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The Relationship Between Democracy and Environmental Degradation: Panel Data Analysis on E-20 Countries

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Abstract

Environmental degradation is a significant problem that makes its impact felt day by day and affects all of humanity. Increased carbon emissions threaten human life and environmental sustainability. Factors such as industrialization, deforestation, and unconscious and excessive use of resources increase environmental degradation. It is envisaged that environmental degradation will be combated in a democratic management approach where solid institutional structures, good governance and freedom of association exist. A democratic system in which the release of information is established will also increase the environmental awareness of individuals. Increasing environmental awareness will increase environmental quality and reduce environmental degradation. It is aimed in this study looks into the relationship between democracy and environmental degradation. By the stated purpose, panel data analysis was carried out using data covering the period 2006-2019 in the E-20 countries. The Democracy Index published by The Economist was used as an indicator of democracy, while carbon emissions (metric tons per capita) were used as an indicator of environmental degradation. In addition, control variables such as GDP per capita, foreign direct investments, the share of the urban population in the total population and the ratio of trade openness were included in the study. It has been found as a result of the analysis that environmental degradation decreases as the level of democratization increases in the E-20 countries.

Keywords: democracy, environmental degradation, panel data analysis, E-20 countries

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Demokrasi ve Çevresel Bozulma İlişkisi: E-20 Ülkeleri Üzerine Panel Veri Analizi

Özet

Çevresel bozulma, günden güne etkisini hissettiren ve tüm insanlığı etkileyen önemli bir problem olarak karşımıza çıkmaktadır. Artan karbon salınımı, insan hayatını ve çevresel sürdürülebilirliği tehdit etmektedir. Sanayileşme, ormansızlaşma, kaynakların bilinçsizce ve aşırı kullanımı gibi faktörler çevresel bozulmayı artırmaktadır. Güçlü kurumsal yapıların, iyi yönetişimin ve örgütlenme özgürlüğünün mevcut olduğu demokratik bir yönetim anlayışında çevresel bozulma ile mücadele edileceği öngörülmektedir. Haber alma özgürlüğünün tesis edildiği demokratik bir sistem, aynı zamanda bireylerin çevresel farkındalıklarını da artıracaktır. Çevresel farkındalıkların artması, çevre kalitesinin artmasını sağlayacak ve çevresel bozulmayı azaltacaktır. Bu çalışmada demokrasi ve çevresel bozulma arasındaki ilişkinin araştırılması amaçlanmaktadır. Belirtilen amaç doğrultusunda E-20 ülkelerinde 2006-2019 dönemini kapsayan veriler kullanılarak panel veri analizi yapılmıştır. Demokrasi göstergesi olarak The Economist tarafından yayınlanan Demokrasi Endeksi, çevresel bozulma göstergesi olarak ise karbon emisyonu (kişi başına metrik ton) kullanılmıştır. Ayrıca çalışmaya kişi başına düşen GSYİH, doğrudan yabancı yatırımlar, kentsel nüfusun toplam nüfus içindeki payı ve ticari açıklık oranı gibi kontrol değişkenleri dahil edilmiştir. Yapılan analiz neticesinde E-20 ülkelerinde demokratikleşme düzeyi arttıkça çevresel bozulmanın azaldığı bulgusuna ulaşılmıştır.

Anahtar Kelimeler: demokrasi, çevresel bozulma, panel veri analizi, E-20 ülkeleri

Introduction

The deformation of the environment, together with the depletion of resources covering all biotic and abiotic elements that make up our environment, including air, water, soil, plants, animals and all other living and non-living aspects of the planet earth, is expressed as environmental degradation (Bourque et al., 2005; Malcolm and Pitelka, 2000; Maurya et al., 2020). Typical forms of environmental degradation include desertification, land degradation, rising sea levels with global warming, and deforestation. The United Nations Conference on Environment and Development has identified four fragile eco-systems of the world, taking into account these processes. These fragile ecosystems are the regions with severe deforestation or desertification, the low-lying coastal areas and the vanishing regions or islands (Suhrke, 1993).

Factors such as modern urbanization, industrialization, overpopulation and deforestation are the main causes of environmental degradation. Environmental pollution refers to the degradation of natural resources, both qualitatively and quantitatively. The smoke emitted by both vehicles and processing plants expands the scale of toxic gases that are noticeable

everywhere. Smoke emitted by waste materials, vehicles and enterprises are the main driving force of contamination (Chopra, 2016).

Environmental degradation is increasing rapidly from the process that started with the Industrial Revolution to the present day. The transfer of nature and natural resources to future generations, concerns about ensuring environmental sustainability and the fact that global warming makes its impact felt thoroughly have shown the necessity of establishing a global action mechanism regarding the issue. International organizations, especially the United Nations, constantly raise the issue of environmental degradation, but the aim of countries for economic growth makes it difficult to reach a common decision on this issue globally.

Institutional quality and environmental degradation relationship into concrete is a subject of much interest and importance that attracts researchers in recent years. Researchers debate the effect of the level of democratization on the environment empirically and theoretically (Li and Reuveny, 2006).

Democracy is defined as a system of government with four essential elements:

a) Democracy recognizes the right to choose and change those who govern through free and fair elections.
b) Likewise, in a democratic system, citizens can actively participate in politics and civil life.
c) The protection of the human rights of all citizens is essential in a democratic system.
d) A democratic system also requires the existence of a rule of law in which laws and procedures are applied equally to all citizens (Diamond, 2004; Nwogu, 2015).

The existence of strong institutions, the effective use of public resources by political authorities, the strong and protected nature of property rights and the establishment of political stability indicate an ideal democratic order. Democracies in which these concepts are incompletely established can be characterized as imperfect democracies (Çoban, 2019).

There are different opinions about the effects of democracy on the environment. While some researchers state that democracy improves the environmental quality (Barrett and Grady, 2000; Neumayer, 2002; Winslow, 2005; Farzin and Bond, 2006; Li and Reuveny, 2006; Arwin and Lew, 2011; Sjöstedt and Jagers, 2014; Adams et al., 2016; Adams and Klobodu, 2017; Hotunluğlu and Yılmaz, 2018; Iwinska et al., 2019; Atay Polay and Çuhadar, 2020), others state

that democracy worsens the environmental quality (Hardin, 1968; Heilbronner, 1974; Dryzek, 1987; Scruggs, 2009; Romuald, 2011; Usman et al., 2020; Ursavaş, 2021). According to those who argue that democracy improves the quality of the environment, it is assumed that people living in democratic countries are free to collect information about the environmental quality of the country in which they live. In democratic societies, citizens can express their preferences and exert pressure on their government. With the freedom of the press brought about by democracy, citizens can be more aware of environmental problems. Furthermore, citizens can voice their preferences on the environment and form lobby groups, using the freedom of expression provided by a democratic government (freedom of association). Citizens, along with their right to vote, can encourage political leaders to implement environmental policies at the national and international levels (Payne, 1995; Romuald, 2011)

Economic models, which are related to the link between public and political decisions (Page and Shapiro, 1983), suggest that politicians are greatly influenced by this situation when people are effectively informed about major problems. Contrary to democratic governances, in autocratic regimes, the public cannot access information and cannot form lobby groups simultaneously because they cannot organize (Romuald, 2011).

According to those who argue that democracy increases environmental degradation, it is stated that the economic and political freedoms advocated by democracy can worsen environmental quality. If the private property rights of natural resources are not well defined, interest groups or free individuals may use these natural resources excessively and unconsciously. This leads to increased environmental degradation (Hardin, 1968). Again, it can be stated that global environmental problems cannot be intervened with the worldwide character of the environment and democracy only at the national and local decision levels (Heilbronner, 1974). Apart from all these, according to those who argue that democracy worsens the environmental quality, democracies adopt the conditions of market economies. These liberal democracies can prioritize the interests of companies and focus more on profit maximization rather than better environmental quality (Dryzek, 1987).

It is aimed in this study to look into the relationship between democracy and environmental degradation in E-20 countries. By the stated purpose, panel data analysis was carried out using data covering the period 2006-2019 in the E-20 countries. The Democracy Index, taken as an indicator of democracy, started to report in 2006, causing the data range of the study to be relatively limited. Today, the consensus that the developing countries are the

pollution havens of the developed countries and that the developing countries are primarily illiberal democracies make the study necessary when considered together with the characteristics of the E-20 countries examined. In the study, there is a literature review section after the introduction, and after the literature review, the data set and method used in the study are introduced. After the data set and method section, econometric analysis is included. Finally, there is a conclusion section in the study.

Literature Review

When the relevant literature is examined, it is seen that different researchers from different country groups have investigated the relationship between democracy and environmental degradation. In some of the studies, it was found that democracy reduces environmental degradation (Barrett and Grady, 2000; Neumayer, 2002; Winslow, 2005; Farzin and Bond, 2006; Li and Reuveny, 2006; Arwin and Lew, 2011; Sjöstedt and Jagers, 2014; Adams et al., 2016; Adams and Klobodu, 2017; Hotunluğlu and Yılmaz, 2018; Iwinska et al., 2019; Atay Polay and Çuhadar, 2020) while in others, it was found that democracy increases environmental degradation (Hardin, 1968; Heilbronner, 1974; Dryzek, 1987; Scruggs, 2009; Romuald, 2011; Usman et al., 2020; Ursavaş, 2021).

The number of researchers who have found that democracy increases environmental degradation is limited. However, it is observed that the relationship between these two variables is still of interest. Because it is seen that there is still no literature that will enable to reach a clear conclusion about the direction of the relationship between the two variables, and the literature is not rich in this direction.

Congleton (1992) examined the role of political institutions in controlling pollution. As a result of the cross-sectional data analysis, it can be concluded that political institutions affect local and international environmental policies. Liberal democracies were more willing to regulate environmental waste than less liberal democracies.

Midlarsky (1998) empirically investigated the relationship between democracy and the environment. As a result of the analysis, it has been determined that democracy affects environmental quality negatively. Based on the findings, it has been suggested to examine the relationship between democracy and the environment in a multidimensional way.

Torras and Boyce (1998) examined their effects on political rights and civil liberties. As a result of the analysis, it has been determined that political rights and civil liberties have substantial impact on environmental quality, especially in low-income countries.

Barrett and Graddy (2000) examined the relationship between democracy and environmental quality. In the study using data covering the period 1977-1987, different models were created, and panel data analysis was performed for 60 countries and 160 countries. As a result of the panel data analysis, it was concluded that democracy positively affected environmental quality in most of the models established.

Neumayer (2002) investigated the relationship between democracy and international environmental commitment in a study where he examined 153 countries. A cross-country analysis for 1998 concluded that the worldwide spread of democracy would lead to increased ecological obligations. There is strong evidence for a positive relationship between democracy and environmental commitment variables.

Fredriksson et al. (2005) examined the effects of environmental lobby groups on pollution control in rich and developing countries. As a result of the research, empirical findings revealed that environmental lobby groups acted to make environmental policies more rigid.

Winslow (2005) analyzed the relationship between democracy and urban air pollution, one of the environmental degradation types, in the study covering the period 1971-1992. In the study, which examined 46 countries, the Freedom House Index and Polity III were used as democracy indicators, and SO2, SPM and smoke were used as urban air pollution indicators. After the analysis, it was found that the higher the level of democratization, the lower the level of environmental pollution.

Farzin and Bond (2006) examined the relationship between democracy and environmental quality. The hypothesis that democracy contributes the most to environmental quality and reduces carbon emissions when compared to other forms of government has been supported by empirical evidence. It has also been stated that the results should be considered for the developing world countries as well as the United States.

Li and Reuveny (2006) investigated the relationship between democracy and environmental degradation. In the study in which the effects of democracy on five different forms of environmental degradation, including carbon emissions, nitrogen dioxide emissions,

deforestation, land degradation and organic pollution in water, were investigated, it has been found that democracy reduces all five types of environmental degradation. Likewise, it has been concluded that the effects of democracy on environmental degradation differ in these five different forms of environmental degradation.

Pellegrini and Gerlagh (2006) analyzed the effects of democracy on environmental policies. As a result of the research, it was found that democracy has an insignificant impact on environmental policies. Apart from this finding, considering that countries with a democratic history tend to be less corrupt, it has been stated that democracy can have a hardening effect on environmental policies in these countries.

Gallagher and Thacker (2008) analyzed the relationship between democracy and environmental quality. OECD countries and non-OECD countries were analyzed in the study using data covering the period 1960-2001. After the analysis, although there has been no evidence of the short-term effect of the current level of democratization on carbon emissions, robust findings have been obtained that the long-term democracy stock helps to reduce carbon emissions.

Scruggs (2009) examined the effects of democracy on environmental protection. As a result of the research, it has been determined that the impact of democracy on the safety of the environment is meaningless. The pace of economic growth has been found to have the most consistent effect on environmental performance.

Arwin and Lew (2011) investigated the effects of democracy on the environment. Carbon emissions, water pollution and deforestation data were used as environmental quality indicators in the study, which used data for the period 1976-2003 for developing countries. It has been found as a result of the analysis that democracy improves the quality of the environment. However, it has also been stated that this result differs according to the environmental quality indicators used.

Romuald (2011) examined the effects of democratic institutions on environmental quality. In the study, which used data covering 1960-2008, 122 developing and developed countries were analyzed. After the panel data analysis, it has been determined that there is a negative relationship between democratic institutions and environmental quality, and it has been found that democratic institutions attract investments that harm environmental quality.

Sjöstedt and Jagers (2014) investigated the relationship between democracy and the environment. In the study examining the effects of democracy levels on overfishing levels in Sub-Saharan Africa, it has been found that as a country's democratization level increases, so does its success in protecting marine environments. In addition, it has been found that democracy has a more substantial impact on environmental performance than corruption and government effectiveness levels.

You et al. (2015) analyzed the determinants of carbon emissions. In the study in which quantitative regression methods were applied, it was concluded that more democracy in the countries with the highest carbon emissions reduced carbon emissions.

Adams et al. (2016) analyzed institutional quality's effects on Ghana's environmental degradation. Bounds test approach and Fully Modified Phillip-Hansen technique were adopted for cointegration in the study, in which data from Ghana covering the period 1965-2011 were used. As a result of the analysis, it has been determined that the variables of institutional quality and environmental degradation are cointegrated in the long run, and it has been found that institutional quality is negatively related to environmental degradation.

Adams and Klobodu (2017) investigated the effects of democracy on environmental degradation. The panel cointegration test was carried out in the study using data from 1970-2011 for 38 African countries. It has been determined as a result of the analysis that democracy and bureaucratic quality effectively reduce environmental degradation in the long run in 38 African countries.

Hotunluoğlu and Yılmaz (2018) analyzed the relationship between democracy and carbon emissions. The importance of democracy for environmental policies was investigated in the study, which was conducted using the data of Turkey between the years 1972-2011. It has been found as a result of the analysis that democracy has a decreasing effect on carbon emissions in Turkey.

Iwinska et al. (2019) investigated the relationship between democracy and environmental quality. An analysis covering the 2006-2014 was made in the study, where the Democracy Index and the Environmental Performance Index were used. After the examination, a positive relationship has been determined between democracy and environmental quality.

Usman et al. (2020) examined the relationship between democracy and environmental degradation in South Africa. Data for South Africa covering the period 1971-2014 were used in the study, which employed the joint Bayer-Hanck cointegration test. As a result of the analysis, although it has been found that democracy increases environmental degradation, it is stated that the result obtained was statistically insignificant.

Atay Polat and Çuhadar (2021) analyzed the effect of democracy on environmental pollution. Static panel data analysis was carried out in the study, in which data were used for the period 1995-2018 in Central and Eastern European countries. As a result of the analysis, it has been determined that the development of democratic institutions in Central and Eastern European countries will contribute to the prevention of environmental degradation.

Haseeb and Azam (2021) investigated the relationship between democracy and environmental degradation. Data from low-income and high-income countries for the period 1995-2015 were used, and panel data analysis and Dumitrescu-Hurlin panel causality analyzes were carried out with the FMOLS method. After the study, it has been proven that democracy is helpful in reducing carbon emissions outside of low-income countries. When the Granger causality test results are examined, a bidirectional causality relationship has been found between the democracy and carbon emission variables.

Ursavaş (2021) investigated Turkey's relationship between democracy and ecological footprint variables. The panel ARDL method was applied in the study, in which data from Turkey's 1980-2017 period was used. As a result of the analysis, it was concluded that democracy increases environmental degradation in Turkey in the long run.

Data Set and Method

Balanced panel data analysis was performed in the study, using data covering the period 2006-2019, belonging to Argentina, Bangladesh, Brazil, China, Colombia, Egypt, India, Indonesia, Iran, Malaysia, Mexico, Nigeria, Philippines, South Korea, Saudi Arabia, South Africa, Thailand, Turkey, Poland and Russia, known as E-20 countries. The fact that the data were available for all the variables in the study effectively determined the data range in the study. Similar studies were used to select the variables (Barrett and Graddy, 2000; Winslow, 2005; Gallagher and Thacker, 2008; Arwin and Lew, 2011; Romuald, 2011; Adams and Klobodu, 2017; Atay Polat and Çuhadar, 2021; Haseeb and Azam, 2021).

In 2010, while 68% of the companies in Fortune Magazine's Global 500 were located in G7 countries, this rate was 17% for E20 countries in the same year. By the end of 2020, the percentage of companies from E20 countries in the Global 500 almost doubled, reaching 34%. In 2020, 124 China-based companies took place in the Global 500, and China pushed the USA to 2nd place as the country that included the most companies in the Global 500. The E-20 countries are a group of the top 20 developing countries selected by Fortune based on their economic and demographic weights. The E-20 group consists of Argentina, Bangladesh, Brazil, China, Colombia, Egypt, India, Indonesia, Iran, Malaysia, Mexico, Nigeria, Philippines, South Korea, Saudi Arabia, South Africa, Thailand, Turkey, Poland and Russia. (Harting, 2021).

The study used carbon emission (metric tons per capita) as an indicator of environmental degradation. Although carbon emission is also a dependent variable, the Democracy Index published annually by The Economist Intelligence Unit is included as an indicator of democracy. It is seen that the Democracy Index is used as an indicator of democracy in some studies. (Kim et al., 2018; Iwinska, 2019). In addition, variables such as GDP per capita, trade openness ratio, the share of the urban population in the total population and foreign direct investment were added to the study as control variables. Data on carbon emissions, GDP per capita, trade openness, the share of the urban population in the total population and foreign direct investment were obtained from the World Bank database.

Detailed information about all variables is shown in Table 1. Table 1 shows the variables in the study, the abbreviation of the variables, and the expected effects of the independent variables on the dependent variable.

Table 1. Information about the Variables

Variable	**The Abbreviation of the Variable**	**Expected Effects on Carbon Emissions**
Democracy Index	DI	+
GDP per capita (current US$)	GDPPC	+
Foreign Direct Investments Net Inflows (%of GDP)	FDI	+
Trade Openness Ratio	TRADE	+

Urban Population (% of the total population)	URB	+
CO_2 Emissions (metric tons per capita)	CO2	

The model estimated within the scope of the study is as follows:

$$CO2_{it}=\alpha_0+\alpha_1 DI_{it}+\alpha_2 GDPPC_{it}+\alpha_3 FDI_{it}+\alpha_4 TRADE_{it}+\alpha_5 URB_{it}+\alpha_i+\lambda_t+\varepsilon_{it}$$

$CO2_{it}$ stands for the carbon emission level, DI_{it} for the Democracy Index, $GDPPC_{it}$ for the GDP per capita, FDI_{it} for the foreign direct investment, $TRADE_{it}$ for the trade openness ratio, URB_{it} for the share of the urban population in the total population, α_0 for the fixed parameter, α_i for the unit effect, λ_t for the time effect and $\varepsilon_{it}$for the error term.

Econometric Analysis

In this section, the summary statistics of the variables will be indicated first, and then the specification tests will be performed. After the specification tests are completed, the model will be estimated with the appropriate resistive estimator. The Stata 14 package program was used to perform all these analyses.

Table 2. Summary Statistics

Variable	**Number of Observations**	**Mean**	**Standard Deviation**	**Min**	**Max**
CO2	280	7.97	14.91	.25	88.83
DI	280	5.62	1.85	1.71	8.13
GDPPC	280	8329.5	6573.94	509.64	33422.9
FDI	280	2.27	1.49	-.20	9.34
TRADE	280	61.63	32.46	20.72	202.57
URB	280	63.02	17.97	27.51	91.99

The summary statistics of the variables included in the model are shown in Table 2. Table 2 shows the number of observations, means, standard deviations, and minimum and maximum values of the variables.

Table 3. The Correlation Matrix

	DI	**GDPPC**	**TRADE**	**URBAN**	**FDI**
DI	1.0000				
GDPPC	0.0455	1.0000			
TRADE	0.1071	0.2591	1.0000		
URBAN	0.0409	0.6898	0.0040	1.0000	
FDI	-0.0089	-0.0458	0.1867	0.1039	1.0000

After stating the summary statistics on the variables, the relationship between the independent variables was investigated. Table 3 shows the correlation matrix. When the correlation matrix is examined, it is seen that the correlation relationship between the independent variables is less than 75%. This shows that there is no multicollinearity problem in the model.

Table 4. VIF Values

Variable	**Tolerance**	**VIF Value**
DI	0.985171	1.02
GDPPC	0.429578	2.33
TRADE	0.802743	1.25
URBAN	0.459143	2.18
FDI	0.893588	1.12

One of the methods used to test whether there is a multicollinearity problem is the VIF test. Table 4 shows the VIF values and tolerance values for the variables. The fact that the tolerance values of the variables are less than 0.2 and the VIF values are greater than 10

indicates a multicollinearity problem. However, when we look at Table 4, the tolerance values of the variables in the model are more significant than 0.2. And likewise, the VIF values of these variables are less than 10. No multicollinearity problem was encountered within the scope of the model.

Table 5. Specification Tests (F Test, Hausman Test, Heteroskedasticity, Autocorrelation and Cross-Section Dependence Tests)

F Test	
F Statistics	24.62
Probability Value	0.0000
Hausman Test	
Chi-square Statistics	20.10
Probability Value	0.0012
Modified Wald Test	
Chi-square Statistics	68912.56
Probability Value	0.0000
Bhargava, Franzini, and Narendranathan's Durbin Watson Test and Baltagi-Wu Locally Best Invariant Test	
Durbin Watson Test Statistic Value of Bhargava, Franzini, and Narendranathan	.38933366
Baltagi-Wu Test Statistic Value	.56144976
Pesaran's CD Test	
Statistical Value	2.407
Probability Value	0.0161

Table 5 shows the findings regarding the specification tests performed. As a result of the F test conducted to determine whether the classical model is valid, it has been concluded that there were unit effects and the classical model was ineffective. Hausman test was used to

determine which of the fixed effects model and the random-effects model were effective. As a result of the Hausman test, it is seen in Table 5 that the fixed effects model was found to be effective. The Modified Wald test was applied to test whether there was heteroskedasticity in the model. As a result of the test, the finding of heteroskedasticity in the model was reached. To test the existence of autocorrelation, the Durbin Watson Test of Bhargava, Franzini and Narendranathan and Baltagi-Wu Local Best Invariant Test were applied. As a result of the tests performed, it is seen that both test statistic values are considerably smaller than 2 when Table 5 is examined. This indicates that autocorrelation is serious for the model, and the problem of autocorrelation exists. Finally, the cross-sectional dependence was tested with Pesaran's CD test. N>T is required for the Pesaran's CD test to be applied. This condition is met, since N=20, and T= 14 in the study. As a result of Pesaran's CD test, it has been found that there was a correlation between the units.

Table 6. Estimation Results

Independent Variables	**Coefficient**	**Driscoll/Kraay Standard Error**	**Probability Value**
DI	-7.275235	1.879314	0.002***
GDPPC	.0008743	.0001847	0.000***
TRADE	-.0142578	.0891014	0.875
URBAN	-1.387331	.2772019	0.000***
FDI	.9872615	.4476423	0.046**
R^2= 0.1758			

Note: ***: 1% Significance Level, **: 5% Significance Level *: 10% Significance Level

Table 6 shows the estimation results for the model. Since both the heteroskedasticity, autocorrelation and the cross-sectional dependence problem were encountered in the model, the model was estimated with the Driscoll Kraay resistive estimator, which can be applied in the presence of these three statistical problems.

Looking at Table 6, it is seen that the R^2 value is 0.1758. R^2 value is important but correctly specified models can have low R^2 values, and misspecified models often have R^2 values (McGuirk and Driscoll, 1995). Furthermore, when dealing with the effects of rare events,

we should know that a low R^2 value does not necessarily indicate that the effect is small and unimportant (Glenn and Shelton, 1983; Moksony, 1999). Likewise, the coefficients and the standard errors and probability values derived with the Driscoll Kraay estimator are given in Table 6.

When the relationship between the Democracy Index and environmental degradation is examined, it is seen that the direction of the coefficient of the Democracy Index is negative. As the level of democratization increases in E-20 countries, environmental degradation decreases. A one-unit increase in the Democracy Index leads to a -7.275235-unit decrease in environmental degradation. Although the negative relationship between the two variables is an expected finding, the result obtained is also statistically significant at the 1% significance level.

When the relationship between the control variables GDPPC and the dependent variable CO2 is analyzed, it is observed that the relationship between the two variables is positive. As GDP per capita increases in E-20 countries, carbon emissions also increase. The result obtained is statistically significant at the 1% significance level.

Considering the relationship between TRADE and CO2 variables, it is seen that the relationship between the two variables is negative contrary to what is expected. The increase in the trade openness ratios of the E-20 countries reduces the environmental degradation in these countries. But this result is statistically insignificant.

If the relationship between the share of the urban population in the total population and carbon emissions is examined, it will be seen that the direction of the relationship between the two variables is negative. As the urbanization rate increases in the E-20 countries, environmental degradation decreases. This obtained finding is also statistically significant at the 1% significance level.

When the relationship between the FDI variable and the CO2 variable is investigated, the direction of the coefficient of the FDI variable shows that the direction of the relationship between the two variables is positive. As foreign direct investments (net inflows) increase in E-20 countries, carbon emissions also increase. The result obtained is also statistically significant at the 5% significance level.

Conclusion

Careless consumption of resources, the use of fossil fuels, increases in energy and resource production, and material production and consumption increase environmental degradation and adversely affect environmental sustainability. The fact that states are pursuing economic growth by ignoring the balance of nature increases carbon emissions and pressure on the planet. Along with very important problems such as global warming and climate change caused by human activities, the natural greenhouse effect is deteriorating.

There is a widespread belief that democracies in which good governance, individual freedoms, the rule of law and strong institutional structures are available to reduce environmental degradation. In a democratic environment, people can organize in favour of environmental protection and take actions to protect the environment in this context. At the same time, an environment where democracy is established indicates an environment where information is not monopolized by any political power or group. In a democratic environment, there are no obstacles to the freedom of information. The existence of freedom of the press also makes democracies advantageous in the context of environmental degradation. Individuals can be aware of environmental problems as the press is free and people's freedom of information is not restricted.

The effects of democracy on environmental degradation in E-20 countries were examined within the scope of the study. Panel data analysis was carried out in the study using data from the period 2006-2019 belonging to the E-20 countries. In the study, carbon emissions (metric tons per capita) were used as the dependent variable and an indicator of environmental degradation. The Democracy Index published annually by The Economist was used as an indicator of democracy. Explanatory variables such as GDP per capita, trade openness ratio, the share of the urban population in the total population and foreign direct investments are also included in the study.

When the findings are examined, it is observed that the results are consistent with the general view about the direction of the relationship between democracy and environmental degradation. When the results of the model estimation are examined in the econometric analysis part of the study, it is seen that the direction of the relationship between democracy and carbon emissions is negative. The obtained result is statistically significant at the 1% significance level. As the level of democratization increases in E-20 countries, carbon emissions decrease. Such result is also consistent with the results obtained in other studies in the literature (Barrett and

Graddy, 2000; Winslow, 2005; Li and Reuveny, 2006; Arwin and Lew, 2011; Sjöstedt and Jagers, 2014; Adams et al., 2016; Adams and Klobodu; 2017; Iwinska et al., 2019; Atay Polat and Çuhadar, 2021).

When the relationship between GDPPC and CO2, which is one of the control variables, is examined, it has been found that carbon emissions will decrease as GDP per capita increases in E-20 countries. The result obtained is also statistically significant at the 1% significance level. It is seen that the direction of the relationship between the TRADE and CO2 variables is negative, contrary to what is expected. But the obtained result is statistically insignificant. When the relationship between FDI and CO2 variables is examined, it is concluded that as foreign direct investments increase in E-20 countries, carbon emissions will also increase. The result obtained is also statistically significant at the 5% significance level.

Considering the direction of the relationship between another control variable, URB and CO2, it is seen that it is negative. Although this finding is not compatible with the general view about the relationship between the two variables, it is compatible with the results obtained in some similar studies in the literature (Balsalobre-Lorente et al., 2021; Zhang et al, 2017; Sorge and Neumann, 2019). With the increase in the urban population, it can be stated that the area in which people affect the environment decreases in these countries and thus natural life is protected in the areas outside the cities. The increasing urban population can contribute to less conversion of wild areas, reducing the pressure on the habitats of other species, and thus improving environmental quality

Based on the results of the study conducted for E-20 countries, it can be stated that democracy is an important issue for reducing environmental degradation. Strong institutional structures should be created and a separation of forces should be established. Good governance must exist. All the principles of democracy must be fulfilled. The individual rights and freedoms of citizens must be guaranteed. In a country where rights and freedoms are ensured, citizens can easily organize and form lobbies. Lobbies and organizations established in favour of environmental sustainability are of great importance in order to prevent environmental degradation. These lobbies can only appear on a democratic ground. Likewise, in order to ensure environmental awareness, the press should be free and the freedom of information should be ensured. The press is free only on democratic grounds, in democratic countries. People have the freedom of information only in countries where democracy functions. Environmental awareness increases with the freedom of the press in countries where the norms

of democracy function. Increasing environmental awareness is also important for reducing environmental degradation. In conclusion, countries should place importance on the functioning of democracy, paving the way for organizations that promote environmental sustainability and take initiatives to prevent environmental degradation by contributing to increased environmental awareness.

References

Adams, S., Adom, P.K. and Klobodu, E.K.M. (2016). Urbanization, Regime Type and Durability, and Environmental Degradation in Ghana. *Environ Sci Pollut Res*, 23, 23825–23839. https://doi.org/10.1007/s11356-016-7513-4

Adams, S., and Klobodu, E. K. M. (2017). Urbanization, Democracy, Bureaucratic Quality, and Environmental Degradation. *Journal of Policy Modeling*, 39(6), 1035–1051. doi:10.1016/j.jpolmod.2017.04.006

Atay Polat, M. and Çuhadar, P. (2021). Demokrasi ve Yenilenebilir Enerjinin Çevre Kirliliği Üzerine Etkisi: Görünürde İlişkisiz Regresyon Analizi. *OPUS–Uluslararası Toplum Araştırmaları Dergisi,* 18(41), 3329-3361. DOI: 10.26466/opus.888826.

Balsalobre-Lorente, D., Driha, O. M., Halkos, G. and Mishra, S. (2021). Influence of Growth and Urbanization on CO_2 Emissions: The Moderating Effect of Foreign Direct Investment on Energy Use in BRICS. *Sustainable Development*, https://doi.org/10.1002/sd.2240

Barrett, S. and Graddy, K. (2000). Freedom, Growth, and the Environment. *Environment and Development Economics*, 5(04), 433–456

Bourque, C.P.A., Cox, R.M., Allen, D.J., Arp, P.A. and Meng, F.R. (2005). Spatial Extent of Winter Thaw Events in Eastern North America: Historical Weather Records in Relation to Yellow Birch Decline. *Global Change Biology*, 11(9): 1477-1492

Chopra, R. (2016). Environmental Degradation in India: Causes and Consequences. *International Journal of Applied Environmental Sciences*, Vol: 11, No: 6, pp. 1593-1601.

Congleton, R.D. (1992). Political Institutions and Pollution Control. *The Review of Economics and Statistics, 74*(3), 412-421.

Çoban, M. N. (2019). *Demokrasi ve Refah: AB Ülkeleri Üzerine Bir İnceleme*. Gazi Kitabevi, Ankara.

Diamond, L. (2004). *What is Democracy?* http://www.standard.edu/~/diamond/Iraq/whalsDemocracy012004.htm. Accessed: 01.02.2022

Dryzek, J. S. (1987). *Rational Ecology: Environment and Political Economy*. Oxford: Blackwell.

Farzin, Y.H. and Bond, C. (2006). Democracy and Environmental Quality. *Journal of Development Economics*, 81 (1), 213–235.

Fredriksson, P.G., Neumayer, E., Damania R., and Gates, S. (2005). Environmentalism, Democracy, and Pollution Control. *Journal Of Environmental Economics And Management*, 49(2):343–365

Gallagher, G. P. and Thacker, S. C. (2008). *Democracy, Income and Environmental Qualit.*, Working Paper no. 164, Political Economy and Research Institute, University of Massachusetts.

Glenn, N. D. and Shelton, B. A. (1983). Pre-adult Background Variables and Divorce: A Note of Caution About Overreliance on Explained Variance. *Journal of Marriage and the Family*, 45: 405-410.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162: 1243-1248.

Harting, M. (2021). *Looking Back and Ahead: Eventful Decades for Emerging Markets*, *Alliance Bernstein*. https://www.alliancebernstein.com/library/looking-back-and-ahead-eventful-decades-for-emerging-markets.htm#, Accessed: 25.01.2022.

Haseeb, M., and Azam, M. (2021). Dynamic Nexus Among Tourism, Corruption, Democracy and Environmental Degradation: a Panel Data Investigation. *Environment, Development and Sustainability*, 23, 5557-5575, doi:10.1007/s10668-020-00832-9.

Heilbronner, R. L. (1974). *An Inquiry into the Human Prospect*. New York: Norton.

Hotunluoğlu, H. and Yılmaz, G. S. (2018). Demokrasi Karbondioksit Emisyonu İçin Önemli Mi? Türkiye İçin Bir Uygulama. *Siyaset, Ekonomi ve Yönetim Araştırmaları Dergisi*, 6(1), 133-141.

Iwińska, K. Kampas, A. and Longhurst, K. (2019). Interactions Between Democracy and Environmental Quality: Toward a More Nuanced Understanding. *Sustainability*, 11:1–17

Kim, Y., Kim, S., Baek, J., and Heo, E. (2018). The Linkages Between Democracy and the Environment: Evidence from Developed and Developing Countries. *Energy & Environment, 0958305X1881363.* doi:10.1177/0958305x18813637

Li, Q. and Reuveny, R., (2006). Democracy and Environmental Degradation. *International Studies Quarterly*, 50(4), 935.

Mak Arvin, B., and Lew, B. (2011). Does Democracy Affect Environmental Quality in Developing Countries? *Applied Economics*, 43, 1151–1160. doi:10.1080/00036840802600277

Malcolm, J.R. and Pitelka, L. (2000). *Ecosystems & Global Climate Change: A Review of Potential Impacts on US Terrestrial Ecosystems and Biodiversity*. Arlington: Pew Center on Global Climate Change.

Maurya, P. K., Ali, S. A., Ahmad, A., Zhou, Q., Castro, J. S., Khan, E. and Ali, H. (2020). *An Introduction to Environmental Degradation: Causes, Consequence and Mitigation*. In: Environmental Degradation: Causes and Remediation Strategies, DOI: 10.26832/aesa-2020-edcrs-01

McGuirk, A. and Driscoll, P. (1995). The Hot Air in R2 and Consistent Measures of Explained Variation. *American Journal of Agricultural Economics*, 77: 319-328

Midlarsky, M.I. (1998). Democracy and the Environment: An Empirical Assessment. *Journal of Peace Research, 35*(3), 341-361

Moksony, G. (1999). Small is Beautiful. The Use and Interpretation of R2 in Social Research. *Szociológiai Szemle,* Special issue. 130-138.

Neumayer, E. (2002). Do Democracies Exhibit Stronger International Environmental Commitment? A Cross-Country Analysis. *Journal of Peace Research*, 39 (2). pp. 139-164. ISSN 0022-3433

Nwogu, G.A.I. (2015). Democracy: Its Meaning and Dissenting Opinions of the Political Class in Nigeria: A Philosophical Approach. *Journal of Education and Practice*, 6(4):131-142

Page, B.I. & Shapiro, R.Y. (1983). Effects of Public Opinion on Policy. *The American Political Science Review*, 77(1), 175-190.

Payne, R.A. (1995). Freedom and the Environment. *Journal of Democracy*, 6(3), 41-55.

Pellegrini, L., and Gerlagh, R. (2006). Corruption, Democracy, and Environmental Policy. *The Journal of Environment and Development 15*(3): 332–354

Romuald, K. S. (2011). *Democratic Institutions and Environmental Quality: Effects and Transmission Channels.* In 2011 International congress, August 30–September 2, 2011, Zurich, Switzerland (No. 120396). European Association of Agricultural Economists.

Scruggs, L. (2009). *Democracy and environmental protection: an empirical analysis.* Annual Meeting of The Midwest Political Science Association 67th Annual National Conference. The Palmer House Hilton, Chicago, Illinois

Sjöstedt, M., and Jagers, S. C. (2014). Democracy and The Environment Revisited: The Case of African Fisheries. *Marine Policy*, 43, 143–148. doi:10.1016/j.marpol.2013.05.007

Sorge, L. and Neumann, A. (2019). *The Impact of Population, Affluence, Technology, and Urbanization on CO_2 Emissions across Income Groups*. Discussion Papers, 1812, DIW Berlin.

Suhrke, A. (1993). *Pressure Points: Environmental Degradation, Migration and Conflict*. American Academy of Art and Science, Cambridge, MA

Torras, M., and Boyce, J.K. (1998). Income, Inequality, and Pollution: A Reassessment of the Environmental Kuznets Curve. *Ecological Economics, 25*(2), 147-160

Ursavaş, N. (2021). Türkiye'de Demokrasinin Ekolojik Ayak İzi Üzerindeki Etkisi. *Third Sector Social Economic Review*, *56*(4), 2745-2757.

Usman, O., Olanipekun, I.O., Iorember, P.T. and Abu-Goodman, M. (2020). Modelling Environmental Degradation in South Africa: The Effects of Energy Consumption, Democracy, and Globalization Using Innovation Accounting Tests. *Environ Sci Pollut Res*, 27, 8334–8349 . https://doi.org/10.1007/s11356-019-06687-6

Winslow, M. (2005). Is Democracy Good for the Environment? *Journal of Environmental Planning and Management*, 48(5), 771–783. doi:10.1080/09640560500183074

You, W.H., Zhu, H.M., Yu, K., and Peng, C. (2015). Democracy, Financial Openness, and Global Carbon Dioxide Emissions: Heterogeneity Across Existing Emission Levels. *World Development*, *66*, 189-207.

Zhang, N., Yu, K. and Chen, Z. (2017). How Does Urbanization Affect Carbon Dioxide Emissions? A cross-country panel data analysis. *Energy Policy*, Vol: 107, 678-687.