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Article

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Exploring the Potential for Renewable Energy Consumption in Reducing Environmental Degradation in Somalia

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ABSTRACT

Somalia has a relatively small amount of forested land, covering only about 10.5% of the nation's total land area. The reason for this is that much of the country's tropical forests, which were originally located along the Shabelle and Jubba rivers reclaimed agricultural land. This study examines the relationship between environmental degradation and various variables, including renewable energy consumption, GDP, FDI inflow, and population. The study employed ARDL model to analyze the econometric relationship between various latent variables. This study found that that in Somalia, renewable energy consumption, GDP and FDI have both short-term and long-term negative and statistically significant effects on environmental degradation. However, FDI exhibits a positive and significant relationship with environmental degradation in both the short and long run. The findings of the study suggest that there is a positive correlation between renewable energy consumption and economic growth, and a negative correlation between renewable energy consumption and environmental degradation. The study also suggests that FDI may play a role in promoting renewable energy consumption and economic growth. The limitation of this study is that the study does not control for all of the potential factors that could influence the relationship between the variables. For example, the study does not control for the level of corruption in Somalia, which could potentially affect both economic growth and environmental degradation. Future research should address the limitations of this study by controlling for all of the potential factors that could influence the relationship between the variables.

Keywords: Environmental degradation, Energy Consumption, FDI, GDP, Somalia
JEL Classifications: P18, Q43, Q56

1. INTRODUCTION

Environmental degradation, resulting from human activities, refers to the deterioration of natural resources such as water, oxygen, and soil (Chopra, 2016). Over the past two decades, there has been a noticeable and concerning increase in the rate of global environmental degradation, which has raised alarm among environmental stakeholders and activists. The significant impact of environmental degradation and ecological imbalances on a global scale has become evident through environmental disasters. This presents a challenge for countries as they strive to address environmental crises while sustaining economic growth (Munir et al., 2020). CO_2 emissions are widely recognized as a major contributor to global warming and environmental degradation. The growing concern over climate change and global warming has been a central focus of global attention for the past two decades. Since the 1990s, researchers have closely examined the economic impacts of global warming, and international organizations like the United Nations have been working to establish binding agreements among nations to mitigate the most severe effects of climate change (Romero and Gramkow, 2021).

Somalia has a relatively small amount of forested land, covering only about 10.5% of the nation's total land area. The reason for this is that much of the country's tropical forests, which were originally located along the Shabelle and Jubba rivers reclaimed agricultural land (World Bank, 2012). During the years 2000 and 2021, Somalia suffered an annual deforestation rate of an average of 429,000 hectares. This equates to an annual deforestation rate of, on average, 4.9%. Despite the prospective value of Somalia's natural resources, its natural capital is currently at risk. Land degradation is now thought to be between 23 and 30%. Between the years 2000 and 2015, as a result of land degradation, Somalia lost 147,704 square kilometers. Several factors are responsible for this loss, including soil erosion, biological degradation, and gully erosion, among others (World Bank, 2022). Most urban and rural Somalian households have used firewood and charcoal for years. Traditional biomass sources provide 82% of the nation's energy (Dawson and Spannagle, 2008).

Somalia faced significant challenges in terms of energy infrastructure and access. The country has a limited energy grid. However, there have been efforts to increase the deployment of renewable energy sources in recent years. These efforts aim to address the country's energy needs and promote sustainable development.

Solar energy has been a focus of renewable energy development in Somalia due to its abundant sunlight. Small-scale solar projects have been implemented to provide electricity to rural communities and support basic services such as schools and health clinics. Additionally, solar-powered water pumps have been installed to enhance access to clean water in remote areas. Some international organizations and NGOs have also initiated renewable energy projects in Somalia. These projects include the installation of solar panels, mini-grids, and micro-hydro systems to improve access to electricity in underserved regions.

A study conducted by Kahia et al. (2019) showed that renewable energy, international trade, and foreign direct investment inflows all contribute to decreases in carbon dioxide emissions. Awan and Azam (2022) found that energy consumption positively correlates with CO_2 emissions, whereas FD and social globalisation attenuate environmental degradation. It is worth noting that the mentioned studies, including the study by Kahia et al. (2019) and Awan and Azam (2022) were conducted in countries other than Somalia, which leads to a lack of contextual information for Somalia. Therefore, the purpose of the research mentioned afterward was to fill this gap by investigating the relationship between environmental degradation and various variables, including renewable energy consumption, GDP, FDI inflow, and population specifically in the context of Somalia.

In order achieve this goal, the study has the following objectives:
1. To determine the relationship between renewable energy consumption and CO_2
2. To establish the relationship between GDP and CO_2
3. To determine the relationship between FDI inflow and CO_2
4. To determine the relationship between Population and CO_2

The organization of this paper is as follows. It begins with section 1 as an introduction. This is followed by a literature review in section 2. Section 3 discusses the methodology of the paper, followed by an analysis in Section 4. Section 5 discusses the findings of the paper, followed by the conclusion and recommendation in Section 6.

2. LITERATURE REVIEW

The term "environmental degradation," which is caused by human actions, describes the deterioration of water, air, and soil (Chopra, 2016). There has been a worrying uptick in the pace of global environmental deterioration over the last two decades, alarming environmental stakeholders and campaigners. Renewable energy consumption is an important factor when it comes to the reduction of environmental degradation. The intersection of energy consumption and environmental degradation has become a critical area of study as societies grapple with the consequences of resource depletion and climate change. This literature review aims to explore the potential of strategic energy consumption practices as a means to mitigate environmental degradation.

Examining the interconnection between Renewable energy consumption and environmental degradation is essential for policymakers to overcome ecological disasters. The linkages among renewable energy, GDP, FDI, Population, and CO_2 have been investigated in past studies utilizing various techniques. For instance, Hu et al. (2018) showed that as more renewable energy sources are utilised, there is a decrease in environmental degradation. Similarly, Djellouli et al. (2022) found that renewable energy consumption significantly reduces CO_2 emissions. Renewable energy has the ability to not only provide the energy needed for industrialization, but also to delay the degradation of the environment (Cheng et al., 2019). Furthermore, consumption of renewable sources of energy may have a significant effect on reducing environmental degradation in a variety of countries, including Russia, Brazil, India, and China (Nassani et al., 2017). Kahia et al. (2019) found that renewable energy and international trade led to decreases in carbon dioxide emissions. However, Short-term CO_2 emissions are reduced when more energy is used (Nurgazina et al., 2021).

Some previous Research has demonstrated that FDI can contribute to environmental degradation. Omri et al. (2019) found that FDI boosts environmental degradation. According to research by Shahbaz et al. (2015), industrialised nations like France reported increased CO_2 emissions due to FDI. For Djellouli et al. (2022) FDI has a positive relationship with CO_2 emissions. According to Khan et al. (2019) indicates that Energy consumption, foreign direct investment have positive effect on CO_2 emissions in Pakistan while urbanization, economic growth has negative effect on CO_2 emissions in Pakistan. However, Zhu et al. (2016) found a reduction in environmental degradation in Asian countries due to FDI. Shao (2018) states that foreign direct investment (FDI) has a substantial and adverse effect on the carbon intensity of the host country. According to the study of Zhang and Zhou (2016), FDI helps lower China's carbon dioxide emissions. The effect of FDI on carbon dioxide emissions decreases from the western region to the eastern and central regions.

In addition, some previous Research has demonstrated that Economic growth has been linked to environmental degradation. For instance, Djellouli et al. (2022) found a positive relationship between economic growth. However, Kasperowicz (2015) used ECM estimation and suggested that a negative long-run relationship between GDP and CO_2 emissions. Similarly, Stern (2004) suggests that as countries become richer, environmental quality initially declines but eventually improves. York et al. (2003) also found economic growth to be a key driver of environmental degradation, but they acknowledged the roles of technology and population. For Saboori and Sulaiman (2013), economic development has a positive impact on the expansion of the economy, but economic growth has a negative effect on the environment, which is the primary cause of environmental degradation.

According to Sharma (2011), both the expansion of industry and the development of the economy have a negative impact on the environment. According to Lau et al. (2014), the nations of ASEAN are striving to attain the maximum possible economic development. In order to do so, the ASEAN economies excessively utilise the natural resources, which has a negative influence on the environment. Khan et al. (2019) indicates that economic growth has negative effect on CO_2 emissions in Pakistan.

The relationship between increasing urban populations and environmental degradation is also a topic of extensive research. Bekhet and Othman (2017) found that the elasticity of CO_2 in relation to urbanization is positive and elastic during the early stages of urbanization; however, throughout the higher stages of urbanization, it becomes negative and inelastic. This result can protect many people from the effects of natural disasters. According to Ahmed et al. (2019) demonstrated that Urbanization and carbon dioxide emission have an inverse U-shaped connection, Initially, Degradation of the natural environment and increased emissions are both linked to urbanization, but after reaching a certain point, it starts to reduce carbon dioxide emissions. However, Wang et al. (2021) proposed that urbanization leads to a decrease in carbon emissions. Similarly, Huo et al. (2020) found that urban population and building floor space have a negative effect on carbon emissions in the urban building sector. Dietz and Rosa (1997) conducted research on the topic of the effects of population and affluence on CO_2 emissions. The study's findings indicate that, for population, there exist economies of scale for the most prominent countries that are not compatible with the premise of direct proportionality (log–linear effects) that was used in the majority of the research that had been done in the past.

3. METHODOLOGY

3.1. Data Source

In this research, yearly time series data for Somalia are utilised, and the study itself covers the period of time from 1990 to 2020, which results in a total of 31 observations. The study was conducted using the World Bank, the World Development Indicator, and SESRIC as its primary sources. The study used factors including Carbon dioxide (CO_2) measured in metric tonnes per capita), GDP per capita in US dollars, renewable energy consumption (REC), measured as a percentage of total final energy consumption, urban population (URPOP), measured as an annual percentage change in population, and foreign direct investment.

Table 1 provides an overview of the variables used in the study, along with their explanations and sources. The data obtained from the World Bank and SESRIC ensures the reliability and consistency of the variables analyzed.

3.2. Method and Model Specification

ARDL is applied to econometrically investigate the relationship between the latent variables. The ARDL model is a symmetric time-series model. In this type of model, both the dependent and independent variables are connected to contemporaneity as well as prior (lagged) values. Pesaran and Shin (1995) were the ones who initially developed the ARDL model, then Pesaran et al. (2001) improved upon it. When compared to traditional cointegration approaches, ARDL's currency integration approach offers many advantages. The ARDL may not integrate the variables in the same order as the research. Therefore, ARDL may be used with any combination of a fundamental obstacle and an integration of order I (1), I (0), or both.

To analyse and interpret data, ordinary least squares (OLS) are often used. It's important to note that the natural log was used to adjust all research variables.

$$Y=f(GDP,FDI,URPOP,RE) \tag{1}$$

$$LCO2_t=\beta_0+\beta_1 GDP_t+\beta_2 LFDI_t+\beta_3 LURPOP_t+\beta_4 LRE_t+\varepsilon \tag{2}$$

LED is the natural log of Environmental Degradation; LGDP is a natural log of GDP; LFDI denotes the natural log of foreign direct investment; LURP denotes the natural log of URBAN Population, while LRE denotes the natural log of Renewable energy consumption.

CO_2 is expected to have a significant relationship with GDP and FDI. Specifically, it is expected that increasing CO_2 emissions are linked with higher GDP growth. Additionally, CO_2 emissions will also be expected to have a significant relationship with the urban population and renewable energy consumption.

3.3. Bounds Testing Procedure

Co-integration analysis is a useful approach for investigating the long-run association among variables of interest. In order to test the long-run relationship among the variables in the model, equation (3) is re-written in ARDL form and evaluated using the F-statistics test.

$$\begin{aligned}\Delta LCO2_t &= \alpha_0+\beta_1 CO2_{t-1}+\beta_2 LGDP_{t-1}+\beta_3 LFDI_{t-1}\\ &+\beta_4 LURPOP_{t-1}+\beta_5 LRE_{t-1}+\sum_{i=0}^{q}\Delta\alpha_1 LCO2_{t-k}\\ &+\sum_{i=0}^{p}\Delta\alpha_2 LGDP_{t-k}++\sum_{i=0}^{p}\Delta\alpha_3 LFDI_{t-k}\\ &+\sum_{i=0}^{p}\Delta\alpha_4 LURPOP_{t-k}+\sum_{i=0}^{p}\Delta\alpha_5 LRE_{t-k}+\varepsilon_t\end{aligned} \tag{3}$$

Pesaran et al. (2001) advocated using two key values to ascertain whether or not a long-term link existed between the model's variables. Indicating the existence of a long-term relationship between the variables, the null hypothesis is rejected if the estimated f-statistic is greater than the upper critical value. When the f-statistic is below the lower critical levels, however, which it would if there were long-term co-integration between the variables, the null hypothesis is not rejected. Additional tests are required to confirm the existence of a co-integration connection between the variables when the estimated f-statistic falls between the upper and lower critical values, making the conclusion questionable. The error-correction term offers a different approach to checking for co-integration in certain cases.

3.4. Granger Causality in the Error Correction Model

After verifying the presence of cointegration through the Johansen and ARDL bound tests, we can incorporate Granger causality within a framework of vector error correction modeling. To estimate the error correction model, we express the equation for the error correction as follows:

$$\Delta \mathrm{CO2_t} = \alpha_0 + \sum_{i=0}^{q} \Delta\beta_1 CO2_{t-k} + \sum_{i=0}^{p} \Delta\beta_2 LGDP_{t-k}$$
$$+\sum_{i=0}^{p} \Delta\beta_3 LFDI_{t-k} + \sum_{i=0}^{p} \Delta\beta_4 LURPOP_{t-k}$$
$$+\sum_{i=0}^{p} \Delta\beta_5 LRE_{t-k} + \lambda ECM_{t-1} + \varepsilon_t \quad (4)$$

Variable definitions remain unchanged except for the error correction term (ECT). The ECM must be negative and statistically significant to connect variables short-term.

4. FINDINGS AND DISCUSSION

This section discusses descriptive statistics, the stationarity unit root test, the long-term relationship of the ARDL model as determined by the bounds F-test, the short-run and long-run coefficients, the error correction term, and the quality of fit via diagnostics and structural stability tests.

Table 2 presents the descriptive statistics for the variables analyzed in the study. the data show that the countries Environmental degradation had an average exchange rate of -2.8; the highest and lowest exchange rates were -2.25 and -3.15, respectively. For the REE variable, we found that the highest and lowest REE were 4.55 and 4.47, respectively, while the mean of it was 4.53.

In addition, GDP has an average of 5.68, and the highest and lowest GDOs of Somalia over the past 30 years were 6.25 and 4.67, respectively. We also found that FDI has an average of 3.32, and the highest and lowest FDI of Somalia over the past 30 years were 6.11 and 1.56, respectively. For URPPOP, the highest and lowest values were 3.81 and 3.39, respectively. But the mean of URP was 3.59.

The stationarity of the data was assessed using both the augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. According to the ADF test results, all variables exhibit stationarity at the first difference, except for GDP, which is stationary at the level. Similarly, based on the PPP test, all variables demonstrate stationarity at the first difference, except for GDP and REE, which are stationary at the level. Therefore, based on this, the null hypothesis can be accepted since some variables at the level have a unit root.

Table 4 presents Pearson's correlation coefficients among the variables, highlighting the direction and strength of their relationships. the correlation between variables indicates the direction and strength of the relationship between them. Table 3 presents Pearson's correlation coefficients for the four constructs, ranging from 0.57 to 0.98. All variables exhibit a positive correlation, meaning that when the value of one variable changes, the value of the other variable tends to change in the same direction. In this study, Renewable energy consumption demonstrates the highest correlation coefficient with CO2, at 0.98. On the other hand, Uprun population exhibits the lowest correlation coefficient with GDP, showing a value of 0.57.

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Table 1: Variable description

Variable	Symbol	Variable type	Years	Source	Unit measurement
Carbon dioxide	CO_2	Dependent variable	1990-2020	World development indicator	Metric tons per capita
GDP per capita	GDP	Independent variable	1990-2020	World bank	GDP per capita US Dollars
Renewable energy consumption	REC	Independent variable	1990-2020	World development indicator	% of total final energy consumption
Foreign direct investment	FDI	Independent variable	1990-2020	World development indicator	Net inflows (BOP, current US$
Population	POP	Independent variable	1990-2020	World development indicator	Annual percentage change of population
Variable	Symbol	Variable type	Years	Source	Unit measurement

Table 2: Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Standard deviation	Observations
LCO_2	−2.800411	−2.882873	−2.246348	−3.150603	0.274249	30
LRE	4.527952	4.535499	4.554193	4.468241	0.023374	30
LGDP	5.679401	5.829335	6.247462	4.669459	0.40389	30
LFDI	3.32255	2.863603	6.113682	−1.560648	2.018702	30
LURPOP	3.586945	3.559422	3.818811	3.389799	0.138001	30

Figure 1: Normality test

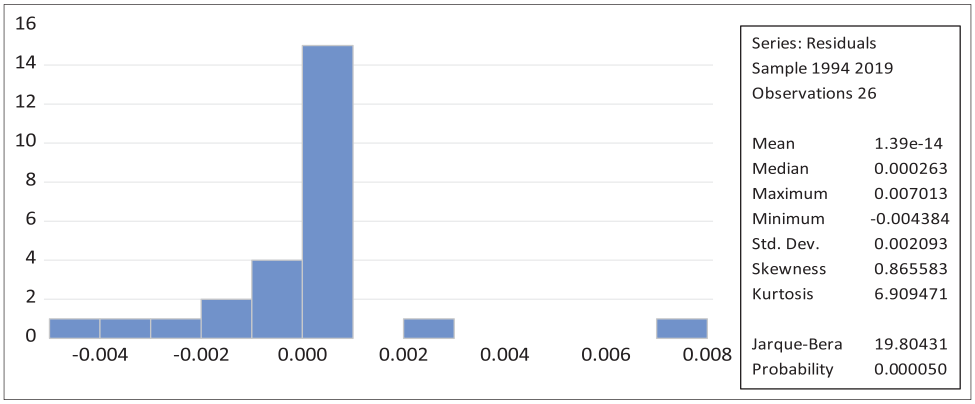

Figure 2: Stability test (CUSUM and CUSUMSQ)

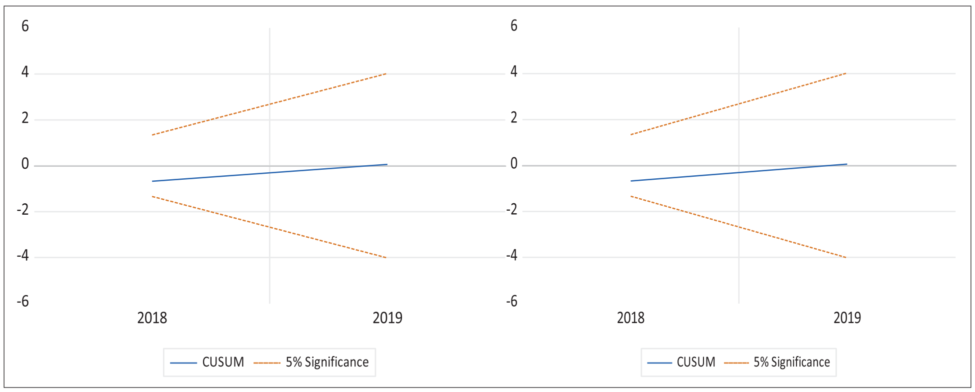

Table 3: Result of unit root test

Variables	ADF			PP		
	T-statistics	Prob	Order	T-statistics	Prob	Order
LCO_2	−3.0933	0.0386**	I (1)	−1.8992	0.0563*	I (1)
LFDI	−9.1597	0.000***	I (1)	−6.5138	0.000***	I (1)
LGDP	−4.7199	0.0008***	I (0)	−3.4212	0.0187**	I (0)
LRE	−4.4833	0.0014**8	I (1)	−4.6965	0.0008***	I (0)
LURPOP	−5.9796	0.000***	I (1)	−5.3774	0.0001***	I (1)

(*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. Lag Length based on AIC

Table 4: Correlation test

Variables	LCO_2	LFDI	LGDP	LURPOP	LRE
LCO_2	1	−0.6527625871733214	−0.7985786902539164	−0.883985578781126	−0.9852685130046248
LFDI	−0.6527625871733214	1	0.4283219315999088	0.8205524816436348	0.6107962152010831
LGDP	−0.7985786902539164	0.4283219315999088	1	0.5755345699755595	0.8082347405565876
LURPOP	−0.883985578781126	0.8205524816436348	0.5755345699755595	1	0.8572828484016656
LRE	−0.9852685130046248	0.6107962152010831	0.8082347405565876	0.8572828484016656	1

0.98. All variables exhibit a positive correlation, meaning that when the value of one variable changes, the value of the other variable tends to change in the same direction. In this study, Renewable energy consumption demonstrates the highest correlation coefficient with CO_2, at 0.98. On the other hand, Uprun population exhibits the lowest correlation coefficient with GDP, showing a value of 0.57.

The Akaike information criterion (AIC) and the Schwarz Bayesian information criterion (SBC) are used to select a suitable lag length for cointegration analysis and estimate the F-statistic value. Based on the AIC, the analysis identifies one lag as the optimal choice. Subsequently, considering the estimations from the previous bound tests in Table 3, the computed F-statistic (4.895306) surpasses the upper bound critical value of 3.91. Consequently, the null hypothesis is rejected, indicating the presence of cointegration among GDP, renewable energy consumption, urban population, FDI, and environmental degradation.

As the estimates in Table 6 show, the regression analysis provides valuable insights into the long-term dynamics between critical variables and environmental degradation in Somalia. As seen in the above estimate, renewable energy usage negatively impacts environmental deterioration in Somalia at a 1% level. This suggests that the use of renewable energy is likely to have a positive impact on the environment in Somalia by reducing the level of degradation.

In addition, GDP and environmental deterioration in Somalia are negatively correlated at 1%. This indicates that as a country's GDP rises, so does the rate at which its environment degrades. As the GDP of Somalia increases, it may be possible to mitigate environmental degradation by adopting sustainable practices and policies.

FDI positively affects environmental deterioration in Somalia at a 10% significance level. This means that FDI contributes to environmental degradation through the development of infrastructure. Construction of roads, airports, and other facilities can lead to deforestation, soil erosion, and disruption of ecosystems, all of which can have negative impacts on the environment. Somalia has faced significant challenges over the past few decades, including years of conflict and instability. This has resulted in the destruction of much of the country's infrastructure, including roads and houses. However, in recent years, the Somali government, with the support of international donors, has been working to rebuild and improve the country's infrastructure. The construction of roads can lead to deforestation, soil erosion, and the disruption of wildlife habitats. It can also contribute to air and water pollution through increased traffic and the use of heavy machinery during construction.

Somalia's urban population is negatively associated with environmental deterioration. This is because urban areas tend to have more efficient and centralized infrastructure for waste management, water treatment, and other environmental protection measures. However, it is important to note that rapid urbanization can also lead to environmental degradation if the necessary infrastructure and policies are not in place. For example, poorly planned urbanization can lead to overcrowding, pollution, and inadequate sanitation systems, which can have negative impacts on the environment and human health. It is important to ensure that urbanization is properly planned and managed to maximize its benefits and minimize its negative impacts. Thus, HI, H2, H3, and H4 are accepted.

Table 5: F-Bound test

F-statistic	Level of significance	I (0)	I (1)
4.895306	10%	2.496	3.346
	5%	2.962	3.91
	1%	4.068	5.25

Table 6: Long –run coefficients

Selected model: ARDL (2,3,0,0,0) Model selection method: AIC Dependent variable: LCO_2			
Variables	**Coefficients**	**T statistic**	**P-value**
C	28.29642	6.338392	0.0000
LREC	−8.280676***	−7.875164	0.0000
LGDP	−0.154183***	−4.768657	0.0002
LURP	−0.40447***	−3.412665	0.0033
LFDI	0.007459*	2.101202	0.0508

(*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%

Table 7: Estimation of error correction model (ECM)

Dependent Variable: D (LCO_2) Method: Least Squares Date: 04/01/23 Time: 10:55 Sample (adjusted): 1992 2019 Included observations: 28 after adjustments				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	1.302278	0.508573	2.560652	0.0182
D(LC02(−1))	0.329843	0.135026	2.442806	0.0235
D(LGDP)	−0.047997	0.022296	−2.152655	0.0431
D(LURPOP)	−0.535353	0.242172	−2.210627	0.0383
D(LFDI)	0.002836	0.003882	0.730578	0.4731
D(LRE)	−3.278849	1.418765	−2.311059	0.0311
ECT(−1)	−0.180138	0.070584	−2.552087	0.0186

Table 7 illustrates ECM-determined short-term adjustments. GDP, renewable energy consumption, urban population, and environmental deterioration have a statistically significant negative connection with the dependent variable in the near term. FDI improves Somalia's environment. The negative error correction term is statistically significant. Negative (ECM-1) suggests that variables will be fixed by 0.18 per cent to return to the long-run equilibrium.

Table 5 illustrates ECM-determined short-term adjustments. GDP, renewable energy consumption, urban population, and environmental deterioration have a statistically significant negative connection with the dependent variable in the near term. FDI improves Somalia's environment. The negative error correction term is statistically significant. Negative (ECM-1) suggests that variables will be fixed by 0.18% to return to the long-run equilibrium.

The diagnostic test revealed that the model's residuals are normally distributed around their mean and have no heteroskedasticity, serial correlation, or multicollinearity. According to the Jarque-Bera normality test, the error term is also normally distributed. The CUSUM and CUSUMSQ tests conclude that the parameters are stable since they fall within the 95% confidence interval. See the results in Figures 1 and 2.

5. CONCLUSION AND POLICY RECOMMENDATIONS

This paper measures the impact of renewable energy consumption and FDI inflows on reducing environmental degradation. The ARDL model is applied to econometrically investigate the relationship between the latent variables. This study provides evidence that renewable energy consumption, GDP, and FDI have both short-run and long-run negative and significant effects on environmental degradation in Somalia, while FDI has a positive and significant relationship with environmental degradation in the short run and long run.

The short-term link between GDP, urban population, and degradation of the environment suggests that if GDP and urban population continue to rise, there is a possibility that environmental degradation will also rise in the short run as a result of the increasing economic and industrial activities. However, external factors such as technological advancements or government policies may mitigate these effects. It is important to continue monitoring and addressing these issues to ensure sustainable economic growth and development.

In the long run, the negative relationship between renewable energy consumption, GDP, urban population, and environmental degradation is significant at a 1% level of significance, indicating that the finding is reliable and not due to chance. while the positive relationship between FDI and environmental degradation is significant at a 10% level of significance.

Environmental degradation is a primary concern in Somalia, and it is deeply linked to desertification, drought, livestock, and agricultural sectors that are not sustainable. However, despite these challenges, there has been significant progress in the adoption of renewable energy. In 2019, renewable energy sources constituted approximately 95% of the total energy consumption in Somalia. This study investigates the impact of renewable energy consumption and FDI inflows on reducing environmental degradation. The result indicates that The long-term relationship between renewable energy use and environmental degradation in Somalia is negative and significant at 1%. This implies that the use of renewable energy is likely to have a positive impact on the environment in Somalia by reducing the level of degradation. This is due to the fact that using renewable energy sources, like solar or wind, is usually seen to be safer for the environment. Thus, H1 is accepted. and this result is in line with Djellouli et al. (2022).

FDI and environmental deterioration are positively correlated at a 10% level. This implies that FDI is hindering environmental quality by contributing to higher levels of carbon emissions. This suggests that FDI contributes to environmental degradation through the development of infrastructure. Construction of roads, airports, and other facilities can lead to deforestation, soil erosion, and disruption of ecosystems, all of which can have negative impacts on the environment. Somalia has faced significant challenges over the past few decades, including years of conflict and instability. This has resulted in the destruction of much of the country's infrastructure, including roads and houses. However, in recent years, the Somali government, with the support of international donors, has been working to rebuild and improve the country's infrastructure. The construction of roads can lead to deforestation, soil erosion, and the disruption of wildlife habitats. It can also contribute to air and water pollution through increased traffic and the use of heavy machinery during construction. Thus, H2 is accepted, and this result is similar to that reported by Shahbaz et al. (2015).

In addition, GDP in Somalia has had a negative significant relationship with environmental degradation from 1990 to 2019. GDP is a measure of economic activity and production within a country, and it is often linked to environmental degradation as economic growth can lead to more industrial activity and resource consumption. However, in the case of Somalia, this suggests that as GDP grows, there are potential benefits from environmental policy and economic growth policies that aim to mitigate the negative effects of increased economic activity. It is also suggested that more income be used to improve environmental quality since there is a risk to Somalia's natural capital right now. Nowadays, land degradation is believed to be between 23 and 30%. Somalia lost 147,704 km^2 of land-to-land degradation between 2000 and 2015. Thus, H3 is accepted, and this result is in line with Kasperowicz (2015).

Somalia's urban population has a negative and significant link with the degradation of the environment. This means that if urbanization increases, there is a corresponding decrease in environmental degradation. This is because urban areas tend to have more efficient and centralized infrastructure for waste management, water treatment, and other environmental protection measures. However, it is important to note that rapid urbanization can also lead to environmental degradation if the necessary infrastructure and policies are not in place. For example, poorly planned urbanization can lead to overcrowding, pollution, and inadequate sanitation systems, which can have negative impacts on the environment and human health. It is important to ensure that urbanization is properly planned and managed to maximize its benefits and minimize its negative impacts. Thus, H4 is accepted, and this result is in line with Ahmed et al. (2019).

The result of this study suggest that renewable energy consumption, economic growth, and foreign investment may contribute positively to environmental sustainability in Somalia. Policymakers and stakeholders can use these findings to inform strategies and initiatives aimed at promoting sustainable development in the country. However, it is important to note that correlation does not necessarily mean causation, and further research is necessary to identify the specific mechanisms that contribute to these relationships. Due to irresponsible land management practices and destructive droughts and floods, land degradation is a common phenomenon in the Somali region. This paper also recommends that Somalia needs to priorities reforestation and integrated sustainable land management as part of a larger land reclamation initiative to fight land deterioration. The study also suggests nations like Somalia, which is facing drought and erosion due to climate change, should invest in renewable energy sources.

Our findings suggest that that in Somalia, renewable energy consumption, GDP and FDI have both short-term and long-term negative and statistically significant effects on environmental degradation. However, FDI exhibits a positive and significant relationship with environmental degradation in both the short and long run. This is consistent with the findings of Djellouli et al. (2022), Shahbaz et al. (2015), Kasperowicz (2015) and Ahmed et al. (2019). However, our findings are also different from the study conducted by Kahia et al. (2019). This difference in findings may be due to that this study doesn't control all of the potential factors that could influence the relationship between the variables. Future research should address the limitations of this study by controlling for all of the potential factors that could influence the relationship between the variables. Additionally, future research should investigate the causal mechanisms underlying the relationships between the variables.

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