

CONCEPTS OF ONE HEALTH APPROACH AND ACHIEVING SUSTAINABLE DEVELOPMENTOzdan Akram Ghareeb^{1*}, Qahtan Adnan Ali², Samed Abduljabbar Ramadhan³ and Awni Ismail Sultan⁴¹Department of Pharmacy, Northern Technical University, Iraq.²Department of Environment and Pollution Technologies Engineering, Kirkuk Technical College Engineering, Northern Technical University, Iraq.³Department of Healthy Nutrition Techniques, Institute of Medical Technology-Baghdad, Middle Technical University, Baghdad, Iraq.⁴Department of Surgery, College of Medicine, Tikrit University, Iraq.

*Corresponding Author: Ozdan Akram Ghareeb

Department of Pharmacy, Northern Technical University, Iraq.

Article Received on 24/02/2024

Article Revised on 16/03/2024

Article Accepted on 05/04/2024

ABSTRACT

The concept of One Health asserts that there is interconnectedness between the health of humans, animals, and the environment. Hence, it is an interdisciplinary procedure that draws on the links between public health, environmental health and animal health with the specific ultimate goal of promoting health for all and recognizing the common characteristics of health between individuals and the biological systems surrounding them. It takes into account toxic sources of contamination, regardless of whether chemical or bacterial, and also looks at the emergence of drug-resistant microorganisms. One Health utilizes interdisciplinary knowledge to address the health issues presented by the contemporary, interconnected world, offering a structure for experts to tackle these concerns. This encompasses a wide range of topics, including the study of zoonotic diseases and a review of the impact of human activities and environmental changes on global health. Sustainable development and health are crucial to the future of our world and its inhabitants. By incorporating sustainable behaviors using a One Health approach, we can guarantee a more salubrious future.

KEYWORDS: One Health, public health, environmental health, sustainable development.**1. INTRODUCTION**

One Health is an interdisciplinary approach that recognizes the interconnectedness between human, animal, and environmental health.^[1,2] This approach aims to address complex health issues by integrating expertise from various sectors.^[3] It provides a framework that facilitates interdisciplinary collaboration between physicians, veterinarians, biologists, environmental scientists, and public health professionals. By working together, we can ensure solutions to protect future generations.^[4-6] The importance of One Health lies in its ability to prevent and respond to zoonotic diseases, mitigate the environmental impact on public health, combat antimicrobial resistance, improve food safety, enhance disaster preparedness, strengthen global health security^[7-9], establish effective policy and governance frameworks, promote education and capacity building, and explore future directions for research and sustainable approaches.^[10,11] In a recent specific publication, World Health Organization stated that collaboration between physicians, veterinarians, and all professionals working in public health using One Health approach can make significant strides in health care.^[12,13] Through case

studies, impact of One Health on public health outcomes can be observed, highlighting successful initiatives and lessons learned.^[14] As infectious diseases, communication technologies, and global travel unite the world in faster and more complex ways, the One Health approach is the only way to keep world ahead of curve and next global pandemic.^[15,16] The future of One Health holds promise for advancements in research, its potential in addressing global health challenges, and its role in promoting sustainability.^[17] This paper highlights the importance of multidisciplinary collaboration and also provides insight into different prevention and improvement of common health outcomes.

2. Definition of One Health

Advancements in this field have caused One Health to be viewed not only as a scientific or medical field, but also as a call to action and a reminder of our shared duty to protect the health of our world and its various interconnected organisms.^[18] During mid-twentieth century, there was a significant increase in knowledge and activity in field of One Health.^[19] An increase in zoonotic illnesses caused officials to become more aware

of interdependence of environmental, animal, and human health as well as the necessity of interdisciplinary cooperation. This approach emphasizes the close relationships between humans, animals, and the environment, as well as the significance of a collaborative and interdisciplinary approach to addressing intricate and interwoven health issues.^[20,21]

The significance of adopting a One Health strategy has increasingly gained recognition in recent years. One reason for this is the prevalence of zoonotic illnesses, which are diseases that can be transmitted from animals to humans.^[22-24] The increased frequency of worldwide travel and trade facilitates the accelerated transmission of both known and unknown diseases. Advancements in technologies, such as gene sequencing, enable us to gain a deeper understanding of environments and their impact on human health.^[25]

The recognition of the interdependence between humans, animals, and the environment has been widely acknowledged throughout history, especially in societies that have a longstanding tradition of keeping animals as friends and aids.^[26] The establishment of One Health approaches aims to enhance the health of entire populations, as well as the individuals within them, by acknowledging the interconnectedness between humans, animals, and their shared environment (figure 1).

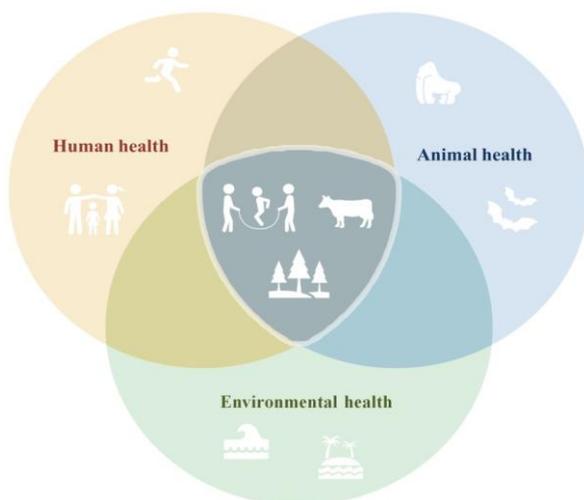


Figure 1: One Health connects human, animal, and environmental health.^[27]

3. One Health and zoonotic diseases

The One Health approach promotes effective surveillance and early detection of zoonotic diseases, which are diseases that can be transmitted between animals and humans.^[28] Many emerging infectious diseases, such as Ebola, Nipah virus, Crimean-Congo hemorrhagic fever, and COVID-19, have demonstrated the need for a coordinated response that involves experts from multiple disciplines. The implementation of a one-health approach is crucial for effectively tackling zoonotic illnesses.^[29-32] This strategy entails the collaboration of specialists from several fields, including

human and veterinary medicine, environmental science, and public health, to collectively address the difficulties presented by zoonotic illnesses. By combining human and animal health surveillance, researchers and professionals can detect and track the possible origins of zoonotic diseases.^[33-35]

Moreover, adopting a One Health strategy allows for the application of interdisciplinary research to gain a deeper understanding of the mechanisms behind zoonotic transmission and to create more successful therapies. Scientists the examination of the relationships between humans, animals, and the environment, they are able to discover elements that increase likelihood of zoonotic outbreaks and develop specific prevent methods.^[36,37]

One Health plan requires the promotion of collaboration among several sectors, such as governments, healthcare professionals, veterinarians, and environmental organizations. Through collaboration, these parties can improve disease monitoring, exchange data, and execute synchronized strategies in response to zoonotic incidents.^[38,39]

Moreover, education and awareness initiatives are essential in prevention of zoonotic infections. To mitigate the spread of zoonotic illnesses, it is crucial to educate people about the related hazards, encourage ethical pet ownership, and advocate for sustainable farming methods.^[40]

By acknowledging the interdependence of human, animal, and environmental well-being, we can improve our efforts in preventing, monitoring, and responding to diseases. By fostering interdisciplinary collaboration, conducting research, and promoting education, we may harness the capability to proactively prevent and manage zoonotic illnesses, safeguarding the well-being of both humans and animals.^[41] Besides, integrating surveillance systems, sharing data, and conducting joint investigations, One Health strives to prevent the spillover of diseases from animals to humans and limit the impact of outbreaks.^[42]

It is worth noting, One Health recognizes the importance of sustainable agricultural practices and responsible antibiotic use in animal production systems. By promoting good animal husbandry practices, ensuring access to veterinary care, and reducing the unnecessary use of antibiotics in animals, One Health aims to minimize the development and spread of antimicrobial resistance, a global threat to human and animal health.^[43]

3. One Health and environment

Environment plays a critical role in promoting and protecting health of both humans and animals. It encompasses various elements such as air, water, land, and biodiversity. Environmental factors have a significant impact on public health, with pollution,

climate change, and habitat destruction leading to the emergence and spread of diseases.^[44,45]

The One Health approach recognizes that human activities, such as deforestation, industrialization, and the irresponsible use of natural resources, contribute to environmental degradation. This degradation, in turn, affects the health and wellbeing of both humans and animals. For instance, loss of natural habitats can lead to the increased interaction between humans and wild animals, increasing the risk of zoonotic diseases.^[46,47] By adopting a One Health approach, we can address these interconnected issues and promote sustainable development. This involves interdisciplinary collaboration among medical professionals, veterinarians, environmentalists, and policymakers to create solutions that simultaneously benefit human health, animal welfare, and the environment.^[48,49]

This approach emphasizes the importance of preventive measures, early detection, and rapid response to emerging infectious diseases. By monitoring ecosystem health, conducting surveillance, and implementing sustainable practices, we can reduce the risk of disease outbreaks and promote overall wellbeing.^[50]

In addition to public health, the One Health approach also advocates for conservation efforts and the preservation of biodiversity. Healthy ecosystems provide essential services, such as pollination, nutrient cycling, and clean air and water, which are crucial for sustaining life on Earth.^[51,52] To promote One Health and environmental sustainability, it is imperative to invest in research, education, and policy development. This includes promoting responsible consumption and production patterns, implementing effective waste management systems, advocating for renewable energy sources, and adopting eco-friendly practices in various industries.^[53,54] Ultimately, integration of One Health approach with environmental considerations creates a comprehensive framework for addressing global challenges and improving health and wellbeing of all living beings.^[55]

5. Sustainable development and one health

In recent years, there has been much focus on sustainable development and health. The interconnection of both principles is intricate, and their implementation is crucial for the well-being of our planet and its inhabitants.^[56] Sustainable development and health are closely interconnected (figure 2) as they both strive to attain a harmonious equilibrium between economic advancement, societal progress, and safeguarding the environment.^[57] With the ongoing increase in global population, there is a corresponding rise in the need for resources and the strain on Earth's ecosystems. Consequently, there has been a surge in pollution, deforestation, the depletion of biodiversity, and the

introduction of novel diseases. Hence, it is imperative to embrace sustainable development strategies in order to prevent resource depletion and environmental harm while simultaneously fostering the health and well-being of all living organisms.^[58,59] Deforestation can cause the loss of animal habitats, which in turn can result in the relocation of animals. Displacement can increase the risk of zoonotic infections, diseases that animals can transmit to humans.^[60] The ongoing COVID-19 epidemic serves as a prominent illustration of this phenomenon. The infection is thought to have originated from a wet market in China, where live animals are sold for eating. The close proximity of humans and animals in these markets facilitates the ideal conditions for the transmission of diseases.^[61] Sustainable development and the concept of health have a substantial influence on the eradication of poverty and the assurance of food security. Poverty is strongly associated with unfavorable health outcomes, as inadequate access to uncontaminated water, sanitation, and nourishing food can result in transmission of infections and malnourishment.^[62] Through promotion of sustainable development techniques, we can guarantee that communities are able to meet these fundamental demands, resulting in enhanced health outcomes and an elevated standard of living.^[63] Furthermore, the implementation of sustainable agricultural methods, such as agro-ecology, can effectively tackle the issue of food insecurity. Agro-ecology advocates for the implementation of nearby, varied, and enduring agricultural techniques that not only supply nourishment for populations but also safeguard environment.^[64] This technique additionally minimizes the use of detrimental pesticides and advocates for the preservation of natural resources, resulting in enhanced ecosystem wellbeing.^[65]

In addition, sustainable development and the concept of health might yield economic advantages. Through promotion of sustainable practices, we can mitigate the worst effects of climate change, including occurrence of natural disasters and depletion of biodiversity. Consequently, this might result in significant cost savings for governments and communities in terms of recovery and reconstruction endeavors.^[66] Furthermore, allocating resources to one health project can also stimulate economic expansion since it generates novel employment prospects in sectors such as public health, veterinary medicine, and environmental conservation.^[67] Ultimately, the well-being of our planet and its inhabitants relies on the crucial factors of sustainable development and health.^[68] By implementing sustainable practices and adopting a one-health approach, we can guarantee a healthier future for generations. The onus lies on governments, businesses, and individuals to collaborate and actively strive towards attaining these objectives.^[69,70]

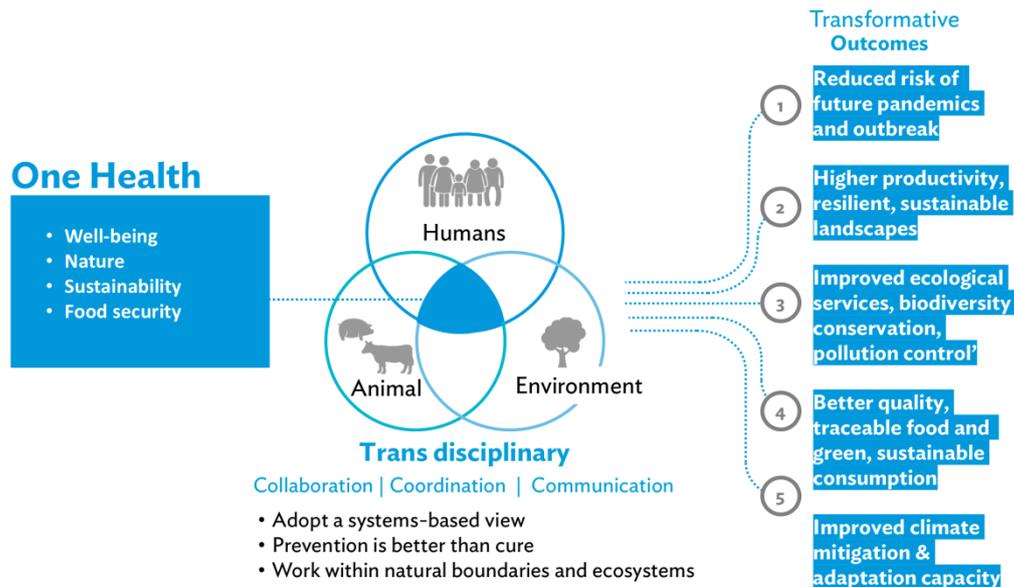


Figure 2: Impact of one health model on development achievements (Source: Asian Development Bank).

5. CONCLUSION

One Health is a comprehensive and collaborative approach that recognizes the interconnections between human, animal and environmental health. By promoting multidisciplinary collaboration, effective monitoring, sustainable practices, and responsible resource management, One Health provides a framework to address current and emerging health challenges and ensure the well-being of all species on our planet. The initiative could provide a new model for collaborative problem solving, by bringing together the brightest minds in many scientific disciplines. Public opinion and leadership may also shift in favor of greater concessions to find ways to better integrate environmental, human, and animal health systems. Sustainable development and health are intricately interconnected as they both strive to achieve a peaceful equilibrium between economic advancement, societal advancement, and environmental preservation. Governments, academia, international organizations, and communities need to work together to develop and implement policies, share knowledge, and build capacities for effective One Health practices.

REFERENCES

- Destoumieux-Garzón D, Mavingui P, Boetsch G, Boissier J, Darriet F, Duboz P, Fritsch C, Giraudoux P, Le Roux F, Morand S, Paillard C. The one health concept: 10 years old and a long road ahead. *Frontiers in veterinary science*, Feb. 12, 2018; 5: 14.
- Ghareeb OA, Ali QA. Pathological Disorders Caused by Atmospheric Nanoparticles. *The Peerian Journal*, Jan. 24, 2024; 26: 44-51.
- Zinsstag J, Kaiser-Grolimund A, Heitz-Tokpa K, Sreedharan R, Lubroth J, Caya F, Stone M, Brown H, Bonfoh B, Dobell E, Morgan D. Advancing One human–animal–environment Health for global health security: what does the evidence say?. *The Lancet*, Feb. 18, 2023; 401(10376): 591-604.
- Danasekaran R. One Health: A Holistic Approach to Tackling Global Health Issues. *Indian Journal of Community Medicine*, Mar. 1, 2024; 49(2): 260-3.
- Ghareeb OA, Ramadhan SA. COVID-19-a novel zoonotic disease: Origin, prevention and control. *Pak. J. Med. Health Sci.*, Jan. 1, 2021; 15: 221-223.
- Kzar AJ, Faiq TN, Ghareeb OA. Recent infection with black fungus associated with COVID-19: a review. *Pakistan Journal of Medical and Health Sciences*, 2021; 15(5): 1771-1773.
- Mudenda S, Chabalenge B, Daka V, Mfuné RL, Salachi KI, Mohamed S, Mufwambi W, Kasanga M, Matafwali SK. Global strategies to combat antimicrobial resistance: a one health perspective. *Pharmacology & Pharmacy*, Aug. 18, 2023; 14(8): 271-328.
- Ghareeb OA, Ali QA. Iodine's Role in Public Health. *The Peerian Journal*, Jan. 30, 2024; 26: 89-100.
- Pitt SJ, Gunn A. The One Health Concept. *British Journal of Biomedical Science*, 2024; 81: 12366.
- Garcia-Bustos V, Cabañero-Navalon MD, Ruiz-Gaitán A, Salavert M, Tormo-Mas MÁ, Pemán J. Climate change, animals, and *Candida auris*: insights into the ecological niche of a new species from a One Health approach. *Clinical Microbiology and Infection*, Jul. 1, 2023; 29(7): 858-62.
- Traore T, Shanks S, Haider N, Ahmed K, Jain V, Rüegg SR, Razavi A, Kock R, Eröndü N, Rahman-Shepherd A, Yavlinsky A. How prepared is the world? Identifying weaknesses in existing assessment frameworks for global health security through a One Health approach. *The Lancet*, Feb. 25, 2023; 401(10377): 673-87.
- ŞAHİN B. Zoonotic Diseases in Veterinary Medicine and Their Importance for Public Health. *MAS Journal of Applied Sciences*, Mar. 12, 2024; 9(1): 35-42.

13. Ali QA, Ghareeb OA. Proposed Solutions to Improve Deterioration of Drinking Water Quality. *Global Scientific Review*, Jan. 24, 2024; 23: 34-46.
14. Kelly TR, Machalaba C, Karesh WB, Crook PZ, Gilardi K, Nziza J, Uhart MM, Robles EA, Saylor K, Joly DO, Monagin C. Implementing One Health approaches to confront emerging and re-emerging zoonotic disease threats: lessons from PREDICT. *One Health Outlook*, Dec., 2020; 2: 1-7.
15. Hoque MN, Faisal GM, Chowdhury FR, Haque A, Islam T. The urgency of wider adoption of one health approach for the prevention of a future pandemic. *Health*, 8(1): 20-33.
16. Ellwanger JH, Veiga AB, Kaminski VD, Valverde-Villegas JM, Freitas AW, Chies JA. Control and prevention of infectious diseases from a One Health perspective. *Genetics and Molecular Biology*, Jan. 29, 2021; 44: e20200256.
17. Adisasmito WB, Almuhairi S, Behraves CB, Bilivogui P, Bukachi SA, Casas N, Becerra NC, Charron DF, Chaudhary A, Zanella JR, Cunningham AA. One Health: A new definition for a sustainable and healthy future. *PLoS pathogens*, Jun. 23, 2022; 18(6): e1010537.
18. van Bruggen AH, Goss EM, Havelaar A, van Diepeningen AD, Finckh MR, Morris Jr JG. One Health-Cycling of diverse microbial communities as a connecting force for soil, plant, animal, human and ecosystem health. *Science of the Total Environment*, May. 10, 2019; 664: 927-37.
19. Hueffer K, Ehrlander M, Etz K, Reynolds A. One health in the circumpolar North. *International journal of circumpolar health*, Jan. 1, 2019; 78(1): 1607502.
20. Ali QA, Ghareeb OA. Drinking Water Quality and Its Impact on Public Health. *Academia Repository*, Sep. 11, 2023; 4(9): 48-64.
21. Lerner H, Berg C. A comparison of three holistic approaches to health: one health, ecohealth, and planetary health. *Frontiers in veterinary science*, Sep. 29, 2017; 4: 163.
22. Bird BH, Mazet JA. Detection of emerging zoonotic pathogens: an integrated one health approach. *Annual Review of Animal Biosciences*, Feb. 15, 2018; 6: 121-39.
23. Faiq TN, Ghareeb OA, Ghaleb AA, Salahaldeen MS. Incidence of Hyposmia and Hypoguesia in COVID-19 Patients in Kirkuk. *Journal of Research in Medical and Dental Science*, Oct., 2021; 9(10): 204-208.
24. Ghareeb OA, Ali QA. Waterborne Zoonotic Bacterial Pathogens. *Texas Journal of Medical Science*, Jun. 20, 2023; 21: 63-69.
25. Malla MA, Dubey A, Kumar A, Yadav S, Hashem A, Abd_Allah EF. Exploring the human microbiome: the potential future role of next-generation sequencing in disease diagnosis and treatment. *Frontiers in Immunology*, Jan. 7, 2019; 9: 412218.
26. Murphy R. Rationality and nature: A sociological inquiry into a changing relationship. Routledge, 2018 Feb 7.
27. World Health Organization. A health perspective on the role of the environment in One Health. World Health Organization. Regional Office for Europe, 2022.
28. Ojeyinka OT, Omaghomi TT. Integrative strategies for zoonotic disease surveillance: A review of one health implementation in the United States. *World Journal of Biology Pharmacy and Health Sciences*, 2024; 17(3): 075-86.
29. Ghareeb OA. Ebola-A fatal Emerging Zoonotic Disease: A Review. *Annals of the Romanian Society for Cell Biology*, 2021; 25(6): 8748-8754.
30. Ghareeb OA, Sultan AI. Nipah-An Emerging Viral Zoonotic Disease: A Review. *Annals of the Romanian Society for Cell Biology*, Apr. 7, 2021; 456-465.
31. Ghareeb OA, Sultan AI. Crimean-Congo hemorrhagic fever represents a zoonotic infection: A review. *Eurasian Medical Research Periodical*, Jul 3, 2023; 22: 1-7.
32. Sultan AI, Ibrahim JM, Ghareeb OA. The prevalence of emergency surgical conditions among COVID-19 patients in Kirkuk Province, Iraq. *Pakistan Journal of Medical and Health Sciences*, 2021; 15(4): 1087-1090.
33. Milgroom MG. Emerging Infectious Diseases. *InBiology of Infectious Disease: From Molecules to Ecosystems*, Nov. 26, 2023; 285-303.
34. Faiq TN, Ghareeb OA. Association of chronic rhinosinusitis with risk of COVID-19 infection. *J Res Med Dental Sci.*, Jan., 2022; 10(1): 407-410.
35. Al-Haidari KA, Faiq T, Ghareeb O. Clinical trial of black seeds against covid-19 in Kirkuk city/Iraq. *Indian Journal of Forensic Medicine & Toxicology*, May. 17, 2021; 15(3): 3393-3399.
36. Rai BD, Tessema GA, Fritsch L, Pereira G. The application of the One Health approach in the management of five major zoonotic diseases using the World Bank domains: A scoping review. *One Health*, Feb. 15, 2024; 100695.
37. Ghareeb OA, Sultan AI. Monkeypox Represents Re-Emerging Zoonotic Disease: Review. *International Journal of Studies in Natural and Medical Sciences*, 2023; 2(2): 1-7.
38. Yasobant S, Memon F, Kalpana P, Saxena D. One Medicine vs One Health: Policy disconnect in India. *CABI One Health*, Jan. 16, 2024; 3(1).
39. Faiq TN, Ghareeb OA, Fadhel MF. Characteristics and outcomes of covid 19 patients in kirkuk city, iraq. *Annals of the Romanian Society for Cell Biology*, Apr. 30, 2021: 12432-12438.
40. Adnyana IM, Utomo B, Eljatin DS, Sudaryati NL. One Health approach and zoonotic diseases in Indonesia: Urgency of implementation and challenges. *Narra J.*, Dec., 2023; 3(3).
41. Laing G, Duffy E, Anderson N, Antoine-Moussiaux N, Aragrande M, Luiz Beber C, Berezowski J,

- Boriani E, Canali M, Pedro Carmo L, Chantziaras I. Advancing One Health: updated core competencies. *CABI One Health*, Jan. 3, 2023; (2023): ohcs20230002.
42. Garcia SN, Osburn BI, Jay-Russell MT. One health for food safety, food security, and sustainable food production. *Frontiers in Sustainable Food Systems*, Jan. 28, 2020; 4: 1.
43. Plowright RK, Reaser JK, Locke H, Woodley SJ, Patz JA, Becker DJ, Oppler G, Hudson PJ, Tabor GM. Land use-induced spillover: a call to action to safeguard environmental, animal, and human health. *The Lancet Planetary Health*, Apr. 1, 2021; 5(4): e237-45.
44. Ghareeb OA, Ali QA. Hepatotoxicity Induced by Some Metal Nanoparticles In Vivo. *Global Scientific Review*, Jan. 24, 2024; 23: 25-33.
45. Schmeller DS, Courchamp F, Killeen G. Biodiversity loss, emerging pathogens and human health risks. *Biodiversity and conservation*, Oct., 2020; 29: 3095-102.
46. Wassie SB. Natural resource degradation tendencies in Ethiopia: a review. *Environmental systems research*, Dec., 2020; 9(1): 1-29.
47. Wilson MW, Ridlon AD, Gaynor KM, Gaines SD, Stier AC, Halpern BS. Ecological impacts of human-induced animal behaviour change. *Ecology Letters*, Oct., 2020; 23(10): 1522-36.
48. Zinsstag J, Schelling E, Crump L, Whittaker M, Tanner M, Stephen C, editors. *One Health: the theory and practice of integrated health approaches*. CABI, 2020 Sep 30.
49. Ghareeb OA. Hematototoxicity Induced by Copper Oxide Nanoparticles and the Attenuating Role of Giloy In Vivo. *Cureus*, Oct. 6, 2023; 15(10).
50. Erkyihun GA, Alemayehu MB. One Health approach for the control of zoonotic diseases. *Zoonoses*, Nov. 30, 2022; 2(1): 963.
51. Oguh CE, Obiwulu EN, Umezina OJ, Ameh SE, Ugwu CV, Sheshi IM. Ecosystem and ecological services; need for biodiversity conservation-a critical review. *Asian Journal of Biology*, 2021; 11(4): 1-4.
52. Ali QA, Ghareeb OA. Wastewater Management and Its Role in Achieving the Various Goals of Sustainable Development: A Review. *Emerging Issues in Environment, Geography and Earth Science*, 2024; 7: 135-149.
53. Ali S, Hamid AB, Ya'akub NI, Iqbal S. Environmental impacts of international tourism: examining the role of policy uncertainty, renewable energy, and service sector output. *Environmental Science and Pollution Research*, Jun 27, 2023; 1-4.
54. Ali QA, Ghareeb OA. Achieving Sustainable Development Goals by Wastewater Management. *Zeta Repository*, Jun. 26, 2023; 19: 99-108.
55. Singh S, Sharma P, Pal N, Sarma DK, Tiwari R, Kumar M. Holistic One Health Surveillance Framework: Synergizing Environmental, Animal, and Human Determinants for Enhanced Infectious Disease Management. *ACS Infectious Diseases*, 2024 Feb 28.
56. Opoku A, Bondinuba FK, Manaphraim NY, Kugblenu G. Advancing the sustainable development goals through the promotion of health and well-being in the built environment. In *The Elgar Companion to the Built Environment and the Sustainable Development Goals*, Feb. 8, 2024; 137-157.
57. Vishwakarma D, Sonkar S, Keshari SK, Jaiswal AK. Achieving Sustainable Development Goals Through Microfinance: An Incremental Steps Towards Growth. *European Economic Letters (EEL)*, Mar. 1, 2024; 14(1): 2022-31.
58. Kolawole AS, Iyiola AO. Environmental pollution: threats, impact on biodiversity, and protection strategies. In *Sustainable Utilization and Conservation of Africa's Biological Resources and Environment*, Apr. 18, 2023; 377-409.
59. Hariram NP, Mekha KB, Suganthan V, Sudhakar K. Sustainalism: An integrated socio-economic-environmental model to address sustainable development and sustainability. *Sustainability*, Jul. 6, 2023; 15(13): 10682.
60. Biswas JK, Mukherjee P, Vithanage M, Prasad MN. Emergence and re-emergence of emerging infectious diseases (EIDs) looking at "One Health" through the lens of ecology. *One Health: Human, Animal, and Environment Triad*, Jun. 19, 2023: 19-37.
61. Al-Haidari KA, Faiq TN, Ghareeb OA. Preventive value of black seed in people at risk of infection with COVID-19. *Pakistan J Med Health Sci.*, Jan. 1, 2021; 15(1): 384-387.
62. Tang X, Bani Y, Samad AR, Ibrahim S. Driving Sustainable Development in South Asia: Unleashing the Power of Microfinance and ICT. *Cuadernos de Economía*, Jul. 31, 2023; 46(130): 135-45.
63. Tonne C, Adair L, Adlakha D, Anguelovski I, Belesova K, Berger M, Brelsford C, Dadvand P, Dimitrova A, Giles-Corti B, Heinz A. Defining pathways to healthy sustainable urban development. *Environment international*, Jan. 1, 2021; 146: 106236.
64. Niggli U, Sonneveld M, Kummer S. Pathways to advance agroecology for a successful transformation to sustainable food systems. *Science and Innovations for Food Systems Transformation*, Jan. 2, 2023: 341-59.
65. Mondal S, Palit D. Agroecology for sustainable food system and footprint mitigation. *Agroecological Footprints Management for Sustainable Food System*, 2021; 69-114.
66. Abbass K, Qasim MZ, Song H, Murshed M, Mahmood H, Younis I. A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution Research*, Jun, 2022; 29(28): 42539-59.
67. Qiang Q, Jian C. Natural resource endowment, institutional quality and China's regional economic growth. *Resources Policy*, Jun. 1, 2020; 66: 101644.

68. Haghghi H, Takian A. Institutionalization for good governance to reach sustainable health development: a framework analysis. *Globalization and Health*, Jan 2, 2024; 20(1): 5.
69. Asogwa IE, Varua ME, Humphreys P, Datt R. Understanding sustainability reporting in non-governmental organisations: a systematic review of reporting practices, drivers, barriers and paths for future research. *Sustainability*, Sep. 12, 2021; 13(18): 10184.
70. Richie C, editor. *Environmental Bioethics: Theory and Practice for Environmentally Sustainable Health Care*. Taylor & Francis, 2024 Apr 4.