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Humanizing Engineering Education for Sustainable Future

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MESSAGE FROM THE CHAIRMAN OF ICEPEE'22



Aisha Hassan Abdalla Hashim Chairman 5th International Conference on Engineering Professional Ethics and Education (ICEPEE 2022)

Assalamu'alaikum warahmatullahi wabarakatuh.

All praises be to ALLAH, the Almighty who has made it possible for the Kulliyyah of Engineering to organize the 5th ICEPEE 22 after the success of the 4th ICEPEE in 2021. The conference will be held from 9-10 August 2022 with the theme entitled "Humanizing Engineering Education for Sustainable Future".

The theme of the conference is of utmost importance as the world is desperately looking for measures to sustain after the pandemic covid 19 has left a detrimental impact in the world at large.

As the International Islamic University aims at providing a value-and-ethics based education to all the students, the ICEPEE serves as a platform to discuss how Engineering Education can be reformed to meet the current challenges. Many of those challenges are closely connected with Engineering Education in some ways. Professionalism and ethics, humanising Engineering Education, social responsibility in Engineering, Engineering Education policies and practices, are a few examples, amongst others.

I would like to take this opportunity to thank the Conference Committee who have put tremendous efforts to ensure the success and smooth running of the conference. I would also like to extend my sincere gratitude to our distinguished keynote speakers, to all presenters and participants. Finally, on behalf of the Organizing Committee, I welcome you all and wish you an enjoyable and fruitful virtual conference.

May ALLAH subhanahu wata'ala guide us all in our work for the betterment of our society.

Best regards,

Aisha Hassan Abdalla Hashim

Chairman, ICEPEE 2022



Ethics and Values Towards Environmental Sustainability during COVID'19

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Abstract— This article is supposed to explore the ethical dimensions of environmental sustainability during, with and post Covid'19. It is contended in the paper to focus on the ethical grounding for environmental sustainability with an effect of Covid'19 that changed the health on Earth planet suddenly and without notifications. The conception of nature suggests the belief of sustainability as a positive value in the society specially with the effect of Covid'19. In the case of nature as environment, nature becomes the natural habitat of man and is always supportive of human, animal and plant existence. The second issue that alarms the present paper relates to ethical sustainability of environment, which is based on the ethical commitments of average human beings if tolerable environmental shield is to occur for our survival on this planet. As such, environmental ethics is alarmed with the problem of accountable individual behavior with respect to sustainability of natural resources specially after Covid'19. The ethical issue at present is the recovery of nature or restoring the nature as an environment rather than as an ordinary entity.

Keywords: Environment, sustainability, Ethics, values, Covid'19

1. INTRODUCTION

The planet earth specifically the nature was the focus of nineteenth and twentieth century due to it is our survival and continuity. The creator and all his messengers teach the human beings to be responsible of guardianship over the natural environment The most popular Hadith on environment states "The earth is green and beautiful, and Allah has appointed you his stewards over it". The environmental ethics argument includes water and air pollution, resource depletion, biodiversity loss, ecosystem devastation, and global climate change were the issues that have rooted themselves into both public awareness and public policy over consequent years [1]. "And Allah has sent down rain from the sky and given life thereby to the earth after its lifelessness. Indeed, in that is a sign for a people who listen." [2]. The state of the environment has the power to aid or harm humans, hence it seems to reason that there should be environmental ethics, which can only be contested by those who reject all ethical principles. One of the main of principle is the Covid'19 which hit the world in 2019 very aggressively and changed the shape of the world absolutely from 2019 to date 2022.

2. CULTURE & RELIGIONS

A society's lifestyle, mannerisms, and religious practices are all examples of how culture is conveyed. Depending on the location and time, these will change. A basic reflection of human culture is how humankind perceives itself in relation to its environment. Human culture can occasionally be uncoordinated with its surroundings, which can be detrimental to the environment. Modern humans have lost their way and are ruining the environment. Nature is ignored whenever it gets in the way of what they wish. Such actions, which are at odds with nature, do not stand for true human culture. Indian culture views manav (man) as a notable example of a human who respects nature, and danav (devil) as such [3]. Theft, fraud, and political crime are just a few of the numerous forms that corruption can take. However, it is impossible to ignore the corruption that has contributed



to environmental problems like the Great Pacific Garbage Patch and the widespread destruction of the Amazon rainforest.

The relationship between individuals and religion which they revere as holy is common for all humankind on earth. Billion people worldwide practice one of nine of the major global religions. There are 750 million Hindus among them, along with 10 million Jains, 700 million Buddhists, 700 million Jews, 12.5 million Sikhs, 16 million Muslims, 1.4 billion Christians, and 5 million Baha'is. Despite what is often considered as a significant discrepancy between the religious scriptures and the present practices of those religions' adherents, all global religions share a common ethic centered on harmony with nature [4].

The teachings of the Qur'an are the ultimate guide because they remind us of our Lord's flawless creations and our duty as khalifahs on Earth at a time when our environment is steadily degrading, resulting in harsh weather and climate change "...And do not commit abuse on the earth, spreading corruption." [5]. The Qur'an warns us to always be mindful of our acts and how they may affect the world around us.

The fundamental tenets of Buddhism's ecological ethics the ideas of Karma, which is the embodiment of human environmental responsibility, Ahimsa, which is the nonviolence principle, and Bodhichitta, which is kindness and compassion for all living things. Most Hindus define "environment" as the natural world, which includes everything in our immediate surroundings that is a part of the Earth and nature [6].

Hindus are taught to practice Ahimsa, or the nonviolent philosophy. Most Hindus hold that the natural environment and all living things are sacred since they are all a part of God [7].

According to Christian doctrine, God created everything out of love, and humanity cannot destroy biological diversity or God's creations without running the risk of annihilating itself. "For that which befalls the sons of men befalls beasts," the Christian Bible's [8] reads. "As the one dieth, so dieth the other... so that a man hath no preeminence above a beast." There are other related passages in the Bible that speak to the preservation of fruit trees, agricultural regions, and wildlife ([9], [10], [11]). Christmas trees originated from sacred groves honoring a pagan goddess, and the holiday itself was once a time of pagan winter solstice revelry.

In Animism, a worldview shared by many Indigenous peoples, shows a spiritual connection between people and nature. Numerous animism-based traditional conservation strategies have been developed, and sacred sites have been proved because of traditional beliefs.

The grandeur and diversity of the natural world, according to the Baha'i faith, are deliberate manifestations of God. Buddhism emphasizes the need of respecting all forms of life in the natural environment, which supports the idea that everything is interrelated.

One of the oldest living religions, Jainism, promotes ahimsa (non-violence) toward people and the entire natural world. It accepts that all elements of nature are interconnected and entwined in a complex web of relationships that depend on one another.

In Judaism, the Torah lays out a number of ethical requirements, some of which are pertinent to the preservation of the natural world. The Bible states: ""See my works, how wonderful they are, how fine they are," God remarked to Adam after creating him and pointing to each tree in the Garden of Eden. I made everything I had for you. Be careful not to ruin and destroy my universe because if you do, no one will be able to repair it after you " [12].

According to Sikhism, God is in control of all forms in the cosmos, and once God creates a life form, God will guard it. The foundation of Sikhism's teachings is a life free from ostentatious spending. Shinto, the Japanese indigenous religious system, is based mostly on rural agricultural customs and includes rituals and activities that regulate interactions between humans and the natural world. As a result, cultures with dwindling biodiversity are perceived as experiencing their own deterioration. It is clear from the foregoing succinct summary that all world religions and cultures adhere to a similar ethic based on harmony with nature.



3. SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The sustainable use of natural resources is the key concern of a model of sustainable development, aside the unities of ecological, economic, and social factors being described. Although the management of nature is what the term "sustainability" refers to in its original sense, this notion of nature has already been practically and socially absorbed and transformed into culture. There is an interacting relationship between nature and culture because it is nature that has been changed into culture. From this vantage point, the idea of sustainability does not go far enough because it exclusively focuses on guaranteeing the sustainable use of natural resources. The sustainable use of both natural and cultural resources should instead be based on the sustainable development paradigm. In other words, keeping the natural and cultural resources in the best way possible for men is the aim of sustainability. Additionally, it is thought that the idea of sustainability today is different from how it has traditionally been applied to forestry. The endeavor to integrate environmental development and protection ideologies can be seen as the preservation and expansion of options for the use of natural and cultural resources.

According to some definitions, sustainable development is a pattern of resource use that tries to satisfy human needs while protecting the environment so that these needs can be satisfied for both the present and for generations to come. The term "sustainability" would refer to a variety of things. For businesses, it would imply supporting profits, and for the environment, it would mean keeping access to natural resources for future generations or having regenerative value [13].

The human species is a part of the ecosystem as well as the flora and wildlife. It is crucial to recognize how interdependent humans and their environment are. Gloomily, it is habitually people who abuse and damage the environment. Humans must be included in any discussion of the environment. We'll need to take ourselves into account if we need to reproduce the surroundings. When we begin the process of developing a recent version of ourselves, we must examine our souls to see where we have failed and fallen short. The focus on sustainability has increased as the nation has reached a crossroads where it must choose between the need for development and to safeguard the environment from catastrophic harm. Many nations throughout the world lay out their national strategies to improve ecological sustainability and help their country adapt to climate change.

4. Environmental Ethical Issues

Moral responsibility typically entails knowledge, ability, freedom of choice, and importance of values, a person's reaction has moral significance because it reflects on his or her worth as a moral person, a peculiarly characteristic quality of humankind. This examination of moral obligation explains why environmental ethics have only recently caught the interest of environmentalists and members of the public. Since it is believed that nature was impersonal and too big to be harmed by our activities, human effects on the environment were long thought to be neutral. It is unable to predict the harm that would come from human interactions with nature. It is aware that humans have the power to seriously and irreparably harm ecosystems, resources, and natural landscapes. Knowing this imposes a moral duty to act cautiously, strategically, occasionally with forbearance and restraint. In summary, humans must ponder, act, or possibly refrain from acting in a way that demonstrates our value as moral individuals and as a moral culture-in other words, behave ethically-in human's interactions with the environment. Human health is negatively affected by pollution, our level of living is threatened by resource depletion, our houses are at risk from climate change, humans lose potential medications due to the loss of biodiversity, and they lose awe and beauty from the wilderness when it is destroyed. Because many environmental issues, like resource depletion and climate change, will affect people far more in the future than they do now, it has been seen important to extend moral standing to future generations. Furthermore, the policies and acts that we as modern humans implement will have a significant impact on the wellbeing of people in the future. Some philosophers have based their environmental ethics on responsibilities to these future generations considering these facts [14].

Environmental ethics concerns are crucial and include moral decisions of the utmost significance that we may and, much more, must make. Humans must have a moral obligation to the environment and the future that is both important and urgent and from which they are unable to escape. That is what environmental ethics are all about. However, giving animals moral standing also results in the creation of specific kinds of environmental responsibility. Because animals are a part of the natural world and are therefore of interest to environmental is, animal welfare is pertinent to environmental ethics. Communities (Ummah) are used by Allah to draw parallels between humans and other animals. The natural structure of moving flocks of birds or swimming schools of fish has a certain beauty and majesty to it. The Qur'an reminds us that respecting animal rights is important, and it is



regrettable to see animals being mistreated anywhere, whether it be through hunting or in labs "And there is no creature on [or within] the earth or bird that flies with its wings except [that they are] communities like you. We have not neglected in the Register a thing. Then unto their Lord they will be gathered." [15]. In essence, these ethics contend that when we think about how our activities influence the environment, we should also examine how those acts affect the interests and rights of animals rather than just how they might harm humans (now and/or in the future) ([16] and [17]). People often claim that it is morally wrong for them to pollute, damage, and consume a significant share of the planet's natural resources. If that's incorrect, is it just because a healthy environment is necessary for people's (present and future) well-being? Or is this behavior likewise unacceptable since the natural environment and/or its diverse elements have inherent values that must be upheld and supported in any case? These are some of the issues that environmental ethics investigates. Others are more general issues that affect organizations and communities. Some of them are unique issues that people meet situations. We humans are the selected and made to rule the earth by Allah. Like the bible, the Qur'an refers to a stewardship duty for humanity by referring to them as "khalifahs" over the entire globe. Therefore, it is our obligation to perform the duty that Allah has given us, and we can do so by protecting the environment "Remember when your Lord said to the angels, 'I am going to place a successive human authority on earth.'" [18]. It seems obvious that the area of environmental ethics is here to stay given the growing concern for the environment and the effects that our actions have on it.

5. SUSTAINABILITY LESSONS FROM COVID'19

There have been infections and pandemics throughout human history [19]. However, the way pandemics spread is influenced by today's globalized economy, communities, and interactions with the environment. There is no question that novel pathogens often appear at the points where domestic and wild animals and humans come into contact, and that these pathogens can occasionally appear as zoonotic diseases Figure 1.

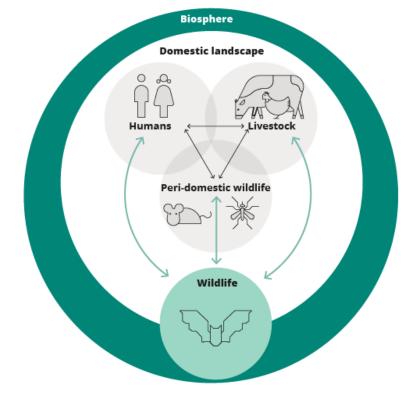


Fig. 1. Pathogen flow at the interface between humans, livestock and wildlife Source: [20], adapted from [21]

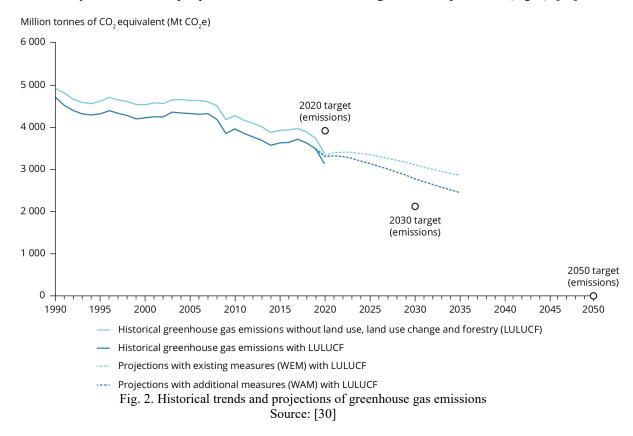
By fostering new and varied interactions between wildlife, livestock, and people, a number of interrelated causes oversee the genesis of zoonotic illnesses. The first two are population growth and rapid, unchecked urbanization, the second is an increase in the demand for animal protein, which leads to increased wildlife exploitation, agricultural intensification, and trade, the third is poor husbandry techniques, the fourth is poorly



controlled informal markets for fresh produce and wildlife, and the fifth is industrial meat processing plants [22]. Additionally, the prominent levels of global trade and travel now hasten the transmission of infections since "diseases can now migrate around the world in times shorter than their incubation periods" [22].

In the first half of 2020 and since, for exceptional national lockdowns, travel restrictions, and the closing of national borders have resulted in short-term improvements in the environment worldwide. Air quality and noise levels suddenly improved due to decreases in traffic, shipping, and planes, while nitrogen dioxide (NO₂) concentrations in some places dropped by up to 60% compared to the same period in 2019. Additionally, the pandemic at once encouraged people to select more active forms of transportation. Cities have grown more bicycle friendly because of the rise in cycling, notably by building new cycling infrastructure ([23] and [24]). Reduced human activity allowed environments to recoup, and animals were able to fill new areas and niches [25]. Additionally, early data reveals a 10% decrease in EU greenhouse gas (GHG) emissions between 2019 and 2020 [20]. However, the demand for protective gear and other disposable items has increased plastic manufacturing and use, which has resulted in an increase in plastic trash. Others than only citizens have had to alter their routines. A rapid response was needed from policymakers to the pandemic's socioeconomic effects.

Humans should take lessons from the past as a civilization. Lower emissions were a result of the 2008–2009 budgetary crisis, however the reduction was only temporary [26]. Once again, there is little hope that the postcorona planet will be more sustainable unless there is an active and conscious change in social and economic practices given the need to get out of the current economic recession and the clear resilience of unsustainable political and economic priorities. Sadly, the early signs are not promising. Concentrations of airborne pollutants are rising and, in some cases, returning to pre-pandemic levels with the resumption of social and economic activities [25]. There have already been warnings about a quick increase in global energy demand and GHG emissions following COVID-19 ([27] and [28]), but nationally determined global contributions lack the ambition needed to keep global warming within the 2°C target, let alone 1.5°C [29]. Recent predictions imply that GHG emissions in Europe could return to pre-pandemic levels unless more safeguards are implemented (Fig. 2). [20].



The COVID-19 epidemic has exposed the structural weakness of our global society and economy. Humans are currently living in a world that is characterized by numerous global crises, including natural disasters, financial



crises, economic crises, and health crises. One thing that the history of pandemics has taught us is that we should predict added pandemics and, at the absolute least, be ready for them.

6. CONCLUSION REMARKS

The topic of ethical behavior about non-human animals, plants, and other natural resources is called environmental ethics. The direct focus of moral philosophy is human behavior. Due to man's efforts to alter the creation and order of nature, the relationship between man and nature has evolved from one of harmony to one of enmity. Everything was wonderful while man coexisted peacefully with his surroundings, but things started to go south when man began to interfere with nature. So that life can be supported, and the beauty of the natural world restored, a new ethic founded on accountability and commitment needs to be revived. The idea of environmental ethics offers more than just the chance for enthusiastic discussion on the merits of sustainable development. It has had a significant impact on the development of viewpoints and ideas that are new to global governance and that aim to reflect the true beliefs and values that should, in an ideal world, guide decision-making for the benefit of people and the rest of the living world. It will take the international community years, if not decades, to fully examine the scope of COVID-19 and its consequences for our society, including its effects on inequality, health, and the well-being of citizens. The way we live our lives and the ways we eat, move, and power our societies cannot stay the same if we are to address the sustainability issue we confront. Social and economic practices must shift across various levels and areas of society. COVID-19 sparked swift and decisive action. Emergencies involve unique dynamics and dangers as humans have seen, anything is possible if someone put his mind to it. Reflecting on COVID-19's unparalleled mobilization and impact of reactions can stimulate fresh ideas and motivate humanity to grab the opportunity and effect change. It seems entirely reasonable that humans can make significant societal changes to prevent COVID-19, 22, 25, or 30, not to mention the other threats resulting from climate change and environmental degradation that we will most likely face if humans can temporarily shut down portions of society to survive the threat of COVID-19.

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REFERENCE

- [1] Trivedi PR, "Environmental Pollution and Control", A.P.H. Publishing Corporation, New Delhi. 2004.
- [2] Quran, 16:6.
- [3] Prime, R, "Hinduism and Ecology". Seeds of Truth; New Delhi. 1994.
- [4] UNITED NATIONS ENVIRONMENT PROGRAMME GOVERNING COUNCIL, "Global ministerial environmental forum policy issues: emerging policy issues". Nairobi, 5-9 February 2001. UNEP/GC.21/5 18 January 2001.
- [5] <u>Quran, 2:60</u>.
- [6] Oyuna V. Dorzhigushaeva and Aryana V. Kiplyuks, "Environmental Ethics of Buddhism". International Journal of Environmental Science and Development, Vol. 11(3): 154-158. 2020, doi: 10.18178/ijesd.2020.11.3.1243.
- [7] R. Renugadevi, "Review Environmental ethics in the Hindu Vedas and Puranas in India". African Journal of History and Culture (AJHC) Vol. 4(1): 1-3. 2012 Available online at http://www.academicjournals.org/AJHC. doi: 10.5897/AJHC11.042.
- [8] Christian Bible's Ecclesiastes, chapter 3, verse 19.
- [9] Deuteronomy, chapter 2, verses 6 and 7, and Genesis, chapter 9.
- [10] Deuteronomy, chapter 20, verse 19.
- [11] Genesis, chapter 19, verses 23 to 25.
- [12] Ecclesiastes, Rabbah 7.
- [13] Redclift, M, "Sustainable Development—Exploring the Contradictions". London: Routledge. 1989.
- [14] Gewirth, A, "Human Rights and Future Generations" in Boylan, Michael (ed.)", Environmental Ethics, (New Jersey: Prentice Hall, 2001). pp 207-211.



- [15] <u>Quran, 6:38</u>.
- [16] Singer, P, "Animal Liberation at 30". New York Review of Books 50(8): 23-6. 2001.
- [17] Regan, T, "The Case for Animal Rights". London: Routledge. 1983.
- [18] <u>Quran, 2:30</u>.
- [19] Waltner-Toews, D, "On pandemics: deadly diseases from bubonic plague to coronavirus", Greystone Books, Vancouver, Canada. 2020.
- [20] EEA, "Healthy environment, healthy lives: how the environment influences health and well-being in Europe", EEA Report No 21/2019, European Environment Agency, accessed 26 July 2022. 2020a.
- [21] Jones, B.A., et al, "Zoonosis emergence linked to agricultural intensification and environmental change", Proceedings of the National Academy of Sciences of the United States of America110(21): 8399-8404. 2013.
- [22] UNEP, "Preventing the next pandemic zoonotic diseases and how to break the chain of transmission", United Nations Environment Programme, accessed 26 July 2022. 2020.
- [23] Kraus, S. and Koch, N, "Provisional COVID-19 infrastructure induces large, rapid increases in cycling", Proceedings of the National Academy of Sciences of the United States of America, 118(15), e2024399118. 2021.
- [24] Nikitas, A., et al, "Cycling in the era of COVID-19: lessons learnt and best practice policy recommendations for a more bike-centric future", Sustainability13(9): 4620. 2021.
- [25] EEA, 'COVID-19 and the environment: explore what we know', European Environment Agency, accessed 26 July 2022. 2020d.
- [26] Peters, G.P., et al, "Rapid growth in CO2 emissions after the 2008-2009 global financial crisis", Nature Climate Change 2(1): 2-4. 2012.
- [27] IEA, "Global Energy Review 2021, International Energy Agency", Paris, accessed 27 July 2022. 2021.
- [28] Tollefson, J, "Carbon emissions rapidly rebounded following COVID pandemic dip", Nature, accessed 27 July 2022. 2021.
- [29] Liu, P.R. and Raftery, A.E, "Country-based rate of emissions reductions should increase by 80% beyond nationally determined contributions to meet the 2°C target", Communications Earth & Environment2, 29. 2021.
- [30] EEA, 'Air pollution goes down as Europe takes hard measures to combat coronavirus', European Environment Agency, accessed 25 July 2022. 2020c.