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DETERMINATION OF VARIABLES ENDANGERING ECOLOGICAL LIVING BY APPLICATION OF DATA–MINING MODELS: IN CASE OF TURKISH GEOGRAPHY

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ABSTRACT

The concept of ecological balance refers to the state in which various organisms coexist harmoniously within a given ecosystem. In recent times, there have been significant environmental challenges that pose a threat to the global ecosystem. It has come to attention that Turkey is experiencing adverse effects of global warming, particularly in the form of water scarcity and temperature fluctuations. Moreover, Turkey is categorized as one of the nations at risk in terms of the detrimental impacts of global warming on the environment. In light of this, the objective of this study is to employ multiple regression analysis and time series analysis to identify the variables that have a negative influence on ecological life in Turkey during the period spanning from 1960 to 2020. The findings of the regression analysis suggest that there is insufficient statistical evidence to support the notion that industrial waste and construction activities have a significant impact on carbon emissions in Turkey. Furthermore, in Turkey, various factors such as population expansion, energy consumption, electricity usage, income levels, reliance on fuel-powered cars, lack of education, energy production, and gas emissions have been identified as having a negative impact on the environment.

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Keywords: Ecological Life, Global Warming, Regression and Time Series Analysis, Turkey

EKOLOJİK YAŞAMI TEHDİT EDEN DEĞİŞKENLERİN VERİ MADENCİLİĞİ MODELLERİ UYGULAMASIYLA BELİRLENMESİ: TÜRKİYE ÖRNEĞİ

ÖZ

Ekolojik denge, belirli bir ekosistemde çeşitli organizmaların uyum içinde bir arada yaşadığı durumu ifade eder. Son dönemlerde, küresel ekosistemi tehdit eden önemli çevresel sorunlar ortaya çıkmıştır. Türkiye, su kıtlığı ve sıcaklık dalgalanmaları gibi olumsuz etkilerin özellikle küresel ısınma tarafından tetiklendiğini belirtti. Küresel ısınmanın çevreye olumsuz etkileri, Türkiye'yi de tehlikeye atabilir. Bu nedenle, çalışmanın amacı, zaman serisi analizi ve çoklu regresyon analizi kullanarak 1960'tan 2020'ye kadar Türkiye'deki ekolojik yaşamı olumsuz etkileyen değişkenleri belirlemedir. Regresyon analizi, endüstriyel atık ve inşaat faaliyetlerinin Türkiye'deki karbon emisyonlarını önemli ölçüde etkilediği fikrini desteklemek için yeterli istatistiksel kanıt sağlamadığını gösterdi. Ayrıca, Türkiye'de enerji üretimi, yakıtla çalışan araçlara olan bağımlılık, nüfus artışı, elektrik tüketimi, gelir düzeyleri, yakıtla çalışan araçlara olan bağımlılık, eğitim eksikliği ve gaz emisyonları gibi çeşitli faktörlerin çevre üzerinde olumsuz etkileri olduğu tespit edilmiştir.

Anahtar Kelimeler: Ekolojik Yaşam, Küresel Isınma, Regresyon ve Zaman Serisi Analizi, Türkiye

1. INTRODUCTION

All organisms within the natural environment are integral components of the ecosystem, which is characterized by an inherent equilibrium. The ecological lifestyle is characterized by a conscientious commitment to preserving the environment, with a focus on safeguarding the natural world and maintaining its delicate equilibrium without causing harm. However, the natural environment is experiencing escalating degradation as a result of human actions. The consumption of fossil fuels has experienced a notable surge since the advent of

the industrial revolution, becoming a prominent environmental detriment attributable to human activity. The progressive escalation of greenhouse gas emissions (GhGs) discharged into the atmosphere through the utilization of fossil fuels leads to a heightened global temperature, which in turn contributes to the occurrence of climate change. According to the Intergovernmental Panel on Climate Change (IPCC, 2018), greenhouse gases (GhGs) significantly contribute to the escalation of global warming. It is projected that the continued utilization of fossil fuels will result in a rise in global temperatures by around 1.5 to 2 degrees. Moreover, should the global temperature rise by 2 degrees, it is anticipated that the melting glaciers will contribute to a rise in sea levels, resulting in the submergence of some continents. Additionally, cattle activities are expected to be significantly impacted.

Based on the findings of the REN21 Global Status Report, it is evident that the energy sector and industrial activities account for the highest proportion of carbon emissions globally when analyzed from a sectoral perspective. In the year 2019, the energy sector accounted for approximately 26% of carbon emissions, making it the largest contributor. Industrial activities followed closely behind with a share of 20%, while forestry accounted for 17%. The transportation sector contributed 14% of carbon emissions, and agricultural activities accounted for 13% of the total emissions. Furthermore, the exponential growth of many forms of environmental harm, including soil, air, and noise pollution, as well as environmental degradation and uncontrolled urbanization, has posed a significant threat to various species. Conversely, the soils, which hold significant significance in addressing the demands for sustenance, are increasingly subjected to contamination as a result of inadequate agricultural methodologies and the disposal of industrial and household refuse. This contamination not only harms the soil ecology but also contributes to climate change. The factors enumerated herein are the primary catalysts for environmental degradation. Environmental degradation refers to the process of using and depleting natural resources, including air, water, and soil, as well as the destruction of ecosystems, habitat, and species. According to Karaca (2019), the United Nations International Strategy for Disaster Reduction (UNISDR) provides a definition of environmental degradation as the process of diminishing the environment's ability to fulfill social and ecological objectives and requirements.

The phenomenon of global warming is widely attributed to the escalation of greenhouse gases (GhGs) within the Earth's atmosphere. Additionally, it is widely believed that some gases, including carbon dioxide, water vapor, and methane, contribute to the phenomenon of global warming by impeding the escape of solar radiation from Earth's atmosphere while

simultaneously absorbing the resulting heat. The composition of the atmosphere encompasses a range of gases, including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ozone (O₃), and chlorofluorocarbons (CFCs). These gases effectively trap a portion of the solar radiation that reaches the Earth, so contributing to the maintenance of a specific temperature on our planet. The prevention of freezing in seas and oceans is attributed to the heat retention property exhibited by the Earth's atmosphere. The phenomenon in question is commonly referred to as the greenhouse effect (Akin, 2006). The signing of the United Nations Convention to Combat Desertification (UNCCD) occurred on the dates of October 14-15, 1994, and afterwards, it was officially enacted on December 16, 1996. Turkey became a member of the United Nations Convention to Combat Desertification (UNCCD) on August 31, 1998, joining a cohort of 197 countries that are currently parties to the convention as of 2018. The primary objective of the convention is to showcase the prevailing state of desertification on a worldwide level. It seeks to foster a sense of urgency among nations to actively combat desertification. Additionally, the convention aims to facilitate the attainment of sustainable development in countries grappling with desertification. It endeavors to foster collaboration and cooperation between nations in addressing this issue. Furthermore, the convention seeks to mobilize both national and global financial resources to support research and studies related to desertification.

The study is organized in the following manner: Section 2 provides a comprehensive literature analysis that investigates the correlation between environmental degradation and several characteristics, including income, energy use, and energy consumption, within the context of the Turkish economy. Section 3 presents the methodologies employed in the data-mining model. Section 4 gives the empirical findings, while Section 5 provides the concluding remarks for the study.

1.1. Literature Review

The energy-environment literature encompasses a multitude of research that investigate the impact of various economic variables on the environment within the context of Turkey.

Dogan (2016) conducted an analysis on the correlation between agricultural and carbon emissions in Turkey spanning the years 1968 to 2010. The findings from the Autoregressive Distributed Lag (ARDL) analysis suggest that the agricultural sector exerts a

beneficial impact on the environment through the mitigation of carbon emissions. In their study, Gökmenoğlu and Taspınar (2016) conducted an empirical analysis to examine the interplay of energy consumption, foreign direct investment, and carbon emissions in Turkey during the time span from 1974 to 2010. To investigate this interaction, the researchers utilized the Autoregressive Distributed Lag (ARDL) model. The empirical findings of their study indicate that energy consumption has a negative impact on the environment, whereas economic expansion has a positive influence on the environment. In their study, Pata (2018) examined the interplay among income, energy consumption, urbanization, industrialization, financial development, and carbon emission in the context of Turkey. The investigation spanned from 1974 to 2013. The findings of the ARDL test indicate that, with the exception of urbanization, all other factors have a positive association with environmental degradation.

The study conducted by Akadiri et al (2020) examines the interconnections between economic growth, power consumption, globalization, and carbon emissions over the period spanning from 1970 to 2014. The researchers reached the conclusion that the relationship between energy consumption and economic growth is positively associated with an escalation in carbon emissions. Conversely, their findings indicate that globalization does not have a significant impact on carbon emissions. In their study, Chandio et al. (2020) conducted an investigation to assess the impact of climate change variables on crop productivity in Turkey, spanning the years 1968 to 2014. The findings derived from the Autoregressive Distributed Lag (ARDL) model support the notion that there exists a negative relationship between average temperature and crop output. This implies that an increase in temperature is likely to lead to a reduction in crop yield, albeit without reaching statistical significance. The authors additionally asserted that carbon emissions and various types of greenhouse gases contribute to a rise in temperature, hence exerting detrimental impacts on the environment. The study conducted by Bas et al (2021) investigated the environmental impact of agricultural practices in Turkey from 1991 to 2019. The findings indicate that agriculture serves as a means of mitigating environmental degradation.

The study conducted by Malik (2021) examined the correlation between economic growth, energy consumption, and carbon emissions in Turkey during the timeframe spanning from 1970 to 2014. The findings of the research using Generalized Methods of Moments (GMM) indicate a positive relationship between energy consumption and economic growth, and the subsequent negative impact on the environment in Turkey. The study conducted by Yıldırım and Yıldırım (2021) examined the relationship between income, energy

consumption, and construction activities in Turkey during the time span of 1970-2015. The findings derived from the autoregressive distributed lag (ARDL) model indicate a positive relationship between construction activities and environmental degradation. Yurtkuran (2021) conducted a study that investigated the influence of globalization, agriculture, and renewable energy generation on carbon emissions over the period from 1970 to 2017. The findings of the Bootstrap ARDL approach indicate that globalization and agriculture have been identified as significant factors contributing to environmental degradation in Turkey, specifically through the amplification of carbon emissions.

1.2. Ecological Life, Global Warming and Data-Mining

This section will analyze the relationship between ecological life and global warming, focusing on the elements that pose a threat to ecological life. Furthermore, an analysis will be conducted on the various elements that contribute to the phenomenon of global warming.

1.2.1. Ecological Life

The concept of ecological living can be succinctly defined as a lifestyle characterized by human beings' reverence for nature, avoidance of disrupting natural ecosystems, and commitment to minimizing environmental pollution. In essence, the concept entails the practice of acknowledging and valuing the existence of all organisms within the natural environment, while coexisting harmoniously with them and refraining from causing harm or disruption. The ecosystem is comprised of the interdependent relationships among organisms inhabiting a specific geographic region and the abiotic factors that encompass their surroundings. The growing circumstances of a particular place are determined by a collection of ecological elements that can be categorized into five groups: climate factors, soil factors, topography factors, biotic factors, and human factors.

According to scholars in the field of etymology, the term "environment" encompasses the entirety of the surroundings or circumstances that include an individual or organism (Young, 2011). According to Albert Einstein, the environment can be defined as "everything outside of oneself," highlighting its expansive nature (Miller and Spoolman, 2010). Various reasons have been identified as contributors to environmental degradation, encompassing the deterioration of aquatic habitats, soil depletion, natural disasters, loss of biodiversity, soil erosion, overcrowding, trash creation, excessive water consumption, emissions from industrial

activities, and illegal hunting. This research aims to analyze the various elements that influence ecological life in a comprehensive manner.

1.2.2. Global Warming

Global warming arises from the escalation of heat-retaining gases, notably carbon dioxide, within the Earth's atmosphere. Consequently, it engenders alterations in the planet's temperature due to the greenhouse effect. The climate changes are evident through the occurrence of various meteorological phenomena, including droughts, deserts, storms, and floods.

Figure 1. illustrates the indicators of global warming. Based on the data presented in the image, it can be observed that global warming is characterized by a persistent upward trend in the Earth's temperature, an elevation in sea levels, the melting of glaciers, the occurrence of storms, heatwaves, and desertification.

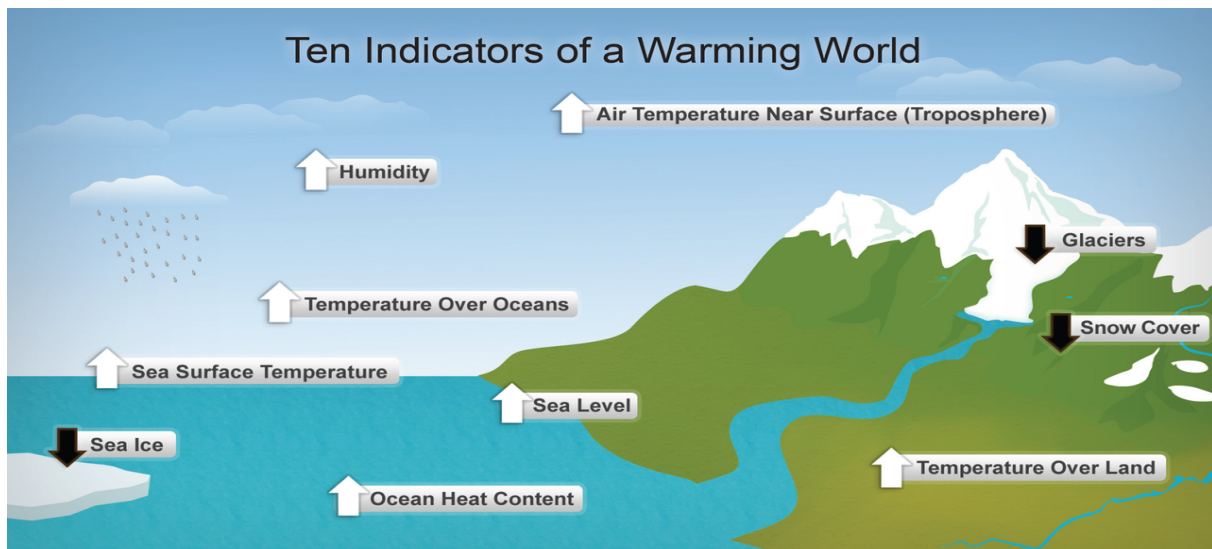


Figure 1. Indicators for global warming

1.2.3. Data-Mining Model

The advent of technology has also brought about a transformation in societal customs and practices. The advent of technology has transformed numerous manual occupations into digitally-based tasks, which may now be efficiently executed using computers, mobile phones, or tablets. Various tasks such as bank payments, shopping, and scheduling hospital

visits can now be conveniently accomplished through the utilization of mobile devices with no effort. The server accumulates data as a consequence of each online transaction conducted on a phone or computer. The term "Data Mining" refers to the systematic procedure of gathering, analyzing, and retrieving the accumulated data stored on company servers (Witten and Frank, 2005). Data mining is a multidisciplinary domain that integrates several fields such as machine learning, pattern recognition, statistics, database management, and imaging methodologies (Cabena et al., 1998). Moreover, it is considered as a fundamental procedure in the field of database management, whereby its main objective is to explore scientific and technological data in order to unveil previously unidentified patterns (Rokach and Maimon, 2005). Data mining is distinct from other forms of statistical analysis due to its utilization of the complete dataset. According to Weiss and Zhang (2003), this approach allows for a preference towards utilizing new independent data that can be more readily analyzed, as opposed to relying on small data gathered through conventional means.

- *Data Mining Knowledge Discovery Process*: The subsequent passage delineates the process of data mining (Han and Kamber 2001):

- *Data Cleaning*: This step involves the procedure of identifying and resolving missing, noisy, and inconsistent data.

- *Data Integration*: Data integration refers to the systematic procedure of amalgamating data from many sources.

- *Data Selection*: The procedure of extracting relevant data pertaining to the topic from the dataset utilized for analysis obtained from the database.

- *Data Transformation*: This stage involves the conversion of data into suitable formats for utilization in data mining.

- *Data Mining*: The usage of data mining methods is contingent upon the intended purpose of the prepared data.

- *Pattern Evaluation*: Pattern recognition refers to the systematic procedure of discerning and categorizing patterns that encapsulate data acquired through measurement.

- *Knowledge Presentation*: Data mining involves the process of presenting the acquired information to the user.

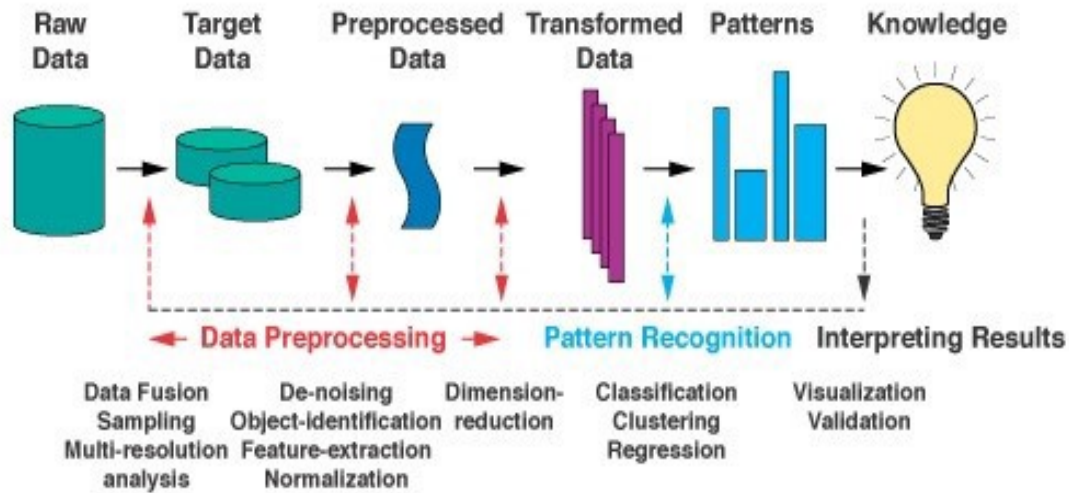


Figure 2. Stages of data mining

Source: Fayyad etc., (1996)

Areas of Use of Data Mining: Data mining encompasses a diverse array of applications that contribute to the attainment of organizational objectives across several domains, including but not limited to statistics, banking, stock market analysis, education, investment, finance, healthcare, tourism, industry, and criminology (İnan 2003, Albayrak 2008, Akgöbek and Çakır 2009, Şekeroğlu 2010).

Methods Used in Data Mining: Data mining involves the utilization of a diverse range of algorithms to execute various tasks. These algorithms analyze the data and choose the model that most accurately aligns with their qualities. Data mining is classified into two distinct groups based on the specific tasks involved. There exist two types of models in the field of data analysis, namely predictive models and descriptive models (Dunham 2003).

- **Predictive Models (Predictive):** Classification, Regression Models, Time Series Analysis, Prediction
- **Descriptive Patterns:** Clustering, Summarization, Association Rules, Sequence Discovery

The conventional techniques employed in data mining encompass Regression analysis, K-Nearest Neighbours, and Clustering Analysis. The primary methodologies of the new generation can be identified as Decision Tree, Association Rules Analysis, and Neural Networks (Berson et al., 1999). Furthermore, there exist various data mining techniques,

including Principal Component Analysis, Discriminant Analysis, Factor Analysis, Kohonen Networks, Fuzzy Logic Methods, Genetic Algorithms, Bayesian Networks, and Methods Based on Rough Set Theory (Chen, 2001).

1.3. Multiple Regression

The use of multiple regression analysis is employed to estimate the dependent variable by considering the independent factors, and to ascertain the independent variables that possess a statistically significant impact on the dependent variable. The objective of regression analysis is to identify the line or plane that provides the most accurate representation of the data points in the sample (Xu, 2003). The equation (1) represents the multiple linear regression model.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_p X_{pi} + \varepsilon_i \quad (1)$$

β_0 : Intercept, β_p : Regression coefficients, ε_i : Random error term

The multiple regression model enables the estimation of its value by utilizing the input values. The regression coefficients in the model are determined by the utilization of the least-squares method.

Multiple metrics are employed to assess the degree to which the created regression model effectively elucidates the underlying data. The coefficient of determination (R^2) and the corrected coefficient of determination (R^2) are the most often employed measurements in this context. The metrics are constrained within the interval of 0 to 1, with the magnitude of the value reflecting the level of appropriateness of the model. The purpose of this analysis is to assess the extent to which the coefficient of determination and the adjusted independent factors provide an explanation for the dependent variable. According to Xu (2003), the adjusted model demonstrates superior performance in assessing fit, which is why it is widely utilized by many statistical software.

1.4. Time Series Analysis

Time series refer to sequences that are constructed by arranging observation values in chronological order. Time series analysis is a statistical technique used to simulate the random process that underlies the observed series of data points, which are collected at regular time intervals. The primary objective of this method is to understand the underlying structure of the time series and make predictions about future values based on past observations. Time series analysis is a commonly employed methodology in the disciplines of economics, finance, business, and engineering. The Box-Jenkins approach, often known as ARIMA models, is a commonly employed technique in the field of time series analysis (Allen, 1964).

The Models of ARIMA: The ARIMA model is comprised of three distinct stages, namely the autoregressive (AR) process, the moving average (MA) process, and the amalgamation of both the AR and MA processes (ARMA). In instances where it becomes imperative to derive a stationary series by taking the difference of a series, the Autoregressive Moving Average (ARMA) model is transformed into the Autoregressive Integrated Moving Average (ARIMA) model. The AR and MA series utilize stationarity criteria, and in cases when stationarity is disrupted, this issue can be resolved by differencing the series. The variable "I(d)" quantifies the extent of dissimilarity, as indicated by Sandy (1990).

Linear equation of the ARIMA (1,0,1) model:

$$Y_t = C + \phi_1 Y_{t-1} + e_t + \theta_1 e_{t-1} \quad (2)$$

ARIMA models are constructed to account for the presence of seasonal effects in a given time series. In this particular instance, the notation employed is ARIMA $(p,d,q)(P,D,Q)$. The inclusion of the second parenthesis in the seasonal ARIMA (SARIMA) model denotes the presence of the seasonal component. The estimate model incorporates the previous value (Y_{t-12} and the error term $(e_t | t - 12)$) of a seasonal series (e.g., 12 months for monthly data) into the estimation equation. The linear equation representing the ARIMA $(1,0,1)(1,0,1)_{12}$ model can be found in Chatfield's work from 1996.

$$Y_t = C + \phi_1 Y_{t-1} + \phi_1 Y_{t-12} + e_t + \theta_1 e_{t-1} + \varphi_1 e_{t-12} \quad (3)$$

2. DATA AND METHODOLOGY

The objective of this study is to identify the variables that have a detrimental impact on ecological well-being in Turkey within the time frames of 1960-2020 and 2000-2020, utilizing multiple regression analysis and time series analysis methodologies. ARIMA models are utilized in the application of time series analysis. The findings from the regression analysis and time series analysis indicate that the five models centered on CO2 emissions exhibit statistically significant and impactful outcomes. The IBM Statistics 25 software package is commonly employed for the purpose of data analysis. The carbon emissions, energy utilization, population expansion, agricultural practices, income levels, and energy consumption data were extracted from the World Bank database spanning the years 1960 to 2020. Conversely, the data pertaining to lack of education, fuel-powered vehicles, industrial waste, construction activities, gas emissions, energy production, and globalization were sourced from the TURKSTAT database.

2.1. Empirical Results

This study use multiple linear regression analysis to build various statistical models using different variables. Table 1 presents the economic models utilized in this investigation. The empirical findings are succinctly presented in Table 2.

Table 1. Econometric models

First Model
Dependent Variable: CO2 Emission Predictors: Energy use (Crude Oil Kg equivalent per person) Population growth (Annually %), Agriculture (It was formed from the annual total greenhouse gas emission data by sectors)
Second Model
Dependent Variable: CO2 Emission Predictors: Population growth (Annually %), Income (Net national income per capita), Electricity consumption (Kwh usage per person)

Third Model	
Dependent Variable: CO2 Emission	
Predictors: Uneducated (An independent variable consisting of the total annual data of individuals who cannot read and write in Turkey), Fuel vehicles, Industrial waste	
Fourth Model	
Dependent Variable: CO2 Emission	
Predictors: Construction, Gas, Energy production	
Fifth Model	
Dependent Variable: CO2 Emission	
Predictors: Globalization, Gas, Energy production	

Source. TURKSTAT (2021) and World Bank (2021)

Table 2. Summary of models

Mode 1	R Square	Adjusted R Square	Std. Error of the Estimate	Mean Square Error	F	F(sig)
1	,973	0,971	,48693	,237	602,038	,000 c
2	,980	0,979	,41073	,169	853,047	,000 c
3	,998	0,998	15,40197	238,221	2968,693	,000 c
4	1,000	0,999	3,04789	9,29	75947,685	,000 c
5	1,000	0,997	1,86324	3,472	153670,51 2	,000 c

Source. IBM SPSS statistics 25 package program analysis output (2021)

The coefficient of determination is observed to be in close proximity to 1 across all models. The results of the Kolmogorov-Smirnov test indicate that all models adhere to the assumption of normality during the normality test. Furthermore, based on the findings derived from the Variance Inflation Factor (VIF), it can be concluded that there is no issue of multicollinearity among the variables. Once various correlation concerns have been confirmed, ANOVA and t-test statistics are utilized to determine the significance level of the variables. All models exhibit statistical significance at a significance level of 5%. In order to

Table 3. The results of Multiple Regression analysis


Model	Variables	B	Std. Error	t	sig
1	Population growth	2,026	,151	13,454	,000
	Agriculture	-,055	,012	-4,459	,000
	Energy use	1,148	,139	8,257	,000
2	Electricity consumption	,001	,000	24,241	,000
	Income	,277	,062	4,485	,000
	Population growth	,568	,039	14,643	,000
3	Fuel vehicles	2,850E-5	,000	19,028	,000
	Industrial waste	,001	,001	1,236	,233
	Uneducated	2,280E-5	,000	8,823	,000
4	Energy production	,931	,024	38,768	,000
	Gas	,548	,083	6,575	,000
	Construction	4,248E-5	,000	1,657	,116
5	Energy production	,928	,017	53,198	,000
	Gas	,669	,063	10,566	,000
	Globalization	-10,660	3,680	-2,897	,012

Note: B, t and sig indicates regression coefficients, t-statistics and significance level, respectively.

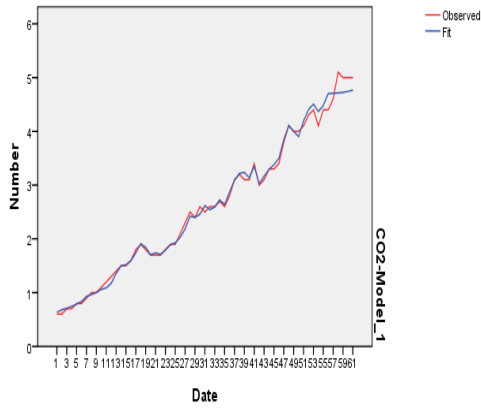
ascertain the impact of various variables on carbon emissions, the t-statistics are computed for each variable independently. The findings are succinctly presented in Table 3. With the exception of industrial waste and building, all other variables exhibit detrimental impacts on the environment. In essence, they contribute to the degradation of the environmental condition.

The initial model demonstrates that population expansion exerts the most significant influence on carbon emissions, resulting in a subsequent rise in carbon emission levels. Likewise, the utilization of energy exerts a detrimental impact on the natural surroundings. On the other hand, agriculture exerts a beneficial impact on the environment through its capacity to alleviate carbon emissions. The second model demonstrates that the ecosystem is negatively impacted by factors such as power usage, income levels, and population expansion. The third model demonstrates that industrial waste has a detrimental impact on the environment; nonetheless, it is deemed statistically negligible. The generation of energy and the emission of gases have been identified as substantial contributors to environmental deterioration, whereas the impact of urbanization on the environment is found to be statistically insignificant in the fourth model. In the fifth model, it is observed that energy production and gas emissions have a detrimental impact on the environment, while

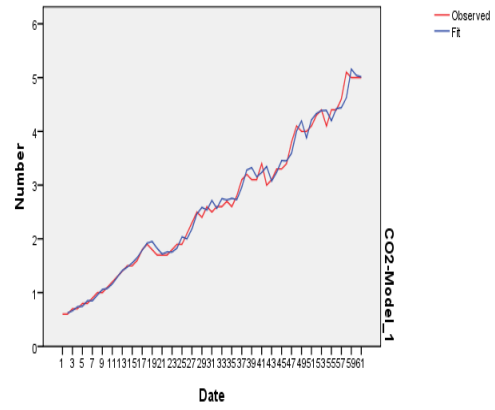
Table 4. Summary statistics table of models in time series analysis

	Model Type	<u>Model Fit statistics</u>		<u>Ljung-Box Q (18)</u>		Number of Outliers
		Stationary Normalized R-Squared BIC		Statistics Sig.	DF	
First Model	ARIMA (0,1,0)	,529 4,067	-	7,502 ,985	18	0
Second Model	ARIMA (0,1,0)	,347 3,972	-	16,198 ,579	18	0
Third Model	ARIMA (0,0,0)	,985 5,086	-	28,076 ,061	18	0
Fourth Model	ARIMA (0,1,0)	,968 5,006	-	8,146 ,976	18	0
Fifth Model	ARIMA (0,0,0)	,976 4,664	-	27,486 ,070	18	0

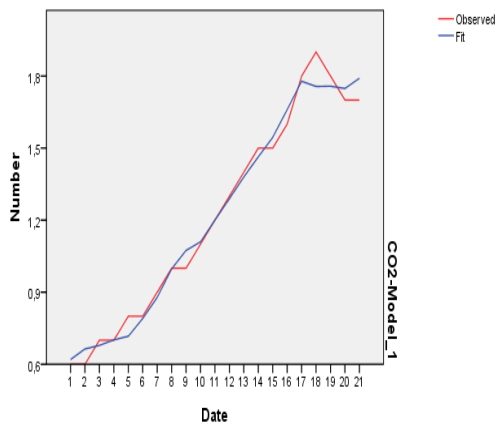
Source: IBM SPSS statistics 25 package program analysis output (2021)



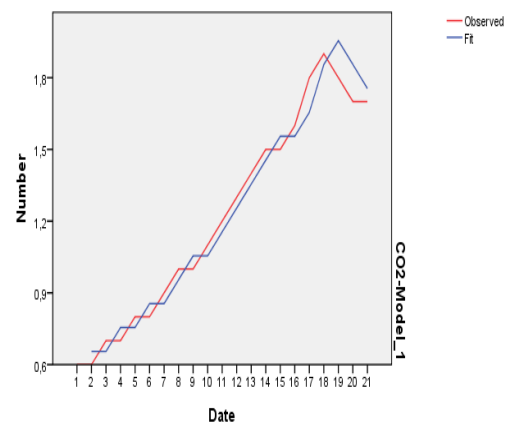
First Model



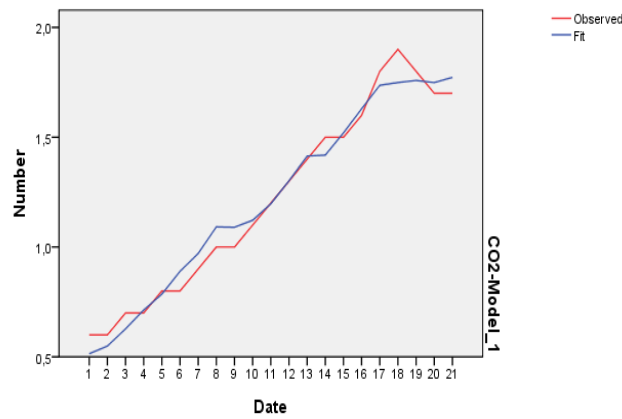
Second Model



Third Model



Fourth Model



Fifth Model

Figure 3. Estimation of models and time-going graph of observed values

Source: IBM SPSS statistics 25 package program analysis output, (2021)

globalization contributes to the enhancement of environmental quality in Turkey. Table 4. presents the summary statistics outcomes for all models.

Based on the data shown in Table 4, it can be observed that the third and fifth models share the same kinds, although the other models exhibit similarities among themselves. The goodness of fit for all models is determined by assessing the similarity between the stationary component of the established model and a basic average model. Additionally, the Normalized Bayes information criteria and Ljung Box test were conducted to assess the suitability of all models for the time series analysis. The figures below depict the graphical representations of all the models.

Based on the graphical representations, the predictability of the variables is corroborated, and all the models employed to examine the variables pertaining to global warming in Turkey exhibit significance and robustness.

3. CONCLUSION

The loss of 12 million hectares of land in the world every year poses a significant threat to human populations due to factors such as desertification, drought, and the depletion of fertile soil. Numerous nations have been impacted by these natural issues.

Recent studies have indicated a progressive escalation of desertification in Turkey. Furthermore, analysis of temperature data collected over a span of 70 years from 70 monitoring sites reveals a discernible upward trend in the annual average temperature across the country. The study observed a notable increase in temperature rates ranging from 0.07 to 0.34 degrees Celsius each decade, with a particular emphasis on the Mediterranean and Southeastern Anatolia regions.

This study employs time series analysis to build five distinct econometric models aimed at identifying the variables that exert a negative impact on the environment. The findings of the empirical study revealed that various factors, such as population increase, energy use, power consumption, income levels, fuel cars, lack of education, energy production, and gas emissions, had a negative impact on the environment in Turkey. In contrast, the practices of agriculture and the phenomenon of globalization have been found to have positive impacts on the environment.

Policymakers should prioritize their attention on formulating effective policies to address the issue of climate change. Conversely, it is imperative for individuals to demonstrate conscientiousness towards environmental stewardship by their deliberate selection of locally sourced veggies, judicious energy conservation practices, and the utilization of carbon-neutral modes of transportation such as bicycles and walking, particularly for shorter distances. Furthermore, it is of utmost significance to combat the phenomenon of global warming by the augmentation of the adoption of renewable energy sources, specifically wind and solar energy, as opposed to the utilization of fossil fuels, which serve as the primary catalyst for the release of greenhouse gas emissions.

ETHICAL DECLARATION

In the writing process of the study titled “Combating Multicollinearity: A New Two-Parameter Approach”, there were followed the scientific, ethical and the citation rules; was not made any falsification on the collected data and this study was not sent to any other academic media for evaluation.

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