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Environmental Statistics and Promoting Sustainability: Nature Reserves in the Emirate of Sharjah as a Model

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Abstract

This research paper aimed to examine the statistical distribution of all nature reserves in the Emirate of Sharjah, and to clarify their most important geographical, environmental, and biological characteristics. It sought to highlight the significant role of environmental statistics in preserving these reserves and to demonstrate their importance in promoting environmental sustainability. The paper was based on the following questions: How have environmental statistics contributed to enhancing the sustainability of nature reserves through their geographical survey and classification? What have these statistics done to promote the sustainability of rare animals and their diverse species, as well as the plant species found within these reserves? Methodologically, the paper adopted a descriptive-analytical method, presenting and analyzing environmental statistics issued by the Department of Statistics and Community Development according to the latest census of 2023. The overall results revealed the effective contribution of environmental statistics to enhancing the environmental sustainability of nature reserves. These statistics provided a comprehensive and accurate inventory of all nature reserves in the Emirate of Sharjah, including their area, geographical location, establishment date, rare animals and their species, and plant species.

Keywords

Environmental Statistics, Environmental Sustainability, Nature Reserves

1. Introduction

There is a general consensus that Emirati society in general, and the Emirate of Sharjah in particular, possesses a rich cultural heritage that permeates many cus-

toms and traditions in all aspects of daily life. This heritage embodies the roots and history of the region and its cultural sites.

In this context, the Emirate of Sharjah undertakes numerous efforts and initiatives aimed at preserving this heritage. Among these efforts are heritage statistics, which aim to compile data and information related to tangible cultural heritage. This contributes to the preservation of these landmarks and helps raise awareness of their importance. These heritage statistics also include environmental statistics, which are official statistics related to the protection of natural resources, specifically nature reserves. These statistics provide citizens and researchers in the natural, human, and social sciences with a comprehensive quantitative understanding of all aspects of these reserves.

These statistics can be considered the link to the national framework for environmental sustainability, encompassing all national strategies, policies, and agendas aimed at regulating environmental work, enhancing quality of life, and preserving a sustainable environment that achieves the Sustainable Development Vision (2030).

This paper will review the contributions that environmental statistics related to nature reserves, in the Emirate of Sharjah, can make, and their role in promoting environmental sustainability, and raising environmental and statistical awareness of the importance of these resources.

2. Methodology for Researching Environmental Statistics and Promoting Sustainability

This research paper aims to examine the statistical distribution of all nature reserves in the Emirate of Sharjah and clarify their most important geographical, environmental, and biological characteristics. This will highlight the significant role of environmental statistics in preserving these reserves and demonstrate their importance, thereby promoting their environmental sustainability.

Methodologically, the paper employs a descriptive-analytical approach, which helps in reaching conclusions and interpretations based on the statistics under study. The available statistical data represents one of the methods that can be used for statistical analysis of the importance of nature reserves and for understanding how these statistics and data have enhanced the sustainability of nature reserves.

2.1. Data Sources

The research will be limited to presenting and analyzing environmental statistics issued by the Department of Statistics and Community Development according to the latest census for the year 2023 (Department of Statistics and Community Development, 2023). This will involve reviewing publications and reports on the number of nature reserves, the rare animal and plant species they contain, their total area, ecosystem, etc., as well as data and statistics provided by the Environment and Protected Areas Authority of the Emirate of Sharjah, and the National Framework for Environmental Sustainability.

2.2. Analysis Procedures

This paper relies on descriptive statistics for secondary data issued by the Department of Statistics and Community Development. This data is presented using simple tables that include the distribution of variables through frequency distributions and proportional distributions for calculating variable categories.

It is worth noting that environmental statistics derived from statistical censuses are conducted through comprehensive surveys of the relevant areas during the enumeration period. These surveys utilize the latest standard methodologies and smart technologies for data collection and analysis to ensure the accuracy, quality, and reliability of the outputs. Among these tools is the (GSBPM v.5.0) Process Business Statistical Generic package, issued by the United Nations Economic Commission for Europe, which serves as a tool to guarantee the quality of the produced data.

2.3. Research Questions

This research paper seeks to answer the following questions:

1) How have environmental statistics contributed to enhancing the sustainability of nature reserves through their inventory and geographical classification?

2) What have environmental statistics done to enhance the sustainability of rare animals and their diverse species within these reserves?

3) To what extent have environmental statistics been able to enhance the sustainability of plant species found in these reserves?

3. Environmental Sustainability of Nature Reserves

Environmental sustainability is defined as a responsible or wise interaction with the environment to meet the needs of current and future generations for services or resources, while minimizing the depletion or degradation of natural resources (Abaidoo & Agyapong, 2022: p. 3056). Key aspects of environmental sustainability include: managing natural resources effectively and responsibly to prevent overexploitation and degradation, and protecting ecosystems and habitats to maintain the diversity of animal and plant species, which is essential for ecological balance (Meena, 2024: p. 46).

At its core, environmental sustainability encompasses the set of policies, activities, programs, and statistics adopted to protect the environment. These policies and programs are often geared towards conserving depletable or non-renewable natural resources and protecting ecosystems as a whole (Abaidoo & Agyapong, 2022: p. 3056). Regarding the use of environmental statistics, it is worth noting that technological advancements in data collection, analysis, and modeling, including remote sensing and satellite technology, have significantly enhanced the effectiveness of these practices required to promote sustainability (Tennakoon et al., 2024: p. 8).

There is no doubt that nature reserves face numerous challenges that hinder their sustainability, including pollution, climate change, deforestation, biodiversity loss, and desertification. Despite these challenges, there are many opportunities to enhance sustainability. These opportunities begin with strong government

policies that issue directives and guide agencies toward achieving sustainability and its objectives. Perhaps the first step in achieving sustainability is to inventory these reserves in their entirety and disseminate this information to promote a culture of sustainability, on the one hand, and to identify the interventions required for their preservation, on the other.

Nature reserves typically encompass specific terrestrial or marine areas where the conservation of animals, plants, soil, water, mineral deposits, fossils, and, in general, is of particular importance or must be protected from any artificial intervention that could lead to their degradation. Therefore, these areas are created to provide long-term protection for unique natural habitats or important species (Guinault et al., 2024: p. 1).

A literature review has demonstrated how environmental statistics and data, and their implications, contribute to the sustainable development of nature reserves. Nature reserves play a crucial role in maintaining ecological stability and achieving comprehensive environmental sustainability (Fan et al., 2013; Wu et al., 2025).

Faith and Walker (1996) emphasize that preserving biodiversity in protected areas is only possible with the availability of alternative information and standardized methods, such as statistical indicators. The lack of such useful information and data is a significant loss of biodiversity and sustainability. Xu et al. (2012) also concluded that national policies related to nature reserves have a positive impact on biodiversity, although these policies face increasing challenges, including the need to update data and statistics, which are essential for developing relevant policies and legislation.

Therefore, statistics contribute to environmental education by providing figures, data, and information about the nature of nature reserves and related environments. These reserves can then become centers for activities covering other important areas of community development, including education, income generation, and ecotourism (Wang et al., 2013; UNDP, 2012; Boente et al., 2019). In the same vein, some literature has shown how certain statistical variables can influence the sustainability of nature reserves (Vačkář et al., 2012; Liao et al., 2019). demonstrated the impact of population density on the geographical pattern of protected areas. After a statistical survey of several wild nature reserves, correlation analysis showed a significant negative relationship between population density and total area. Therefore, Henderson & Loreau (2023) emphasize prioritizing actions aimed at preserving ecosystem services and promoting well-being, and rationalizing awareness of goals that combine social and environmental policies.

4. Analyzing the Contributions of Environmental Statistics to Promoting the Sustainability of Nature Reserves

4.1. Statistics on the Geographical Distribution and Total Area of Nature Reserves in the Emirate of Sharjah

The environmental statistics discussed in this paper encompass all aspects of en-

vironmental statistics, including the application of diverse statistical methods, procedures, and techniques across various environmental activities. Statistical methods are used in designing environmental projects and in analyzing and interpreting environmental data to assist and guide scientists and researchers in drawing useful and meaningful conclusions about different aspects of the environment. Furthermore, they are used to describe environmental problems through mathematical modeling to understand the impact of selected variables under investigation and to demonstrate the direction of change (increase, decrease), or the nature of the relationship (positive, negative) (Alkarkhi & Alqaraghuli, 2020).

Environmental statistics are typically obtained from primary sources such as administrative records, statistical censuses, environmental management surveys, monitoring systems (for water quality, air pollution, climate, and soil), remote sensing, and estimates and modeling based on various statistical methods.

We can conclude that environmental statistics, in its environmental aspect, aims to provide quantitative data and information about the state of the environment and its most significant changes over time and across different regions. It aims to provide high-quality statistical information to improve policymaking and decision-making, with the ultimate goal of environmental statistics being to promote and sustain the environment and achieve the Sustainable Development Goals (Singh et al., 2023).

Looking at the statistics issued by both the Department of Statistics and Community Development and the Environment and Protected Areas Authority, as shown in **Table 1**, the geographical diversity of these reserves becomes clear. They are distributed across four different regions within the emirate: Sharjah City, the West Coast, the Central Region, and the Eastern Region. However, the majority of the reserves are located in the Central Region, which alone contains eight of the thirteen nature reserves, representing (61.5%) of the total distribution.

In the same context, official statistics have been able to determine the establishment dates of these reserves, based on the Emiri decree that designates an area as a nature reserve. As the table shows, the earliest establishment date for a nature reserve is that of the Lmadynah Reserve, which was established in 1996, more than a quarter of a century ago, specifically 30 years ago (2026).

It is also noted that seven nature reserves were established in 2007, nineteen years ago. This reflects the commitment to protecting these reserves and ensuring their environmental sustainability as wilderness areas that can achieve ecological balance. This is achieved by safeguarding them from unregulated use, overhunting, or reduction in their area for other purposes related to land reclamation or urban development.

Furthermore, the table highlights the most recent establishment date of these reserves, which is 2012, more than a decade ago, when both Al Hafaiyah Reserve and Al Qurm Reserve were established.

Regarding the total area of these nature reserves, their sizes vary, mirroring their geographical distribution across the four boundaries of the Emirate of Sharjah. The total area of the nature reserves reaches 45,247.5 square kilometers.

Table 1. Geographical distribution, date of approval, and total area of nature reserves in the Emirate of Sharjah.

Region	Reserve Name	Area	Year of Approval	No.
Sharjah City	Wasit Nature Reserve	0.86	2007	2
	Sir Bu Na'air Island	--	--	
West Coast	Al Qurm Protected Area - Al Hamriyah	4.997	2012	1
Central Region	Al Dhelaimah Protected Area	1.9413 m	2007	8
	Al Ebridi Protected Area	18.000	2007	
	Misanad Protected Area	--	--	
	Jebel Buhais Protected Area	--	--	
	Elmentether Greenbelt	9.000	2007	
	Lemdynah Protected Area	--	1996	
	Shnoof protected areas	--	--	
	Wadi Garha Protected Area	--	--	
Eastern Region	Al Qurm Protected Area	4.997	2012	2
	Al Hefaiyah Protected Area	5.4522	2012	

Source: 1) Environment & Protected Areas Authority, Sharjah, 2023. 2) Department of Statistics and Community Development, Environmental Statistics, 2023 Census.

The table shows that the smallest of these reserves, in terms of area, is Wasit Nature Reserve, which covers less than one square kilometer. This is a small area that, despite its size, has been included in environmental statistics alongside other protected areas. It was declared a nature reserve in 2007 by Emiri Decree No. 7 of 2007, issued by His Highness Sheikh Dr. Sultan Bin Mohammed Al Qasimi, "Member of the Supreme Council and Ruler of Sharjah". It is worth noting that this reserve is home to approximately 198 different bird species, in addition to a great diversity of small mammals, reptiles, and insects (EPAA, 2026).

The table also highlights the largest of these reserves in terms of area (Al Ebridi Reserve), which covers 18,000 square kilometers, representing (39.8%) of the total area, approximately one-third of the total area of all nature reserves in the Emirate of Sharjah.

According to data from the Environment and Protected Areas Authority (EPAA, 2026), Al Ebridi Reserve is characterized by its abundance of acacia trees, which are of exceptional environmental importance due to their unique characteristics and nutritional value for the animals in the region. These trees are a primary source of fodder for camels and goats in desert and semi-arid areas, given the lack of other feed sources, thus contributing to increased camel production. The reserve is also home to the mangrove tree, whose nectar is a valuable food source for bees that produce local honey. Part of the reserve is being developed into a nature park in the future.

4.2. Statistics on Promoting the Sustainability of Rare Animals and Their Species

Environmental statistics play a vital role in counting animals in Sharjah's nature reserves. These statistics are undoubtedly important for specialists in agriculture, veterinary medicine, and those responsible for environmental protection and heritage preservation.

Although the section on analysis procedures refers to the precise standard methodologies used in collecting and analyzing data, the incomplete data for environmental surveys, which includes (missing values and ongoing surveys) in some reserves, negatively affects the comprehensiveness of the data for interpreting the state of biodiversity and comparisons between nature reserves, which has been an obstacle to the analysis and interpretation of the data.

Table 2 illustrates the statistical efforts in counting and classifying animals in all the aforementioned nature reserves. The data show that all reserves contain numerous animals, whether known, native, or invasive. Only three nature reserves contain none of these three types: the Al Qurm Reserve, characterized by its dense mangrove trees reaching heights of up to 8 meters, and the Lemdynah and Shnoof Reserves. The statistics also indicate that surveys of living organisms have been ongoing since the last census in 2023.

Table 2. Number of animals in nature reserves in the Emirate of Sharjah by species.

Reserve Name	Total of identified species	Native Species	Invasive alien species
Al Dhelaimah Protected Area	78	72	6
Al Qurm Protected Area	250	242	8
Al Qurm Protected Area - Al Hamriyah	--	--	--
Al Ebridi Protected Area	100	89	11
Wasit Nature Reserve	160	150	10
Sir Bu Na'air Island	16	12	4
Al Hefaiyah Protected Area	72	64	8
Jebel Buhais Protected Area	52	46	6
Elmentether Greenbelt	78	72	6
Lemdynah Protected Area*	--	--	--
Shnoof protected areas	--	--	--
Wadi Garha Protected Area	78	72	6
Msanad Protected Area	78	72	6

Source: 1) Environment & Protected Areas Authority, Sharjah, 2023. 2) Department of Statistics and Community Development, Environmental Statistics, 2023 Census. * Surveys of living organisms are still ongoing, (--) No species.

The largest nature reserve, containing the greatest number of animals, is Wasit Nature Reserve, which is home to 160 known animal species, 150 endemic species, and 10 invasive species, totaling (320) species. This represents (16.6%) of the total animal population in all nature reserves in the emirate.

Overall, the statistics in the table indicate that the total number of known animal species in these reserves reach 962. The total number of endemic species is 891, while the total number of invasive species is 71, bringing the total number of animals in all reserves to 1924.

Operationally, the main variables are classified based on the classification system of the Environment and Protected Areas Authority of the Emirate of Sharjah, as follows:

1) Native Species: Native species that occur naturally within nature reserves without human intervention.

2) Endemic Species: Species that live in a specific and unique location and are not found in any other reserves. They are sometimes endangered due to their isolation.

3) Invasive Species: These are defined as non-native species of animals, microorganisms, reptiles, and plants. Their introduction or spread poses a threat to biodiversity within nature reserves. These species usually lead to biodiversity loss and environmental degradation. Alien species introduced by humans, whether intentionally or unintentionally, such as domesticated or predatory animals or reptiles like snakes, or black and brown rats, can compete with native animals, mammals, birds, reptiles, and invertebrates for extinction or range reduction, but the effects usually appear after many years.

Environmental statistics play a vital role in raising awareness about endangered animals. Table 3 shows that the total number of endangered animal species is 14, compared to 198 species that are not endangered. In addition, there are 593 species that are neither endangered nor not endangered (unclassified).

Table 3. Number of animal species in nature reserves in the Emirate of Sharjah by status.

Reserve Name	Threatened	Least Concern	Not Listed
Al Dhelaimah Protected Area	3	25	24
Al Qurm Protected Area	--	--	--
Al Qurm Protected Area - Al Hamriyah	6	29	191
Al Ebridi Protected Area	1	27	13
Wasit Nature Reserve	1	21	126
Sir Bu Na'air Island	--	3	9
Al Hefaiyah Protected Area	0	17	53
Jebel Buhais Protected Area	0	15	37
Elmentether Greenbelt	1	18	59
Lemdynah Protected Area	--	--	--
Shnoof protected areas	--	--	--
Wadi Garha Protected Area	1	18	59
Msanad Protected Area	1	25	22

Source: 1) Environment & Protected Areas Authority, Sharjah, 2023. 2) Department of Statistics and Community Development, Environmental Statistics, 2023 Census. (--) No species.

To reiterate, paying attention to endangered animals and raising awareness about their numbers, geographical locations, and the reasons behind their extinction will enhance their sustainability. Furthermore, interventions such as reducing waste, preserving water resources, and avoiding disturbance of wildlife are essential. Therefore, it can be said that environmental commitment to these animals is preceded by a statistical inventory of their numbers, species classifications, and habitats. This inventory serves as a foundation for interventions, efforts, and initiatives aimed at protecting these rare animals from extinction.

In general, environmental statistics promote sustainability through a causal pathway; it begins with comprehensive surveys, which aim to collect data on nature reserves and their geographical distribution. This made it possible to accurately determine the areas of these reserves and their contents, such as the number of animals and birds, their classification, and to formulate policies and issue evidence-based decisions aimed at achieving sustainability. Examples of this include Emiri Decree No. 7 of 2007, which we referred to previously, as well as decisions issued by the Environment and Protected Areas Authority, such as Executive Council Resolution No. 9 of 2012 regarding the prevention of environmental degradation in the terrestrial areas of the Emirate of Sharjah, and Administrative Resolution No. 3 of 2000 regarding the prevention of environmental degradation on (Sir Bu Na'air) Island, which stipulated in Article (2) the necessity of stopping the degradation of the reserve, working to develop it, and protecting the living organisms in it from all environmentally harmful activities and actions that threaten them with extinction.

This also resulted in Article (3) stipulating that the provisions of Federal Law No. 24 of 1999 concerning the protection and development of the environment shall be observed, prohibiting the hunting of sea turtles of all ages, sizes, and types, or the collection of their eggs, as well as prohibiting the carrying out of any actions that would threaten the safety of the birds residing in the reserve.

4.3. Statistics on Promoting Plant Sustainability and Classifications in Nature Reserves

Statistics were compiled detailing the number of plant species in the Emirate of Sharjah, categorized by type. **Table 4** shows the total number of known plant species in these reserves, reaching 235 species. It should be noted that no plant species statistics are available for the Al Qurm and Al Shnoof reserves. The Al Ebridi Reserve ranked first in terms of the number of plant species it contains, with 41 species, followed by Msanad Reserve in second place with a total of 36 species.

It is worth mentioning that the aforementioned reserves represent the highest rankings in terms of the number of endemic plant species, which totals 227 species. The Al Ebridi Reserve contains 38 of these plant species, thus ranking first, while the Al Ebridi Reserve came in second place with a total of 38 species, followed by the Msanad Reserve in third place with a total of 36 species.

Table 4. Number of plant species in nature reserves in the Emirate of Sharjah.

Reserve Name	Total of identified species	Native Species	Invasive alien species
Al Dhelaimah Protected Area	29	29	0
Al Qurm Protected Area	--	--	--
Al Qurm Protected Area - Al Hamriyah	22	21	1
Al Ebridi Protected Area	41	38	2
Wasit Nature Reserve	28	27	1
Sir Bu Na'air Island	2	2	0
Al Hefaiyah Protected Area	22	20	2
Jebel Buhais Protected Area	10	10	0
Elmentether Greenbelt	14	13	1
Lemdynah Protected Area	9	9	0
Shnoof protected areas	--	--	--
Wadi Garha Protected Area	22	22	0
Msanad Protected Area	36	36	0

Source: 1) Environment & Protected Areas Authority, Sharjah, 2023. 2) Department of Statistics and Community Development, Environmental Statistics, 2023 Census. (--) No species.

5. General Conclusion and Findings

After analyzing the statistical data of nature reserves, we can conclude the extent to which environmental statistics contribute to enhancing the environmental sustainability of nature reserves, as these statistics provided us with a comprehensive and accurate inventory of all nature reserves in the Emirate of Sharjah, whether through area, geographical location, or the founding history of these reserves. Thus, they serve as the link that conveys the features of these reserves and embodies them in a digital form; as one of the descriptive tools of these statistics, as well as providing scientific evidence of the importance of geographical location and area, and making clear the effectiveness of achieving environmental sustainability for users of these statistics, whether citizens, researchers, or decision-makers.

To answer the paper's second question, "What have environmental statistics contributed to promoting the sustainability of rare animals and their diverse species?", we can confidently assert the success of statistical agencies in providing official statistics on nature reserves, including all animals, whether native, invasive, or endangered. This digital statistical narrative is among the most significant contributions of environmental statistics in raising awareness and promoting the conservation of these animals and their diverse species. It also enhances environmental knowledge about the importance of preserving all animals living in these reserves, thus indirectly contributing to the protection of the natural heritage of these reserves and the diverse organisms that inhabit them.

Finally, we can point out that the aforementioned analyses have answered the

question posed by the paper's methodology, entitled "To what extent can environmental statistics enhance the sustainability of plant species included in these reserves?" The statistics provided all the different information and data about the types of plants that grow in these reserves, whether known, endemic, or invasive. Thus, we conclude from this accurate statistical classification the extent to which statistics contribute to providing diverse evidence of the importance of these plants and trees, and the incentive to protect rare species among them as one aspect of protecting these plants, and highlighting the importance of wildlife for the birds that inhabit them. Thus, we conclude the effectiveness of statistics in describing the features of biodiversity required to enhance the environmental sustainability of these reserves.

Based on the general conclusions and results, it is clear that environmental statistics play an active role in contributing to the promotion of environmental sustainability, and therefore the paper recommends the following:

- Increase public awareness of the importance of environmental statistics by intensifying workshops and training courses that highlight the efforts of statistical agencies in serving sustainable development. This includes proposing advanced programs that keep pace with the latest developments and serve environmental statistics, while also enhancing the skills of statisticians to provide more accurate environmental statistics needed across all aspects of sustainable development.

- Alongside the importance of raising statistical awareness, efforts should be intensified in environmental education and public awareness campaigns about the importance of nature reserves and the heritage, environmental, and developmental benefits of preserving and sustaining them. Therefore, a strategy should be formulated to achieve the desired outcomes of environmental education, in coordination with media outlets, research institutions, and all relevant agencies.

- Cooperation and participation should be strengthened between statistical agencies, the Environment and Protected Areas Authority, and research centers in managing nature reserves. Longitudinal research should be conducted on nature reserves and the potential challenges that hinder improving sustainability within these ecosystems. In addition to proposing ways to invest in development in those reserves, to the extent that they become a source of national income, and one of the sources of providing new job opportunities for citizens.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Abaidoo, R., & Agyapong, E. K. (2022). Environmental Sustainability Risk, Institutional Effectiveness and Urbanization. *Energy & Environment, 34,* 3055-3079. https://doi.org/10.1177/0958305x221118876

Alkarkhi, A. F. M., & Alqaraghuli, W. A. A. (2020). Multivariate Data. In A. F. M. Alkarkhi, & W. A. A. Alqaraghuli (Eds.), *Applied Statistics for Environmental Science with R* (pp.

1-10). Elsevier. https://doi.org/10.1016/b978-0-12-818622-0.00001-0

Boente, C., Albuquerque, M. T. D., Gerassis, S., Rodríguez-Valdés, E., & Gallego, J. R. (2019). A Coupled Multivariate Statistics, Geostatistical and Machine-Learning Approach to Address Soil Pollution in a Prototypical Hg-Mining Site in a Natural Reserve. *Chemosphere, 218,* 767-777. https://doi.org/10.1016/j.chemosphere.2018.11.172

Department of Statistics and Community Development (2023). *Sharjah Annual Statistical Yearbook, Environmental Statistics, 2023 Census.*

Environment & Protected Areas Authority (EPAA) (2026). *Nature Reserves Department, Sharjah.* https://epaashj.ae/

Faith, D. P., & Walker, P. A. (1996). Environmental Diversity: On the Best-Possible Use of Surrogate Data for Assessing the Relative Biodiversity of Sets of Areas. *Biodiversity and Conservation, 5,* 399-415. https://doi.org/10.1007/bf00056387

Fan, Z., Zhang, X., Li, J., Yue, T., Liu, J., Xiang, B. et al. (2013). Land-Cover Changes of National Nature Reserves in China. *Journal of Geographical Sciences, 23,* 258-270. https://doi.org/10.1007/s11442-013-1008-8

Guinault, C., Coster, P., Avoine, J., & Simien, F. (2024). The Historical and Current Role of the Nature Reserves Network in Preserving Geoheritage in France. *Geosciences, 14,* Article 354. https://doi.org/10.3390/geosciences14120354

Henderson, K., & Loreau, M. (2023). A Model of Sustainable Development Goals: Challenges and Opportunities in Promoting Human Well-Being and Environmental Sustainability. *Ecological Modelling, 475,* Article ID: 110164. https://doi.org/10.1016/j.ecolmodel.2022.110164

Liao, C., Luo, Y., Tang, X., Ma, Z., & Li, B. (2019). Effects of Human Population Density on the Pattern of Terrestrial Nature Reserves in China. *Global Ecology and Conservation, 20,* e00762. https://doi.org/10.1016/j.gecco.2019.e00762

Meena, R. K. (2024). Environmental Sustainability: Challenges and Opportunities. *International Journal of Social Impact, 9,* 46-54.

Singh, A., Rami, E., Singh, A., & Rami, E. (2023). *Introduction to Environmental Statistics ([Edition Unavailable]).* Delve Publishing. https://www.perlego.com/book/3833596/introduction-to-environmental-statistics-pdf

Tennakoon, W. D. N. M. S., Janadari, M. P. N., & Wattuhewa, I. D. (2024). Environmental Sustainability Practices: A Systematic Literature Review. *European Journal of Sustainable Development Research, 8,* em0259. https://doi.org/10.29333/ejosdr/14604

United Nations Development Programme (UNDP) (2012). *The Community Nature Reserve Development Network (REDERC), Benin. Equator Initiative Case Study Series.*

Vačkář, D., Chobot, K., & Orlitová, E. (2012). Spatial Relationship between Human Population Density, Land Use Intensity and Biodiversity in the Czech Republic. *Landscape Ecology, 27,* 1279-1290. https://doi.org/10.1007/s10980-012-9779-3

Wang, W., Pechacek, P., Zhang, M., Xiao, N., Zhu, J., & Li, J. (2013). Effectiveness of Nature Reserve System for Conserving Tropical Forests: A Statistical Evaluation of Hainan Island, China. *PLOS ONE, 8,* e57561. https://doi.org/10.1371/journal.pone.0057561

Wu, H., Song, F., Li, H., Bai, J., Cui, L., Su, F. et al. (2025). The Role of Nature Reserves in Ecosystem Services and Urban Ecological Sustainable Development. *Land, 14,* Article 136. https://doi.org/10.3390/land14010136

Xu, J., Zhang, Z., Liu, W., & McGowan, P. J. K. (2012). A Review and Assessment of Nature Reserve Policy in China: Advances, Challenges and Opportunities. *Oryx, 46,* 554-562. https://doi.org/10.1017/s0030605311000810