

The *Fiqh* of Coronaviruses: Towards an Islamic Biocentric Approach to COVID-19

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Abstract

COVID-19, a disease caused by a novel coronavirus, is widely believed to have originated in animals. In the Islamic worldview, animals, including those suspected to be reservoirs of coronavirus or other zoonotic viruses, are divine creations, guided by divine command and sustained through divine provisions. Based on content analysis of relevant literature in environmental sciences, humanities and social sciences, I provide an Islamic religious understanding (fiqh) of certain ecological functions and ecosystem services that support life on earth but could also be harmful to humans. The objective of the study is to contribute to the discourse on biocentric environmental ethics from an Islamic perspective. The biocentric environmental ethics I advanced is framed on al-takāful al-bīī (mutual guarantee among environmental components) and corroborated by the One Health approach to zoonotic diseases in which human health is intractably linked with the health of animals and ecosystems. The study concludes that the breakout of zoonotic diseases is often a result of the breakdown of ecological barriers precipitated by human actions.

Keywords

COVID-19, coronavirus, One Health, environmental ethics, biocentric ethics.

Introduction

The world increasingly faces several environmental crises. With the scientists alone unable to proffer lasting solutions to them all, there is a clarion call to the world religions to address the crises from their domain. Religion and ecology is an emerging field of study that embraces multiple disciplines, particularly environmental sciences, humanities, and social sciences. Religious ecology is a hybrid discipline that explores the dynamics of nature, the interrelation between its constituent elements, design, and purpose in nature, and how human culture has shaped the environment. It investigates the complex system of human relations with non-human organisms in nature as enshrined in or adapted to religious traditions to ensure a healthy environment. Ecology

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is the science that studies the interrelationships of all organisms on earth, including animals, plants, fungi, and microbes, their interactions with their environment, and the structure and function of ecosystems, to discover the principles which govern their relationship.¹ While drawing on the scientific conclusions on the interrelationships between living and non-living organisms in nature, religious ecology delves into a cultural awareness of kinship with and dependence on nature for the coexistence and continuity of all life on earth.

The latest global outbreak that has posed a serious health problem is the coronavirus disease discovered in 2019 (COVID-19). The COVID-19 outbreak has quickly and effectively (re)set a new norm for socio-cultural interaction and religious practices, leading to a state of great anxiety and confusion in the greater part of the world. An invisible enemy from which many countries deployed their military might to defend their citizenry, COVID-19 preys on human propensity to connect and associate with one another.

Several research works have been conducted from multiple angles on the root cause of and remedy to the pandemic. Religion, as a transnational marker of identity, is called to intervene. In particular, religion influences how people perceive and respond to the pandemic. The World Health Organization acknowledges that religious leaders and faith-based groups played a major role in saving lives and providing primary healthcare support, guidance, and comfort for the communities they serve during the COVID-19 pandemic.²

The current study forges a link between Islamic studies and environmental sciences to contribute to biocentric environmental ethical discourse from an Islamic perspective. This theoretical research is based on content analysis, and the study draws on the findings of climate experts, ecologists, and virologists on the interface between zoonotic infectious diseases and ecology. The word *fiqh* in the title is characteristically an Islamic term used in its literal sense in the primary sources of Islamic studies, namely the Qur'ān and Prophetic traditions as “deep understanding” of any given issue or phenomenon, particularly the one related to religion.³ It is not used here in the sense of Islamic

¹ Charles Krebs, *The Ecological World View* (Berkeley, CA: University of Carolina Press, 2008), 4.

² World Health Organization, “Practical Considerations and Recommendations for Religious Leaders and Faith-Based Communities in the Context of COVID-19,” April 7, 2020, https://iris.who.int/bitstream/handle/10665/331707/WHO-2019-nCoV-Religious_Leaders-2020.1-eng.pdf?sequence=1.

³ For example, see the following Qur'ānic verses: 4:78; 6:65; 9:8, 87, 127; 11:91; and 17:44. It was also used in the same sense in the following Prophetic tradition: “If Allah wants to do good for somebody, He makes him comprehend the Religion (i.e. Islam)”

jurisprudence or legal code, as it later became known. Rather, *fiqh* is here juxtaposed with biology and ecology to signify a religiously inspired understanding and interpretation of certain biological and ecological functions and ecosystem services that support life on earth but could also be harmful to humans when certain ecological barriers are compromised. Such is the concern of a biocentric perspective in an Islamic context. After a review of current Islamic studies literature on COVID-19 and the ecology of coronavirus, I examined ecosystem services as divine provisions, the ecology of animals as contained in the Qur'ān, and the ecological barriers which, when broken, could make humans vulnerable to zoonotic diseases.

Islamic Studies Literature on COVID-19

Epidemic, a disease affecting a large number of people within a community, translated into Arabic as “*wabā*” is known to the early Muslim communities in the form of plague (*ṭā'ūn*).⁴ Several Prophetic traditions made references to the plague. In one famous *ḥadīth*, the Prophet is reported to have said, “If you hear of an outbreak of plague in a land, do not enter it; but if the plague breaks out in a place while you are in it, do not leave that place.”⁵

Ibn Ḥajar al-‘Asqalānī’s (d. 852/1449) book titled *Badhl al-Mā'ūn fī Faḍl al-Ṭā'ūn* is the earliest known literature on the topic that details the earliest infectious disease experienced by the early Muslim communities. In this book, al-‘Asqalānī mentioned the difference between epidemic and plague, the analysis of Prophetic tradition on plague, the role of *jinn*s, the status of the victims, the importance of medical precautions and confinement in areas affected by the plague, and the need for prayer to Allah for protection and cure.⁶

Muḥammad b. Ismā'īl al-Bukhārī, *Ṣaḥīḥ*, kitāb farḍ al-khumus, bāb qawl Allāh ta'ālā: “Fa'anna li Allāhi khumusahu” ḥadīth 3116, <https://sunnah.com/bukhari:3116>.

⁴ Musferah Mehfooz, “Understanding the Impact of Plague Epidemics on the Muslim Mind during the Early Medieval Period,” *Religions* 12, no. 10 (2021): 2, <https://doi.org/10.3390/rel12100843>. For further studies on the early Muslims' exposure to the outbreak of epidemic disease, see Lawrence I. Conrad, “Tā'ūn and Wabā': Conception of Plague and Pestilence in Early Islam,” *Journal of the Economic and Social History of the Orient* 25, no. 3 (1982): 265-307, <https://doi.org/10.2307/3632188>; Nahyan Fancy and Monica H. Green, “Plague and the Fall of Baghdad (1258),” *Medical History* 65, no. 2 (2021): 157-77, <https://doi.org/10.1017/mdh.2021.3>.

⁵ Al-Bukhārī, *Ṣaḥīḥ*, kitāb al-ṭibb, bāb mā yudhkar fī 'l-ṭā'ūn, ḥadīth 5728, <https://sunnah.com/bukhari:5728>.

⁶ Aḥmad b. 'Alī b. Ḥajar al-‘Asqalānī, *Badhl al-Mā'ūn fī Faḍl al-Ṭā'ūn* (Riyadh: Dār al-‘Āshimah, 1991).

Contemporary approaches to understanding COVID-19 from an Islamic Studies perspective primarily focus on *fiqh*-jurisprudential or ethical approaches. Suyadi, Nuryana, and Fauzi reconstruct *fiqh* (Islamic jurisprudence) of crisis management and its actualization in COVID-19. This includes replacing “*ḥayya ‘alā ‘l-ṣalāh*” (come to the prayer) with “*ṣallū fī buyūtikum*” (pray at your homes) in the *adhān* (call to prayer); converting Friday prayer to *ḥuḥr* prayer; converting all congregational prayers in the mosque, including *‘īd* and *tarāwīḥ* prayers to individual prayers at home; and replacing *janāzah* (funeral) prayer with *ṣalāt al-ghā’ib* (absentee funeral prayer). The authors also discuss the role of Muhammadiyah as a religious organisation in Indonesia in mitigating the COVID-19 pandemic in compliance with prescribed protocols.⁷ Similarly, Dahlan and others examine the application of the *maqāṣid al-sharī‘ah* (the objectives of Islamic law) principle of *ḥifẓ al-naḥs* (protection of life) in the practice of worshipping during crisis management. The authors demonstrate how a religious organization successfully applied this life-protecting principle in managing the performance of various rituals and religious activities at the Nurul Iman mosque in Indonesia while at the same time complying with the health protocols to prevent transmission of COVID-19.⁸ In his study on the correlation between Islamic teachings on religious ritual practices and health protection, Piwko observes that Islam obliges its followers to perform several rituals without putting their health at risk. He demonstrates how uncontrolled religious practices in congregation could contribute and indeed have contributed to the spread of COVID-19. He cites, as examples of such transmission, the pilgrimage to Iran’s Qom and the religious meetings of the Jamā’at al-Tablīgh movement in Sri Petaling mosque near Kuala Lumpur, Malaysia in early 2020.⁹

From an ethical perspective, Shabana reviews the morality of measures taken to prevent or contain the spread of COVID-19, including protocols for treating individuals who have already contracted the disease or handling the corpses of COVID-19 victims. The author posits

⁷ Suyadi, Zalik Nuryana, and Niki Alma Febriana Fauzi, “The *Fiqh* of Disaster: The Mitigation of Covid-19 in the Perspective of Islamic Education-neuroscience,” *International Journal of Disaster Risk Reduction* 51 (2020): 1-9, <https://doi.org/10.1016/j.ijdr.2020.101848>.

⁸ Moh Dahlan et al., “The Islamic Principle of *Ḥifẓ al-Naḥs* (Protection of Life) and COVID-19 in Indonesia: A Case Study of Nurul Iman Mosque of Bengkulu City,” *Heliyon* 7, no. 7 (2021), <https://doi.org/10.1016/j.heliyon.2021.e07541>.

⁹ Aldona Maria Piwko, “Islam and the COVID-19 Pandemic: Between Religious Practice and Health Protection,” *Journal of Religion and Health* 60, no. 5 (2021): 3291-308, <https://doi.org/10.1007/s10943-021-01346-y>.

that Muslims' responses to the COVID-19 pandemic balance the religious and metaphysical dimensions of the scriptural sources with the practical implications of the real experience of COVID-19.¹⁰

From a historical perspective, BaHamam and Mehfooz enumerate several Islamic religious practices enshrined in the Qur'ān and Prophetic *sunnah* as well as measures advanced by Muslim physicians during the medieval period to control the spread of contagious diseases. Such religious practices and measures could be adapted to contain the spread of COVID-19. The authors' objective is to demonstrate the Muslims' contributions to the management and control of contagious diseases and pandemics long before the development of infection control rules in modern medical practice.¹¹

The approach adopted in the current study is grounded on what can be called *al-takāful al-bī'ī* (pact of environmental components on mutual guarantee). While the word *bī'ī* simply means "environmental" from *bī'ah*, meaning environment, *takāful* needs more elaboration. *Takāful* is an Arabic word derived from *takāfala*, which is a derivative of the root verb *kafala/kaffala*.¹² *Kafala/kaffala* means to guarantee, protect, support or sponsor while *takāfala* means to mutually guarantee and protect each other. Unlike *kafala/kaffala* and its verbal noun *kafālah*, where at one end is a giver and at the other end is a recipient of guarantee and support, *takāfala*, and its verbal noun *takāful*, refers to a pact of two or more participants to mutually guarantee the support and protection of each other. Thus, *al-takāful al-bī'ī* conveys the idea of a pact of complementary components of the environment to mutually guarantee and support each other. In a similar exposition, Abdur-Razzaq Lubis observes that each element of creation plays an essential part in maintaining, sustaining, and preserving the whole.

¹⁰ Ayman Shabana, "From the Plague to the Coronavirus: Islamic Ethics and Responses to the COVID-19 Pandemic," *Journal of Islamic Ethics* 7 (2021): 92-128, <https://doi.org/10.1163/24685542-12340060>.

¹¹ Ahmed BaHamam, "The Contributions of Islam and Muslim Scholars to Infection Control: Dealing with Contagious Diseases and Pandemics," *Journal of Nature and Science of Medicine* 5, no. 4 (2022): 372-78; Mehfooz, "Understanding the Impact of Plague Epidemics."

¹² The word *kafala/kaffala* and its verbal variants are used in the Qur'ān in the context of taking care and upbringing of Prophet Mūsa (20:40; 28:12) and Maryam, the mother of Prophet 'Īsā (3:37, 44). *Kafīl* (guarantor) is also used to refer to Allah in that the believers have made Him their Guarantor/Surety (16:91). Today *takāful* is used in Islamic banking and finance to refer to mutual insurance or some type of contract of mutual guarantee and support between two or more parties. There is also what is called *al-takāful al-ijtimā'ī* (social security), referring to the principle of mutual cooperation among members of society.

In other words, each of nature's components, including humankind, plays its self-preserving role and supports the rest.¹³

This *al-takāful al-bīrī* approach adopted in this study is corroborated by “One Health.” One Health considers health issues in a broader, ecological context, tackling health threats at their origins at the ecosystem-animal-human health interface. Studies have shown that human beings throughout history have heavily relied on domestic and wild animals and the provisions of ecosystems for their physical, mental, social, and spiritual well-being. Consequently, constructing a holistic approach to human health requires addressing animal health and ecosystems. In other words, ecological processes and environmental factors are key determinants of human health. Framed on biocentric environmental ethics that extend the status of moral value from human beings to all other living beings in nature, One Health incorporates human health, animal health, and ecosystem health. It is generally believed that achieving all three at once—human health, animal health and ecosystem health—is the only means of achieving any of them.¹⁴

Such biocentric ground is not inimical to the teachings of the Qur'ān. Human beings are addressed in the Qur'ān, not as self-sufficient or isolated beings, but often as *khalīfah*, God's agents and trustees over many other living beings. That means, as El Maaroufi observes, human beings are “being-with-others” who are always existentially related to others in a world to be shared with others. These others are equally creatures of God and cohabitants of nature.¹⁵ A world without these diverse non-human creatures would be too lonely, and too unbearable for human survival and sustainability.¹⁶ What is certain is that the Qur'ān refers to several natural phenomena, a variety of species, their delicate

¹³ Abdur-Razzaq Lubis, “Environmental Ethics in Islam,” *Muslim Environmental Watch*, <https://muslimenvironment.wordpress.com/2010/04/04/environmental-ethics-in-islam/>.

¹⁴ B. R. Evans and F. A. Leighton, “A History of One Health,” *Revue Scientifique et Technique* 33, no. 2 (2014): 414; <https://doi.org/10.20506/rst.33.2.2298>; Mouchang Yu and Yi Lei, “Biocentric Ethical Theories,” in *Development and Environment*, ed. Teng Teng and Ding Yifan (Oxford: Eolss Publishers, 2009), 2:254; M. Letko et al., “Bat-borne Virus Diversity, Spillover and Emergence,” *Nature Reviews Microbiology* 18 (2020): 469, <https://doi.org/10.1038/s41579-020-0394-z>; World Organisation for Animal Health, “One Health,” <https://www.oie.int/en/what-we-do/global-initiatives/one-health>.

¹⁵ Asmaa El Maaroufi, “Towards an Ethic of Being-With: An Islamic-Phenomenological Perspective on Human-Animal Encounters,” *Journal of Islamic Ethics* 6 (2022): 87, <https://doi.org/10.1163/24685542-12340078>.

¹⁶ Abdul Kabir Hussain Solihu, “Valuing Biodiversity: A Qur'anic Account,” *International Journal of Environmental Science and Development* 5, no. 3 (2014): 250, <https://doi.org/10.7763/IJESD.2014.V5.486>.

interdependence, and the ecosystem services they offer as part of the grand divine design. Studies that explore ecological functions, their interconnections, symbiotic relations, and benefits to humankind in understanding what the Qur'ān calls “*ṣun‘ Allāh*” (the artistry of Allah) are central to Islamic biocentric eco-theological inquiries which should be considered as an integral part of Islamic studies, as the current study sets to advance.

Ecology of Coronaviruses

Studies on the ecology of viruses suggest that some viruses circulate only within a given species while others cross the species barrier. About 60–75% of pathogens which cause diseases in humans are multi-host, and zoonotic, meaning they originate in animals but can cross-infect humans and other species.¹⁷ Humans too can transmit some viruses to animals through a process called “reverse zoonosis”, “anthroponosis” or “zooanthroponosis.”¹⁸

“Coronaviruses” (CoVs) refer to a large group of viruses that cause upper respiratory infections. Hundreds of coronaviruses are known to affect birds and mammals with varying degrees of illnesses. Like other viruses, certain types of coronaviruses circulate among non-human species alone. This includes “infectious bronchitis virus” in chickens, “feline infectious peritonitis virus” in cats, and “transmissible gastroenteritis virus” in piglets, none of which is known to cause disease in humans.¹⁹ Only seven are known to infect humans and all are zoonotic, that is, of animal origin. They are: HCoV-229E, HCoV-NL63, HCoV-OC43, HCoV-HKU1, SARS-CoV, MERS-CoV, and SARS-CoV-2.²⁰ The

¹⁷ S. Cleaveland, M. K. Laurenson, and L. H. Taylor, “Diseases of Humans and Their Domestic Mammals: Pathogen Characteristics, Host Range and the Risk of Emergence,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 356, no. 1411 (2001): 991–93, <http://doi.org/10.1098/rstb.2001.0889>; S. E. Bowden and J. M. Drake, “Ecology of Multi-host Pathogens of Animals,” *Nature Education Knowledge* 4, no. 8 (2013), <https://www.nature.com/scitable/knowledge/library/ecology-of-multi-host-pathogens-of-animals-105288915>; Joel Henrique Ellwanger and José Artur Bogo Chies, “Zoonotic Spillover: Understanding Basic Aspects for Better Prevention,” *Genetics and Molecular Biology* 44, no. 1 (2021): 1, <https://doi.org/10.1590/1678-4685-GMB-2020-0355>.

¹⁸ Tim Newman, “Reverse Zoonosis: Can You Make Your Pet Sick?” *Medical News Today*, March 30, 2017, <https://www.medicalnewstoday.com/articles/316624>; Evans and Leighton, “History of One Health,” 414.

¹⁹ Ana Sandoiu, “Zoonotic Diseases: Why are Infections from Animals so Dangerous to Humans?” *Medical News Today*, February 11, 2020, <https://www.medicalnewstoday.com/articles/zoonotic-diseases-why-are-infections-from-animals-so-dangerous-to-humans>.

²⁰ Z. W. Ye et al., “Zoonotic Origins of Human Coronaviruses,” *International Journal of Biological Sciences* 16, no. 10 (2020): 1686–87; Ding X. Liu, Jia Q. Liang, and To S. Fung,

first four types usually cause mild to moderate symptoms, affecting people at least once in their lifetime. These viruses disappear on their own most of the time. The last three strains are more virulent and pose a greater risk. SARS-CoV or Severe Acute Respiratory Syndrome Coronavirus causes Severe Acute Respiratory Syndrome (SARS) disease. First identified in China in November 2002, it is the first major disease of the twenty-first century that caused an epidemic in 2002–2003.²¹ MERS or Middle East Respiratory Syndrome is another viral respiratory disease caused by a novel coronavirus named MERS-CoV or Middle East Respiratory Syndrome Coronavirus. It was first identified in Saudi Arabia in 2012.²² The 2019 novel coronavirus is officially called “Severe Acute Respiratory Syndrome Coronavirus 2” (SARS-CoV-2). The disease caused since its outbreak in December 2019 is called “Coronavirus Disease 2019” (COVID-19). Though first discovered in China in December 2019, the virus and the disease it causes were formally named so by the International Committee on Taxonomy of Viruses (ICTV) and the World Health Organisation (WHO) respectively on February 11, 2020. Ever since its emergence, the virus has mutated into different kinds of variants with waves in many parts of the world.

Bats are widely believed to be the natural reservoir of SARS-CoV-2 and their ecological role will be discussed later. Some researchers considered pangolin as an intermediary vector responsible for transmitting SARS-CoV-2 to humans.²³ Other researchers however exonerated pangolins.²⁴ What is clear is that there must be an affinity between the reservoir and vector animals on the one hand, and humans, on the other. It has been shown that SARS-CoV-2 attacks human cells through what is clinically known as “ACE2 receptor” among other probable receptors in the human body.²⁵ Widely distributed in the

“Human Coronavirus-229E, -OC43, -NL63, and -HKU1 (Coronaviridae),” in *Encyclopedia of Virology*, 4th ed. (2021), 2:428, <https://doi.org/10.1016/B978-0-12-809633-8.21501-X>.

²¹ Vincent C. C. Cheng et al., “Severe Acute Respiratory Syndrome Coronavirus as an Agent of Emerging and Reemerging Infection,” *Clinical Microbiology Reviews* 20, no. 4 (2007): 664, <https://doi.org/10.1128/CMR.00023-07>.

²² Esam I. Azhar et al., “The Middle East Respiratory Syndrome (MERS),” *Infectious Disease Clinics* 33, no. 4 (2019): 892, <https://doi.org/10.1016/j.idc.2019.08.001>.

²³ Ellwanger and Chies, “Zoonotic Spillover,” 10; Sandoiu, “Zoonotic Diseases.”

²⁴ Roger Frutos et al., “COVID-19: Time to Exonerate the Pangolin from the Transmission of SARS-CoV-2 to Humans,” *Infection, Genetics and Evolution* 84 (2020), <https://doi.org/10.1016/j.meegid.2020.104493>.

²⁵ H. Kai and M. Kai, “Interactions of Coronaviruses with ACE2, Angiotensin II, and RAS Inhibitors—Lessons from Available Evidence and Insights into COVID-19,” *Hypertension Research* 43 (2020): 649, <https://doi.org/10.1038/s41440-020-0455-8>; Markus Hoffmann et al., “SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a

human body, including the kidney, heart, small intestine and lungs, ACE2 (angiotensin-converting enzyme 2) plays a vital regulatory and protective role in blood pressure, wound healing and inflammation, and it is an integral component of the renin-angiotensin system (RAS) which keeps fluid and salt in balance.²⁶ Whether adding more ACE2 into the body might be a risk factor for people with COVID-19 or might distract the virus and thus help patients remain unclear. Human-to-human transmission could be through direct contact with an infected person's respiratory droplets or tiny particles called aerosols generated during coughing, sneezing or talking, as well as contact with infected surfaces, among other possible modes.²⁷

Due to shared traits and ecological similarities between species, more than half of human viruses are shared with other animals, particularly mammals, capable of cross-species transmission. The emergence of coronaviruses into the human population is, therefore, ecologically a natural biological process, but it is often triggered by how humans relate with other species, especially with birds and mammals, and the ecosystem, as will be examined later.

Ecosystem Services as *Rizq Allāh* and Human Portion therein

The term “Ecosystem services” refers to “the various ways that organisms, and the total of their interactions with each other and the environments in which they live, function to keep all life on this planet, including human life, alive.”²⁸ A complex of natural cycles generates these services. Ecosystem services provided by biodiversity are commonly divided into four categories: 1) provisioning services, like food, medicines and fuel; (2) regulating services, like the purification of air and water, control of climate, plant pests and pathogens, mitigation of floods, decomposition of wastes and detoxification of soils; (3) cultural services, like aesthetic, spiritual, and intellectual needs; and (4) supporting services, which make possible all other ecosystem services, like pollination, nutrient (re)cycling, and the photosynthetic capture of the sun's energy and production of biomass by plants, and other

Clinically Proven Protease Inhibitor,” *Cell* 181 (2020): 271, <https://doi.org/10.1016/j.cell.2020.02.052>.

²⁶ Kai and Kai, “Interactions of Coronaviruses with ACE2,” 649.

²⁷ Heshu Sulaiman Rahman et al., “The Transmission Modes and Sources of COVID-19: A Systematic Review,” *International Journal of Surgery Open* 26 (2020): 128, <https://doi.org/10.1016/j.ijso.2020.08.017>; Raymond Tellier, “COVID-19: The Case for Aerosol Transmission,” *Interface Focus* 12 (2022): 1-2, <https://doi.org/10.1098/rsfs.2021.0072>.

²⁸ E. Chivian and A. Bernstein, *Sustaining Life: How Human Health Depends on Biodiversity* (Oxford: Oxford University Press, 2008), xi.

elements required for the chemistry of life.²⁹ These ecosystems of the world, as Chivian observes, “deliver their life-sustaining services for free, and in many cases, they involve such complexity and are on a scale so vast that humanity would find it impossible to substitute for them.”³⁰

References to nature, its forces, functions, and phenomena abound in the Qur’ān. The Qur’ān makes it crystal clear that it is Allah Who creates all things in due proportions and sets their ecological interactions, causes, and effects in motion. He creates A, B, and C with properties which could affect or be affected by one another. He also provides the conditions and enabling environment that harbour interactions and interconnections of all things in the universe. These complex systems in nature are forcefully exhibited in the Qur’ān as *khalq Allāh* (God’s creature) (27:59-64; 31:11) and their interconnected functionalities as *ni’mah* (blessing) (14:34; 16:18, 72; 3:31), *tabṣirah* (insight), *dhikrā* (reminder) (50:8), and most prominently *āyāt* (signs) (36:33-40; 41:39) which are not to point to themselves and thereby assume some sort of deity, but to Allah, their Creator (41:37).

This gigantic machine of the universe with its causal processes and fully functioning system is presented in the Qur’ān as the prime sign and proof of its Maker. As Fazlur Rahman remarks, this functioning system could be called a “natural sign” as compared to a “supernatural miracle,” “Who else but an infinitely powerful, merciful, and purposeful Being could have brought into existence something with dimensions so vast and an order and design so complex and minute?”³¹ It is clear from the Qur’ānic presentation that these natural objects have no inherent power to cause or effect; they could not deviate or act differently in defiance of Allah’s command. In one revealing passage, recounting ecological services provided by Allah, the Qur’ān states,

And the earth—We have spread it out, set thereon mountains firm and immovable, and produced therein all kinds of things (evenly) weighed (*mawzūn*). And We have provided therein livelihood (*ma’āyish*)—for you and for those whose sustenance (*rizq*) does not depend on you. And there is not a thing but its reserves/treasures (*khazā’inuh*) are with Us; and nought do We send down unless it be in due and knowable measure (*bi-qadar ma’lūm*). And We send down winds fertilising/pollinating (*lawāqih*) (vegetation), then cause the rain to descend from the sky, therewith

²⁹ Chivian and Bernstein, *Sustaining Life*, 76; Klaus Birkhofer et al., “Ecosystem Services—Current Challenges and Opportunities for Ecological Research,” *Frontier in Ecology and Evolution* 2 (2015): 1-2, <https://doi.org/10.3389/fevo.2014.00087>.

³⁰ Chivian and Bernstein, *Sustaining Life*, 75.

³¹ Fazlur Rahman, *Major Themes of the Qur’an*, 2nd ed. (Chicago: University of Chicago Press, 2009), 68-70.

providing you with water (in plenty)—though you are not the guardians of its sources. (15:19-22)

In another passage, the Qur’ān recounts how Allah makes natural objects offer ecological services. In that passage, it is mentioned that natural objects should serve as *āyah* to humans:

A sign for them is the dead land that *We* have brought to life; from it *We* have brought forth grain, from which they eat. And *We* have made therein orchards of date-palm and grapes, and *We* have caused springs of water to gush forth therein. . . . And a Sign for them is the night from which *We* strip off the day whereupon they are in darkness. And the sun runs its fixed course: that is the decree of the Almighty, All-knowing. And the moon, *We* have determined its phases, until it finally appears like the old date-palm stalk. It is not permitted to the sun to catch up the moon, nor can the night overtake the day: each swims along in (its own) orbit. (36:33-40)

The expression here is always “*We*” and “*We*”, referring to Allah as the causative agent of all ecosystem products and services, and that none is of human making. As such, amidst recounting of these resources, glory is declared to be to Allah: “Glory be to Him Who created pairs, all of them, of what the earth produces as well as of themselves and of what they have no knowledge” (36:36). Thus, the natural and ecological processes, as Nomanul Haq observes, are firmly grounded on the transcendental realm.³²

In advancing a biocentric perspective to address a perennial problem, it is worth noting that not all of what is provided in the biosphere is necessarily and exclusively made for human use or consumption. Some are beneficial while others are detrimental to humans; yet each ecologically plays a unique, precious, and complementary role. Humans share this planet with millions of other species; each deserves its fair share in Allah’s provisions as alluded to in the Qur’ān (15:20; 29:60). Here comes the principle of *ḥalāl* and *ḥarām* that sets the limit for humans’ portion.

Ḥalāl means permissible and lawful while *ḥarām* means impermissible and unlawful. When applied to useable or consumable items (directly or indirectly obtained from ecosystem services and their processes) of non-human species in nature, *ḥalāl* and *ḥarām* set the standard for what is lawful and what is unlawful therein, respectively. The terms also set the standard for intra-human conduct and dealings. *Ḥalāl* and *ḥarām* apply to moral agents (*mukallaḥūn*) who, out of the free will, make deliberate decisions and thus operate within the domain of

³² S. Nomanul Haq, “Islam and Ecology: Toward Retrieval and Reconstruction,” *Daedalus* 130, no. 4 (2001): 148, 155-59.

moral law. The moral law is used here to refer to the categorical imperatives applicable to and binding upon human beings as moral agents.³³

Two keywords which are often associated with *ḥalāl* and *ḥarām* in the Qur'ān are *ṭayyib* (pure, clean) and *khabīth* (impure, unclean), respectively (2:168; also see 5:4; 7:157). *Ṭayyib* is a key axiological term that is generically used in the Qur'ān to qualify a variety of ecological benefits provided in nature, such as fertile land and soil (7:58; 34:15), favourable wind (10:22), healthy tree (14:24), pure soil (4:43; 5:6) and pure foodstuff (2:168; 5:88; 16:114). It is also used to refer to a good lifestyle, such as chaste and pure men and women (3:38, 24:26), pure earning (2:267), good word and salutation (14:24, 22:24, 24:61, 35:10), good life (16:97) and good dwelling in Paradise (9:72; 61:12). *Khabīth*, associated with *ḥarām*, opposes everything *ṭayyib* stands for. It refers to impure and unclean things for human use or consumption. When describing *ḥalāl* food, *ṭayyib* means any good thing typically expected of food, particularly nutrition, hygiene, healthiness, and wholesomeness. The qualities of *ṭayyib* are, in effect, the intrinsic attributes of *ḥalāl*. In other words, *ṭayyib* adds no new quality not already embedded in *ḥalāl*.³⁴ It is inconceivable that an item which is impure and harmful to human health (which are the attributes of *khabīth*) could be made *ḥalāl*, just as that which is ecologically pure and healthy for human biological and spiritual well-being (being the attributes of *ṭayyib*) could be made *ḥarām*. Thus, put together, *ḥalālan ṭayyiban* refers to organically good, hygienically nutritious, ecologically healthy, and environmentally friendly foods. What makes things *ḥalāl* is a question that has been concisely answered in the Qur'ān itself as *ṭayyib*, “They will ask you (O Muhammad) what is *ḥalāl* for them (as food). Say: ‘*Al-Ṭayyibāt* are made *ḥalāl* for you’” (5:4).

It must be noted, however, that *ḥalāl* and *ḥarām* relate solely to humans by setting their dietary standards. They do not cover or apply to provisions of non-human species. The same thing applies to *ṭayyib* and *khabīth*. As explained above, *ṭayyib* (pure, clean) is the determinant factor of *ḥalāl* while *khabīth* (bad, impure, unclean) is the determinant factor of *ḥarām*. The former is beneficial, while the latter is harmful to humans. In nature, however, the

³³ Abdul Kabir Hussain Solihu, “Making Sense of Natural Disasters: An Islamic Hermeneutics of Malevolent Phenomena in Nature and Its Implication for Sustainable Development,” *American Journal of Islamic Social Sciences* 24, no. 1 (2007): 57-59, <https://doi.org/10.35632/ajis.v24i1.416>.

³⁴ Solihu, “Ecological Conceptualization of Halal-Haram Divide,” in *Proceedings of the International Conference on Science, Technology and Social Sciences (ICSTSS) 2012*, ed. Azman Kasim et al. (Singapore: Springer, 2014), 106.

beneficial and the harmful are relative terms. What humans construe as beneficial might be a source of harm to other living beings. Conversely, if an object has no immediate benefit to humans, it could benefit other living beings upon which human sustenance directly or indirectly depends.³⁵

Not everything in nature is necessarily congruent with human dietary requirements. Some animal and plant species are not ecologically meant for direct human consumption or contact. For example, the Manchineel tree (dubbed “Hippomane mancinella” or “dead tree species” that is native to South Florida, the Caribbean, Central America and northern South America), is widely considered to be one of the deadliest plants on earth. Every part of the Manchineel tree, such as leaves and fruits, contains extreme toxins for humans and many bird and animal species. Simple contact with human skin can lead to blisters, and blindness can occur if it touches a person’s eyes or when the eyes are exposed to the smoke from the burned Manchineel tree. In 2011, a world records tracker dubbed it “the world’s most dangerous tree.”³⁶ Manchineel trees are often marked with caution like this one found in the Cayman Islands.

DO NOT TOUCH!!!

This tree is very TOXIC | The fruit is poisonous and the sap from leaves and stems can produce painful blisters. Do not stand under this tree during rain as the water on the leaves can pick up the toxin and drip it on the skin.³⁷

Nevertheless, the Manchineel tree provides certain ecological benefits. They act as windbreakers and prevent natural beach erosion. This is a useful ecosystem service in the face of rising sea levels and bigger Atlantic storms. In addition, a lizard species called “iguana” or “garrobo” of Central and South America can eat the fruits of this tree and is sometimes found living among the tree’s limbs.³⁸

A cosmic and ecological principle under which *halāl* and *ḥarām* operate and which could account for the ecological function of what is detrimental to human nature is the Qur’ānic keyword “*rizq*.” *Rizq*, repeatedly mentioned in the Qur’ān, literally means “sustenance” or “provision.” *Rizq Allāh* refers to God-given, life-sustaining provision that sustains all living beings. *Al-Rāziq* and *al-Razzāq* are Attributive Names of Allah, which refer to Him as the Sustainer, the Bestower and the

³⁵ Solihu, “Ecological Conceptualization of Halal-Haram Divide,” 110-11.

³⁶ Guinness World Records, “Most Dangerous Tree” (2001), <https://www.guinnessworldrecords.com/world-records/most-dangerous-tree/>.

³⁷ R. McLendon, “Why Manchineel Might Be Earth’s Most Dangerous Tree,” *Treehugger Sustainability for All*, January 21, 2021, <https://www.treehugger.com/why-manchineel-might-be-earths-most-dangerous-tree-4868796>.

³⁸ McLendon, “Why Manchineel Might Be Earth’s Most Dangerous Tree.”

Provider of all sustenance. He is described in the Qur'ān as “*Khayr al-Rāziqīn*” (the Best Sustainer/the Best of sustainers) (5:114; 22:58; 23:72; 34:39; 62:11). More often, *rizq* is used in the verb form where God is said to provide sustenance for all. Unlike *ḥalāl* and *ḥarām* which are anthropocentric, regulating human needs, *rizq* is ecocentric and biocentric, covering all living beings. Other Qur'ānic words similar to *rizq* are *ma'āyish* (singular: *ma'īshah*) (7:10, 15:20) and *aqwāt* (singular: *qūt*) (41:10), both mean “nourishments” and life-sustaining provision.

God's *rizq* or provision as cited in the Qur'ān could be classified at least into three categories. First, God's provision is mentioned in reference to human needs or in association with *ḥalāl* and *ḥarām*, *ṭayyib* and *khabīth* to indicate that humans are allowed to feed only on *ḥalāl*, and they must abstain from *ḥarām* of God's *rizq* (7:32; 6:140; 2:172), though, as Fakhr al-Ḍīn al-Rāzī (d. 606/1210) observes, some humans disobediently feed and survive on *ḥarām rizq*.³⁹ Second, God's provision is also cited about both human and non-human species nourishments to show that the source of non-human provision is not dependent on humans, but on Allah just as human provision is dependent on Allah (15:20, 29:60). Third, God's provision is mentioned in reference to biospheric provisions with no reference to humans or animals (41:10). It should be added that *rizq* is one of the few Qur'ānic keywords that have no antonym. Unlike *ḥalāl* and *ḥarām*, *ṭayyib* and *khabīth*, *ḥaqq* (truth) and *bāṭil* (falsehood) binaries, *rizq* has no opposite word. Hence, within the operationalization of *rizq*, nature is free from wastage; one species' waste is the nourishment of another.

Animal Ecology in the Qur'ān

The Qur'ān has been the primary source of Islamic perspective on ecological consciousness. References to animals, plants, mountains, the sun, moon, stars, and many other celestial and terrestrial bodies abound. Some *sūrah*s of the Qur'ān bear the names of non-human species, such as al-Baqarah (the Cow), al-An'ām (the Cattles), al-Naḥl (the Bee), al-Naml (the Ants), al-'Ankabūt (the Spider) and al-Fīl (the Elephant). The Qur'ān speaks of non-human living beings in nature as autonomous *umam* (plural of *ummah*, meaning community) of worshipers (16:48-50, 22:18), comparable to human communities (6:38), and occasionally recounts some of their behaviours (7:176; 24:41; 29:41; 62:5; 67:19), interactions among themselves (27:18), interactions with other organisms (16:68-69) and their communications with human beings (5:31; 27:20-31).⁴⁰

³⁹ Fakhr al-Ḍīn al-Rāzī, *Tafsīr al-Fakhr al-Rāzī* (Beirut: Dār al-Fikr, 1985), 17:193.

⁴⁰ Solihu, “Ecological Conceptualization of Halal-Haram Divide,” 107.

Animals are key components of the ecosystem and perform critical ecological services in support of their species and other species they share the biosphere with. Some of these services include pollination, seed dispersal, fertilization of plants, and control of plant and animal populations through predation. They are a source of food, transportation, clothing, medicine, recreation, and other cultural activities for human well-being.⁴¹

Animals are generally cited in the Qur'ān for various purposes that could be grouped into seven categories. First, they are cited as a source of knowledge and inspiration. A *ghurāb* (raven/crow) taught humankind how to bury a corpse (5:31). A *dābbat al-arḍ* (a creeping creature of the earth/earthworm) gnawed away at Prophet Sulaymān's staff to make known to the jinn that their master has died (34:14). A staff-turned-snake and a mud-turned-bird were cited as part of the miracles of Prophet Mūsā and Prophet 'Īsā respectively. A fish became alive and made its way into the sea at the junction of the two seas which is meant to be the meeting spot between a God's servant (Khiḍr, a master) and Prophet Mūsā (a disciple) during the latter's quest for knowledge (18:60-64). A mosquito is cited as a parable to indicate that no matter how more or less insignificant, repugnant, or disgusting a creature might seem to be within the prima nature, it could be a source of knowledge and inspiration and thus worthy of recognition (2:26).⁴² Humans are invited to explore the creation of the camel (88:17) and the design of birds (16:79; 67:19), among others. In addition, animals are cited as a parable to illustrate several characteristics of unbelievers or hypocrites (7:176-77; 62:5; 74:50-51).

Second, animals are used to demonstrate the possibility of Resurrection in the Hereafter. Four birds/flying creatures (2:260), a donkey (2:259) and a dog (18:18, 22) were killed and brought back to life on separate occasions to demonstrate that Allah is capable of resurrecting the dead. An organ of a slaughtered cow was used to revive the murdered among the People of the Book (2:67-73).

Third, they are cited as parables to portray the scene of eschatological events. For example, it is stated that on the Day of Resurrection, people will rise from their graves moving *en masse* like a swarm of locusts (54:7) in quantity and like a rabble of butterflies (101:4) in confusion and disarray.

⁴¹ Ansa Hameed, "An Ecolinguistic Perspective on Framing of Animals in Quranic Discourse," *Arab World English Journal for Translation and Literary Studies* 5, no. 3 (2021): 118-22, <http://dx.doi.org/10.24093/awejtls/vol5no3.9>.

⁴² Ṭanṭāwī Jawharī, *al-Jawāhir fī Tafsīr al-Qur'ān al-Karīm* (Beirut: Dār al-Fikr, 1930), 1:44; Solihu, "Ecological Conceptualization of Halal-Haram Divide," 108-9.

Fourth, animals are cited to illustrate the powerlessness and helplessness of idols and idolatry. The idols could neither individually nor jointly create a fly nor recover anything a fly snatched from them (22:73). In its weakness, Idolatry is compared to a spider house (Qur'ān 29:41). The calf is also mentioned in an instance of zoolatry (7:148; 20:88-89).

Fifth, some animals were associated with human misfortune. Prophet Yūnus/Jonah was swallowed by a fish when he was thrown into the sea (37:139-48; 68:48-50). The people of Thamūd were destroyed when they cruelly hamstrung the she-camel given to Prophet Ṣāliḥ as his miracle and insolently defied the commandment of their Lord (7:73-79; 11:61-68; 26:141-58; 54:23-31; 91:11-15). Pharaoh and his people were overwhelmed with swarms of locusts, lice, and frogs (7:133) when they violated the divine commands, and the Sabbath-breaking Jews were turned into apes and pigs (2:65; 5:60; 7:166). Just before the birth of Prophet Muḥammad, the *aṣḥāb al-fīl* (the Army of the Elephant) were chastised with flocks of birds, striking them with stones of baked clay (105:1-5).

Sixth, animals are mentioned as subservient to human utility, comfort and consumption. *Al-an'ām* (cattle/livestock), in particular, are a source of great benefit to humans, upon which they ride, from which they eat and drink and of which they derive many other benefits (16:5-7, 80; 23:21-22; 36:71-73; 40:79-80).

Finally, animals are ordained to partake in nature's beauty and biodiversity. They are of different colours and different patterns of movement. Among them, some fly in the sky (6:38; 67:19; 16:79), some crawl on their bellies, some walk on two, and some walk on four legs (6:38; 24:45).

Now, within the broad vital ecological services animals provide, animals could also be a source of misfortune to humans by transmitting harmful or infectious germs to humans, as in the fifth category above. Scientists have estimated that more than six out of every ten known infectious diseases affecting humans can be spread from animals, and three out of every four emerging infectious diseases in humans are zoonotic.⁴³ In the case of coronaviruses, bats are widely presumed to be the natural reservoir of COVID-19 and other highly pathogenic viruses that cause harm to humans.⁴⁴

⁴³ Centre for Disease Control and Prevention, "Zoonotic Diseases," July 1, 2021, <https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html>.

⁴⁴ Bruce Byers, "Ecology and COVID-19 #5: Coronavirus, Human Hubris, and Life in the Coevolving Biosphere," *Public Affairs*, August 25, 2020, <https://www.esa.org/esablog/2020/08/25/ecology-and-covid-19-5-coronavirus-human-hubris-and-life-in-the-coevolving-biosphere/>; Ellwanger and Chies, "Zoonotic Spillover," 8-10.

Not bird, but mammal and incredibly ecologically diverse, bats comprise over 1,400 different species, constituting more than twenty per cent of all identified mammal species.⁴⁵ They fit well into the category of flying animals referred to in the Qur'ān as *ṭayr* meaning “fliers, flying creatures” that form communities of their own like those of humans (6:36), and upon which the Qur'ān invites humans to study their creation, design, and aerodynamics (16:79; 67:19). Researchers at the Max Planck Institute for Ornithology in Radolfzell have identified the Brazilian free-tailed bat (*Tadarida brasiliensis*) as the fastest horizontal flier in the animal kingdom, with the flying speed through the night skies of over 160 kilometres (or 100 miles) per hour.⁴⁶

Researchers have identified several viruses believed to originate from bat species and studied the characteristics of bats that make them suitable reservoirs of such viruses and other pathogens, but they are almost immune to the illnesses caused by these viruses.⁴⁷ With this, the bat is a prominent candidate of animal species that could cause substantial viruses highly pathogenic to humans and from which humans have much to learn, fitting well within the first, fifth and sixth categories of purposes for reference to animals in the Qur'ān.

Evidence has been put forth from an Islamic legal perspective to explain the *ḥarām* status of bats consumption.⁴⁸ Suffice it to say here that because of several pathogens hazardous to human health associated with

⁴⁵ Diana D. Moreno Santillán et al., “Large-scale Genome Sampling Reveals Unique Immunity and Metabolic Adaptations in Bats,” *Molecular Ecology*, 30, no. 23 (2021): 6449-50, <https://doi.org/10.1111/mec.16027>; A. T. Irving et al., “Lessons from the Host Defences of Bats, a Unique Viral Reservoir,” *Nature* 589 (2021): 363, <https://doi.org/10.1038/s41586-020-03128-0>.

⁴⁶ Gary F. McCracken et al., “Airplane Tracking Documents the Fastest Flight Speeds Recorded for Bats,” *Royal Society Open Science* 3 (2016): 5-6, <https://doi.org/10.1098/rsos.160398>.

⁴⁷ R. Moratelli and C. H. Calisher, “Bats and Zoonotic Viruses: Can We Confidently Link Bats with Emerging Deadly Viruses?” *Memórias do Instituto Oswaldo Cruz* 110, no. 1 (2015): 15-16, <https://doi.org/10.1590/0074-02760150048>; Sandoiu, “Zoonotic Diseases;” Arinjay Banerjee et al., “Bats and Coronaviruses,” *Viruses* 11, no. 1 (2019): 6-7, <https://doi.org/10.3390/v11010041>; Tony Schountz et al., “Immunological Control of Viral Infections in Bats and the Emergence of Viruses Highly Pathogenic to Humans,” *Frontiers in Immunology* 8 (2017), <https://doi.org/10.3389/fimmu.2017.01098>; C. H. Calisher et al., “Bats: Important Reservoir Hosts of Emerging Viruses,” *Clinical Microbiology Reviews* 19, no. 3 (2006): 536, <https://doi.org/10.1128/cmr.00017-06>.

⁴⁸ Mohammad Hashim Kamali, *Shariah and the Halal Industry* (New York: Oxford Academic, 2021), 176, <https://doi.org/10.1093/oso/9780197538616.001.0001>; Adem Yerinde, “The Concept of the Qur'ānic Prase ‘at-Tayyib’ in the Context of the Scientific Statements Regarding the Origin Source of SARS-CoV2 Virus,” *Universal Journal of Theology* 6, no. 2 (2021): 206, <https://dergipark.org.tr/en/pub/ujte/issue/65097/1024630>.

bats, bats are impure (*khabiṭh*) for humans, and thus, their consumption is *ḥarām* (impermissible) for humans.

Despite the harmful viruses they could harbour, bats play significant ecological roles within the complex web of *rizq Allah* (God's provisions) in nature that operates at a level higher than that of the *ḥalāl-ḥarām* or *ṭayyib-khabiṭh* binary. The latter is an anthropocentric provision regulating human consumption while the former is an ecospheric/ecocentric provision that caters to human and non-human species, as mentioned earlier. Bats promote biodiversity and are an important part of a healthy ecosystem. They provide crucial ecosystem services, primarily through three ways: "Seed Dispersal," "Pollination," and "Pest Control."⁴⁹ Since plants cannot walk around and take their seeds to other places for germination, seed dispersal, provided by different means, ensures their germination and reproduction. Among the seed dispersers, bats are a major agent. They disperse seeds close to the parent plants as well as far and wide from the parent plants in the forest. It is believed that more than one hundred species of fruit-eating bats are responsible for seed dispersal from hundreds of species of tropical trees and shrubs.⁵⁰ Next, bats are major pollinators of the fig and cacao trees. Over three hundred species of fruit trees, including bananas, avocados and mangoes, and several plants, such as agave or the iconic saguaro cactus, depend on bats for pollination. Because bats are nocturnal animals that are mainly active at night, many types of cacti that open their flowers only at night depend on bats for pollination.⁵¹ Last, bats are major consumers of arthropods, and they play a pivotal role in the fight against agricultural pests. Insectivorous bats, largely feeding on airborne insects and other arthropods, suppress both naturally occurring and anthropogenically generated insect populations. They consume many crop-eating insects and reduce farmers' need for

⁴⁹ Thomas H. Kunz et al., "Ecosystem Services Provided by Bats," *Annals of the New York Academy of Sciences* 1223, no. 1 (2011): 1-38, <https://doi.org/10.1111/j.1749-6632.2011.06004.x>; Ramteke Asha Vilas, "Ecological and Economical Impact of Bats on Ecosystem," *International Journal of Life Sciences* 4, no. 3 (2016): 432-40, <https://oaji.net/articles/2016/736-1478253492.pdf>; Paul A. Racey, "The Uniqueness of Bats," in *Bats and Viruses: A New Frontier of Emerging Infectious Diseases*, ed. Lin-Fa Wang and Christopher Cowled (New Jersey: John Wiley, 2015), 6, <https://doi.org/10.1002/9781118818824.ch1>.

⁵⁰ Vilas, "Ecological and Economical Impact," 434; Racey, "The Uniqueness of Bats," 6.

⁵¹ Kunz et al., "Ecosystem Services," 1; Volker Walldorf and Heinz Mehlhorn, "Bats: A Glimpse on Their Astonishing Morphology and Lifestyle," in *Bats (Chiroptera) as Vectors of Diseases and Parasites: Facts and Myths*, ed. Sven Klimpel and Heinz Mehlhorn (Berlin: Springer, 2014), 14-15, https://doi.org/10.1007/978-3-642-39333-4_2.

pesticides. Each night, bats can eat thousands of insects, as much as their body weight or even more.⁵²

What needs to be emphasized here is that the natural world is flowing from what the Qur'ān calls "*amr Allāh*" (Allah's command) or simply "*amr*" (command). Both *khalq* (creation) and *amr* (command) are prerogatives of Allah: "Lo! To Him alone belong the creation and the command" (7:54). The Qur'ān speaks of the cosmos as an integral gigantic system governed by a set of immutable laws: "and He revealed to each heaven its command" (41:12). This *amr*, as Nomanul Haq observes, is

a universal operative principle whereby every created natural entity plays its assigned role and takes its assigned place as an integral element in the larger cosmic whole. Thus, *amr* is the specific principle of being of each thing *in relation to that of all other things*, inhering in it according to the command it uniquely receives from God.⁵³

Several natural phenomena were made subservient to humankind based on *amr*, as recorded in the Qur'ān. The ecological processes and the services derived from the ecosystem also flow from the same principle of *amr*. In what seems to be beneficial or detrimental, pleasant or repugnant to humans in nature, non-human species are simply complying with Allah's *amr*. Thus, when pollinating, seed-dispersing, or pest-controlling, bats follow Allah's command: the same command they follow when transmitting pathogens. In short, non-human species are brought into existence by, and remain to be, *khalq Allāh* (God's creature), guided by *amr Allāh* (God's command), and sustained by *rizq Allāh* (God's provisions). Humans in their actions in and with the natural world are therefore expected to respect and learn from Allah's creation, command, and provisions that manifested in non-human beings as well. The fact that bats do not typically get sick from the coronaviruses they allegedly harbour and transmit, as referenced earlier,⁵⁴ suggests that the problem might not be so much with the transmitters as much as it is with the recipients.

Breaking Ecological Barriers

Researchers have demonstrated that all zoonotic pathogens must overcome a series of hierarchical barriers, from a reservoir host to vector host, if applicable, and finally to a recipient host, to cause

⁵² Xavier Puig-Montserrat et al., "Pest Control Service Provided by Bats in Mediterranean Rice Paddies: Linking Agroecosystems Structure to Ecological Functions," *Mammalian Biology* 80 (2015): 237–45, <https://doi.org/10.1016/j.mambio.2015.03.008>; Kunz et al., "Ecosystem Services," 3–6; Walldorf and Mehlhorn, "Bats," 14–15; Racey, "The Uniqueness of Bats," 6.

⁵³ Nomanul Haq, "Islam and Ecology," 158–59; italics in the original.

⁵⁴ See note 47.

spillover infections in humans; “if any of these barriers is impenetrable, spillover cannot occur.”⁵⁵ Spillover, as used by disease ecologists, refers to an event in which a “pathogen passes from members of one species, as host, into members of another.”⁵⁶ They uphold that although humans are continually exposed to many potentially infectious pathogens originating from other species, most of these microorganisms cannot infect or cause disease in humans. However, if spillover eventually occurs, it must be “a relatively rare event,” according to Plowright and others;⁵⁷ “an accidental process . . . [and] an extremely low probability event,” according to Afelt, Frutos, and Devaux;⁵⁸ an “unprecedented breaking down of natural barriers,” according to Devaux and others;⁵⁹ and “an ecological imbalance” according to Cornelius, Scarpelli, and Burrows.⁶⁰ How this could happen requires further clarification.

Climate experts have confirmed that human activity is unequivocally changing the earth’s climate in ways “unprecedented” in thousands of years, and some of these changes are becoming “irreversible.” In its landmark report released on August 9, 2021, the Intergovernmental Panel on Climate Change (IPCC) declared that this human-induced climate change is instigating many weather and climate extremes in every region across the globe, causing extreme heat waves, droughts, heavy precipitation, and tropical cyclones, among others. Some of these extreme conditions occurring over the past decade “would have been *extremely unlikely* to occur without human influence on the climate system.”⁶¹ In the same year, the National Oceanic and Atmospheric Administration (NOAA) declared that July 2021 was the

⁵⁵ R. Raina Plowright et al., “Pathways to Zoonotic Spillover,” *Nature Reviews Microbiology* 15 (2017): 504, <https://doi.org/10.1038/nrmicro.2017.45>.

⁵⁶ David Quammen, *Spillover: Animal Infections and the Next Human Pandemic* (New York: W. W. Norton, 2012), 33.

⁵⁷ Plowright et al., “Pathways to Zoonotic Spillover,” 502.

⁵⁸ Aneta Afelt, Roger Frutos, and Christian Devaux, “Bats, Coronaviruses, and Deforestation: Toward the Emergence of Novel Infectious Diseases?” *Frontier in Microbiology* 9 (2018): 2, <https://doi.org/10.3389/fmicb.2018.00702>.

⁵⁹ Christian A. Devaux et al., “Infectious Disease Risk across the Growing Human-Non Human Primate Interface: A Review of the Evidence,” *Front Public Health* 7 (2019): 1, <https://doi.org/10.3389/fpubh.2019.00305>.

⁶⁰ Charles E. Cornelius, Dante G. Scarpelli, and William Burrows, “Animal Disease,” *Encyclopedia Britannica* (2021), <https://www.britannica.com/science/animal-disease>.

⁶¹ IPCC, “Summary for Policymakers,” in *Climate Change 2021: The Physical Science Basis: Contribution of Working Group I to the Sixth Assessment Report of The Intergovernmental Panel on Climate Change*, ed. V. Masson-Delmotte et al. (Cambridge: Cambridge University Press, 2023), 8, <https://doi.org/10.1017/9781009157896.001>.

world's hottest month ever recorded on earth since record-keeping began 142 years ago.⁶²

Such human activity in the environment creates ecological imbalance and conditions for pathogens. Researchers have shown how climate and ecological changes brought about by humans can affect disease emergence and transmission. Some viruses occur naturally among wild animals and could infect domestic animal species and other bird and animal species without necessarily affecting humans under normal conditions. However, climate change, due to massive deforestation, destruction of ecosystems, and increasing contact with wildlife for consumption or ecotourism, has destabilized the species habitats and brought both the pathogen-host reservoir and the vector into close contact, diminishing the natural barriers and exposing humans to zoonotic pathogens.⁶³ In their research, Shaman, Day and Stieglitz reveal that widespread drought caused by a prolonged shortage in the water supply has brought into close contact Aquatic birds, which are the primary natural host reservoirs for all types of avian influenza viruses, and the intermediary vector mosquitoes. This has facilitated the epizootic cycling and amplification of the arboviruses within these populations, making it possible for human infection.⁶⁴ Paull and others also found that drought could change the host-vector contact and transmission dynamics, engendering conditions that make humans vulnerable to vector-borne pathogens, like West Nile virus (WNV).⁶⁵ Furthermore, a team of researchers conducted a study on the spread of coronavirus in wild animals in the northeast of Gabon in Africa to determine the factors driving the infection within the bat species. They found that coronavirus spreads more within the bat species during a particular season and in places where villagers frequently hunt bats for human consumption. The hunting pressure causes stress and habitat

⁶² Oliver Milman, "July was World's Hottest Month ever Recorded, US Scientists Confirm," *The Guardian*, August 13, 2021, <https://www.theguardian.com/environment/2021/aug/13/july-worlds-hottest-month-ever-recorded-us-scientists>.

⁶³ Devaux et al., "Infectious Disease Risk," 1; J. Vidal, "Destroyed Habitat Creates the Perfect Conditions for Coronavirus to Emerge," *Scientific American*, March 18, 2020, <https://www.scientificamerican.com/article/destroyed-habitat-creates-the-perfect-conditions-for-coronavirus-to-emerge/>; Bowden and Drake, "Ecology of Multi-host," 5.

⁶⁴ Jeffrey Shaman, Jonathan F. Day, and Marc Stieglitz, "Drought-induced Amplification and Epidemic Transmission of West Nile Virus in Southern Florida," *Journal of Medical Entomology* 42, no. 2 (2005): 134-41, <https://doi.org/10.1093/jmedent/42.2.134>.

⁶⁵ Sara H. Paull et al., "Drought and Immunity Determine the Intensity of West Nile Virus Epidemics and Climate Change Impacts," *Proceedings of the Royal Society B* 284, no. 1848 (2017): 2-3, <https://doi.org/10.1098/rspb.2016.2078>.

disturbance and stress to these animals, making these bats susceptible to the acquisition and shedding of viruses.⁶⁶

In an entry on animal disease in *Encyclopedia Britannica*, Cornelius, Scarpelli, and Burrows further clarify how Enzootic disease (analogous to an endemic disease in humans) can become epizootic disease (analogous to an epidemic disease in humans) under ecological imbalance. Enzootic disease, which typically affects animals in a particular district or at a particular season, usually reflects a relatively ecological balance, a stable relationship between the pathogen agent and the animals affected by it. Epizootic disease, affecting a greater number of non-human animal populations, represents an ecological imbalance, an unstable relationship between the pathogen and affected animals. In a relatively ecological balance, the causative agent exists enzootically among its hosts and seldom involves humans.⁶⁷ When driven out of their natural habitats, however, the animal hosts of the disease are forced to feed near the human population or where vectors can amplify and transmit it to other species, including humans. This is what David Quammen, the author of *Spillover: Animal Infections and the Next Pandemic*, aptly observes:

We invade tropical forests and other wild landscapes, which harbor so many species of animals and plants — and within those creatures, so many unknown viruses. We cut the trees; we kill the animals or cage them and send them to markets. We disrupt ecosystems, and we shake viruses loose from their natural hosts. When that happens, they need a new host. Often, we are it.⁶⁸

A reference to the nexus of creation in the Qur'ān can be found primarily in two terms: *qadar/taqdīr* (measure) and *mīzān* (balance) which could form the basis for *al-takāful al-bīrī* addressed in the early part of the study. In many places where *qadar/taqdīr* was used, the word suggests that Allah measured all created beings in due proportion: “verily, all things have We created in proportion and measure” (54:49) and “it is He who created all things, and ordered them in due proportions (25:2). With *mīzān*, everything is said to have been created in a delicate balance that must not be overused: “And the firmament has He raised high, and He has set up the balance, in order that you may not transgress (due) balance. Keep up the balance with equity, and do not fall short in the balance” (55:7-9).

⁶⁶ Gael Darren Maganga et al., “Genetic Diversity and Ecology of Coronaviruses Hosted by Cave-Dwelling Bats in Gabon,” *Scientific Reports* 10 (2020): 9, <https://doi.org/10.1038/s41598-020-64159-1>.

⁶⁷ Cornelius, Scarpelli, and Burrows, “Animal Disease.”

⁶⁸ David Quammen, “We Made the Coronavirus Epidemic,” *New York Times*, January 28, 2020, <https://www.nytimes.com/2020/01/28/opinion/coronavirus-china.html>.

In the Qur'ān, nature is presented as a finite entity, and its resources are not limitless but measured (*taqdīr*). Over-exploitation of natural resources infringes on natural resources' *taqdīr* and the balance of creation and thus violates *al-takāful al-bī'ī* pact. Such an approach to nature is unsustainable and self-defeating. In Islam, extravagance and excessive consumption are prohibited. By contrast, cultivating the environment, avoiding pollution, and not harming animals are all considered good deeds. The Qur'ān states: "Eat and drink but waste not: verily, Allah does not love the wasteful" (7:31). Fakhr al-Dīn al-Rāzī notes the importance of taking care of the environment even in times of distress. He reminds us how Prophet Nūḥ was asked to preserve pairs of different species from the impending catastrophe of the Great Flood. In the two verses of the Qur'ān where such instruction was given, the preservation of animal species preceded that of humans (11:40; 23:27). Al-Rāzī explains this by saying that humans possess reason, allowing them to navigate to safety, making their survival less urgent compared to animals in that situation.⁶⁹

These overwhelming testimonies oblige that environmental constituents must be accorded due recognition if humans are to enjoy any of their benefits and avert their detriments. In Islam, human beings and other constituents of the environment are creatures of Allah. Within a divinely designed hierarchical system, human beings are ranked higher⁷⁰ and granted the supervisory role of *khalīfah* (trustee and guardian) over the other constituents of the environment to use, respect, and preserve them. However, both the former and the latter submit themselves to the service of Allah and fulfil the *al-takāful al-bī'ī* pact for mutual existence and sustainability. Non-human constituents of the environment do their part and render their services generally involuntarily based on their nature. Humans' failure to uphold their duties will cause *fasād* (mischief) on earth,⁷¹ leading to great disruption and discomfort. When such *fasād* strikes back, its perpetrators become its prime victims.

⁶⁹ Al-Rāzī, *Tafsīr al-Fakhr al-Rāzī*, 17:236.

⁷⁰ This is a reference to the following Qur'ānic verse: "We have honoured the children of Adam; provided them with transport on land and sea; given them for sustenance things good and pure; and conferred on them special favours, above a great part of our creation" (17:70).

⁷¹ This is a reference to the following Qur'ānic verse "Fasād has appeared on land and sea because of (the meed) that the hands of men have earned, that (Allah) may give them a taste of some of their deeds: in order that they may turn back (from evil)" (30:41). Abdullah Yusuf Ali translates *fasād* as "mischief." See Abdullah Yusuf Ali, *The Holy Quran: Translation and Commentary* (Birmingham: Islamic Vision, 2001), 1190. T. B. Irving translates *fasād* as "pollution." See T. B. Irving, *The Qur'an: The First American Version; Translated and Commentary* (Brattleboro, VT: Amana Books, 1985), 224.

Conclusion

Islam accords great value to the environment and recognizes the ecosystem services provided by non-human animals as part of God's provisions or *rizq Allāh*. Since humans and non-human animals share the same environment, it puts in place several mechanisms, primarily through the *ḥalāl-ḥarām* law, to regulate human consumption and contact with non-human animals. These regulations, among others, are set to protect human lives and ensure a sustainable healthy environment and ecosystem services.

Multiple ecological barriers are set in place to protect humans from zoonotic pathogens. Many of these viruses do not transmit directly from the host to humans but go through intermediaries, a vector or an amplifier, corroborating layers of protection to the human population. A pathogen must overcome these barriers before a cross-species transmission could occur. If any of these barriers is impenetrable, spillover is highly unlikely. These barriers could be seen, from a religious perspective, as part of what the Qur'ān calls "*hafaḏah*" (guards) (6:61) and "*mu'aqqibāt*" (guards in succession/shift or multi-layered guards) (13:11),⁷² set to protect humans from "*amr Allāh*" (Allah's command), the same "*amr Allāh*" set to guide actions of non-human species as they live, feed, and interact within and across species, including their pathogen transmission. The uniqueness of bats in the diversity of their species, the variety of their diets, and their ability to power flight at night make them unique vehicles for both the variety of ecosystem services they provide and the multiplicity of viruses they harbour. Humans must harvest what is beneficial and avert what is detrimental to human needs without destabilizing the ecological balance (*mīzān*).

It is worth noting that viruses that naturally circulate only within a given animal species may not need serious human intervention. Nature is resilient; what nature infects naturally, it cures naturally. Nature will recover if left to follow its due course within a healthy ecological process. As for viruses that could cross species barriers, humans have made themselves vulnerable. They have diminished the natural barriers between virus-host animals and themselves and thus exposed themselves to cross-species transmission. The breakout of such zoonotic epidemics is often the result of the breakdown of ecological barriers precipitated by human actions. It is then safe to conclude that these animals do not transmit the pathogens to humans; rather, humans contract them from them.

* * *

⁷² Each of these two words, "*hafaḏah*" (guards) (6:61) and "*mu'aqqibāt*" (guards in succession/shift or multi-layered guards) (13:11) was mentioned once in plural form in the Qur'ān.