Hindawi
Mathematical Problems in Engineering
Volume 2023, Article ID 9856428, 1 page
https://doi.org/10.1155/2023/9856428

Retraction

Retracted: An Analysis of the Driving Factors of the Desertification in the Desert-Oasis Transition Zone Utilizing the Perspective of the Marx's Concept of Nature: A Case Study of the Ulan Buh Desert

Mathematical Problems in Engineering

Received 1 August 2023; Accepted 1 August 2023; Published 2 August 2023

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Xie, X. Zhao, and H. Zhou, "An Analysis of the Driving Factors of the Desertification in the Desert-Oasis Transition Zone Utilizing the Perspective of the Marx's Concept of Nature: A Case Study of the Ulan Buh Desert," *Mathematical Problems in Engineering*, vol. 2022, Article ID 4643667, 9 pages, 2022.

Hindawi
Mathematical Problems in Engineering
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https://doi.org/10.1155/2022/4643667

Research Article

An Analysis of the Driving Factors of the Desertification in the Desert-Oasis Transition Zone Utilizing the Perspective of the Marx's Concept of Nature: A Case Study of the Ulan Buh Desert

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Received 17 April 2022; Revised 13 May 2022; Accepted 20 May 2022; Published 27 June 2022

Academic Editor: Naeem Jan

The Ulan Buh Desert is in an arid and semiarid area in China, which features an exceedingly vulnerable ecological environment and has severe desertification. Based on Marx's explanations for the human-nature relationship, this research applies the remote sensing data and meteorological and socioeconomic data from 2006 to 2018 to conduct a quantitative analysis of the desertification driving factors in the Ulan Buh Desert by adopting the method called multivariate random forest regressor. The findings of the research suggested that the average model employing a random forest algorithm is found to be 84.20%. The desertification in the Ulan Buh Desert showed a declining trend from 2006 to 2018, and the reversed desertification areas mainly are expanded into the hinterlands of the Ulan Buh Desert and along the Yellow River. While the main driving factor of desertification was found to be related to human activities, which were undertaken based on natural factors, the regional desertification was mainly attributed to human economic activities, population density, and altitude. Thus, lessening the excessive impact of human activities on the desert ecosystem would be crucial to protecting the local desert resources and increasing the ecological capacity of the desert ecological capacity. As a consequence, to reduce pressure on land, expand environment capacity, protect vegetation cover in the region, and lower the probability of triggering desertification, the interaction between human beings and nature should be carefully managed and observed.

1. Introduction

Desertification is one type of land degradation in arid, semiarid, and subhumid areas resulting from many factors, including climatic variations and human activities, and is on the top of the ten major environmental issues in the world. Desertification is a particularly prominent problem in the arid and semiarid areas of northwest China and has restricted the economic development in the northwest region adversely. The analysis of the driving factors of desertification is of great importance and scientific significance for regional sustainable development. The research on the driving forces of desertification in the Ulan Buh Desert centers on the analysis of the changes in the vegetation cover. The results of the research indicate that the driving factors of desertification involve both human and natural factors, but there exist still some unanswered points in the study as the mere changes in the vegetation cover are insufficient to reflect the evolution of desertification. Meanwhile, the research covered the years before 2004. It was generally found that desertification was observed in the rapid development period from the 1980s to about 2000 in China. However, China has successively launched a series of key forestry ecological projects in the last decade. Thus, it is necessary to track and analyze the dynamic changes in desertification in this region. The present studies have been mainly conducted based on a combination of methods such as remote sensing, system dynamics, factor analysis, principal component analysis, multivariate regression analysis [1], and correlation analysis. However, this research was carried out based on

Marx's explanations for the human-nature relationship using the machine learning algorithm; for example, the random forest provides a systematic and accurate analysis of the human-nature relationship and the driving factors of desertification in a bid to lead scientific guidance on the control of the desertification. Therefore, this research reveals the desertification degree and variation trend by contemporary remote sensing means and makes a systematic analysis of the Ulan Buh Desert as the research area concerning the perspective of the Marx's concept of nature, which contains the regional environmental changes and human activities, including natural, social, and economic factors, such as climate, landform, hydrology, soil [2], and population. The outcomes provide a scientific basis for the coordinated development related to population, resources, and environment in the region. Thus, desertification control in desert regions has great significance to maintain ecological equilibrium and promote harmonious coexistence between human beings and nature.

2. The Study Area and the Methodology

2.1. The Overview of the Study Area. The Ulan Buh Desert, one of China's eight largest deserts, is in the temperate zone having a temperate climate, which is an area of transition from desert-to-desert grassland. The area features a vulnerable ecological environment and covers a total of 14,900 km^2. As part of the Alashan Desert, the attempts to prevent and control the desertification of the Ulan Buh Desert began back in the 1950s. The Ulan Buh Desert spans Langshan Mountain in the north, the Bayan Ula Mountain in the west, the Helan Mountain in the south, and the Yellow River in the east and is situated in a zone of transition from semiarid to the arid climate, namely a temperate continental climate. Besides, it joins an area in the east where the southeast monsoon prevails. This is an area characterized in China with frequent strong winds and sandstorms and is characterized by an arid climate, rare precipitation, large temperature difference during the days and nights, strong evaporation, high winds, and a short frost-free season.

In the northwest, the area borders extend to the core arid area of Eurasia with precipitation of less than 100 mm. The northerly wind prevails in winter, while the southerly wind prevails in summer. Throughout the year, the maximum wind speed occurs in spring, with a yearly average of 4.1 m/s, except for the southern plains and basins. There are 10 to 15 days in a year that see regional fresh gale or stronger winds. The annual rainfall is between 90 and 215 mm, the evaporation is mostly above 2,800 mm, the dryness is between 0.2 and 6.4, and the longest continuous drought lasts between 58 and 180 days. The annual average temperature is between 7.5 and 8.6°C, the monthly average temperature is between −15 and 8°C, and the annual sunshine duration is between 2,800 and 3,400 hours. There exist four types of soil in the area, i.e., aeolian sandy soil, grey desert soil, grey-brown desert soil, and saline soil.

The data are obtained using those resources as follows: 1. the Landsat 8 TM images with a resolution of 30 m were selected from June to August of 2006 and 2018, 2. the climate data were acquired from the world climate database at http://www.worldclim.org; the landform data are the STRMO data with a resolution of 30 m from the United States Geological Survey (USGS), 3. the data pertinent to underground water are provided by Dengkou County Water Authority that surveilled groundwater depths of 17 experimental wells monthly from 1990 to 2015 [3]. Population density data and gross national product (GDP) were obtained from the Resource and Environment Science and Data Center of the Chinese Academy of Sciences; the number of livestock was extracted from the Inner Mongolia Statistical Yearbook 2017.

Administrative departments have adopted various measures such as engineering of sand control, forestry ecological projects, and grazing prohibition in recent years to prevent further evolution of desertification and restore the regional ecological environment.

2.2. The Study Method

2.2.1. The Data Source and Treatment Process. The Landsat 8 TM images with a resolution of 30 m were selected from June to August of 2006 and 2018 when plants thrived, and cloud cover was less than 5 percent. The images were preprocessed by the ENVI5.3 software, including atmospheric correction, geometric precision correction, fusion, image clipping, and image enhancement.

The climate data were acquired from the world climate database at http://www.worldclim.org; the landform data are the STRMO data with a resolution of 30 m from the United States Geological Survey (USGS), focusing on the elevation data; the data pertinent to underground water are provided by Dengkou County Water Authority that surveilled groundwater depths of 17 experimental wells monthly from 1990 to 2015.

Population density data and gross national product (GDP) were obtained from the Resource and Environment Science and Data Center of the Chinese Academy of Sciences; the number of livestock was extracted from the Inner Mongolia Statistical Yearbook 2017. GDP is one of the major indexes of socioeconomic development, regional planning, and resource and environmental protection. Based on the county-level GDP statistics provided nationwide, the gridded spatial distribution dataset of China's GDP gives overall consideration for factors such as types of land use, night light intensity, and residential spot density that are closely related to human economic activities. Using the multifactor weight allocation method, GDP data based on the statistic unit of administrative regions are distributed on the grid cells, thus providing GDP spatial distribution. Therefore, they can represent a wide range of human activities in the research.

The steps of the research contain the image data set on the research area that was first downloaded and preprocessed in the earlier stage. Then, NDVI and Albedo indicators were calculated and the normalization process was conducted before a desertification degree index (DDI) of the study area was obtained as a dependent variable. Subsequently, the random forest algorithm was employed to investigate which driving factors play roles in the process of

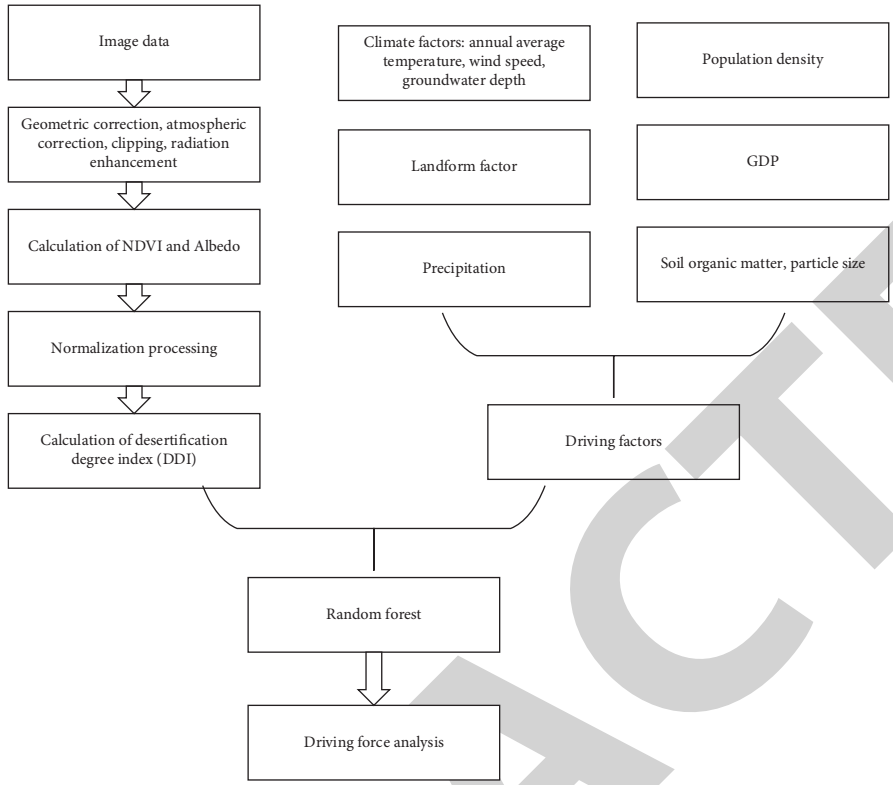

Figure 1: Flow map of the technology.

desertification in the region. The total number of environmental and human factors utilized as independent variables is 10. The details of the process are shown in Figure 1.

2.2.2. Classification of the Land Desertification Degree. The desertification classification information was extracted based on the difference vegetation index (DVI) of desertification. The DDI values were classified using the natural break classification method utilizing the ArcGIS 10.5 software.

2.2.3. The Driving Factors. The desert-oasis transition zone is a subsystem in nature and an important integral part of the human living environment. Thus, it is greatly influenced by human activities. Marx pointed out that man, on the one hand, is endowed with natural powers and vital powers and is an active natural being; on the other hand, man is a natural, corporeal, sensuous, and objective and is a suffering, conditioned, and limited creature, just like animals and plants [4]. Marx's proposition has fully asserted that man is a subsystem of nature as a natural being and is in a symbiotic relationship with nature. Moreover, man can actively transform nature, exert influence on nature, and make nature become humanized nature. Man is also conditioned or restricted by nature too. There are objective laws in nature that are independent of human will. Human activities must conform to these objective laws. As Marx put it, "the sensuous world around is not a thing given directly from all eternity, remaining ever the same, but the product of industry and the state of society; and, indeed, in the sense that it is a historical product, and the results of the activities of the whole generations that have succeeded" [4]. The "sensuous world" mentioned here is the humanized nature, recognized and transformed by human beings. According to this logic, the changes in the desert-oasis transition zone took place on the one hand under the influence of human activities and, on the other hand, due to the impacts of nature by itself. Based on Marx's theory of the human-nature relationship and the concepts in the United Nations Convention to Combat Desertification, the roles that natural factors and human activities have played in driving desertification are analyzed in combination with the characteristics of the ecological environment in the northwest arid areas.

Natural factors cover a wide range of factors in nature that may create impacts on the natural ecosystem such as climate, hydrology, geology, landform, and soil, which are generally regarded as natural factors of desertification analysis. Hence, changes in each natural factor produce a linkage effect. Moreover, human activities are material activities in nature driven by humans' subjective consciousness. So, the human activity factors can be divided into human activity driving factors (level of population, economic level, and urbanization level), mode of human activities (changes in the state of land use), and management of human activities. In combination with the actuality of human activities in the research area, the population density, stocking density, and GDP per capita are taken as human activity factors to analyze the driving forces of regional desertification.

2.2.4. The Study Method

(1) Desertification Difference Index (DDI). The desertification difference index (DDI) and the normalized difference vegetation index (NDVI) have been widely applied to the evaluation of land desertification in recent years [5]. Surface albedo can be used as a major physical parameter of the surface to reflect the desertification degree and can be obtained by the Landsat-TM data inversion model that is represented by the following equations [6]:

$$DDI = \alpha \times NDVI - Albedo. \tag{1}$$

$$\begin{aligned} Albedo = {} & 0.356\rho_{TM_1} + 0.130\rho_{TM_3} + 0.373\rho_{TM_4} \\ & + 0.085\rho_{TM_5} + 0.072\rho_{TM_7} - 0.0018, \end{aligned} \tag{2}$$

where α is determined according to the slope of the fitting curve in the feature space, and $TM_i\,(i = 1, 2, 3, \ldots 7)$ represents the 7 wavebands of the TM images.

(2) Random Forest Regression. The random forest method is one of the bagging methods built based on the decision tree. Many decision tree predictors are combined, where each tree depends on the values of random vectors in the random forest.

Regarding the discussion about influencing factors, the present studies indicate that the random forest requires neither estimating the multicollinearity that the general regression analysis suffers nor needing to conduct variable selection. Thus, it is convenient for calculating the nonlinear effect of variables and allows for evaluating the importance of independent variables. Besides, the random forest has two major parameters: firstly, the number of preselected tree node variables, i.e., the situation of a single decision tree. The number is set to 150 after analyzing the simulation results; secondly, the number of trees in the random forest, i.e., the overall scale of the random forest. The value is set to10 in the simulation results.

(3) The Evaluation Statistics of the Model Precision. The coefficient of determination (R^2) as a commonly used statistic was applied to the evaluation of the model precision in the research of the random forest regression. R^2 is defined as follows:

$$R^2 = 1 - \frac{\sum_i \left(\widehat{y}_i - y_i\right)^2}{\sum_i \left(y_i - \overline{y}_i\right)^2}, \tag{3}$$

where y_i is the observed value and $\widehat{y}_i$ is the predicted value. R^2 means how the predicted value explains the variance of the variable y_i in proportion. It measures how well the predicted value fits the truth value. Assuming that the variance of y_i is 1 unit, R^2 indicates "how much the variance of the residual of y_i has reduced after this model is used."

$R^2 = 1$: the most ideal condition is that all predicted values are equal to the true values.

$R^2 = 0$: one possible cause is to "simply predict that all the values of 'y' are equal to its average value."

$R^2 < 0$: the model has a poor prediction ability, with an effect even worse than "simply predicting that all the values of 'y' are equal to their average value." This means that a false model was used, or the model assumption is unreasonable.

There is no lower limit for the minimum value R^2. Therefore, R^2 is contained in the range of $(-\infty, 1]$.

The root-mean-square error (RMSE) is a method of measuring the difference between the observed value and its predicted value, or between the observed value and its analog value. RMSE is expressed as follows:

$$\mathrm{RMSE} = \sqrt{\frac{1}{m}\sum_{i=1}^{m}\left(y_i - \widehat{y}_i\right)^2}. \tag{4}$$

The expression of the root-mean-square error (RMSE) is expressed as follows:

$$\mathrm{MAE} = \frac{1}{m}\sum_{i=1}^{m}\left|\left(y_i - \widehat{y}_i\right)\right|. \tag{5}$$

3. Discussion and Analysis

3.1. Trend Analysis of Desertification in the Ulan Buh Desert

3.1.1. Situation of Desertification. The research conducted in 2006 presents that the Ulan Buh Desert featured medium desertification whose total area was 67.34 percent of the whole area and located in the middle. On the other hand, the slightly desertified area covered 6.8 percent that was scattered in the south. The mildly desertified area, located mainly distributed sporadically in the middle and south, covered 8.85 percent. The severely desertified one covered 15.34 percent, which was mainly in the east and along and on the north of the Yellow River. The very severely desertified area, along the Yellow River, covered just 1.68 percent (Table 1).

In 2018, the Ulan Buh Desert featured mild desertification, which covered an area of 81.00 km^2, accounting for 54.45 percent of the research area, in the middle and south sections of the area. When compared with 2006, the mild desertification area increased by 67.84 km^2; the area of slight desertification covered 57.29 km^2 of land, taking up 38.51 percent; the moderate desertification area was 0.59 km^2, making up 0.39 percent; the severe desertification area covered 9.88 km^2 of land, taking up 6.64 percent, mainly distributed near the Yellow River irrigation (Figure 2) area and in the northeast of the research area. Therefore, the very severe desertification area had almost disappeared (Figure 3).

3.1.2. Variation Features of the Desertification. The past 12 years of analysis related to desertification trends suggested that the moderate desertification area remarkably reduced by 99.58 km^2, the severe desertification area decreased by 12.93 km^2, and the slight and mild desertification areas increased by 47.17 km^2 and 67.84 km^2, respectively. Thus, the nearly 12 years of desertification control, especially the planting of artificial haloxylon forests, yielded promising results. The overall progress of desertification has been contained to some extent. The severe and very severe desertification areas tended to be transformed into slight and mild desertification areas (Figure 4).

Table 1: Desertification of the land in the Ulan Buh Desert.

Desertification degree	2018		2006		Variation trend (km^2)
	Area (km^2)	Percentage	Area (km^2)	Percentage	
Slight	57.29	38.51	10.12	6.80	47.17
Mild	81.00	54.45	13.16	8.85	67.84
Moderate	0.59	0.4	100.17	67.33	−99.58
Severe	9.88	6.64	22.81	15.34	−12.93
Very severe	0.00	0.00	2.50	1.68	−2.50
Total	148.76	100.00	148.76	100.00	0.00

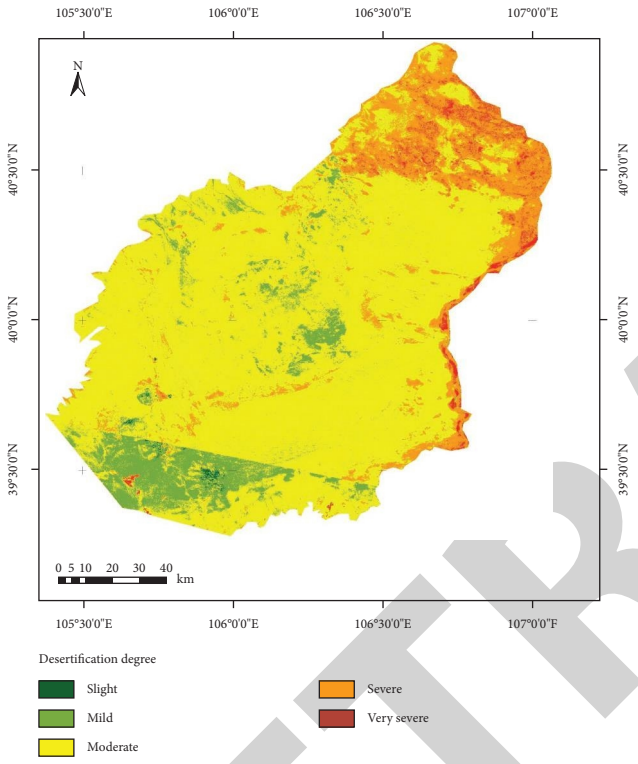

Figure 2: Spatial distribution map of desertification of the Ulan Buh Desert in 2006.

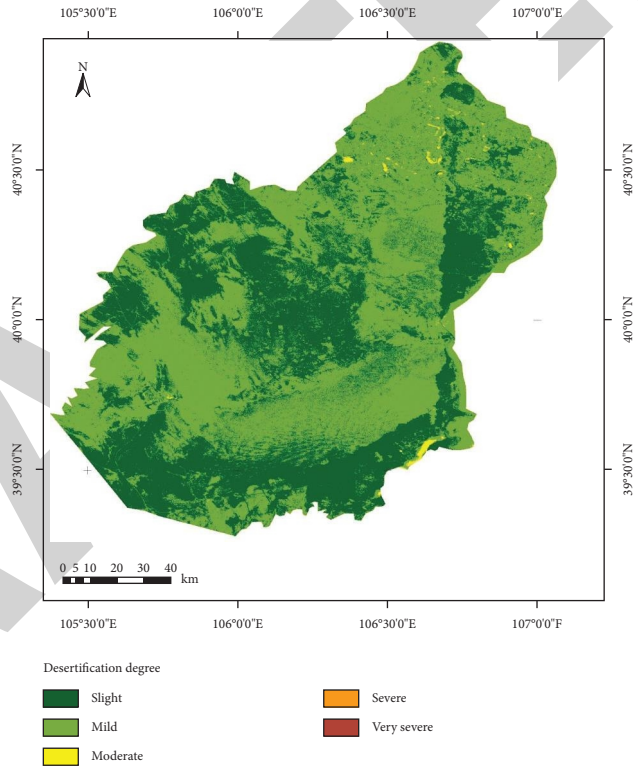

Figure 3: Spatial distribution map of the desertification in the Ulan Buh Desert in 2018.

3.2. The Analysis of the Driving Factors of the Desert Evolution. The driving factors of desertification center on the effect of both climate and human activities [7], as well as the socioeconomic driving effects [8, 9]. These studies, which are based on quantitative data, have proved that Marx's views on the human-nature relationship were found to be both scientific and accurate.

This research takes desert variation as the dependent variable when the driving effects, which are called 10 types of driving factors, are investigated. The results reveal that the random forest algorithm has an average of 0.84220 with the RMSE value of 0.037 and the MAE value of 0.0178. The leading driving factor of desertification in the research was found to be human activities such as population density and GDP per capita whose corresponding contribution ratios are 25.08 and 29.57 percent, respectively. The altitude is found to be the greatest natural factor, whose contribution rate is 20.29 percent. The average wind speed came next to the altitude with a contribution rate of 18.79 percent. The desertification in the research area is attributed to the combined action of natural factors and human activities. However, human activities were more dominant. The details of the contribution rates are shown in Figure 5.

To determine the best random forest regression model, several simulations are conducted, which is a total of 12 simulations. Table 2 presents the descriptive statistical outcomes of these simulations including minimum, maximum, and average values of assessment statistics such as MAE, R^2, and RMSE, while both MAE and RMSE assessments denote the average errors when a constructed statistical model is utilized to make predictions, namely the random forest regression model herein. Thus, the average error is 0.037, which is almost 4 percent. On the other hand, the R^2 value denotes how much variance of the dependent variable has been accounted for by the independent variables used for the construction of the model, whose average is 0.84, namely a statistically high value.

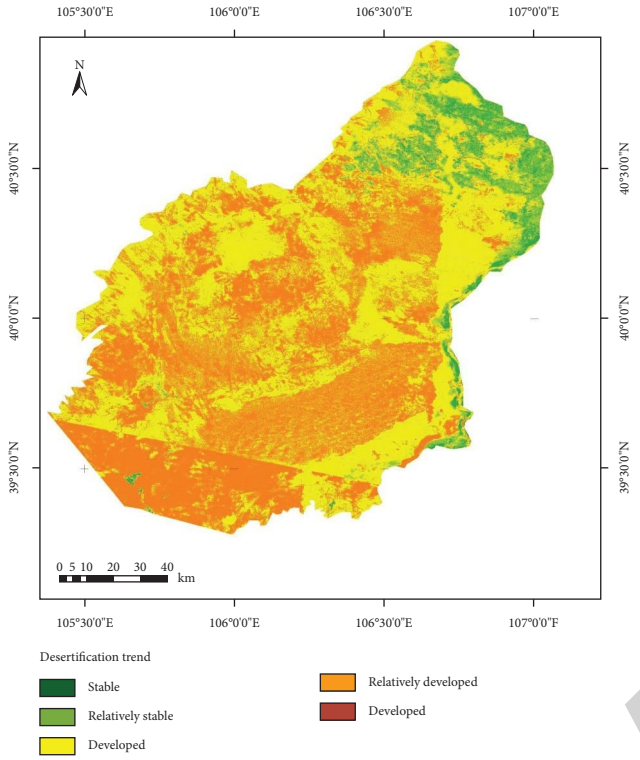

Figure 4: Desertification trends in the Ulan Buh Desert (2006–2018).

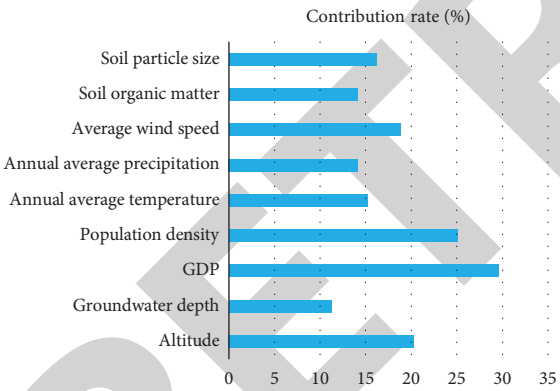

Figure 5: Contribution rates of the driving factors to the desertification in the Ulan Buh Desert.

3.2.1. The Effect of the Population Density on the Desertification. Population growth means increased consumption of produced materials and livelihood products. Excessive resource exploitation and irrational agricultural production are major causes of land desertification. According to Marx's survey on population growth, resource, and grain consumption in some industrial cities of England, "the population of Birmingham grew from 73,000 in 1801 to 200,000 in 1844; that of Sheffield from 46,000 in 1801 to 110,000 in 1844, and the consumption of coal in the latter city alone reached 515,000 tons in 1836." All mines are now much more energetically operated than did formerly. A similarly increased activity was observed to produce tin, copper, and lead mines. As a consequence of the increase in population, the demand for agricultural products increased in such measure from 1760 to 1834, and 6,840,540 acres of wasteland were reclaimed; despite this, England was transformed from a grain exporting to a grain importing country [10]. It is not difficult to discover that there is an inevitable link between population growth, intensified resource exploitation, and the increase in agricultural production. These actions have brought about by-products of the destructed natural environment and barren land. Meanwhile, the heavy consumption of fossil energy sources was accompanied by severe contamination of the natural environment. It was in the industrial period that some large cities in England witnessed the "Great Smog." For example, London has been known as a "city of fog."

Table 2: Evaluations of the implemented random forest model.

Number of simulations	MAE	R^2	RMSE
1	0.0177	0.8477	0.0363
2	0.0178	0.8520	0.0358
3	0.0179	0.8337	0.0379
4	0.0179	0.8398	0.0372
5	0.0177	0.8421	0.0369
6	0.0177	0.8443	0.0367
7	0.0177	0.8453	0.0366
8	0.0177	0.8471	0.0364
9	0.0179	0.8427	0.0369
10	0.0180	0.8380	0.0374
11	0.0179	0.8292	0.0384
12	0.0179	0.8423	0.0369
Max.	0.0180	0.8520	0.0384
Min.	0.0177	0.8292	0.0358
Mean	0.0178	0.8420	0.0369

The Ulan Buh Desert has a characteristic of low vegetation cover, a relatively harsh natural environment, low bearing capacity, frequent human activities in the middle and later periods of the twentieth century, and a relatively centralized population at Jilantai Town and Dengkou County. The average population density in the research area has reduced from 6.37 persons/km^2 to 5.98 persons/km^2. Moderate, severe, and very severe desertification areas decreased sharply in the corresponding period. A less degree of desertification has further indicated that human activities produce a major driving effect on regional resource development and utilization. When agricultural production is under consideration, the study area contributes corn, sunflower, and other commercial crops to meet people's living needs. The study on desertified land indicates that the higher the population density is, the higher the desertification degree will be [11]. The findings are found to be consistent with the judgments of Marx and Engels and the present findings of the research on land desertification. In other words, irrational agricultural activities were one of the most important human factors that lead to land degradation.

3.2.2. The Effect of the Livestock Number on the Desertification. The number of livestock is correlated with land desertification. When surveyed from both historical and observational perspectives, livestock husbandry

typically expanded and has been expanding in two different directions: transforming the forest and the arable land into grassland to increase the area of grazing and the number of livestock and increasing the number of livestock on a unit area of grassland, i.e., the increasing density of the livestock. The rapid expansion of livestock husbandry was synchronized with industrial development, especially the development of the textile industry, as was observed in some industrial countries. England, for example, proceeding with the industrial revolution and technical improvement, had experienced a boosted leapfrog advancement in the textile industry, which led to radical demand increments for wool. For this, Marx stated outright that "to produce more wool, arable land was converted into sheep pastures" [10]. A similar case was observed in Italy. "The Italians of the Alps used up the pine forests so carefully cherished on the northern slopes; they had no inkling that by doing so they were cutting at the roots of the dairy industry in their region; they had still less inkling that they were thereby depriving their mountain springs of water for the greater part of the year" [10]. It is observed that converting forests and arable land into pasture or unlimited increase in livestock on the grassland is likely to break through the bearing capacity of grassland, resulting in grassland degradation, and inducing or aggravating land desertification. By research on the destruction of the natural environment caused by industrial development in some countries, Marx concluded that "the development of civilization and industry, in general, has always shown itself so active in the destruction of forests that everything that has been done for their conservation and production is completely insignificant in comparison" [10].

Undoubtedly, an increasing number of grazing animals produced a major effect on the bearing capacity of the desert-oasis transition zone. Abundant groundwater resources in the desert-oasis transition zone provide favorable conditions for land expansion. Improper land management, shortage of water resources and water management, plus unreasonable grazing of livestock, which may lead to the unreasonable temporal and spatial distribution of resources, will further accelerate the progress of desertification. The present studies have revealed that reclaiming one hectare of grassland can result in the desertification of three hectares of land. This is identical to Marx's views about the destructive effect of expanding animal husbandry on forest and arable land. The livestock in the study area comprises large animals, sheep, pigs, etc., with the predominance of sheep. The number of livestock in the study area showed a declining trend from 2006 to 2016. Figure 6 depicts the details. In recent years, the number of sheep and pigs in the study area has dropped, which has effectively mitigated the pressure on desert grassland and made for its restoration. Besides, the number of large animals has tended to increase and the degree of desertification has lowered. The desertification of the Ulan Buh Desert is negatively correlated with the number of large animals. It is inferred that there should be relatively a fair number of large animals in this area.

Environment connotation includes humanistic attributes. The research related to resource-carrying capacity will effectively alleviate the tension of the man-land relationship and help to some extent achieve sustainable regional development.

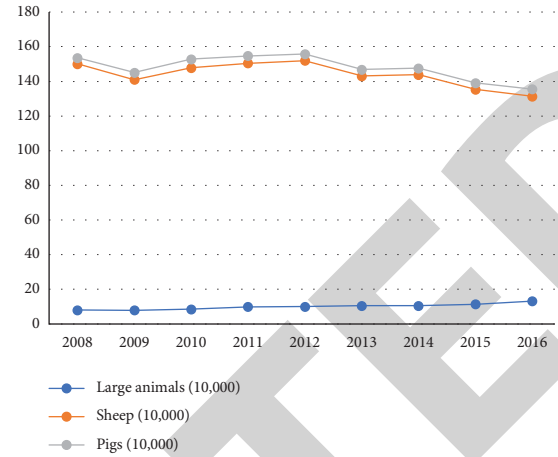

Figure 6: Number of livestock in the study area over the years.

3.2.3. The Effect of the Socioeconomic Activities on the Desertification. Humans cannot survive and develop without nature. Once separating themselves from nature, humans would not be able to engage in any sense of practical production activities. According to the viewpoint of Marx, the human-nature relationship is in essence a relationship of material transformation between human beings and nature, and a connection between human beings and nature is called labor. "Labor, in the first place, is a process in which both man and nature participate, and in which man of his own accord starts, regulates, and controls the material reactions between himself and nature" [10]. Thus, there are two levels of material transformation activities between human beings and nature: firstly, biological material transformation at the level of individual life, which is following J. V. Liebig's law of material metabolism; secondly, material transformation at the social level, i.e., material exchange between human's social life and nature through human labor. Human beings take advantage of their natural powers—arms, legs, head, and hands. Thus, human beings act on the external world and change it on the one hand. On the other hand, human beings give play to their potential to change their nature. The economic activities of human beings are the basic labor for them to survive and develop. So, their means are to create use value or wealth. However, the use value does not only originate from labor. In this regard, Marx completely agreed with William Petty's view; i.e., "labor is the father of material wealth, the Earth is its mother." Marx pointed out that "the use values, coat, linen, and cotton., i.e., the bodies of commodities, are combinations of two elements-matter and labor. ... Labor is ... Not the only source of material wealth, i.e., of the use values it produces" [10].

In summary, human beings transform nature and create material wealth through labor. As labor gets involved in the production, however, the material transformation activities between human beings and nature have turned into social activities of "need ⟶ production-consumption ⟶ abandonment." The process of creating material wealth

through productive labor and natural materials is accompanied by large-scale production, heavy consumption, and mass abandonment, which are the very root causes of worldwide environmental issues. Marx concluded after examining the capitalist process of production and consumption that "capitalist production, therefore, develops technology, and combines various processes3, only by sapping the sources of all wealth—the soil and the laborer" [10]. Thus, land (nature) will be inevitably destructed if the logic of "large-scale production ⟶ heavy consumption ⟶ mass abandonment" is applied to both production and consumption.

The social and economic development in the research area is mainly described through GDP indexes (with overall consideration of types of land use, night light intensity, etc.). GDP is to a large extent a material wealth that human beings start and create through labor and natural materials. It is found from the analysis of relevant data that the GDP of the Ulan Buh Desert declined from 591,500 yuan/km^2 in 2006 to 465,900 yuan/km^2; that is, social-economic activities have decreased and the regional desertification degree has reduced. GDP was the human driving force of desertification in the study area from 2006 to 2018. Some studies have revealed that human social activities go against desert restoration. Human economic activities should be reduced as much as possible in the future in a bid to prevent the evolution of desertification. Therefore, to boost the restoration of desertification land in the study area, the production and consumption logic of "large-scale production ⟶ heavy consumption ⟶ mass abandonment" must not be allowed. Human economic activities should be decreased as much as possible where the masses' living conditions permit.

3.2.4. The Effect of Both Policy and Administration Factors on the Desertification. According to Marx's concept of nature, human beings regard the entire nature as a direct source of means of livelihood and treat the entire nature as an object (material) and a tool of the human's vital movement. Does that mean human beings can grab resources from nature without scruples or dominate nature like a conqueror ruling alien races? The answer is no! For human beings, "freedom does not consist in any dreamt-of independence from natural laws, but the knowledge of these laws, and the possibility this gives of systematically making them work towards definite ends." [10]. This means that natural laws should be respected and complied with the planned and scientific performance of activities, no matter whether the means of livelihood is acquired from nature or nature is treated as an object and tool of human vital movement. In the process of social production, spontaneous production activities are apt to cause excessive resource exploitation and wasting and bring about the destruction of nature. Marx once noted that "cultivation—when it proceeds in natural growth and is not consciously controlled (as a bourgeois he naturally does not reach this point) — leaves deserts behind it, Persia, Mesopotamia, etc., Greece" [10].

Extensive management was also a driving factor in the deterioration of the natural environment, which has been proved. "In the case of sheep-farming, and stock-raising in general as an independent branch of production, there is some degree of communal exploitation of the land, and this exploitation is fundamentally extensive from the outlet" [10]. Thus, extensive management has become a direct cause of land desertification in the regions where animal husbandry serves as a major branch of production. However, some research indicates that there exists a lack of management and protection for the grazing of peasant households; the management is extensive, and the management encounters some difficulties. It can be said that difficulties in management aggravated the extensive management of the animal husbandry, which further led to the long-term existence of the driving factors of land desertification. Therefore, targeted management policies considering resource-carrying capacity can be combined with the system of grass-based livestock husbandry to effectively slow down land desertification.

The research analyzes the driving forces of desertification in a regional dimension. It in essence provides explanations for the regional desertification from the perspective of the external environment. Further survey and verification will be required when it comes to internal causes or analysis on the sample area [12] or individual scale [13]. Meanwhile, as the process of desertification is a relatively complicated ecological process, this research only focuses on the analysis of representative human and natural driving factors, rather than all factors. This will be a direction of exploration in further research.

4. Conclusion

According to the findings of a quantitative study related to the driving factors of the desertification employing the random forest algorithm, the average is found to be 84.20 percent covering from 2006 to 2018, and the reversed desertification area in the Ulan Buh Desert was mainly distributed into the hinterlands of the desert and along the Yellow River, mainly transforming from severe and very severe desertification to slight and mild desertification.

From the perspective of Marx's concept of nature, the desertification of the desert-oasis transition zone is the consequence of the coupled effect of human activities and natural factors. The desertification of the Ulan Buh Desert in recent years has been attributed to excessive human interference. It showed an overall reversal trend but tended to intensify in the southern part. Thus, farming and grazing activities should be undertaken scientifically and rationally in the future. Sand control in the Ulan Buh Desert requires reasonably allocating the regional water and soil resources, controlling population density, and ensuring the resource-carrying capacity that remains above the redline to reduce pressure on land, expand environment capacity, protect vegetation cover in the region, and lower the probability of triggering the desertification. By these measures, the progress of desertification will be effectively held back and harmony between human beings and nature would be achieved.

Data Availability

The data used in this study are available from the Chinese Forestry Science Data Center (http://www.cfsdc.org/).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

The authors would like to thank the National Natural Science Foundations of China (No. 31971653) for the financial support of this study.

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