, an environmental consciousness surfaced due to fast means of communication through information communication and technology.

However, the paradigm shift and the internalization which has happened during the Great Acceleration continues to dominate the popular narrative and there is a clear disconnect between what we know and what we do, or what Crutzen and Steffen call "business-as-usual" approach and note:

> "The institutions and economic system that have driven the Great Acceleration continue to dominate human affairs. This approach is based on several assumptions. First, global change will not be severe or rapid enough to cause major disruptions to the global economic system or to other important aspects of societies, such as human health. Second, the existing market-oriented economic system can deal autonomously with any adaptations that are required. This assumption is based on the fact that as societies have become wealthier, they have dealt effectively with some local and regional pollution problems."[160]

This raises a more philosophical and ethical question with regard to the developmental approach that the human kind has subscribed to - an *anthropocentric* approach which places

[159] Steffen et al, *supra* note 138 at 852.
[160] McNeill et al, *supra* note 145 at 619.

itself at a dominant position and views nature as something only to be exploited and to serve anthropocentric ends. This approach or rather the internalization of this behaviour in humankind is more or less a result of the Great Acceleration which although has allowed unrestrained development of human kind but has severely depleted the habitable conditions of the home planet Earth, perhaps irreversibly or if at all repairable, only in a long-long time to come.

It is for us now, as humanity, to contemplate our actions and retrospect on what could have avoided the reckless brutal damage that we, as the only intelligent and supposedly supreme species, have brought upon the Gaia – the mother Earth. In this way, we should also learn from the mistakes and as in my attempt here, see the very obvious analogy of outer space entering into the early phase of exploitation. Other than the already alarming situation with regard to orbital sustainability, what could the internalized anthropocentric human behaviour entail in outer space cannot be predicted as yet, but the appeal here is for the shift in the value system, the perception of nature and the perception of cosmos as a natural system with a cosmic order. In the next section, I discuss this need for paradigm shift in detail, reflecting on why is ecocentrism or cosmocentrism quintessential for future of human space ventures and how viewing the Earth as a natural system or organism, helps shifts humanity's focus in tune to the same.

2.2. What could have avoided it – the Paradigm Shift

As discussed, the transition of humanity from Holocene to Anthropocene has been rapid and even within the Anthropocene epoch, we are transiting towards tipping points of our Earth system faster than ever. If we compare on a time scale basis, the humanity has brought upon itself significant irreversible environmental damages only in the last 70 years, whereas in the past the humanity has existed for thousands of years with a stable Earth system.

The Anthropocene and the environmental degradation are only symptoms and the root cause of which is the anthropocentric world view where humans consider themselves as the master of the nature.[161] In order to survive as species and sustain the habitability of our fragile planet we need not only corrective measures for the previous wrongs, but also a paradigm shift, a change in our value system which does not treat nature as "to be used" or external but nature as "itself", and views human-nature relation as a symbiotic relationship. Thereby, the following discussion argues a case against anthropocentrism and advocates adopting a new value system of ecocentrism by understanding nature as a superorganism in which humanity is only a miniscule part. Towards the end of discussion, bringing the focus to space, I advocate a leap forward to theorizing cosmocentrism which could protect us from repeating our Earthly mistakes in outer space.

2.2.1. Abandoning Anthropocentrism – *Changing the Weltanschauung*

Scholars have long argued that the origins of anthropocentric thoughts lie in the post-Enlightenment era where the worldview changed swiftly - materialism took over, a line between humanity and nature was drawn and thus, humans placed themselves at the apex and the center of a mechanical nature.[162] Some even suggest that it was the scientific revolution, predominantly starting with the Newton, that turned long prescribed intrinsically valued nature to a mathematically derivable, mechanical nature, soon aggravated by Darwinism which evaluated human species to be a supreme and a most evolved form of life.[163]

Over the time, anthropocentrism has become central and today, it dominates almost everything in the world - the ethics, culture, economy, politics and even the moral status of self

[161] Francesca Ferrando, "The Party of the Anthropocene: Post-humanism, Environmentalism and the Post-anthropocentric…" in eds., Serenella Iovino & Roberto Marchesini et al., *Relations Beyond Anthropocentrism* (Italy: LED Edizioni Universitarie, 2016) at 159.
[162] Ronald E. Purser, "Limits to Anthropocentrism: Toward and Ecocentric Organization Paradigm?" (1995) 20:4 Academy of Management Review 1053 at 1055. [Purser]
[163] Jonathan Goldhirsch, "Has Anthropocentrism Ruined Our Planet" (2016) Environmental Science and Technology, online: < https://macaulay.cuny.edu/eportfolios/est2016/2016/09/11/has-anthropocentrism-ruined-our-planet/>

and the others.[164] Anthropocentrism, accordingly prescribes that the non-human world has no value of its own and only value ever assigned to it, is through human agency and for serving human interests.[165]Anthropocentrism, for example, would mean that a non-human form is important for humans only to an extent that they serve or benefit anthropocentric ends. Katherine & Colleen give an example, that in an anthropocentric ethic, it would be wrong to cut down a forest because it contains herbs that could cure some diseases, while in contrast, in an ecocentric ethic, cutting down a forest would be wrong because the trees or the nature hold an intrinsic value of their own and cutting them down may result into extinction of plants and may affect the habitat of animal species and so forth.[166]

The sheer disregard for placing an intrinsic value in nature, is what is central to anthropocentrism and in a nutshell, is all that is wrong with it. While one cannot blame the entire human history or human footprint on Earth for anthropocene, however a strong case can be made out against humanity that has lived in the 20th and the 21st century, which has had full scientific knowledge of the wrath that it has been inflicting onto the environment. As part of a solution, we need to "engineer a transition from the current, nearly universal human mindset… to a new operating paradigm where we recognize our utter dependence on healthy ecosystems and make their nurture central to our culture".[167]

It is often advanced by advocates of anthropocentrism that the humanity looks out for itself and in a long-term view (of anthropocentrism) or perhaps in a purer form of anthropocentrism, humans would always act in due regard of the nature, because it serves their long-term interests.

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[164] Rob Boddice, "Introduction: The End of Anthropocentrism" in Rob Boddice, ed, *Anthropocentrism: humans, animals, environments* (Leiden: Brill, 2011) at 1.

[165] Kate McShane, "Anthropocentrism vs. Nonanthropocentrism: Why Should We Care?" (2007) 16:2 Environmental Values 169 at 170. [Kate]

[166] Katherine V. Kortenkamp & Colleen F. Moore, "Ecocentrism and Anthropocentrism: Moral Reasoning About Ecological Commons Dilemmas" (2001) 21 J Env Phil 261 at 262. [Kortenkamp & Moore]

[167] Bob Douglas, "Transforming Human Society from Anthropocentrism to Ecocentrism: Can We Make It Happen in Time?" in eds., Colin D. Butler, Jane Dixon & Anthony G. Capon, *Health of People, Places and Planet: Reflections based on Tony McMichaels's Four Decades of Contribution to Epidemiological Understanding* (Australia: ANU Press, 2015) at 609. [Bob]

This perspective has been advanced by Bryan Norton as *convergence hypothesis,* where he suggests that if anthropocentrism is reasonably interpreted and acted through policies, it would advocate the same environmental policies as a nonanthropocentric ethic would.[168] However, scholars have widely rebutted the convergence hypothesis on several grounds, and I largely agree on these rebuttals for following reasons.

First, human beings acting in the premise of anthropocentric ethics, have evidently not, perhaps ever, acted from a long-term point of view and have always acted in a very short sighted manner and have chosen immediate benefits over considering long term sustainability. Second, as argued by Alexander Lautensach, in an anthropocentric ethic, viewing non-human agencies only for utility they serve to human kind, is deep rooted in "ignorance of the totality of the network of ecological interdependencies within which our species has evolved".[169] Lastly, as Kataie McShane argues, human species tends to act based on feelings, in a nutshell she argues that prescribing no intrinsic value to the nature changes our behaviour since feelings are inadvertently a source of value system. In an anthropocentric ethic, there is no intrinsic moral value prescribed to the nature, and thus, accordingly in deep sense it greatly affects our overall behaviour towards it.[170] Therefore, among many other reasons, these rationales call for abandonment of the anthropocentric *weltanschauung,* the world view, which can be held solely responsible for the prevailing global environmental crisis.

In my view, till the time we are guided by anthropocentrism in our actions, it is highly unlikely for us to truly co-exist with nature and now is the time as good as any to start bringing this paradigm shift by abandoning anthropocentrism in terms of world view, and by taking a small step forward by understanding the relationship of nature and humans as interdependent

[168] Bryan G Norton, *Searching for Sustainability: Interdisciplinary Essays in the Philosophy of Conservation Biology* (Cambridge: Cambridge University Press, 2004) at 11.
[169] Alexander K. Lautensach, "The Ethical Bases for Sustainable Human Security: A Place for Anthropocentrism?" (2009) 6 Bioethical Inquiry 437 at 444.
[170] See generally, Kate, *supra* note 165 at 175.

and symbiotic, for which reliance can be placed on deep ecology and the Gaia hypothesis, which consider nature or the Earth as a deeply interconnected superorganism regulating complex processes to maintain a habitable environment.

2.2.2. Adopting Ecocentrism, Deep Ecology and the Gaia Hypothesis – *A Small step for Humans*

Ecocentrism, in contrast to anthropocentrism, places intrinsic value in the nature and accordingly assigns moral consideration to it, giving nature a "value aside from its usefulness to humans."[171] For those who advocate ecocentrism staunchly oppose the dominant world view guided by anthropocentrism and blame it as the root cause of prevailing environmental crisis.[172] Having argued a case against anthropocentrism – the root cause of - anthropocene and the growing environmental degradation, it is high time that the human kind adopts a nature-centric world view and does not assume its moral superiority or dominant position, as anthropocentrism is clearly pushing humanity and the planet Earth towards the brink of apocalypse.

Anthony McMichael in his book *Planetary Overload*, advocating a ecocentric world view stated that "humans are newcomers to our planet with no special immunity against the usual fate of biological species on Earth; namely extinctions."[173] It is a known scientific fact that civilizations in the past have been wiped out due to causes rooted in forces of nature, however this time around, particularly since the Great Acceleration, human beings are the strongest and biggest force, prophesying and writing their own fate of extinction.

Perhaps again rooted in anthropocentrism there clearly is a deep disconnect between what humanity knows and how it behaves. The crossing of planetary boundaries as scientifically

[171] Kortenkamp & Moore, *supra* note 166 at 262.
[172] Purser, *supra* note 162 at 1069.
[173] Anthony J. McMichael, *Planetary Overload: Global Environmental Change and the Health of the Human Species* (Cambridge: Cambridge University Press, 1995) as quoted in Bob, *supra* note 167.

chalked out by Rockström & Steffen et al.,[174] is a matter of fact and yet there largely appears a strong global denial of the adverse human impact on the Earth systems. In what way then can we answer this disconnect and raise an environmental consciousness, which does not view nature-as-object but subscribes to nature-as-self ideology, remains the question and answer lies in ecocentrism.

As has been argued previously there is a need for paradigm shift but in what way can the humanity truly understand of what has went wrong with the anthropocentric understanding and why a paradigm shift to ecocentrism is must, can be argued in two ways – Deep Ecology and the Gaia hypothesis.

i. Deep ecology

Deep ecology is a philosophical approach towards understanding human-nature relationship, it seeks a "new metaphysics, epistemology, cosmology and environmental ethics of person [and] planet"[175] Deep ecology, being an ecocentric paradigm focuses on human and nature relationship and considers humankind as only a part of a giant natural system without hierarchical order, without placing humans at the top or outside of nature.[176] The deep ecology paradigm challenges the dominant social paradigm of modern society, namely anthropocentrism and is not new to humanity as scholars agree that deep ecology was instilled in the early Eastern philosophies and in the ethics of certain minority traditions and aboriginals of the west.[177]

Many scholars and philosophers writing on Deep Ecology since the 1950s have staunchly critiqued the dominant social paradigm of anthropocentrism as a futile and a detrimental societal set up and among many others, Aldo Leopold, George Sessions and Arne Naess's

[174] Rockström et al, *supra* note 155
[175] Bill Devall, "The Deep Ecology Movement" (1980) 20 Natural Resources Journal 299 at 299. [Devall]
[176] *Ibid.*
[177] *Ibid* at 304-306.

writings are considered seminal in the field of deep ecology. Initiating an argument from deep ecological perspective, Aldo Leopold, who is called the father of environmental ethics, writes that, in order to change the dominant social paradigm we must "think like a mountain"[178] as for him land was not a dead or inert object to be exploited at the whims of human-kind, as he recognized the land as a living organism, as a source and part of a giant biotic community.[179] Leopold advocated land ethics and described that " [it] simply enlarges the boundaries of community to include soils, plants, and animals, or collectively: the land"[180] and for him "[this] changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such."[181]

Leopold triggered a transformation of nature ethics by arguing against the mechanist approaches towards nature, and embedded a sense of deep interconnectedness in the ecology, a sense of rather a community of wholeness, where living and non-livings are placed at equal footing. He further argued that the next evolution in the ethics of humankind would involve the relation and ethics of humankind with land,[182] and today, this is increasingly becoming necessary in the epoch Anthropocene.

Arne Naess advocates *biological equalitarianism,* which again takes an ecocentric approach, where human kind is an integral part of the nature and not over or apart from it.[183] In his understanding the shallow ecology movement is currently a powerful movement which is reflected in the present ecologically responsible policies where objective is to only "fight against pollution and resource depletion" with target being "the health and affluence of people

[178] Term "Think Like a Mountain" was popularized by Aldo Leopold in his book A Sand County Almanac, 1949.
[179] Purser, *supra* note 162 at 1072.
[180] Aldo Leopold, *A Sand County Almanac: And Sketches Here and There* (New York: Oxford University Press, 1968) at 239. [Aldo]
[181] *Ibid.*
[182] Purser, *supra* note 162 at 1072.
[183] Arne Naess, "The Shallow and The Deep, Long-Range Ecology Movement" (1973) 16 Inquiry 95 at 100. [Naess]

in the developed countries."[184] However, he notes that there are deeper concerns in the ecology and the current paradigm is not addressing any of these concerns. He identifies seven such areas where these deeper concerns exist and vests them in the deep ecology movement, and argues, *inter alia*, for an intrinsic relationship of humankind and nature which exists in a "relational, total field model" and explains this relationship as an interdependency where one is not the same without the other. Then he prescribes a biospherical egalitarianism, where all life is respected and this value must be instilled in each of us as we receive "deep pleasure and satisfaction" from "close partnership with other life forms."[185]

Therefore, deep ecology philosophy can be viewed as raising of an ecological consciousness in the humans, where humankind perceives the non-human forms, living or non-living, as part of a biotic community with feedback mechanisms and an interdependent relationship between all that is involved, or as simply put by Aldo Leopold, treating nature as *community* and not *commodity.*[186] In this way we can trigger a paradigm shift.

ii. The Gaia Hypothesis

The Gaia hypothesis was scientifically formulated in 1970s by Dr. James Lovelock, a NASA scientist who while working on detecting life on Mars, eventually ended up theorizing the Gaia hypothesis and later scientifically proved and improved it in the next two decades.[187] The name "Gaia" is rooted in the Greek mythology which personifies and refers to the planet Earth. The hypothesis prescribes that our planet Earth is a giant organism or a superorganism self-regulating complex processes to maintain a habitable environment or life sustainable environment. According to Gaia hypothesis, Earth is understood as a living organism, where

[184] *Ibid* at 95.
[185] See generally, Naess, *supra* note 183.
[186] Naess, *supra* note 183.
[187] Toby Tyrrell, *On Gaia: A Critical Investigation of The Relationship between Life and Earth* (Princeton: Princeton University Press, 2013) at 4.

like other living organisms, its chemistry and temperature are self-regulated and are maintained at a state favorable to life, that the Earth sustains.[188]

In Lovelock's words:

> "[Gaia is] a complex entity involving the Earth's biosphere, atmosphere, oceans, and soil; the totality constituting a feedback or cybernetic system which seeks an optimal physical and chemical environment for life on this planet."[189]

In other words, the hypothesis suggests that all the biomass (all living organisms on Earth) act in a way that they self-regulate the physical environment of the Earth, particularly temperature and chemistry of the atmosphere and in doing so they make planet more hospitable to all that constitutes life on Earth.[190] Accordingly, the Gaia hypothesis is a representation of interactions between the biota (all forms of life), the oceans, the geosphere and the atmosphere and which when viewed in totality or wholeness, reflects a self-regulating, life-like organism - planet Earth which responds to changes in time to sustain the habitability of life.

While environmentalists welcomed such a hypothesis, the scientific community however attacked and criticized the Gaia hypothesis on various accounts, even the teleological style of writing that Lovelock had adopted in his first few writings on the Gaia. Scientific community came down heavily particularly on the point that living organisms were in anyway involved as and in a feedback or cybernetic system (self-regulating system), if at all they are, scientists questioned the mechanisms of the same.[191] There were major disagreements with many of the scientific propositions that Lovelock had made in the Gaia hypothesis, rather loosely. However, in response to such criticism Lovelock along with Watson developed a mathematical model,

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[188] James Lovelock, *Gaia, the Practical Science of Planetary Medicine* (London: Oxford University Press, 2000).
[189] James Lovelock, *Gaia: A New Look At Life on Earth* (Oxford: Oxford University Press, 2000) at 10. [Lovelock]
[190] *Ibid.*
[191] "Gaia Hypothesis", *Environment and Ecology*, online: <http://environment-ecology.com/gaia/70-gaia-hypothesis.html#cite_note-Lovelock01-0>

popularly known as the *Daisyworld Stimulation* and demonstrated successfully that feedback mechanisms can evolve from the actions or activities of self-interested organisms.[192]

Since the time the Gaia Hypothesis was proposed, it has evolved significantly and Lovelock has worked over two decades to respond to all the criticism and doubts surrounding the theory. Today, the hypothesis has gained significant scientific support and is considered as "potentially viable, testable scientific hypothesis or theory."[193] In fact, in the Amsterdam Declaration on Global Change, work of four international research organizations - the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP) and the International Biodiversity Programme DIVERSITAS was condensed in a document and the declaration asserts:

> "Research carried out over the past decade under the auspices of the four programmes to address these concerns has shown that: The Earth System behaves as a single, self-regulating system comprised of physical, chemical, biological and human components."[194]

The conference which drafted the Amsterdam Declaration comprised of noted scientists and research organizations and the language of the declaration, particularly the portion quoted above, seems to have been heavily influenced by the work of Lovelock, reflecting a growing acceptance of Gaia hypothesis in the scientific community. Lovelock, having emerged scientifically right, in year 2006, responding to growing concern with regard to environmental degradation published a new book, *The Revenge of Gaia* where he condemns the

[192]A J Watson & James Lovelock "Biological Homeostasis of the Global Environment: The Parable of Daisyworld" (1983) 35B Tellus 286 at 286.
[193] Karnani & Annila, "Gaia Again" (2009) 95:1 Biosystems 82 at 86-87.
[194] Challenges of a Changing Earth: Global Change Open Science Conference, "The Amsterdam Declaration on Global Change" online: < http://www.colorado.edu/AmStudies/lewis/ecology/gaiadeclar.pdf>

anthropocentric actions which have significantly damaged the Gaia's cybernetic system and believes that we have crossed planetary boundaries and it is now too late to repair.[195]

While with deep ecology, the foundation and suggestions of paradigm shift to ecocentrism lie in philosophy and environmental ethics, in contrary the case with Gaia hypothesis is dominantly scientific with tenable proofs which suggest that the Earth is a giant living organism with interdependent self-regulatory mechanisms. If we understand the nature a web of cybernetics system, then our role in the ecology not only is humbled but it also appends a sense of responsibility.

Therefore, in my view, adoption of ecocentrism and abandoning anthropocentrism can be sufficiently aided with a more rigorous philosophical foundation provided by deep ecology and supplemented by growing scientific facts discovering the truth in deep ecology, like the Gaia hypothesis. Now while, Gaia hypothesis and deep ecology are largely conceived geocentrically, that is with respect to Earth, in view of human ambitions in outer space, I propose a giant leap for mankind to cosmocentrism, which places the universe at the center of dominant worldview, as is discussed below.

2.2.3. Cosmocentrism – *A Giant Leap for Mankind*

Each day we are getting a little closer towards realizing space activities such as terraforming, human settlement in outer space and space resource mining and it is about time we think of space ethics in terms of space environment. Cosmocentrism or cosmocentric ethics places the universe at the center of our dominant world view and treats the whole, the cosmos, as having an intrinsic value.[196] The anthropocentrists often put forward an argument, that there is nothing

[195] Sarah Sands, "We are all doomed! 40 years from Global Catastrophe – and There's Nothing We Can Do About It, Says Climate Change Expert", *Daily Mail* (March 22, 2008), online: <http://www.dailymail.co.uk/news/article-541748/Were-doomed-40-years-global-catastrophe--theres-NOTHING-says-climate-change-expert.html>

[196] Mark Lupisella & John Logsdon, "Do We Need Cosmocentric Ethic?", (Paper delivered at the 48th International Astronautical Federation Congress, Turin, Italy, 1997), online: <https://www.researchgate.net/publication/2317949_Do_We_Need_A_Cosmocentric_Ethic> [Mark & John]; M. L. Lupisella, "Cosmocentrism and the Active Search for Extraterrestrial Intelligence" (Paper delivered at the

to be protected in the outer space, in an environmental sense, as everything in outer space is already brutally harsh to humans.[197] This argument in my view is rooted in an egoistic anthropocentric world view, which has already brought the Earth system to its tipping points and beyond and does not appear to be stopping anytime soon. Thus, in light of the arguments made in the sections above, such an anthropocentric paradigm needs to be rejected completely. In opposing this view, we must also consider the limited scientific knowledge we have with regards to natural phenomena of the cosmos, as with the Earth in the 1800s nobody could grasp a concept such as a hole in the ozone layer or a human induced climate change. Perhaps, similarly at present we do not yet know of such phenomena which may exist in the outer space and may degrade due to increasing human activities in outer space.

A second popular view of the prevailing anthropocentric environmentalism or what Arne Naess called the shallow ecology, argues that the outer space environment needs to be protected so far as the human interests are preserved. For example, in this view the natural conditions of other planets must be protected from contamination so that the interest of humanity in studying the pristine conditions of other planets is preserved. Another example, is the growing concern for maintaining the sustainability of orbits around the Earth that serve the anthropocentric interests. This approach is popular among environmental policy and law makers who make the focal point of environmental ethics - the conservation of resources for long term anthropocentric benefits. Though lesser of an evil in comparison to pure anthropocentric idea, it is still a faulty approach, as in the absence of an intrinsic value appended to nature or cosmos, human tendency usually acts reactively and not proactively, as has been witnessed on Earth, where measures to correct the wrongs are taken *after* they have been committed.[198]

Astrobiology Science Conference, 2010) online: <http://www.lpi.usra.edu/meetings/abscicon2010/pdf/5597.pdf> [Lupisella]

[197] J.H. Huebert & Walter Block, "Space Environmentalism, Property Rights, and the Law" (2007) 37 The University of Memphis Law Review 281 at 290.

[198] Read Section 2.2.1, Kataie McShane at page 49.

The third form - *cosmocentrism*, which I advocate and has been proposed by some scholars, is in principle same to ecocentrism or deep ecology but at a grander scale of cosmos. As deep ecology prescribes an intrinsic value to all that is on Earth, biotic and abiotic, cosmocentric ethics extends the same principle and treats the cosmos, with all that there is – the planets, the stars, the moons, the asteroids, the void and every other thing contained in the cosmos, to have an intrinsic value.

As Aldo Leopold argued in his land ethics,[199] that the land comprising of the soil, the plants and the animals have an intrinsic value, and this whole forms a biotic community. The argument from cosmocentric ethics is the same and it considers the universe or the cosmos as one giant community with interdependencies that must be respected. Similarly, Keekok Lee, has also argued that the nature should not be understood geocentrically, meaning limited to Earth, but it extends well beyond into space and accordingly in response so must our environmental ethics.[200] She specifically notes that our "environmental ethics informed by features unique to Earth may be misleading and [may] prove inadequate as technology increasingly threatens to invade and colonize other planets in the solar system."[201]

Today, the humanity is looking outwards in space to fulfil its hunger for resources and on the brink of destroying the habitability of its home planet it is aiming to terraform other planets in the solar system. This attitude of planet disposal brings us to a fundamental question, if the anthropocentric paradigm, which has aided and abetted the environmental degradation on Earth and brought upon itself the epoch of Anthropocene, is really a right way to approach the new domain of outer space environmentally. Till now, in our approach towards outer space, we have largely been subscribers of the shallow ecology paradigm or the conservational ethics, which

[199] Aldo, *supra* note 180.
[200] Keekok Lee, "Awe and Humilty: Intrinsic Value in Nature. Beyond an Earthbound Environmental Ethics" (1994) 36 Royal Institute of Philosophy Supplements 89 at 89. [Lee]
[201] *Ibid.*

aims to preserve space environment only to an extent that it serves anthropocentric interests.[202] This shallow ecology paradigm or the conservational ethics which treats nature respectfully only for humanity's vested interests is deeply and blatantly faulty and as a lesson from our earthly journey from Holocene to Anthropocene, we must proactively change the dominant anthropocentric paradigm, especially in view of human-space relationship, as the consequences of spatial degradation may be far more catastrophic from what we have witnessed on Earth.

As of today and to best of human knowledge, there exists no life in the outer space, except for what is on Earth and therefore cosmocentrism is posed with a serious question of how we place an intrinsic value in the abiotic or the non-living matter. One way to look at it, is from Leopold's understanding of land ethics where he perceives the soil as not inert but alive and one that plays an important role in the whole of biotic community based on the interdependency.

Second approach, which is philosophically better founded, is what has been adopted by Lee, who while elaborating on ethical considerations for terraforming Mars, propounded two theses - the Autonomy thesis and the Asymmetry thesis. The former suggests that the nature, particularly abiotic (the non-living), has existed independently of human beings and does not exist to serve human purposes and would have evolved the same way if the human life did not exist on the planet. Also, should human species get extinct, the abiotic would continue to exist in similar fashion autonomously and in this sense, "humans are, therefore, dispensable and could even be redundant." [203] However, this autonomy of nature does not mean, that human kind cannot damage such an autonomous nature, in fact evidently, we already have.

On the other hand, as per the Asymmetry thesis, there is no autonomy in human species and without nature, including abiotic, humans would not have survived or existed autonomously.[204]

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[202] Alan Marshall, "Ethics and the Extraterrestrial Environment" (1993) 10:2 Journal of Applied Philosophy 227 at 229. [Marshall]; Outer Space Treaty, *supra* note 6 at Article IX.
[203] Lee, *supra* note 200 at 93.
[204] *Ibid.*

This, autonomy of nature and "asymmetry of casual dependence" [205]of humans on nature humbles our perspective towards nature by taking away our arrogance rooted in the anthropocentric view of humanity as a privileged being in the biosphere and "highlights the frailty and the limitations of humans before nature".[206]

In view of Aldo's land ethics & Lee's theses, we can make a strong case for placing intrinsic value in outer space or cosmos. Where in extending Aldo's land ethics approach to outer space, we can extend the superorganism perspective to the cosmos, where the Earth (and its humanity) is only a citizen, a miniscule part, to this giant biotic community, simply viewing the whole cosmos as one superorganism with interdependent subsystems.

Applying Lee's two theses, the outer space, including all celestial bodies and the void, don't exist to serve human kind and don't depend on the Earth or the earthlings for their existence. In fact, in contrast, it is a scientific fact, that there exists dependency of Earth (and the human kind) on other celestial bodies, for example, the Moon's gravitational tug is responsible for tides in the ocean with great ecological implications, similarly Earth's (and the human kind) dependence on Sun is also undeniable. Some scientists have even argued that the planetary motions affect each other and there is precise dependency of Earth and earthlings on other planets in the solar system, say, Mars or Saturn.[207] The same can be argued for non-tangible phenomena of the space, say, the electromagnetic shielding which protects the Earth from solar radiation and prevents it from becoming a barren planet, like Venus.

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[205] *Ibid,* at 94.
[206] *Ibid.*
[207] University of Toronto, "Other Planets Influence Earth's Climate, University of Toronto Scientists Says." *Science Daily* (18 December 1997), online: <www.sciencedaily.com/releases/1997/12/971218090305.htm>; Ellie Zolfagharifard, "Did life on Earth flourish thanks to SATURN? Computer models reveal enormous influence planet has on our orbit" *Mail Online* (26 November 2014), online: <http://www.dailymail.co.uk/sciencetech/article-2850059/Did-life-flourish-Earth-flourish-thanks-SATURN-Computer-models-reveal-enormous-influence-planet-orbit.html>; Lee, *supra* note 200 at 98 states "Earth's atmosphere, its biosphere upon which human survival and flourishing depends, in turn depend on Mars and other planets in the solar system rotating and exerting gravitational pull on one another in certain ways. So while the existence of humans depends on the existence of Mars, the existence of the latter would not be affected should humans, as a species on Earth, become extinguished."

In this way the humanity can extend unwavering respect (or in Lee's words "awe and humility") for nature and the cosmos by placing an intrinsic value in the whole - the cosmos, thereby, making exploitation of space resources or terraforming of Mars or for that matter any futuristic human activity carried out in outer space with an anthropocentric or shallow ecology ethic, an ethically wrongful act.

Thus, for an environmentally ethical human-space relationship, for humanity to flourish in its truest sense and rationally co-exist with the cosmos, cosmocentrism as a paradigm and embedding of cosmocentric ethic in each one of us is the *only* way forward….

2.3. Conclusion

Against all odds, as life evolved, it evolved to destroy itself, could soon become the Gain narrative in the epoch of Anthropocene and the blame undoubtedly would lie in the way human kind has evolved to perceive nature as something external to it. Our journey from Holocene to Anthropocene, particularly in the duration of *Great Acceleration* has resulted into crossing of crucial thresholds or tipping points and we may have damaged our home planet – the only habitable planet – perhaps irreversibly in a very short duration.

Anthropocentrism being the dominant worldview has guided the callous inexorable exploitation of planet Earth beyond a return point. Today, almost every environmentally conscious being wishes to revisit the developmental evolution and ethics to correct what went wrong in the past and continues to be palpably and maliciously wrong – the ethical paradigm of anthropocentrism. It is high time that humans proactively accept a paradigm shift to ecocentrism and in making their way to outer space, accept cosmocentrism. For it is the intrinsic value we place in nature that can guide our developmental ethics and bring to humanity a sense of respect and responsibility towards nature and avoid catastrophe of paramount degrees.

At this beginning of new space age of exploitation, with proposals ranging from space mining, grabbing an asteroid and even terraforming Mars, we need to thoroughly examine each of such space activity from a cosmocentric perspective, otherwise we could, perhaps, set ourselves on a journey to become a greater natural force, this time bringing a space equivalent of Anthropocene, altering some of the very fundamental phenomena of the cosmos, such as gravity, electromagnetic shielding or even planetary motions.

In order to avoid becoming a force of nature that alters space environment in future, we need to instill cosmocentrism as a dominant paradigm and value system which could then yield a conceptual shift in the notion of responsibility, personally, societally and legally.

CHAPTER 3 -
Theorizing Cosmocentric Space Environmental Law

Introduction

The Outer Space Treaty[208] entered into force on October 10, 1967 and was drafted at a time when humanity's interests in the outer space were nascent, little known and science was far less developed as compared to today. Within a short period of fifty years of Outer Space Treaty and sixty years of humanity's first venture into space, our interests in the outer space have fairly matured and we have come a long way from being mere observers and explorers of outer space to a stage where it is possible to use, exploit and even modify certain natural *in situ* conditions of the outer space. As on the Earth, the humanity evolved from being simplistic hunter-gatherer species to a mentally and technologically evolved species with an ability to alter the natural conditions of the Earth systems globally. It appears, that at the current pace of development, humanity is destined to evolve from mere spectator-explorer of outer space to an exploiter-modifier species in the outer space.

Today, proposals for terraforming Mars by inducing atmospheric changes by gradually pumping green-house gases or by detonating multiple nuclear bombs are being researched exhaustively and to convert Mars to a habitable Earth-like planet as a backup option is an idea that is being pondered upon seriously in the scientific and futurist communities.[209] It is growingly becoming acceptable that "this century will see serious debate about—and perhaps implementation of—deliberate planetary-scale engineering."[210] Furthermore, as technology permits, the interest in the space-based natural resources today, is at all-time high and has even

[208] Outer Space Treaty, *supra* note 6.
[209] See generally, Christopher P. Mckay, Owen B. Toon & James F. Kasting, "Making Mars Habitable" (1991) 352 Nature 489; Martin Beech, *Terraforming: The Creation of Habitable Worlds* (New York: Springer, 2009); Lee, *supra* note 200 at 91.
[210] David Keith, "Geoengineering" (2001) 409 Nature 420 at 420.

garnered political and legal interest. The United States of America in year 2015 having introduced the *Commercial Space Launch Competitiveness Act*, established a mechanism to legalize, through licensing, private rights in the extracted space resources and this has already triggered a race towards space-based natural resources.[211] Recently, following the footsteps of the United States of America, the parliament of Luxembourg has also adopted a similar law on the exploration and use of space resources which allows ownership over space resources and is set to go into effect on August 1, 2017.[212]

The future thus, is growingly and undoubtedly inclined towards humanity becoming an exploiter-modifier species in the outer space, however to such fictions of the past becoming tomorrow's reality, the value system on which the current international law, particularly international space law is based upon must change in accordance with the broader environmental debate bordering anthropocentrism vs. cosmocentrism, as has been discussed in the previous chapter.

The Outer Space Treaty being a framework that defines fundamental principles governing humanity's interaction with outer space, today, is being faced with challenges from all facets. However, as one would expect in the realm of anthropocentric paradigm, environmental ethics in view of outer space is the least of the concerns taken up by the global community as against molding of laws and its interpretation to suit the needs of popular commercialization or humanity's greed for resources. In this view, towards theorization of cosmic environmental law that places an intrinsic value in the cosmos, it is pertinent that the existing paradigm and perception of outer space in view of Outer Space Treaty and the Moon Agreement be critiqued through the lens of cosmocentrism. Further, it is likely that our future actions in outer space,

[211] US CSLCA, *supra* note 131.
[212] Luxembourg's *Draft Law on the Exploration and Use of Space Resources* online: < http://www.spaceresources.public.lu/en/actualites/2017/Luxembourg-is-the-first-European-nation-to-offer-a-legal-framework-for-space-resources-utilization.html#> art 1.

will be governed by *shallow ecology*[213] or what Howard Baker has called "enlightened anthropocentrism",[214] rooted in international environmental law, where according to these principles outer space environment would be protected only for and to the extent it preserves anthropocentric interests, and thus a brief analysis of key environmental principles in the general international law or international environmental law from a cosmocentric perspective is important towards suggesting a cosmocentric environmental paradigm for outer space. Towards the end of the chapter an attempt has been made to find gateways towards theorizing cosmocentric space environmental law.

3.1. Cosmocentric Critique of the Existing Space Law Paradigm

The Outer Space Treaty undoubtedly set the tone for humanity's interaction with outer space and defined the kind of relationship humanity were to have with the outer space. During the negotiations and drafting of the treaty, it was intended that the Outer Space Treaty were to define only the broad and general principles governing human activity in outer space and more specific and elaborate rules were to be developed at a later stage by means of separate legal instrument(s).[215] These key and fundamental principles laid down in the treaty, *inter alia*, broadly relate to freedom of exploration and peaceful use of outer space, in compliance with the international law, for the benefit of all mankind, prohibiting appropriation of outer space by whatsoever means.[216]

From a cosmocentric perspective, indeed, the whole outer space treaty can be put under scanner as without a doubt it is designed by anthropogenic agencies built on an anthropocentric value paradigm to serve its interests, and the same is clearly reflected by the use of terms like

[213] As used by Arne Naess, see Section 2.2.2 at page 52.
[214] Howard Baker, *The Application of Emerging Principles of International Environmental Law to Human Activities in Outer Space,* DCL Thesis (Montreal: McGill University, 1996) at 58. [Howard]
[215] Stephan Hobe, "Historical Background" in eds, Stephan Hobe, Bernard Schmidt-Tedd & Kai-Uwe Schrogl, *Cologne Commentary on Space Law* (Cologne: Carl Heymanns Verlag, 2009) vol 1 at 14. [Hobe]
[216] Outer Space Treaty, *supra* note 6, art I, II & III.

"prospects" or "*use* of outer space".[217] However, perhaps as a remnant of post-war and post-colonial political lessons of the 19th and 20th century, a tint of broader philosophical assertion can be traced in certain undefined wordings of Outer Space Treaty, when terms like "common interest of all mankind", "benefit and in interests of all countries" and "envoys of mankind" has been used by the drafters.[218] Fortunately, some of these undefined terms may provide a gateway towards establishing a cosmocentric paradigm where long-term *benefit* and *interest* of mankind and countries may well be understood as the preservation of the outer space, by placing an intrinsic value in the cosmos. I would discuss later in this chapter how this may be achieved, but at this point it is more important to critique, with a cosmocentric perspective, the reading of Outer Space Treaty particularly on two accounts,[219] first, the popular misinterpretation of treating outer space as a *province of all mankind* interchangeably used with concepts like *global commons*, *common heritage of mankind* and *common pool resource*. Second, is the ill-founded limited environmental protection stipulated in Article IX of the treaty. Followed by a similar analysis of environmental protection stipulated in Article 7 of the Moon Agreement.

3.1.1. Outer Space a Global Common?

The outer space is widely considered a global common in general parlance and in the legal domain has been often termed as the common heritage of mankind. The problem with understanding outer space as global commons or common heritage of mankind is not only that this notion is not well founded in the outer space treaty, but treating outer space as global commons may, and perhaps certainly, would lead to over exploitation as has been argued by numerous scholarships on the concept of global commons.

[217] Outer Space Treaty, *supra* note 6, Preamble.
[218] *Ibid,* Preamble, art I & V.
[219] Article IV of the Outer Space Treaty does prohibit placement of nuclear weapons or weapons of mass destruction in outer space and in turn has a consequential environmental protection embedded in it, however it holds its place in Outer Space Treaty predominantly as a provision against militarization and use of outer space for peaceful purposes lacking the ethical consideration from environmental perspective.

The term *global commons* refers to areas or resources that are beyond sovereign jurisdiction of any State,[220] and this idea is based upon the premise of *res communis* which means that such identified areas are owned by all States collectively and each nation-State shares a common and equal interest in them.[221] The Organization for Economic Co-operation and Development (OECD) defines global commons as "natural assets outside national jurisdiction such as the oceans, outer space and the Antarctica."[222] Further, the law division of the United Nations Environment Programme (UNEP) recognizes global commons under the International Environmental Governance as "areas [that] have historically been guided by the principle of the common heritage of humankind - the open access doctrine."[223] The UNEP further states that "international law identifies four global commons namely: the High Seas; the Atmosphere; Antarctica; and, Outer Space."[224] Scholars agree that the main feature of a global common is its equal access to all States and in a traditional conceptualization of a global common, this access "is unrestricted, leading to accelerated consumption of, or degradation of a resource."[225]

Garret Hardin in 1968, in his seminal article titled *The Tragedy of the Commons*,[226] identified a fundamental problem with the idea of commons in a local context and critiqued staunchly that the *res communis* or the commons allow open unrestrained access and this in turn incentivizes over exploitation of resources. He categorically writes:

> "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all".[227]

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[220] John Vogler, "Global Commons Revisited" (2012) 3:1 Global Policy 61 at 61. [Vogler]
[221] Erin A. Clancy, "The Tragedy of the Global Commons" (1998) 5:2 Indiana Journal of Global Legal Studies 601 at 603. [Clancy]
[222] OECD, *Glossary of Environment Statistics,* Studies in Methods, Series F, No. 67, (New York: United Nations, 1997) online: < https://stats.oecd.org/glossary/detail.asp?ID=1120>
[223] Law Division of the United Nations Environment Programme, "IEG of the Global Commons" online: < http://staging.unep.org/delc/GlobalCommons/tabid/54404/Default.aspx> [UNEP]
[224] *Ibid.*
[225] Vogler, *supra* note 220 at 64.
[226] Garret Hardin, "The Tragedy of the Commons" (1968) 162 Science 1243. [Hardin]
[227] *Ibid* at 1244.

Indeed, perceiving certain areas as *commons* has led us to the ruin, as was conceptualized by Hardin, and is very much today's reality in terms of our global common, the atmosphere, where States have collectively utilized atmosphere as a sink for green-house gasses and have severely degraded it to the limit that it endangers humanity's future on Earth.[228] The same is increasingly becoming true for outer space, as the sustainability of orbits around the Earth is seriously endangered with the rise of man-made orbital debris.[229] While direct exploitation of other commons, the Antarctica or deep-sea bed resources in the High Seas has not yet become economically viable but good chances are, as technology progresses these areas would be under threat as well.[230]

While the two concepts in essence are the same, however, the only difference between *global commons* and the *common heritage of mankind* principle is that, the latter has been crystallized into only two international legal instruments so far, namely the Moon Agreement[231] and the United Nations Convention on the Laws of the Sea.[232] Wherein, certain special responsibilities have been prescribed towards sharing of benefits derived from such areas and nature of activities that can be undertaken in such areas,[233] making the access and exploitation of a

[228] Vogler, *supra* note 220 at 64.
[229] See generally, Nicholas L. Johnson, "Orbital Debris: The Growing Threat to Space Operations" (Paper delivered at the 33rd Annual Guidance and Control Conference, Breckenridge, CO; United States, 6 – 10 February 2010) (2010) AAS 10-011 NASA Technical Reports Server 1; Johnson states that - "For nearly 50 years the amount of man-made debris in Earth orbit steadily grew, accounting for about 95% of all cataloged space objects over the past few decades. The Chinese anti-satellite test in January 2007 and the accidental collision of two spacecraft in February 2009 created more than 4000 new cataloged debris, representing an increase of 40% of the official U.S. Satellite Catalog. The frequency of collision avoidance maneuvers for both human space flight and robotic operations is increasing along with the orbital debris population. However, the principal threat to space operations is driven by the smaller and much more numerous uncataloged debris. Although the U.S. and the international aerospace communities have made significant progress in recognizing the hazards of orbital debris and in reducing or eliminating the potential for the creation of new debris, the future environment is expected to worsen without additional corrective measures".
[230] Vogler, *supra* note 220 at 64.
[231] Moon Agreement, *supra* note 9.
[232] *United Nations Convention on the Law of the Sea,* 10 December, 1982, 1833 UNTS 3, Article 136 (entered into force 16 November 1994). [UNCLOS]
[233] An authoritative body to monitor and share "equitably" the resources derived from a common heritage has formally been adopted only in the UNCLOS under Part XI, Section 4, whereas the Moon Agreement in Article 11(5) has only recommended formation of such an international regime as and when exploitation of extra-terrestrial resources is practicable.

common heritage of mankind slightly restrictive than the traditional idea of the unrestrained access to the global commons.

The underlying problem with the concept of global commons or the common heritage of mankind is that, their very categorization of being such is based upon a resource-exploitation-centric anthropogenic methodology rather than nature-preservation approach based in ecocentrism. Understandably the global commons or the common heritage of mankind principle are concepts based upon an anthropocentric paradigm, and though one might assume, at least by the connotation of the term global commons, an extension of greater environmental protection towards such areas but the reality reflects stark contrast. The perception of global commons, perhaps, is not based in an understanding of their inherent value being natural, but instead financial, and accordingly "these global commons are labeled as such not in the hopes of maintaining pristine treasures, but for extracting the most profit over the longest period."[234]

Accordingly, the very inception of the common heritage of mankind principle, as propounded by Arvid Pardo first time in the United Nations in year 1967, was not rooted in environmental ethics but was propounded and pitched as a mechanism for equitable access and claim to seabed resources for the benefit of mankind, as is reflected in his speech stating that "a common heritage of mankind and should be used and exploited for peaceful purposes and for the exclusive benefit of mankind as a whole."[235] Accordingly, the common heritage of mankind principle is premised around exploitation of resources as it "involves inclusive enjoyment and sharing the products of the common heritage, and its thrust remains redistribution not conservation."[236]

Clancy, critiquing the common heritage of mankind principle states that:

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[234] Clancy, *supra* note 221 at 601.
[235] Arvid Pardo, *The Common Heritage: Selected Papers on Oceans and World Order 1967-1974* (Malta: Malta University Press, 1975) at 38.
[236] Laksman Guruswamy, "International Environmental Law: Boundaries, Landmarks, and Realities" (1995) 10 Natural Resources & Environmental 43 at 48. [Guruswamy]

> "..the focus of [Common Heritage of Mankind principle] is not on how states can work together to protect these areas, but how states can divide the profits of exploitation. [Common Heritage of Mankind principle] is designed to capitalize on exploitation with an entitlement given to all parties involved. Obviously, the more the resources are exploited, the more each party gets. The incentive therefore is not to conserve, but to "maximiz[e] resource exploitation and economic returns.""[237]

Therefore, in our experiences so far, especially with the atmosphere, the treatment of an area as a global commons having open access, has only lead to exploitative usage severely degrading the embedded pristine ecology. This is due to an ill-founded ethical paradigm which results in the significant and fundamental gaps in the international regulatory frameworks which currently address the environmental protection of the global commons.[238]

In context of outer space, in order to identify such gaps, one must look into the ideation and conception of outer space being a global common or a common heritage as must have been perceived in the drafting or wording of the Outer Space Treaty. However, it is astonishing that the definitions of global commons across international platforms (dealing with global economic development or global environmental governance) like the OECD and the UNEP, identify outer space as a global common when there is nothing in the Outer Space Treaty which directly states that the outer space is in fact a global common or even a common heritage of mankind. Hertzfeld et al. have argued this misconception more elaborately[239] and have stated that extension or imposition of such concepts to outer space, by reading too much into the text of the treaty, would be beyond the rules of treaty interpretation as have been prescribed in the Article 31 of the Vienna Convention on the Law of Treaties (VCLT).[240]

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[237] Clancy, *supra* note 221 at 606 referring Guruswamy *supra* note 236.
[238] UNEP, *supra* note 223.
[239] Henry R. Hertzfeld, Brian Weeden & Christopher D. Johnson, "How simple Terms Misled Us: The Pitfalls of Thinking about Outer Space as a Commons" (2015) 58 *Colloquium on the Law of Outer Space* 553 at 554;
[240] *Vienna Convention on the Law of Treaties,* 23 May 1969, 1155 UNTS 331, art 31, (entered into force on 27 January 1980. [VCLT] Article 31 General rule of interpretation: (1) "A treaty shall be interpreted in good faith in accordance with the *ordinary meaning* to be given to the terms of the treaty in their context and in the light of its

This problem perhaps is rooted in the most commonly and widely misinterpreted provision of the Outer Space Treaty, Article I, wherein paragraph 1 states that:

> "The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[241]

Lawyers and scholars from across discipline have fallen prey to this rather notorious provision, which at times in a simple and casual reading, mistakenly conveys the following two concepts. First, that the outer space as whole, the void and the celestial bodies combined, is the province of all mankind and second, the use of word *province,*[242] in general parlance conveys a notion of territoriality or even property. This interpretation is a fallacy of great consequences as it changes the treatment, nature and status of outer space jurisprudentially and is perhaps the source of ill-founded categorization of outer space as the global commons.

If one pays careful attention while reading the provision, it is obvious that the intended interpretation implies that, it is ***the use and exploration of outer space***, - the ***activity***, which is the province of all mankind and it is not the physical space that is referred to as the province of all mankind. Thus, the reference to province of all mankind in Article I of the Outer Space Treaty, is to the *human activities* in outer space, rather than outer space *per se*.

Since, there is no clear definition of the term *province of all mankind* provided by the Outer Space Treaty, a lot of discussion in the academia has existed over what is exactly meant by the term and many scholars have closely associated the term to the principle of *common heritage of mankind*.[243] However, such derivation is vague and often the rationale for associating these

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object and purpose." Note: Though VCLT post-dated Outer Space Treaty and is not applicable retroactively, but it is an accepted principle that VCLT merely codifies customary international law, which is applicable otherwise directly.

[241] Outer Space Treaty*, supra* note 6, art I.

[242] "An administrative district or division of a country" - Merriam-Webster, Merriam-Webster.com, *sub verbo* "province", online: <https://www.merriam-webster.com/dictionary/province>

[243] Hobe, *supra* note 215 at 37.

two terms has been argued to be the explicit declaration made in the Article 11 of the Moon Agreement, which declares the Moon and other celestial bodies as a common heritage of mankind.[244]

In my opinion, particularly in the context of space treaties, the two terms *province of all mankind* and the *common heritage of mankind*, cannot be equated as they are quite distinct in essence and meaning. The Outer Space Treaty's reference to *province of all mankind* is rather broad, and is a reference to intangible notion, that the utilization of space shall be through *actions* in common interest of each State. Whilst the *common heritage of mankind* principle, as stated (only) in the Moon Agreement, is more precise with a tangible notion referring to celestial bodies and natural resources found in them, giving it a notion close to tangible property.[245] Thereby, even if *province of all mankind* is a concept relatable or parallel to *common heritage of mankind principle*, it is only the human *activities* in outer space that gets the status of common heritage of mankind within the context of Outer Space Treaty as nowhere from Preamble, Article I or any other provisions of the Outer Space Treaty, an interpretation flows that the outer space, as a whole, is a global common or a common heritage of mankind.

Additionally, the global acceptability of the declaration of the Moon and other celestial bodies being a common heritage of mankind as under the Moon Agreement, can be viewed with high scepticism as the Moon Agreement has not floated well within the international community, and a whole new debate can be initiated on the topic, where States actively negotiated the treaty in good faith and later, bunked on ratifying the same, contradicting the good-faith spirit as stated under the VCLT.[246] It is also pertinent that we consider the fact, that

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[244] Moon Agreement, *supra* note 9.

[245] B. Maiorsky, "A Few Reflections on The Meaning and The Interrelation of "Province of All Mankind" and "Common Heritage of Mankind" Notions" (1986) 29 Proceedings on the Law of Outer Space 58 at 60.

[246] So far only 17 non space faring nations have ratified the Moon Agreement. Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, "Status of International Agreements Relating to Activities in Outer Space as at 1 January 2017", (2017) UN Doc. A/AC.105/C.2/2017/CRP.7, online: <http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2017_CRP07E.pdf> [Status of Space Treaties]; See generally, VCLT, *supra* note 240.

the two instruments, the Outer Space Treaty and the Moon Agreement, stand independently and in absence of an explicit expression or intent, there is no retroactive implication of the Moon Agreement on the interpretation of the Outer Space Treaty.

In my opinion, the reason for limited ratification to the Moon Agreement can again be construed to be Article 11 (5) wherein it is an obligation on state parties to "establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible".[247] In my assessment perhaps it is this obligation that did not go down well with the interests of the space-faring nations as it proposes to redistribute the benefits equitably among other States and formalizes the restrictions to their ability to extract maximum benefit from an otherwise exponentially high investment activity in the outer space.[248]

A pertinent question now surfaces as to what then is the status of outer space, because for understanding and ascribing any value paradigm in environmental ethics, it is important to understand the legal status of outer space. There is no clear answer to this question, however we can only rule out what it is not, to arrive at what it can be. Applying the general interpretation rules to the law as it stands today, the term province of all mankind refers and is only limited to the *activity* of exploration and use of outer space. On the other hand, as founded in the Moon Agreement, the status of celestial bodies to be a *common heritage of mankind* implying limited application only to the celestial bodies *not* including the void space, also cannot be perceived as widely accepted status of outer space, owing to the limited membership to the Moon Agreement and no retroactive implication of the same on the Outer Space Treaty.

This discussion rather leaves us with a fortunate implication, one which Judge Manfred Lachs has asserted as well and it is as if he spoke from a cosmocentric ethics perspective. He asks in

[247] Moon Agreement, *supra* note 9, art 11 (5).
[248] Mark Williamson, "A Pragmatic Approach to the "Harmful Contamination" Concept in Art. IX of the Outer Space Treaty" (2010) 53 Proceedings of the International Institute of Space Law 666 at 667.

his writing whether the outer space with all its vacuum and celestial bodies is a "*thing*" or a "*res"* (as used in the terms like *res communis, res nullis*, *res extra commercium or res communis omnium*) which can be owned by anyone, by all or by nobody at all. Judge Manfred Lachs, answers this question by stating that the vacuum and the celestial bodies not "being a *res*, they cannot in fact become *res extra commercium* or *communis*."[249] Thereby, meaning that the outer space is neither a global common, nor a common heritage of mankind, it is devoid of ownership of any kind, and in my opinion that is how it should be. It is rather egoistic of law or the humanity to perceive the grand expanse of outer space as a property or thing, especially when viewed through a cosmocentric perspective. To own everything that was, that is and that ever will be even collectively is anthropocentrism of supreme proportions. Such a value system imposing ownership of any kind, even collective ownership, is a means to justify anthropocentric ends which usually result into degradation of the ecology.

It is based in this understanding of treating outer space, not as a thing to which any kind of ownership can be appended, but in contrast it is something that is devoid of the very attribute of being "owned" is where we can initiate a transition to cosmocentric paradigm for environmental considerations and through this we can establish an intrinsic value in the cosmos. Once again recalling Aldo Leopold's land ethics,[250] wherein he considers humanity to be only a citizen to a grand biotic community with land being a living entity, if extended to outer space, the whole understanding of prevailing, so-called environmental concepts, like that of global commons or the common heritage of mankind principle based in *shallow ecology*[251] get demystified and appear profoundly ill-founded. And thus, the widely-accepted concepts like the global commons or the common heritage of mankind are deep-rooted anthropocentric pretense of being environmentally responsible and on an ethical front are complete farce.

[249] Manfred Lachs, *The Law of Outer Space: An Experience in Contemporary Law-Making* (Leiden: Martinus Nijhoff Publishers, 2010) at 46.
[250] See Chapter 2, Section 2.2.2 at page 52.
[251] See Arne Naess use of shallow ecology as mentioned in Chapter 2, Section 2.2.2 at page 52.

Further, the very idea of conceiving outer space as a common heritage of mankind, *sensu stricto*, is nowhere based in the Outer Space Treaty and thus, is a common misconception.

I must now turn to analyze the specific environmental provision in the Outer Space Treaty and critique it from a cosmocentric perspective.

3.1.2. Limited scope of Article IX of the Outer Space Treaty

It has to be stated at the outset, that as an obvious result of an anthropocentric paradigm the drafting of Article IX of the Outer Space Treaty is least expected to encompass ecocentric or cosmocentric values but even otherwise when it is weighed in terms of "enlightened anthropocentrism",[252] or shallow environmental standards, this provision does not even seem to meet the general standards, as has been correctly pointed out by Ram Jakhu, that Article IX is "a general, and weak, legal instrument for the regulation and control" of space environment.[253]

Howard Baker has carried out a historical inquiry and an in-depth analysis of the negotiation and drafting of the text of Article IX[254] and he states that the drafting of this particular provision was heavily influenced by the scientific community, having limited scientific knowledge of the then emerging new domain, to predominantly only preserve "the interests of their professional endeavours" and they regarded outer space "essentially as a pure scientific laboratory."[255] Baker further concludes that Article IX is an ineffective provision for environmental protection as the approach to the drafting of the text of Article IX was based "not from an environmental point of view, but from the [science]-lab perspective"[256]

[252] See Howard Baker's reference "enlightened anthropocentrism" above in Introduction at 65.
[253] Ram S. Jakhu, "Space Debris in the Geostationary Orbit: A Major Challenge for Space Law" (1992) 17 Annals of Air and Space Law 313 At 321
[254] See generally, H.A. Baker, "Protection of the Outer Space Environment: History and Analysis of Article IX of the Outer Space Treaty" (1987) 12 Ann. Air & Sp. L. 143. [Baker]
[255] Howard, *supra* note 214 at 194.
[256] Baker, *supra* note 254 at 166.

Breaking down Article IX textually, provides three key points and I must now analyze the provision from a cosmocentric perspective:

i. Due Regard to Interests of all States Parties

The first part of Article IX states that:

> "…States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty."[257]

It is obvious from a plain and simple reading of this part of the provision, that the focal point here is protection of the future anthropocentric interests in the outer space and not the protection of environment as such. The responsibility appended via the above quoted part of the provision, is of giving *due regard* to corresponding interests of all other States Parties to the Treaty. Thus, not only the responsibility is to only preserve anthropocentric interests but it is also limited in scope where the provision excludes interests of States which are not party to the Outer Space Treaty. This can be viewed to be in sheer contrast to the general spirit of the Outer Space Treaty, where actions in outer space are to be in the interest and benefit of all countries, irrespective of their membership to the Outer Space Treaty.[258] Further, this language has also taken a depart from the preceding 1963 UN Declaration of Legal Principles which in paragraph 6 did in fact acknowledge the "due regard for the corresponding interests of *other* States", thereby meaning all States.[259]

Additionally, the term *corresponding interests* is vague and Baker's analysis suggests that the *travaux preparatoires* reveal that this was understood only "as being restricted to potentially harmful interference with space activities, harmful contamination to celestial bodies

[257] Outer Space Treaty, *supra* note 6, art IX.
[258] Outer Space Treaty, *supra* note 6, Preamble & art I.
[259] UNGA, *Declaration of Legal Principles Concerning the Activities of States in the Exploration and Use of Outer Space*, Res. 1962 (XVIII) (13 December 1963). [Declaration of Legal Principles]

and adverse changes to the environment of Earth from back contamination caused by extraterrestrial organisms."[260] This potentially leaves out activities which degrade the outer space environment as such, but are not harmful for current or future space activities of States parties to the Treaty.

Again, from a cosmocentric critique, the responsibility to give due regard is only imposed insofar as the human interests are protected, that too only of the States Parties to the Treaty. Thus, there is a clear absence not only of an intrinsic value to the outer space, but even otherwise the responsibility is owed only to the interests of States which subscribe to the membership of the Outer Space Treaty.

ii. Avoiding Harmful Contamination

Article IX further states that:

> "States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose."[261]

The focal point of this part of the provision is to pursue studies and conduct activities in outer space in a way so as to avoid harmful contamination. While the language in this part of the provision is extremely ambiguous and confusing and it is not clear, what is meant by the term like "pursue studies" – is it an obligation on all States Parties to do so – if yes, what kind of studies? Also, it is unclear, what is meant by the term "harmful contamination" – and leads to an obvious question - is contamination which is not harmful, permissible?[262]

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[260] Baker, *supra* note 214 at 220 referring to UNCOPUOS, *Committee on the Peaceful Uses of Outer Space, Legal Subcommittee*, 6th Sess., 47th Meeting, UN Doc. A/AC.105/PV.47 (1967) [provisional] at 27.
[261] Outer Space Treaty, *supra* note 6, art IX.
[262] Stephen Gorove, "Pollution and Outer Space: A Legal Analysis and Appraisal" (1972) New York University Journal of International Law & Policy 53 at 62. [Stephen]; Stephen Gorove, "Contamination and the Outer Space Treaty" (1972) 14 Colloquium on the Law of Outer Space 63, at 64. [Stephen Gorove]

However, what is clear from the language of the provision is that the drafters were concerned with two kinds of harmful contamination – first, forward contamination, meaning export of (Earth-based) contaminants to the environment of outer space. Second, back contamination, meaning import of extra-terrestrial contaminants back to Earth which may bring adverse changes to the environment of the Earth.[263]

Analyzing this part of the provision, in the first place, there is no definition of the term *harmful contamination* and thus it is open to interpretation and a State, as it may deem appropriate, according to its own needs, interpret the term as widely or as narrowly as possible. Scholars have noted that the use of word *harmful*, in this article, is meant to be referred to as harmful only to humans (or their space activities) and not to the environment as such[264] and it is evident from the reading of *travaux preparatoires* to this article, that activities can only be termed as *harmful* if they adversely affect or interfere with the future use of outer space through space activities.[265] To this effect, Kolossov suggests that the term *contamination* would mean "introduction of such items, substances and energy into outer space which results in endangering the health of cosmonauts, causing hindrance for legitimate outer space activities, and causing damage to outer space objects."[266] Thus, all that is cared for – is the interest and future of human activities in the outer space and clearly not the environment.

Furthermore, the wording of this part of the provision suggests that there is no prohibition on activities creating harmful contamination, but the obligation is only to *avoid* it. Additionally, interpreting the provision, giving simple and ordinary meaning,[267] it appears that the obligation to avoid harmful interference is only while carrying out two specific mentioned activities –

[263] Stephen Gorove, *supra* note 262 at 55 & 57.
[264] Mark Williamson, "Protection of the Space Environment Under the Outer Space Treaty" (1997) 40 Proceedings on the Law of Outer Space 296 at 300; Baker, *supra* note 214 at 225, he writes "In addition, it was never intended that the protection offered by [this provision] would apply to the environments of outer space, the Moon and other celestial bodies per se"
[265] Baker, *supra* note 214 at 219.
[266] Y. M. Kolossov, "Legal Aspects of Outer Space Environmental Protection" (1980) 23 Colloquium on the Law of Outer Space 103, at 103.
[267] VCLT, *supra* note 240, art 31.

studies and *exploration*. Thus, the *avoidance* obligation is not applicable on other uses of outer space, for example, the exploitation of natural resources or use of orbits by commercial telecommunication satellites, as such activities are neither *studies* nor merely *exploration*.

Therefore, it is evident, that *contamination* within the scope of this provision is only when it is adverse to human interests, is only *harmful* when it is a hindrance to current or future human space activities, and is not prohibited but only to be *avoided* while carrying out *studies* and *exploration* of outer space. Nowhere, in this provision a protection to the outer space environment has been afforded, let alone an intrinsic value.

iii. Potential Harmful Interference

Article IX further states that:

> "If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment."[268]

In simpler terms the obligation in this part of the provision is to enter into consultation with other States Parties, should the State have a reason to believe that its activity or experiment in the outer space, would cause potentially harmful interference with the activities of other States Parties in the peaceful exploration and use of outer space. Similarly, if a State Party to the treaty has a reason to believe that an activity or experiment of another State Party would create potentially harmful interference with peaceful exploration and use of outer space, it may request consultation with regard to such proposed activity.

[268] Outer Space Treaty, *supra* note 6, art IX.

Again, the focal point in this last part of the provision is not the environment, but it is ensuring continuity of human activities in outer space, free of interference. The term *potentially harmful interference* again is not defined, however the meaning of the term *harmful*, bears the same connotation as discussed above – one which only applies to human activities and not the environment *per se.* Similarly, following the preceding sentence, this part of the provision as well applies only in between member States Parties to the treaty and cannot be invoked by non-member States, irrespective of the fact, even if they are facing legit harmful interference of some kind, this is again in contrast with Article I "benefit and in interest of all mankind" provision.[269]

Thus, it is conclusive that Article IX of the Outer Space Treaty, is overwhelmingly anthropocentric and is only focused at protecting human interests in carrying out space activities and no environmental protection of whatsoever means has been afforded to outer space through this provision, making it a classic example of law, that is entirely based upon an absolute anthropocentric value system.

3.1.3. Limited scope of Article 7 of the Moon Agreement

Article 7 (1) of the Moon Agreement is specifically of relevance to this discussion as it extends, rather improves greatly, the ill-founded environmental protection provided in Article IX of the Outer Space Treaty.[270] It is extremely unfortunate, that the application of Moon Agreement is limited due to two reasons – first reason undoubtedly is the limited membership that this treaty has garnered as so far only 17 States have ratified the agreement and additionally 4 have signed it.[271] This, in turn, affects the wide applicability of the provisions stated herein and also puts into question the global acceptability of the legal obligations provided in the treaty. Second reason is that the applicability of the Moon Agreement, excluding the Earth, is

[269] Outer Space Treaty, *supra* note 6, art I.
[270] For the purpose of discussion, only the first paragraph of Article 7 is being considered, as paragraph (2) and (3) are predominantly procedural in nature and endow little obligations on the States Parties.
[271] Status of Space Treaties, *supra* note 246.

limited only to the celestial bodies in the solar system and orbits around or other trajectories to or around them, thereby not protecting outer space environment *per se*, and leaving considerable void/space, out of its purview.[272]

The drafting of the Moon Agreement and specifically Article 7 "coincided with the beginning of what has been referred to as the 'international environmental law movement.'"[273]

Article 7 (1) states:

> "In exploring and using the Moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the Earth through the introduction of extraterrestrial matter or otherwise."[274]

Reading Article 7 (1) of the Moon Agreement after Article IX of the Outer Space Treaty, one can clearly observe a significant change in tone and philosophy, where in Article IX, environment was not at all a focal point, Article 7 (1) clearly provides an obligation to prevent the disruption of existing environmental balance of Moon and other celestial bodies.

The ethical leap in Article 7 (1) is considerable and it rectifies several shortcomings embedded in Article IX of the Outer Space Treaty. Article 7 (1) at first, makes the obligation applicable to "*exploration and use*" of the Moon and other celestial bodies, making a clear depart from ambiguous usage of terms "studies" and "exploration" as in the Article IX of the outer space treaty. Second, by stating the obligation of States Parties to take "*measures to*

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[272] Moon Agreement, *supra* note 9, art 1:
1. The provisions of this Agreement relating to the Moon shall also apply to other celestial bodies within the solar system, other than the Earth, except insofar as specific legal norms enter into force with respect to any of these celestial bodies."
2. For the purposes of this Agreement reference to the Moon shall include orbits around or other trajectories to or around it.

[273] Steven Freeland, "Article 7 (Environment/Radioactive Materials)" in eds, Stephan Hobe, Bernard Schmidt-Tedd & Kai-Uwe Schrogl, *Cologne Commentary on Space Law* (Cologne: Carl Heymanns Verlag, 2013) vol 2, at 372. [Freeland]

[274] Moon Agreement, *supra* note 9, art 7.

prevent the disruption of existing balance..." the Moon Agreement, makes the environmental protection more certain in contrast to Article IX's use of term "avoid". Third important shift is the usage of the term "*existing balance of its environment*" through which it becomes clear that the focal point here is the preservation of environment and solely future human activities. Lastly, the Moon Agreement specifies clearly that the disruption of existing balance of the environment on the celestial bodies "*by introducing adverse changes*" or "*by harmful contamination through introduction of extra-environmental matter*" and even "otherwise" should be prevented by States taking measures to that effect. This clear prescription of disruptive activities and more importantly the inclusion of other kinds of activities by use of the word "otherwise" is far more broad and inclusive in application and reach compared to limited whatsoever protection under Article IX of the Outer Space Treaty.

However, for the reasons stated above, though Article 7 (1) of the Moon Agreement is a considerable step-up compared to Article IX, and scholars have argued it to be a "more concrete legal regime"[275] but it is unclear at this moment how different is "measures to prevent" of Article 7 different from "avoid" of Article IX as it still does not interpretatively appear prohibitive, but only as a "positive obligation"[276] on State Parties. Further, as with the Article IX, this provision as well has definitional gaps, where what amounts to harmful contamination", "disruption", "adverse changes" to yet again undefined termed of "existing balance of its environment" is open to interpretation, however scholars suggest that the Moon Agreement's use of these terms is broader and more comprehensive than Article IX of the Outer Space Treaty.[277]

Therefore, admittedly, this provision of the Moon Agreement is a significant improvement upon Article IX, and it does appear to extend and improve environmental protection to celestial

[275] Ram Jakhu, Stephan Hobe & Steven Freeland, "The Appropriateness of the Moon Agreement for Lunar Exploration and Use" (2010) 53 Proceeding of the International Institute of Space Law 562 at 566.
[276] Freeland, *supra* note 273 at 374.
[277] *Ibid*, at 373-375.

bodies, however, whether this provision is founded in a value system based on a "enlightened anthropocentric"[278] paradigm where space environment is only being preserved for anthropocentric interests or whether it is actually based in deep ecology by understanding the "balance of environment" and giving nature an intrinsic value, is a matter of open interpretation, and it is likely, in the anthropocentric paradigm, that the former will prevail. As noted unfortunately the Moon Agreement has not floated well within the international community, and for now the environmental protection of outer space is left to ill-conceived Article IX of the Outer Space Treaty.

In such a situation and even generally, with growing human actions in outer space it is definite that the prevailing shallow environmental consciousness would draw inference from the already existing environmental principles in the domain of international environmental law, and therefore, I must now briefly analyze these principles from a cosmocentric perspective in speculation of their future applicability to outer space environment.

3.2. Cosmocentric Critique of the International Environmental Law

The current regime of International Environmental Law can be categorized broadly into three sets where the first set relates to the concepts and principles propounded for *prevention* of an environmental harm - the *prevention set*. Second set relates to concepts and principles which are reactive, post-facto and focus on *restoration* of an already degraded environment – the *restoration set*. Lastly, the third set is of concepts and principles which focuses on striking a *balance* between the environment and the development, in turn often bearing a mixed notion of being *preventive* and *restorative* simultaneously – the *balance set.*[279]

[278] See the use of this term as used by Howard Baker, above at page 65.
[279] For detailed categorization of environmental concepts and principles see generally - Pierre-Marrie Dupuy & Jorge E. Viñuales, *International Environmental Law* (Cambridge: Cambridge University Press, 2015) at 51-55. [Dupuy et al.]; Dupuy et al. has identified only two categories – prevention and balance, as he mergers restorative principles under the ambit of *balance* principles.

Since the focus of this discussion is to critique the very ethical paradigm due to which environmental degradation occurs, the principles from the *restorative set* are out of the scope of our discussion, for example, the polluter-pays principle being a post-facto, restorative principle is ruled out of our discussion here. However, the concepts and principles from the *prevention set* and the *balance* set, are relevant, as they relate to our debate on ethical paradigm on which environmental principles and concepts in each of such sets are promulgated.

The evolution of International Environmental Law from the early 1970s has now come to some maturity and accordingly when assessed within the boundaries of an anthropocentric paradigm, fundamental principles and concepts of the environmental law, from the *preventive set* as well as the *balance set* have come to certain finality. In my opinion, from the *preventive set* the *precautionary principle* is where the finality of preventing an environmental harm has come to rest and the *balance set* can be said to have attained finality with the concept of *sustainable development*. Other than the precautionary principle and the concept of sustainable development, a significant number of concepts and principles do exist within the two sets, however, in my opinion, they are more or less variants of the precautionary principle or the sustainable development.

For example, the concept of *global commons*, *common heritage of mankind, common concern of mankind* or the *intergenerational equity* are closely relatable in varying degree to the concept of *sustainable development*. Similarly, the principles like *no-harm principle*, the *prevention principle*, the *environmental cooperation & consultations* and even the *environmental impact assessment* are closely relatable in varying degree to the concept of *precautionary principle*. Admittedly, there is faint impression of both of these concepts in the Outer Space Treaty and the Moon Agreement, however as discussed above, their interpretation and extent of applicability remains, to great extent, ambiguous. Therefore, for the purpose of critiquing the prevailing international environmental law from a cosmocentric perspective, it would appear

justified if these two concepts are the focal point of analysis, as they may serve as the guiding principle for interpreting the ambiguity embedded in the environmental provisions of the space treaties or may even serve independently as guiding principle in our future exploration and use of outer space.

3.2.1. Precautionary Principle

The *precautionary principle* prescribes that the States should take appropriate measures to protect the environment irrespective of the fact that there is lack of scientific certainty regarding the "actual or potential effects of an activity".[280] This principle has evolved from two predecessors, first, the *no-harm principle* which basically was a concept, much like Article IX of the Outer Space Treaty, protecting only State interests and not the environment per se. The no-harm principle was acknowledged by the International Court of Justice in few cases,[281] however with rising environmental consciousness, it soon transformed into the *prevention principle.* The prevention principle, second predecessor to the precautionary principle, aimed to protect the environment itself and not merely the interest of the States, thus the focus was not reparation of damages caused to another State but to prevent the environmental damage itself.[282] The difference between the prevention principle and precautionary principle is that the former corresponds to preventing *foreseeable* environmental harm, while the latter aims at preventing a potential hazard for which due to scientific uncertainty, "a proper prediction cannot be made as to the environmental impact."[283]

The precautionary principle, today, finds mention in almost majority of international legal instruments dealing with the environment,[284] however, the most recent and "the most accepted

[280] Dupuy et al, *supra* note 279, at 61.
[281] In the *United States v. Canada* (1941), 3 RIAA, vol. III at 1965 (Charles Warren, Robert A. E. Greenshields, Jan Frans Hostie); *Corfu Channel Case (UK v. Albania)*, [1949] ICJ Rep 4 at 22.
[282] Dupuy et al, *supra* note 279 at 55-60.
[283] Sumudu A. Atapattu, *Emerging Principles of International Environmental Law* (New York: Transnational Publishers, 2006) at 205-206. [Atapattu]
[284] *United Nations Framework Convention on Climate Change,* 4 June 1992, 1771 UNTS 107, art 3 (3) (entered into force 21 March 1994) [UNFCC]; *Convention on Biological Diversity*, 5 June 1992, 1760 UNTS 79, preamble

formulation in general discussions about the concept of precaution in international law"[285] is prescribed in the Rio Declaration, Principle 15, which states that:

> "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[286]

Thus, criteria under precautionary principle are – first, States shall take *precautionary approach*; second, this approach is to be taken according to States' *capabilities*; third, the potential threats to environment must be *serious and irreversible*; lastly, precautionary measures taken must be *cost-effective*. Therefore, by ordinary reading of the most accepted formulation of the precautionary principle, each of the criteria mentioned can be staunchly critiqued for being at root – anthropocentric under the garb of environmental protection.

First, by the very wording it is clear that "the international community [did] not wish to endow..the status of a principle" as the word "approach" has been used instead of principle.[287] Some scholars have considered the use of the term "approach" as softening of the "principle" and the United States of America has categorically stated and preferred the use of "approach" as the term "principle" has serious legal implications, "and that a principle can be considered a source of law and compulsory".[288]

& para 3 (entered into force 29 December 1993) [CBD]; *Montreal Protocol on Substances that Deplete the Ozone Layer*, 16 September 1987, 1522 UNTS 29, preamble & para 6 (entered into force 1 January 1989); *Vienna Convention for the Protection of the Ozone Layer*, 22 March 1985, 1513 UNTS 293, preamble & para 5 (entered into force 22 September 1988).

[285] Dupuy et al, *supra* note 279 at 63.

[286] UN, Report of the United Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, Annex I, "Rio Declaration on Environment and Development", UN Doc. A/CONF.151/26 (Vol. I) (1992). [Rio Declaration].

[287] Baker, *supra* note 214 at 117.

[288] Jon M. Van Dyke & Sherry P. Broder, "International Agreements and Customary International Principles Providing Guidance for National and Regional Policies" in eds, Billiana Cicin-Sain, David Vanderzwaag & Miriam C. Balgos, *Routeldge Handbook of National and Regional Ocean Policies* (New York: Routledge, 2015) at explanation provided in endnote 28.

Second, the precautionary approach is only to be taken according to one's capabilities, presumably financial and technological capability, thus if the State lacks such a capability to take precautionary approach, it is exempted altogether to take one.[289] Thus, this leaves a loop-hole in the effectiveness of the provision as a State may, after the environmental harm has occurred, argue that it did not possess capability of taking a precautionary approach, coupled with the fact that the term *capabilities* is not defined.

Third, the precautionary approach is only to be taken when there are threats of *serious and irreversible damage*, and this raises the question on the spectrum of damage as to which damage would be considered a serious damage and which would be a non-serious damage.

Lastly, the most controversial part of the precautionary approach is the use of the term *cost-effective measures*, which implies - given the scientific uncertainty, measures which are expensive and not cost-effective in comparison to the uncertain environmental impact or damage may not be taken, as it may prove to be "an unnecessary burden on states."[290]

The above criticism of the precautionary approach as in the Rio Declaration has been pointed out by numerous scholars and to this effect, Jaye Ellis & FitzGerald, in their scholarly writing have attempted to rectify the above ambiguities and loop-holes and have proposed an unambiguous drafting of the precautionary principle, as follows:

> "Where threats of harm to the environment exist, scientific uncertainty will not be used as a reason to postpone the taking of measures for the protection of human life or health or the environment."[291]

Now, in the context of outer space, Article 7 of the Moon Agreement, to some extent already seems to include the *prevention principle* however, none of the space treaties include the precautionary principle despite the fact, that "scientific uncertainties" are extraordinarily high

[289] Atapattu, *supra* note 283 at 209.
[290] *Ibid.*
[291] Jaye Ellis & Alison FitzGerald, "The Precautionary Principle in International Law: Lessons from Fuller's Internal Morality" (2004) 49 McGill Law Journal 779 at 782.

in the domain of outer space. Therefore, clearly, due to reasons stated above, the most accepted drafting of the precautionary principle, as in the Rio Declaration, is inundated with anthropocentric interests, and application or extension of the same to outer space activities, is not expected to be an export without its flaws and limitations.

3.2.2. Sustainable Development

At the center of the concept of *sustainable development* is the recognition and implied allowance of exploitation of nature and the environment and ironically, in reality, promotes development at the expense of the environment. Atapattu writes, that "no concept of international environmental law has been used and abused more than the concept of sustainable development"[292] and the environmental narrative of the Earth would confirm this stern criticism as in the name of sustainability, humanity has execrably exploited the natural resources degrading the environment and has proffered little to no environmental protection. Concepts such as the common heritage of mankind, common interest of mankind, intergenerational equity and even global commons are closely relatable and incorporate the essence and meaning of sustainable development, and as discussed above, incentivize exploitation.[293]

Sustainable development is also a feature of many of the international environmental legal instruments[294] and has the following components attached to its meaning - first, it requires States to account for needs and interests of future generations; second, it appends a duty to 'sustainably' exploit natural resources; third, in this sustainable exploitation of natural

[292] Dupuy et al, *supra* note 279 at 79.
[293] See Section 3.1.1, Clancy at page 69.
[294] Sustainable development is stated in, i*nter alia*, UNFCC, *supra* note 284; CBD, *supra* note 284; *Declaration of the United Nations Conference on the Human Environment*, 16 June 1972, UN Doc. A/CONF.48/144 (1972), reprinted in 11 International Legal Materials 1416 [Stockholm Declaration]; *World Charter for Nature*, GA Res. 37/7, UN GAOR, 34th Sess., Item No. 21, UN Doc. A/37/L.4 and Add.1 (1982), reprinted in 22 International Legal Materials 455; *World Summit on Sustainable Development*, UN Doc. A/CONF.199/20; United Nations, *Agenda 21: A Blueprint for Action for Global Sustainable Development into the 21st Century* (New York: United Nations,1992);

resources, interests of other States are to be accounted and protected; lastly, it obligates States to "incorporate environmental considerations into their development policies."[295]

Dernbach in his writing critiquing the concept of sustainable development questions the effectiveness of sustainable development and takes a skeptical view on whether it actually protects the environment, as with the growing acceptance of the concept of sustainable development, the environment continues to deteriorate.[296] The problem with sustainable development is that, though it is valuing environment and is extending certain kind of protection or restoration of the environment, however, the very objective of doing so remains the anthropocentric interest of protecting future human needs, and such needs further exploit the nature deteriorating the environment. Also, added to the fact, the history conveys that the humanity has preferred short-term benefits over long-term benefits and has rarely ever chose the latter as its value system.

In the context of outer space, this is evident, particularly so with the growing threat to orbital sustainability where despite of already existing and acknowledged orbital debris problem, States like the USA and China, have chosen to act in self-interest and generate exponential amount of debris via anti-satellite missile tests.[297] The concept of sustainable development can be expected to make a quick import to the space law domain, as the exploitation of natural resources becomes practicable. Though, yet again, such an export of already ethically flawed concept would lead only to degradation of the outer space environment and would only serve short term anthropocentric interest as against, ecocentric or cosmocentric notions holding intrinsic value in the cosmos, allowing coexistence with the environment and nature at large.

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[295] Dupuy et al, *supra* note 279 at 80.

[296] John C. Derbach, "Targets, Timetables and Effecting Implementing Mechanisms: Necessary Building Blocks for Sustainable Development" (2005) 6:1 Sustainable Development Law and Policy, Fall ed., 46 at

[297] See generally, US, Department of Defense, Annual Report to Congress: Military and Security Development involving the People's Republic of China 2011, Office of the Secretary of Defense, online: Department of Defense <http://www.defense.gov/pubs/pdfs/2011_cmpr_final.pdf>, at 37; See also Phillip C. Saunders and Charles D. Lutes, 'China's ASAT Test: Motivations and Implications' (2007) 46 Joint Force Quarterly 39, at 40;

Having critiqued the two paradigms from a cosmocentric perspective, I must now attempt to explore gateways towards establishing a cosmocentric environmental law for outer space.

3.3. Gateways to Cosmocentric Environmental Law for Outer Space

In my opinion there are two gateways towards theorizing cosmocentric environmental law for outer space, first being the broadened interpretation of the Outer Space Treaty and the Moon Agreement, which to some extent, through undefined terms, allows reading of the existing paradigm in synchronization with cosmocentric values. Second gateway is the development of a new space environmental regime based on a cosmocentric value system, as admittedly the Outer Space Treaty was intended to lay out only broad and general principles and more specific and robust paradigm was to be developed at a later stage by means of separate legal instrument(s) for specific subjects.[298]

Both the gateways may be considered speculative, but are desirable.

3.3.1. Broadened interpretation of Outer Space Treaty & Moon Agreement

The Outer Space Treaty is the fundamental document and framework which defines the nature of relationship, humanity has with the outer space, and perhaps, was intentionally drafted broadly with undefined terms so as to not curtail any future interests humanity may have in the outer space. In doing so the treaty makes use of the terms like *common interest of all mankind*.[299] Similarly, the Moon Agreement, improving upon the Article IX of Outer Space Treaty, uses a term *existing balance of environment.*[300] In absence of definition of such term, in my opinion, if we allow a broader interpretation, perhaps even beyond the rule of ordinary meaning, but within the context of the object and purpose of the treaty, we can embed a cosmocentric paradigm within the context of the existing treaties.

[298] Hobe, *supra* note 215.
[299] Outer Space Treaty, *supra* note 6, preamble.
[300] Moon Agreement, *supra* note 9, art 7 (1).

i. Common Interest of all Mankind

The term *common interest of all mankind* appears in the preamble of the Outer Space Treaty, recognizing the interest of mankind "in the progress of the exploration and use of outer space for peaceful purposes."[301] The preambular significance in an international instrument is undisputed as Article 31 of the VCLT prescribes that the preamble is an integral part of the treaty and provides context for the interpretation of the treaty.[302] Meaning thereby, that the terms used in preamble, however broad, general and "unspecific"[303] bear a significant contextual value and are reflective of the circumstances, spirit, object and purpose of the treaty.

Since, there exists no specific definition of the term *common interest of all mankind* as used in the preamble, in the spirit of the discussion so far, recognizing the need for a paradigm shift in the value system of the human society and advocating for a cosmocentric value system in determination of nature's treatment at the hand of humanity, we can extend and interpret the meaning of the term common interest of all mankind to be in sync with cosmocentric ethics as discussed in Chapter 2, Section 2.2.3. Cosmocentrism – A Giant Leap for Mankind.

In doing so, learning from our Earthly environmental experience, we would have to acknowledge that the *interest of all mankind* lies in extending an intrinsic value to the whole cosmos, and only so shall our activities, of exploration and use, be guided by a cosmocentric ethics. This would entail treating the outer space - the whole universe as not a resource center, but the whole of a biotic community where humanity is a minuscule and unimportant part however acknowledging itself as possessing ability of the disruption of this community, bearing natural cosmic order as discussed in Chapter 1 – Chaos vs. Cosmos: In Quest of a Cosmic Order. And in this way, perhaps not from the operative part of the treaty, but an integral

[301] Outer Space Treaty, *supra* note 6, preamble.
[302] VCLT, *supra* note 240, art 31.
[303] Stephan Hobe & Hedman, "Preamble" in eds, Stephan Hobe, Bernard Schmidt-Tedd & Kai-Uwe Schrogl, *Cologne Commentary on Space Law* (Cologne: Carl Heymanns Verlag, 2009) vol 1 at 21.

part of the treaty, the preamble – we may be able to establish an ethical paradigm which would truly make humanity's coexisting with the cosmos, symbiotic.

ii. Existing Balance of Environment

The obligation under Article 7 (1) of the Moon Agreement,[304] in exploration and use of the Moon and other celestial bodies within the solar system,[305] is to prevent the disruption of the *existing balance of its environment.* Once again, the term *existing balance of its environment* is not defined and is left open to interpretation and thus, if read creatively, can act as a gateway towards establishing a cosmocentric environmental protection for the Moon and other celestial bodies.

The use of the term *existing balance of its environment* is particularly interesting in light of the discussion above, specifically, on the notion of cosmic order, as has been discussed in the Chapter 1, as the term presumes that there is some sort of environmental balance on the celestial bodies as opposed to humanity's general perception of the outer space being chaotic, harsh and anti-environmental. This presumption can be interpreted as a leap towards cosmocentric paradigm where a greater form of responsibility can be appended towards preventing the disruption of this pristine balance.

3.3.2. New Environmental Regime

As discussed above, the Outer Space Treaty was only meant to be a general and broad framework providing a ground for more specific laws to emerge and develop in the future. Perhaps it is right time now in this moment of new space age of exploitation, to think of a new space environmental regime, particularly one which is based on a cosmocentric ethic. As discussed in the Chapter 2, how an anthropocentric value system has brought us to the epoch of Anthropocene, we must now in our way forward into outer space, rectify this mistake by

[304] Moon Agreement, *supra* note 9.
[305] Including their including orbits around or other trajectories to or around it.

adopting a cosmocentric paradigm which acknowledges and extends an intrinsic value in the cosmos. Such a legal regime should complement the existing space treaties, and is suggested to be designed or improved upon the following suggested provisions:

A. Prohibition on disruption of - and obligation towards maintenance of - the natural existing balance of the outer space.

The exploration and use of outer space, including all celestial bodies, shall be carried out for the benefit and interest of all mankind, so far as, such exploration and use of outer space must not disrupt the existing natural environmental balance of the outer space, by whatsoever means. Wherein the term *existing natural environmental balance* shall be defined or read as widely as possible.

B. Endowment of an intrinsic value to the abiotic and biotic matter including the void space.

In exploration and use of outer space, including all celestial bodies, all States must endow an intrinsic value to the biotic and abiotic matter including to the void space, and shall at all times act in a way acknowledging the outer space as a natural interdependent system bearing a natural cosmic order and harmony with possible feedback mechanisms.

C. Prohibition on activities with uncertain outcome.

States in carrying out space activities widely acknowledge the highest degree of scientific uncertainties in the outer space, including all celestial bodies, and in so far, all activities without a precise and absolutely certain environmentally non-disruptive outcome, shall be prohibited.

D. Responsibility for carrying out an activity with uncertain long-term or short term environmental effects.

A State(s) shall be internationally responsible for carrying out any activity, the long-term and short-term effect of which has not been scientifically exacted.

E. Environmentally Conscious Development

States undertake to cooperate and mutually assist, in research and development of environmentally conscious development in outer space, with a least possible environmental footprint, being guided, at all times, by the above provisions of this treaty.

3.4. Conclusion

The widely-accepted idea of outer space being a common heritage of mankind or a global common, is not based in the ordinary reading of the outer space treaty and is a fallacy of great consequences as it changes the treatment, nature and status of outer space jurisprudentially and by giving it a status of global commons, incentivizes its unrestrained exploitation and thus, significant possible degradation of the outer space environment. Added to the fact that current environmental protection extended to the outer space through the Outer Space Treaty is profoundly ill-founded and is drafted with anthropocentric interests being the focal point and not the protection of the outer space environment *per se*. On the other hand, the little environmental protection that could have been afforded to the moon and other celestial bodies, through the Moon Agreement, is limited in its applicability owing to the limited ratification the Moon Agreement has received.

Further, in such a situation, where space treaties are not exhaustive for environmental protection of the outer space. In view of the growing human activities, it is an intelligent guess that key principles from the international environmental regime would be exported and applied to the space domain, however, as critiqued, these principles are also flawed in view of the cosmocentric paradigm as these principles focus only on preserving human interests and limited protection of the environment is conceived in the principles as discussed.

Towards establishing a cosmocentric paradigm, two gateways can be utilized, first, by broadening the interpretation of terms like the Outer Space Treaty's *common interest of all mankind* and the Moon Agreement's *existing balance of its environment*, therefore by

interpreting the existing treaties cosmocentrically, hopefully establishes a slightly stronger environmental protection, especially in a situation where development of new space treaties has been stagnant, and in future is expected to remain so. On the other hand, the second gateway is formulation of an entirely new regime based on a cosmocentric paradigm giving intrinsic value to the cosmos and back-stepping the human-centric ends at the cost of the environment. To this effect, the suggested provisions may prove helpful.

CHAPTER 4 -
Conclusions & Summary

The discussion and analysis in the first chapter has led to the conclusion, based partly in science and predominantly in cosmological theories, that the outer space is a natural system in a state of cosmos with cosmic order, harmony and interdependency. This understanding of a prevailing cosmic order should guide humanity's treatment of the outer space and eventually providing profound philosophical foundation should aid the extension of an intrinsic value to the cosmos.

The discussion in the second chapter, briefly narrated the evolution of humanity from simplistic hunter-gatherer species to becoming a brutal geophysical force, that brought upon itself the epoch of Anthropocene. This evolutionary journey from Holocene to Anthropocene, particularly in the duration of the Great Acceleration has resulted into crossing of crucial thresholds or tipping points of our Earth systems and we may have damaged our home planet – the only habitable planet – perhaps irreversibly in a very short duration that we have lived on the Earth. The blame for this brutality against nature by humanity's hands, lies in the dominant worldview of Anthropocentrism which has guided the callous inexorable exploitation of the planet Earth, perhaps, beyond a return point.

To this effect, it was argued that there is an immediate need for a shift in our ethical paradigm, from Anthropocentrism to Ecocentrism, where the ecocentric paradigm endows an intrinsic value to the nature, placing the living and non-living things at par, by understanding the whole nature as a biotic community. It was then elaborated and concluded through deep ecology and later through the Gaia hypothesis, how perceiving land and the whole Earth as a living organism self-regulating complex processes for maintenance of precise habitable environment may help develop an understanding and the much-needed shift to ecocentrism. Today, as we are entering the new space age of exploitation and possible colonization, this ecocentric paradigm should

now be extended to outer space in the form of cosmocentrism, so that the humanity does not repeat the mistakes it committed on Earth, and does not end up becoming a brutal force that alters adversely and irreparably the space environment in future.

In chapter three, at the beginning the widely-accepted notion of outer space being a common heritage of mankind or a global common was refuted, and it was argued that such an interpretation is not grounded in the provisions of the outer space treaty. From a cosmocentric critique, the concept of global commons and common heritage of mankind incentivizes exploitation and does not protect the environment *per se*. Thus, not only terming outer space a global common is legally ill-founded but is also ethically and environmentally wrong in view of a cosmocentric critique.

Similarly, upon critiquing the Article IX of the outer space treaty it appears that the provision is extremely vague and is focused exclusively towards protection of human-centric interests and no protection of whatsoever kind is extended to the environment by Article IX. Next, Article 7 of the Moon Agreement was critiqued through a cosmocentric perspective and yet again, like Article IX, the provision is not devoid of definitional challenges and though it significantly improves upon Article IX, by recognizing "the existing balance" in the environment of the moon and other celestial bodies, however owning to the small and limited membership, applicability and acceptability of such environmental protection remains a challenge. Recognizing the vacuum of a robust environmental regime with regards to outer space, it appears obvious that inferences from the international environmental law would be made for regulating future human activities in outer space, and therefore key concept of sustainable development and precautionary principle was critiqued to be found ill-conceived in view of a cosmocentric paradigm.

Acknowledging that the environmental protection founded on an anthropocentric value paradigm, principally incentivizes exploitation and protects human interests and not the

environment *per se*, it is important to embed an environmental regime from a cosmocentric perspective, and to effect the same, two gateways, were proposed which may be considered speculative but are desirable. First, gateway toward establishing an environmental regime from a cosmocentric perspective, is by broadening the interpretation of undefined terms of the outer space treaty and the moon agreement, respectively, the *common interest of all mankind* and the term *existing balance of its environment.* Wherein, the common interest of all mankind should be interpreted to be mean an interest in the protection of the outer space environment from a cosmocentric perspective. And the term, *existing balance of* .. the environment of the moon and other celestial bodies can be interpreted in light of the discussion on the state of universe being in cosmos bearing a cosmic order, disruption of which should be prevented.

Lastly, a second gateway is suggestive in the form of a new environmental regime for outer space, and five broad provisions have been proposed towards theorization of cosmic environmental law.

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