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Animal Comfort in Natural Environment Protection Areas Integrating RS and DIS

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Abstract: The progress of biodiversity is an important indicator of ecology and livelihoods. The establishment of natural reserves to protect biodiversity can scientifically and effectively regulate the stability of the biological environment, prevent and reduce species extinction to a certain extent, and ensure the safe and healthy development of the natural ecological environment. It can also play a role in establishing and protecting habitats and even enriching species. RS (Remote sensing) and DIS (Digital information system) help personnel involved in remote detection image monitoring and analysis in the region to quickly respond to emergencies and protect biodiversity and animal comfort. Therefore, this paper analyzes the problems that affect the comfort of animals in natural environment protection areas, and then uses RS and DIS to analyze the processing steps of regional images, and finally proposes corresponding protection strategies to improve the comfort of animals. It can be seen from the comparison that the animal comfort after the optimization of the nature reserve is 19% higher than that before the optimization of the nature reserve, and the ecological monitoring effect is 21.2% higher than that before the optimization of the nature reserve. In short, RS and DIS are of great significance in species monitoring in natural environment protection areas.

1. Introduction

With the development of science and technology, especially the development of RS and DIS, RS provides large-scale synchronous observation of environmental data and dynamic monitoring, and has the advantages of long service life, short cycle, fast speed, etc. RS environmental dynamic observation data has played an important role in evaluating the habitat of DIS, and DIS has strong spatial data analysis and visual graphic analysis capabilities. The ability to improve their habitat and

promote biodiversity by controlling and analyzing the comfort of animals in the reserve.

Natural environment protection areas are important for the ecological effectiveness of animals. Robertson Ian proposed a definition of perception, extending the current legal responsibility to not only protect animals from unnecessary and unreasonable negative conditions, but also provide them with opportunities for positive emotional conditions [1]. Smith Adrian J proposed animal research and experimental program planning, covering three broad areas that determine the quality of animal research preparation and the quality control of each component of the study, and provided links to animal research and testing guidelines [2]. Apriyani Lusi believes that the legal reform of wildlife protection in Indonesia can be completed by comparing the legal framework of wildlife protection in Indonesia and the United States [3]. Yang Nian prevents further public health threats by prohibiting the consumption of any wild animals caught in the field or raised artificially, until the revised wildlife protection law is issued [4]. Pearson Ryan M can localize and better support sustainable consumer choices by redesigning trade networks and supply chains, and can also improve environmental monitoring through better use of automation, and ensure that protection funding programs remain active [5]. Mitra Ishani believes that the latest progress in molecular genetics research provides a series of new possible applications of genetic methods in wildlife research, protection and management [6]. Lee Derek E used analysis to assess the ecological effectiveness of Burundi's wildlife management area, and compared the density of wild animals and livestock inside and outside the wildlife management area with the sampling data [7]. The above studies have described the benefits of natural environment protection areas to animals, but they have not combined remote sensing technology and digital information system.

Many scholars have carried out relevant research on climate suitability. Cetin Mehmet understands the applicability of regional change vector analysis and elevation parameters. With the help of biological climate comfort conditions, the map considers temperature, humidity and rainfall data as well as biological climate comfort zone [8]. Cetin Mehmet determines the hourly climate comfort and the adaptation of people inside and outside the city, establishes an index to determine the climate comfort, and classifies these indexes according to the psychological map equivalent to temperature. It is found that due to the change of climate comfort, biological development has different lifestyles [9]. Cortes-Vazquez Jose A analyzed how local people living in nature reserves care, act and think about their environmental protection actions by actively participating in the protection government and management, which helps to understand the relationship between different regulatory systems and the formation of environmental subjects more clearly and more carefully [10]. Visseren-Hamakers Ingrid J proposed a framework for analyzing and practicing comprehensive governance, which is defined as the theory and practice of focusing on the relationship between governance tools or systems [11]. The above studies have described the impact of climate adaptation on the living environment, but have not proposed optimization strategies.

In order to study the comfort of animals in the nature reserve, this paper analyzes the comfort of animals in the nature reserve through the maximum likelihood classification algorithm, then analyzes the image steps of animals in the nature reserve using RS and DIS, and finally analyzes the construction perfection and regional division rationality of the optimized nature reserve through experiments, Finally, the animal comfort and environmental monitoring effect before and after optimization were analyzed through comparative experiments. Compared with other literatures, this paper focuses on the comparative experiment to analyze the living environment of animals and the construction of protected areas.

2. Animal Comfort in Nature Reserves

There are three main problems affecting animal comfort in the current nature reserve, as shown

in Figure 1.

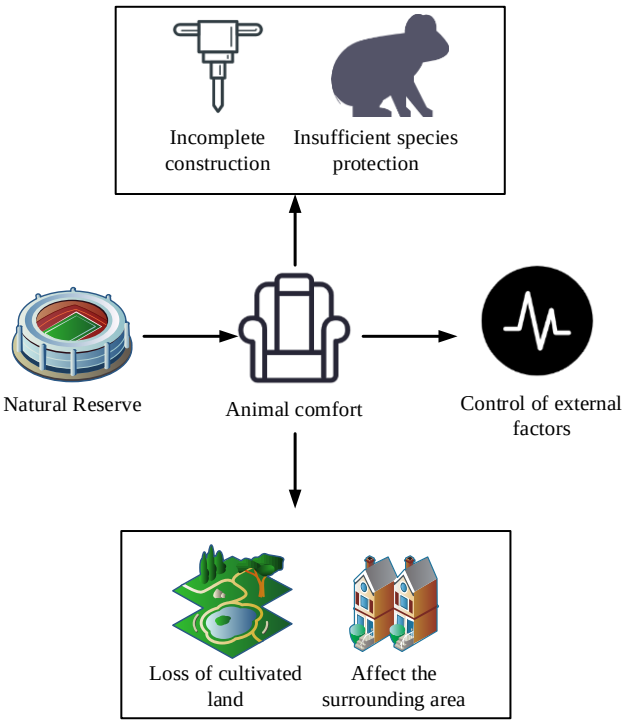


Figure 1. Analysis of animal comfort in nature reserves

2.1. Incomplete Construction and Insufficient Species Protection

At present, the science and technology related to biodiversity conservation is relatively immature, small in scale and few in types. In the face of complex natural and geographical environment, it cannot fully play an important role. Although a large amount of funds have been invested, the efficiency of this project is low, which in itself is a formal waste of scientific, technological and financial resources, which is not conducive to the establishment and development of natural reserves. Despite the continuous efforts of relevant governments and voluntary service groups, overfishing of endangered species and weak law enforcement are still worrying [12]. Due to the complex terrain and the small area of the nature reserve itself, the nature reserve is not conducive to large-scale construction and full protection of biodiversity, which not only hinders the goal of biodiversity conservation, but also hinders the development of biodiversity in the nature reserve to a certain extent.

2.2. Significant Impact on Surrounding Areas, Loss of Cultivated Land

In order to implement the "environmental protection of biological organisms" project, it is necessary to reserve sufficient free zones in advance to ensure the basic guarantee of biological life. All residents in the region migrate according to national regulations, which leads to conflicts between people who do not want to move and builders, loss of arable land, number of immigrants, investment and time costs. The growth of urban population, the deepening of urbanization and some negative impacts related to the construction of large-scale ecological protection areas are undoubtedly external conditions that are not conducive to the country and society, and will hinder development. The huge area has also caused the shortage of scarce cultivated land resources. The waste of cultivated land will not only reduce people's income and food production, but also destroy other biological habitats, reduce the diversity of other species and increase pollution over time.

Only by taking appropriate protection and management measures can the negative impact of the ecological protection zone on the environment be minimized [13].

2.3. Lack of Control over External Factors

Ecological reserves can protect the biodiversity of natural reserves and prevent other external factors from adversely affecting biological disasters. Compared with wild animals, animals in natural reserves face much less risks. Although other natural reserves also play a role in protecting wild rare animals, many rare animals are still not protected. Therefore, it is urgent to use DIS to establish a reserve.

3. Application of RS and DIS in Animal Comfort of Nature Reserves

Before RS and DIS monitor the comfort of animals, it is usually necessary to preprocess the remote sensing data, including atmospheric correction, geometric correction, image creation and clipping, and band optimization, as shown in Figure 2.

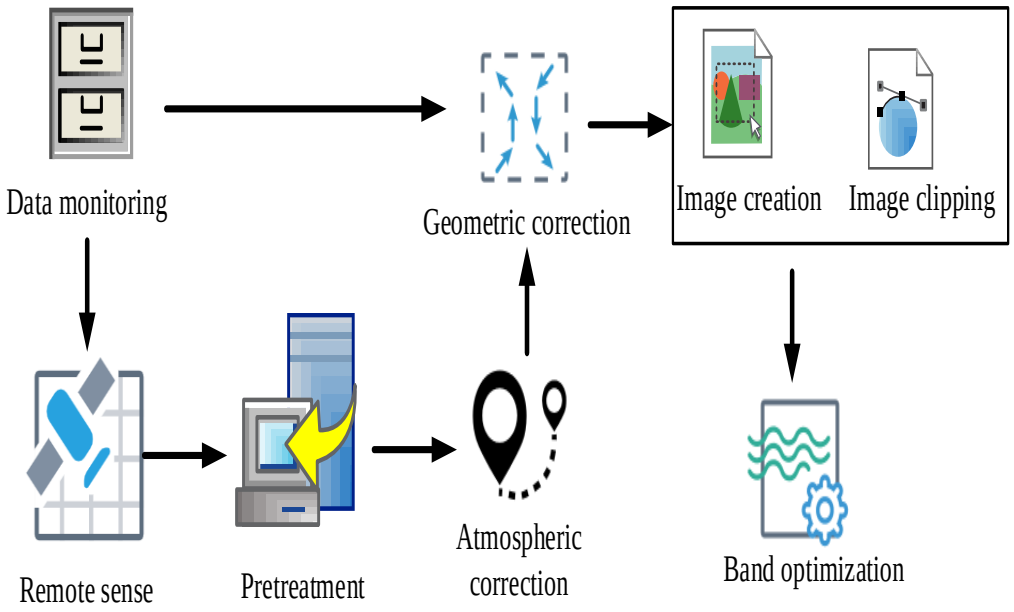


Figure 2. Preconditioning of comfort data of RS and DIS monitoring animals

First, atmospheric correction. Remote sensing images recorded by satellite sensors inevitably reflect the radiation errors brought by atmospheric images. Molecular aerosols in the atmosphere are electromagnetic waves and composite image data. Due to the interaction, the energy of some electromagnetic waves propagating in the atmosphere will decay. Therefore, the atmosphere must be corrected before using remote sensing data.

Second, geometric correction. Geometric correction of remote sensing image is the process of eliminating geometric distortion of image. Due to factors such as earth rotation and earth curvature, the direction, height, speed and fluctuation of remote sensing images are usually characterized by geometric deformation, which leads to the inconsistency between the image itself and the actual terrain. This often leads to confusion in data collection, reduces the quality of remote sensing data, and reduces the accuracy of image analysis. Therefore, geometric image correction becomes a necessary step in analyzing and processing remote sensing images.

Third, create and crop images. Before cropping distant images, you need to combine the two images to create an image that covers the entire area. Smooth colors can be used to keep the image tone as consistent as possible to prevent color distortion and information loss. After the acquisition is completed, the captured image is clipped using the vector data format of the protected area.

Fourth, band optimization. The wavelength range of different remote sensing image bands has unique characteristics. Therefore, selecting appropriate frequency band combination is also the key to improve the image. Selecting appropriate frequency band combination also plays an important role in remote sensing image translation. It can be fine-tuned when selecting samples, and the richness of spectrum is directly related to the quality of samples. At the same time, selecting appropriate frequency band combination can effectively eliminate unnecessary frequency bands, reduce the amount of calculation and improve the calculation speed.

4. Maximum Likelihood Classification Algorithm in Animal Comfort in Natural Environment Protection Areas

In order to study the specific application effect of RS and DIS in animal comfort in natural environmental protection areas, this paper analyzes the probability density function of environmental protection areas through the maximum likelihood classification algorithm, and then analyzes the multivariate normal density function of remote sensing data of natural environmental protection areas, and finally obtains the animal comfort. First, the probability density function of the natural environment protection zone is calculated as follows:

$$\hat{a}\left(y|\alpha_i\right)=\frac{1}{\left(2\pi\right)^{\frac{1}{2}}\delta_i}\exp\left[-\frac{1}{2}\frac{\left(y-\alpha_i\right)^2}{\delta_i^{\ 2}}\right] \tag{1}$$

α_i is the land type probability of the nature reserve. δ_i is the estimated variance of remote sensing monitoring in the nature reserve. Then analyze the multivariate normal density function under remote sensing data as follows:

$$\hat{a}\left(y|\alpha_i\right)'=\frac{1}{\left(2\pi\right)^{\frac{n}{2}}\left|x_i\right|^{\frac{1}{2}}}\exp\left[-\frac{1}{2}\left(V-B_i\right)^T x_i^{-1}\left(V-B_i\right)\right] \tag{2}$$

$\left|x_i\right|$ is the determinant of the covariance matrix of the nature reserve. x_i^{-1} is the inverse matrix of the covariance matrix, and B_i is the mean vector. Finally, we can get the comfort of animals in the natural environment protection area as follows:

$$S=\frac{n\hat{a}\left(y|\alpha_i\right)}{\hat{a}\left(y|\alpha_i\right)'-\hat{a}\left(y|\alpha_i\right)} \tag{3}$$

In the formula, n is the climate of natural animal reserves.

5. RS and DIS Measures to Improve Animal Comfort in Nature Reserves

When using RS and DIS to study the comfort of animals in nature reserves, the comfort of animals can be improved in the following ways, as shown in Figure 3.

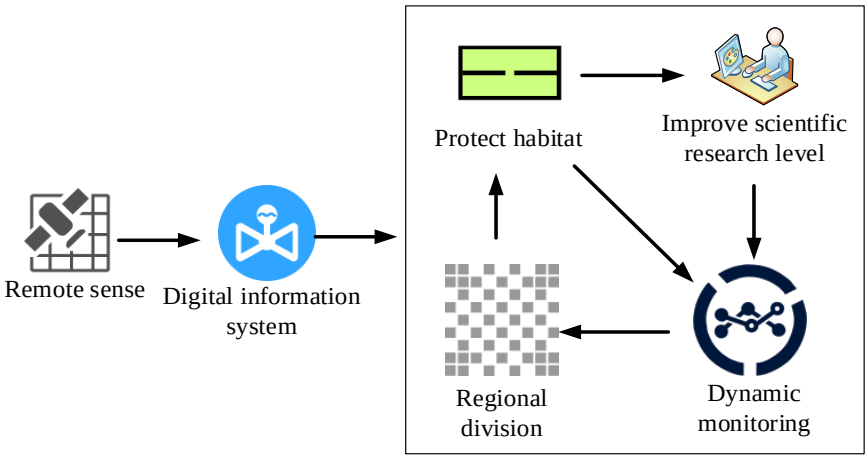


Figure 3. Measures for RS and DIS to improve animal comfort in nature reserves

5.1. Habitat Protection

Establish biological corridors in the reserve, connect scattered habitats, protect and restore potential habitats inside and outside the reserve, so that animals can effectively use resource habitats, expand habitats, maintain stability and population growth. Relevant functional departments should strengthen inspection and monitoring, improve animal protection awareness, improve the management of protected areas, minimize human interference, minimize the impact on animal life, and reduce the damage to ecology and habitat. Endangered species reserve can be established in the nature reserve [14]. Organize experts to monitor the performance and reproduction effect of animals, incorporate environmental protection measures and tools into relevant laws, protect biodiversity legally and maintain the stability of biodiversity.

5.2. Improve the Level of Scientific Research

The main goal of animal protection is to maximize the population. Therefore, we should strengthen the ability of wild domestication and reintegration of animal populations, improve breeding methods, strengthen gene protection in the field of breeding, and strive to expand and reproduce wild animal populations. In addition, in terms of animal comfort, there are some corresponding deficiencies in animal legislation and monitoring mechanism. Therefore, formulating policies and regulatory systems for the management of natural reserves can effectively remedy the blind spots of habitat fragmentation management.

5.3. Establishment of Ecosystem Monitoring Mechanism

The establishment of an advanced ecosystem monitoring network in the reserve can help managers protect the environment. This means that managers can observe the nature reserve in real time indoors and gradually establish a comprehensive monitoring and early warning mechanism. Technicians can install monitors in areas and hidden areas that pose a threat to the ecosystem of the Reserve, which can not only carry out remote monitoring and observation, but also support scientists' scientific work and ecosystem research. Evaluate the environmental quality of the reserve through monitoring systems such as air pollution indicators, water and soil pollution measurements, store parameters in the monitoring, and analyze the final environmental status according to local actual conditions [15].

5.4. Scientific Division of Management Areas

Without affecting the growth of species in the reserve, the nature reserve includes three main areas, including buffer zone, central zone and experimental zone. The central area is completely managed by scientific research and is used for comprehensive use and protection. It usually refers to similar areas in the depth of the forest, showing people the nature, with almost no traces of human activities. Even if there is slight damage, it can be gradually repaired through intervention. The area is rich in natural resources and cannot be accessed without permission. The buffer zone is located near the central area, focusing on the protection of local endemic species, scientific research and observation, and providing scientists with opportunities to study ecosystems and biological resources. The pilot area should be the area outside the buffer zone to the boundary of the reserve. It can carry out activities similar to the buffer zone, but it can also carry out ecotourism practice, visit, research and teaching.

6. Experimental Analysis of Animal Comfort in Nature Reserves

In order to study the specific comfort of animals in the nature reserve, this paper analyzes the construction perfection and regional planning rationality of the nature reserve before and after optimization through RS and GIS, and then analyzes the animal comfort and environmental monitoring effect before and after optimization through comparative experiments. First of all, this paper investigated the construction perfection and regional division rationality of the three nature reserves before and after optimization. The specific investigation results are shown in Table 1.

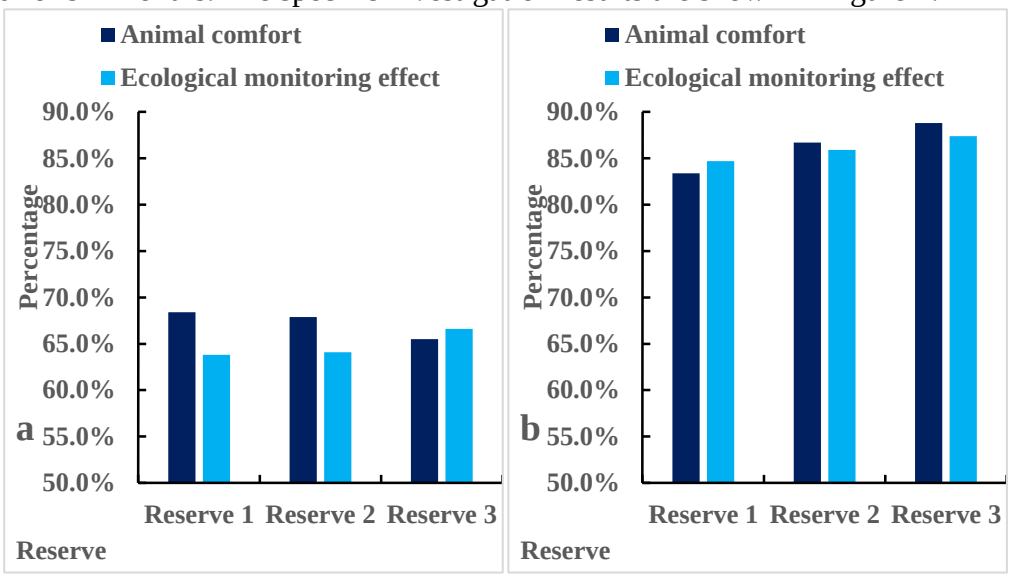
Table 1. Construction perfection and regional division rationality of the three nature reserves before and after optimization

	Construction perfection		Rationality of regional division	
	Before optimization	After optimization	Before optimization	After optimization
Nature Reserve 1	59%	81%	64%	82%
Nature Reserve 2	56%	86%	75%	86%
Nature Reserve 3	64%	84%	72%	87%

According to the data described in Table 1, before the optimization of the natural reserve, the construction perfection degree of the natural reserve 1 is 59%, and the rationality of the regional division is 64%; The construction perfection degree of Nature Reserve 2 is 56%, and the rationality of regional division is 75%; The degree of perfection of construction of Nature Reserve 3 is 64%, and the rationality of regional division is 72%. After the optimization of the natural reserve, the construction perfection degree of the natural reserve 1 is 81%, and the rationality of the regional division is 82%; The degree of construction perfection of Nature Reserve 2 is 86%, and the rationality of regional division is 86%; The degree of perfection of construction of Nature Reserve 3 is 84%, and the rationality of regional division is 87%. On the whole, the construction perfection degree of the nature reserve before optimization is 60%, and the rationality of regional division is 70%; After the optimization of the nature reserve, the degree of construction perfection is 84%, and the rationality of regional division is 85%. Through comparison, it can be seen that the construction perfection degree of the optimized nature reserve is 24% higher than that of the optimized nature reserve, and the rationality of regional division is 15% higher than that of the optimized nature

reserve. After the optimization of the nature reserve, the comfort of animals has been greatly improved, and the environmental planning is also more reasonable, allowing animals to choose areas suitable for their own development as habitats, greatly improving the livability of the environment.

Finally, to analyze the animal comfort and ecological monitoring effect before and after the optimization of the nature reserve, a total of three nature reserves were investigated, each of which lasted for six months. The specific investigation results are shown in Figure 4.



a:Before the optimization of the nature reserve b:After the optimization of the nature reserve

Figure 4. Animal comfort and ecological monitoring effect before and after the optimization of the nature reserve

Figure 4a shows the natural reserve before optimization, and Figure 4b shows the natural reserve after optimization. It can be seen from Figure 4a that before the optimization of the nature reserve, the animal comfort of area 1 is 68.4%, and the ecological monitoring effect is 63.8%; The animal comfort of area 2 is 67.9%, and the ecological monitoring effect is 64.1%; The animal comfort of area 3 is 65.5%, and the ecological monitoring effect is 66.6%. It can be seen from Figure 4b that after the optimization of the nature reserve, the animal comfort of area 1 is 83.4%, and the ecological monitoring effect is 84.7%; The animal comfort of area 2 was 86.7%, and the ecological monitoring effect was 85.9%; The animal comfort of area 3 is 88.8%, and the ecological monitoring effect is 87.4%. On the whole, the animal comfort before the optimization of the nature reserve is 67.3%, and the ecological monitoring effect is 64.8%; The animal comfort after optimization in the nature reserve is 86.3%, and the ecological monitoring effect is 86.0%.

It can be seen from the comparison that the animal comfort after the optimization of the nature reserve is 19% higher than that before the optimization of the nature reserve, and the ecological monitoring effect is 21.2% higher than that before the optimization of the nature reserve.

7. Conclusion

The protection of biodiversity is an important measure for the healthy development of the ecological environment, and is crucial to the coordinated development of the entire ecological environment. This requires the relevant departments to use scientific and effective methods to repair the reserve and maximize the protection of biodiversity in the reserve. In the future, when

establishing animal reserves, to protect the integrity of the habitat, we should pay more attention to the environmental division of the region, take the quantity and quality of animal reserves as the starting point, use RS and DIS to carry out targeted and flexible planning and monitoring of the reserve, so that the reserve can become a natural reserve that can provide good habitat for animals.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Robertson, Ian, and Daniel Goldsworthy. "Recognising and defining animal sentience in legislation: A framework for importing positive animal welfare through the five domains model." Monash University Law Review 48.1 (2020): 244-271.

[2] Smith, Adrian J. "PREPARE: guidelines for planning animal research and testing." Laboratory animals 52.2 (2018): 135-141.

[3] Apriyani, Lusi, Fahmi Yoesmar AR, and Marta Erwandi. "Comparison of wildlife protection law between Indonesia and the United States." Hasanuddin Law Review 4.2 (2018): 181-193.

[4] Yang, Nian. "Permanently ban wildlife consumption." Science 367.6485 (2020): 1434-1434.

[5] Pearson, Ryan M. "COVID-19 recovery can benefit biodiversity." Science 368.6493 (2020): 838-839.

[6] Mitra, Ishani, Soma Roy, and Ikramul Haque. "Application of molecular markers in wildlife DNA forensic investigations." Journal of Forensic Science and Medicine 4.3 (2018): 156-160.

[7] Lee, Derek E. "Evaluating conservation effectiveness in a Tanzanian community wildlife management area." The Journal of Wildlife Management 82.8 (2018): 1767-1774.

[8] Cetin, Mehmet. "The effect of urban planning on urban formations determining bioclimatic comfort area's effect using satellitia imagines on air quality: a case study of Bursa city." Air Quality, Atmosphere & Health 12.10 (2019): 1237-1249.

[9] Cetin, Mehmet. "Climate comfort depending on different altitudes and land use in the urban areas in Kahramanmaras City." Air Quality, Atmosphere & Health 13.8 (2020): 991-999.

[10] Cortes-Vazquez, Jose A., and Esteban Ruiz-Ballesteros. "Practising nature: A phenomenological rethinking of environmentality in natural protected areas in Ecuador and Spain." Conservation and Society 16.3 (2018): 232-242.

[11] Visseren-Hamakers, Ingrid J. "A framework for analyzing and practicing Integrative Governance: The case of global animal and conservation governance." Environment and Planning C: Politics and Space 36.8 (2018): 1391-1414.

[12] Eid, Ehab, and Ramzi Handal. "Illegal hunting in Jordan: using social media to assess impacts on wildlife." Oryx 52.4 (2018): 730-735.

[13] Wintle, Brendan A., Sarah Legge, and John CZ Woinarski. "After the megafires: What next for Australian wildlife?." Trends in Ecology & Evolution 35.9 (2020): 753-757.

[14] Koh, Lian Pin, Yuhan Li, and Janice Ser Huay Lee. "The value of China's ban on wildlife trade and consumption." Nature Sustainability 4.1 (2020): 2-4.

[15] Aguilar, Xavier Fernandez. "PPR virus threatens wildlife conservation." Science 362.6411 (2018): 165-166.