



## Financial Development and Population Growth as Drivers of Environmental Change: Evidence from South Asia

Syed Ammar Husain<sup>1</sup>, Wajid Alim<sup>2</sup>, Hina Gull<sup>3</sup> & Muhammad Azeem<sup>4</sup>

<sup>1</sup>MS Scholar, Lahore School of Accountancy and Finance, University of Lahore, Email: [ammar.zaidi826@gmail.com](mailto:ammar.zaidi826@gmail.com)

<sup>2</sup>Assistant Professor, Lahore School of Accountancy and Finance, University of Lahore, Email: [wajid@uolcc.edu.pk](mailto:wajid@uolcc.edu.pk)

<sup>3</sup>MPhil Scholar, Lahore School of Accountancy and Finance, University of Lahore, Email: [hina.gull9891@gmail.com](mailto:hina.gull9891@gmail.com)

<sup>4</sup>MS Scholar, Lahore School of Accountancy and Finance, University of Lahore, Email: [azeemlahore9211@gmail.com](mailto:azeemlahore9211@gmail.com)

### ARTICLE INFO

#### Article History:

Received: January 11, 2025  
Revised: February 22, 2025  
Accepted: February 24, 2025  
Available Online: February 26, 2025

#### Keywords:

Financial Development, Population Growth, Environment, South Asia

#### Corresponding Author:

Syed Ammar Husain

#### Email:

[ammar.zaidi826@gmail.com](mailto:ammar.zaidi826@gmail.com)

### ABSTRACT

*This study examines the effects of financial development and population growth on environmental sustainability in South Asia. This region has a population density of over 400 people per square kilometer coupled with rapid economic growth leading to an increasing ecological footprint. For this study, panel data for the period 1980 to 2022 of South Asian countries was used. The descriptive study, regression analysis, and fixed effect model were used to analyze the data. The results show that there is a strong positive relation between financial development and ecological footprint, indicating that economic and financial growth contributes significantly towards environmental degradation. However, the relationship between ecological footprint and population density is negative but very weak, which suggests that increasing population density and urbanization that uses shared infrastructures may lead to a marginal reduction in ecological footprint.*



## Introduction

Economic growth is a major concern for many developing countries around the world (Acemoglu, 2012). Many countries are striving for growth but also facing a crucial problem of environmental degradation and increasing ecological footprint the environment. The South Asian region is not different from that. This region is experiencing rapid economic growth along with rapid growth in population, which is taking its toll on the environment (Sarker et al., 2016).

South Asian region is made up of nation-states like Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. It has a total populace of around 1.95 billion people, placing it among the most densely populated regions of the world which has a population density of over 405 people per

square kilometer (Data from World Bank, World Development Index). A large population coupled with the region's financial development and steady population growth poses a serious challenge to environmental sustainability (Sivakumar & Stefanski, 2011). Studies have found that the demands of humanity for natural resources exceed the planet's ability to provide those resources (Mancini et al., 2016). Environmental sustainability is often measured through the Ecological Footprint, which means the impact humans cause on the environment and it is more a comprehensive measure than carbon emissions (Al-Mulali & Ozturk, 2015).

The financial development of any region is the growth, improvement, and expansion of its financial structure, financial systems, and financial markets and institutes. It is also a strong indicator of the country's or region's overall economic growth (Asghar et al., 2024). Financial development contributes largely to economic development, which in turn raises the quality and standard of life but also significantly impacts the ecological footprint (Van et al., 2024; Baloch et al., 2019; Sethi et al., 2020; Iram et al., 2024). The relationship between environmental sustainability and financial development is complex. In some cases, it is evident that at first, with the increase in financial development ecological footprint of the region also increased, but it is reduced in the longer run due to advancements in technology and an increase in the consumption of greener energy (Sun et al., 2023; Asghar et al., 2024). In some other cases, an increase in financial development became one of the factors of reduction in ecological footprint (Xu et al., 2022). The strict environmental laws and their implementation in true letter and spirit are also a factor for the reduction in ecological footprint (Balsalobre-Lorente et al., 2023).

The population of the world has grown at an exponential rate in the last five decades. It became possible due to the increased life expectancy and decreased infant mortality rate. The main reason behind the increased life expectancy and reduced infant mortality is the technological advancement and improvements in medical science. (Woolf & Schoemaker, 2019) ; (Yang et al., 2010) ; (Leon, 2011). Apart from that, the world has also learned a few lessons from the two world wars, and many efforts were made to stop large-scale conflicts after 1945, which included many steps like the setting up of international organizations like the United Nations. Due to these reasons, the world's overall population has increased exponentially after the Second World War. The South Asian region is also affected by this phenomenon, and with the addition of other causes like lack of education, the population increased many times in this region, and it became home to almost one-quarter of the world's population (Pandey & Asif, 2022). A large population needs more land for living and cultivation to fulfill the food needs. It also needs more natural resources to survive, which is also the main cause of pollution, urbanization, deforestation, and increasing ecological footprints. However, it is not a universal law that an increase in population density will lead to an increased ecological footprint. Ahmed studied Japan and found out that increased population density is causing a decrease in ecological footprint. It is occurring mainly due to the use of public transportation, shared living spaces, and achieving economies of scale.

This study intends to examine the impact of population growth, density, and financial development on ecological footprint in the South Asian region. For the past two decades, this region has been experiencing rapid economic and financial growth; however, there is a lack of focus on the sustainability of the environment. The findings will provide valuable insights for policymakers and stakeholders working to strike a balance between economic and financial development with environmental conservation in one of the world's most populated and rapidly developing regions.

## **Literature Review**

The world nowadays is becoming a global village. This rapid globalization is increasing foreign direct investment and trade among countries (Panayotou, 2000). However, globalization itself is not the significant factor in increasing ecological footprints, but the increasing need for energy consumption to achieve higher production levels directly affects the environment (Ahmed et al., 2019). Kuznets (1955) developed a hypothesis that at the beginning of economic growth of the region, its income inequality and environmental degradation also rise, but after a certain threshold of income level, both factors start to improve. Al-Mulali et al. (2015) tested the Environmental Kuznets Curve (EKC) hypothesis by gathering data from 93 countries and their findings reveal that the EKC hypothesis stands true for middle- and high-income countries, but in the case of low-income countries the hypothesis is not proved. It is also revealed that the increase in free trade and energy consumption leads to an increase in ecological footprint, however, the growth of the financial system reduces the negative impact on the environment. Charfeddine and Mrabet (2017) examined 15 Middle Eastern and North African countries, and their study concluded that energy consumption increases the ecological footprints, with urbanization reducing it.

Financial development has a distinctive relationship with ecological footprint. In some cases, it has a positive relation, which implies that the ecological footprint will increase with the rise in financial development. However, in some cases, the relationship is negative, which refers to the fact the increase in financial development will result in the reduction of ecological footprint. On the other hand, some countries exist where the financial development and ecological footprint have an inverted U-shaped relationship which is in line with the Environmental Kuznets Curve hypothesis. In an inverted U-shaped relation, financial development will cause an increase in ecological footprint to a certain extent, and after enough development is achieved, society and businesses will realize the importance of the environment and will take steps to reduce environmental degradation. After that point, an increase in financial development will result in a decrease in ecological footprint. An increase in ecological footprint has been observed with the increase in financial development in Central and Eastern Europe (Chen et al., 2019). Saud et al. (2020) examined the countries associated with China's Belt Road Initiative and the results indicate that ecological footprint has a positive relationship with financial development. These findings are also true in a specific case of Singapore (Ngoc & Awan, 2022). Kihombo et al. (2021) studied West Asian and Middle Eastern countries and found a positive relationship. In another study, Pata and Yilanci (2020) examined G7 countries and found that financial development is positively linked with the increase in ecological footprints in France, Japan, and the United Kingdom. In the case of APEC countries, financial development is playing its role in the reduction of ecological footprints (Usman & Hammar, 2021). On the other hand, Dogan et al. (2019) studied four countries, i.e., Mexico, Indonesia, Nigeria, and Turkey, and concluded that the financial development is contributing toward a reduction in ecological footprint. Majeed and Mazhar (2019) studied a global panel of 131 countries and found that financial development reduces ecological footprints. Finally, Ashraf et al. (2022) examined global panel data from 124 countries and found out that financial development has an inverted U-shaped relation with ecological footprint, which means that initially with financial development the environment deteriorates, but after a certain point an increase in financial development eventually leads to a decrease in ecological footprint. Destek and Sarkodie (2019) examined countries 11 like Brazil, China, India and Turkey which are categorized as newly industrialized countries and the results of the study show that the financial development and ecological footprint have U shaped relationship. This relationship is also found to be valid in Turkey (Godil et al., 2020). Khan et al. (2021) examined the relationship between

ecological footprint and financial development in Bangladesh and interestingly results of the study reveal that there is no relationship between both variables.

Robert Thomas Malthus developed a theory that the human population has the potential to grow exponentially, and eventually, Earth's resources will be unable to cater to the needs of all populations and become extinct (Malthus, 1798). In opposition to Malthus, a Danish economist, Esther Boserup, argued that humans will also respond to the growing population by intensifying agricultural efforts, using more land, and developing and implementing new technologies to get more yield out of the same area of land (PARAJULI, 2007). Researchers have contradictory opinions about the relationship between the rate of population growth and the rate of environmental degradation. It means that some researchers think that environmental degradation rises in proportion to the growth in population while others are of the view that environmental degradation increases out of proportion to the increase in population. Weber and Sciubba (2019) examined the European region and found a strong positive relation between both, which means that the increase in ecological footprint will be disproportionate. The assumption that ecological footprints increase in proportion to the population, with the underlying assumption of a fixed per capita consumption, is also proved to be not true in certain cases where different factors interact, and the author argued that the whole is greater than the sum of its parts (Harte, 2007). In another study, Ehrlich and Holdren (1971) argued that an increase in population growth causes a disproportionate negative impact on the environment. However, studies have found that measures to control the population help decrease ecological footprints (Rozelle et al., 1997). Cafaro and Crist (2012) argued that good policies to reduce population growth can result in a decrease in ecological footprint. Population growth also leads to the urbanization of land, which in turn is the cause of deforestation, resulting in an increased ecological footprint (Lambin & Meyfroidt, 2011). Ahmed et al. (2020) examined the model of developed countries like G-7 member states, and their results also show that urbanization is contributing towards an increase in ecological footprint. However, in the case of Japan, urbanization led to a decrease in ecological footprint due to achieving economies of scale and centralization of resources to a few urban centers (Ahmed et al., 2019). Sharma (2011) also concluded that urbanization reduces ecological footprints in a study that examined a panel of 69 countries. Kongbuamai et al. (2020) examined the 42-year data of Thailand and concluded that an increase in population density leads to a decrease in ecological footprints. Alola et al. (2019) examined 16 countries of the European Union, and the empirical evidence indicates that the fertility rate is positively linked with the ecological footprint in the long term and in the short term, the relationship is insignificant.

## **Methodology**

The main objective of this study is to examine the effects of financial development and population growth on the ecological footprint in the South Asian region. Population density is used as a proxy for population growth. It was used by Klasen and Nestmann (2006) to examine the impact of population growth on changes and advancements in technology. It can be argued that the growth rate of the population is a more appropriate measure of population growth, but it is necessary to understand that the growth rate depicts the year-to-year percentage change in the growth of the population, and it could be positive or negative depending upon the fact of how much the population has increased or decreased in comparison to last year. It could have a decreasing trend, but that does not necessarily mean that the population is not growing; it only means that the pace of growth is slowed down. This decreasing trend could generate misleading results when analyzed, and to mitigate this effect, population density is being used in this study. Another argument can be made that total population may be used, but it could also generate misleading results due to the

factor that regions with high populations may also have large areas of land, which means that total arable land is higher, producing more resources and reducing the burden on land for residential use. Population density is a more appropriate metric that can be used as a population growth proxy because it mitigates the effects of both percentage change trends and total land available, as it is calculated by dividing the total population by total land. It provides us with the total population per square kilometer of land. For this study, secondary data from 1980 to 2022 from eight South Asian countries were collected from the World Bank Database (World Development Indicators), International Monetary Fund, and Global Footprint Network. The econometric model is

$$EFP = \alpha + \beta_1 FD + \beta_2 PD + \varepsilon$$

<b>Variables</b>	<b>Description</b>	<b>Source</b>
<b>EFP</b>	Ecological Footprint measured in global hectares	Global Footprint Network
<b>FD</b>	Financial Development measured through the Financial Development Index	IMF
<b>PD</b>	Population Density measured as persons per square kilometers	World Bank

To find out the measure of dispersion in data, the descriptive statistics method is employed as the first test. This test is also helpful in establishing the normality of data. The is also tested for the correlation among variables using the correlation matrix which was developed by Pesaran and Smith (1995) and amended by Chudik and Pesaran (2015). For the selection of an appropriate model for estimation between random and fixed effect models, the famous Hausman Test is used. To determine the significance of variables, OLS is also used.

## **Results and Discussions**

This study has employed different statistical tools to analyze, evaluate, and quantify the impact of financial development and population growth on the ecological footprint in the South Asian region. Firstly, tests for descriptive statistics were run on the data to find the dispersion and deviation from the mean values of the data.

**Table: 1 Descriptive Statistics**

<b>Variables</b>	<b>Observation</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Ecological Footprint (EP)</b>	344	17.30822	1.974318	13.341	21.11636
<b>Financial Development (FD)</b>	344	0.2157788	0.1047435	0	0.5387585
<b>Population Density (PD)</b>	344	393.0569	408.1667	9.276031	1747.02

The results in Table 1 show that the mean of the ecological footprint over the entire South Asian region is 17.3 global hectares with a range of 13.3 to 21.11. This indicates that some of the regions have significantly higher ecological footprints in comparison to the others. Financial development results suggest that there is a disparity in the financial system. Some of the countries in the region have more established financial systems, and they are more financially developed. Interestingly,

population density results show that some areas are very densely populated. It is also an indication that the population lives in both urban and rural settings in South Asia.

**Table: 2 Correlation Matrix**

	<b>Ecological Footprint</b>	<b>Financial Development</b>	<b>Population Density</b>
Ecological Footprint	1.0000		
Financial Development	0.7029	1.0000	
Population Density	-0.1247	-0.0537	1.0000

Table 2 depicts the correlation matrix, and it reveals that there is a strong positive relationship between ecological footprint and financial development, which means that in the South Asian region, financial development is one of the major contributors to the increasing ecological footprint. These results are consistent with the findings of Islam (2022); Javaid et al., (2023) and Tahir et al. (2021), who has also studied the South Asia Region. However, population density and ecological footprint are negatively correlated. This negative correlation is very weak. It implies that urbanization contributes to the reduction of ecological footprint, but it has a very low impact. It also shows that there is virtually no linear relation between financial development and population density, and results are free of multicollinearity issues.

**Table 3: Ordinary Least Square**

<b>EF</b>	<b>Coefficient</b>	<b>St-Error</b>	<b>t</b>	<b>P&gt;  t </b>	<b>95% Conf</b>	<b>Interval</b>
PD	-0.0004217	0.0001852	-2.28	0.023**	-0.0007859	-0.0000574
FD	13.1609	0.7216144	18.24	0.000***	11.74152	14.58028
Cons	14.63412	0.190892	76.66	0.000***	14.25865	15.00959
Prob > F				0.0000		
R – Squared				0.5017		
R - Squared				0.4987		
Adjusted						

Results of OLS analysis are shown in Table 3 which suggests that the independent variables explain a significant portion of the dependent variable as the value of adjusted  $R^2$  is 0.4987. Furthermore, this analysis also shows that there is a negative relationship between population density and ecological footprint but its impact is less significant, however, the relationship between ecological footprint and financial development is strong and positive. These results are also in line with the correlation matrix results shown in Table 2.

**Table 4: Hausman Test**

chi2(2)	8.56
Prob>chi2	0.0138

The Hausman test was also conducted to select appropriate models from the random or fixed effect models. For this purpose, hypotheses were constructed as  $H_0$ : Random effects model is appropriate and  $H_a$ : Fixed effects model is appropriate. Results in Table 4 indicate that the null hypothesis is to be rejected and the fixed effect model is to be used.

**Table 5: Fixed Effect Model**

EF	Coefficient	St-Error	t	P>  t	95% Conf	Interval
PD	-0.008482	0.002775	-3.06	0.002**	-0.0013943	-0.0003022
FD	14.68346	0.8445212	17.39	0.000***	13.02152	16.34539
Cons	17.64162	0.1549977	113.82	0.000***	17.3366	17.94664

After performing the Hausman test and finding an appropriate model, the fixed effect model was analyzed, and its results as shown in table 5 depict that there is a positive and strong relationship between ecological footprint and financial development. The development of the financial sector of the South Asian region contributes significantly to the economic development of the region (Ahmed & Ansari, 1998). The economic development of the region is often fueled by its policies toward trade openness, foreign direct investment, and consistent policies toward trade (Guha-Khasnobis & Bari, 2003). Economic development may lead to many good things, like higher quality of life, better infrastructure, good healthcare, and a poverty reduction. However, there are some costs of the economic development, which is largely concerned with the environment of the region. The cost to the environment of economic development often outweighs its benefits to the overall society (Islam et al., 2003). Energy consumption is also a determining factor in the economic development of the South Asian region (Rahman et al., 2019). The rise in consumption and utilization of energy is leading to a rising ecological footprint (Omer, 2008). The results of this study show that a one-unit increase in financial development will lead to almost a 15-unit increase in ecological footprint. This is a strong positive relation and is consistent with the findings of several studies. Chen et al. (2019) examined the central and eastern European countries and concluded the same. The Belt Road Initiative countries also show the same results (Saud et al., 2020). The results are also true in the case of Singapore (Ngoc & Awan, 2022). Kihombo et al. (2021) studied West Asian and Middle Eastern countries and also found a positive relationship. In the case of G7 countries, the results are consistent with the United Kingdom, France, and Japan only (Pata & Yilanci, 2020). In contrast to these results, researchers have also found a negative relationship between financial development and ecological footprints while examining countries like Mexico, Indonesia, Turkey, and many others (Dogan et al., 2019; Majeed & Mazhar, 2019).

The results of this study also show that the relation between population density and ecological footprint is negative and weaker. In other words, we can say that the increase in population density reduces the ecological footprint, but its effect is very insignificant. These results are in disagreement with the population theory of Robert Malthus, which says that an increase in population will eventually end all of the resources of the planet. The findings of this study are consistent with the studies of Sharma (2011); Ahmed et al., (2019) and Kongbuamai et al. (2020) all of those studies concluded that urbanization decreases the negative impact on the environment. One of the main contributors to carbon emissions and ecological footprints is the vehicles and traffic on roads (Boikos et al., 2025). Due to increased population densities and urbanization, people tend to rely more on the combined public transport systems, and it slightly reduces the impact on the environment. Buildings around the globe use around 40% of the total energy, leaving a very significant negative impact on the environment (Omer, 2008). Increasing population density and urbanization are pushing people towards the use of combined residential and office spaces due to ever-increasing rents and a shortage of urban land. It is also contributing slightly towards the betterment of the environment of the planet.

## **Conclusion**

Development is the ultimate goal of every nation. Development may be technological, infrastructure, human capital, military, economic, or financial. To achieve the ultimate goal, humans are sacrificing their natural environment. The intended purpose and objective of this study was to examine the impact of financial development and population growth on the environment in the South Asian Region. The findings of this study reveal that financial and economic development is highly beneficial to society as well as the individuals who contribute significantly to environmental degradation. However, this effect could be mitigated in the long run by implementation of strict environmental policies and switching towards renewable energy sources. Conversely, the relationship between population density and ecological footprint was found to be weakly negative. This suggests that higher population density may lead to certain efficiencies, such as the use of public transport and shared residential accommodations, which lessens the burden on the environment. Policymakers should focus on the development of infrastructure and capabilities to support this. The results emphasize the pressing need for South Asian countries to adopt policies that balance financial development with environmental conservation. Policymakers should focus on promoting sustainable financial practices, investing in green technologies, and enforcing stringent environmental regulations to mitigate the ecological footprint.

## **References**

1. Acemoglu, D. (2012). Introduction to economic growth. *Journal of economic theory*, 147(2), 545-550.
2. Ahmed, S. M., & Ansari, M. I. (1998). Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3), 503-517.
3. Ahmed, Z., Wang, Z., Mahmood, F., Hafeez, M., & Ali, N. (2019). Does globalization increase the ecological footprint? Empirical evidence from Malaysia. *Environmental Science and Pollution Research*, 26, 18565-18582.
4. Ahmed, Z., Zafar, M. W., & Ali, S. (2020). Linking urbanization, human capital, and the ecological footprint in G7 countries: an empirical analysis. *Sustainable cities and society*, 55, 102064.
5. Al-Mulali, U., & Ozturk, I. (2015). The effect of energy consumption, urbanization, trade openness, industrial output, and political stability on the environmental degradation in the MENA (Middle East and North African) region. *Energy*, 84, 382-389.
6. Al-Mulali, U., Weng-Wai, C., Sheau-Ting, L., & Mohammed, A. H. (2015). Investigating the environmental Kuznets curve (EKC) hypothesis by utilizing the ecological footprint as an indicator of environmental degradation. *Ecological indicators*, 48, 315-323.
7. Alola, A. A., Bekun, F. V., & Sarkodie, S. A. (2019). The dynamic impact of trade policy, economic growth, fertility rate, and renewable and non-renewable energy consumption on ecological footprint in Europe. *Science of the total environment*, 685, 702-709.
8. Ashraf, A., Nguyen, C. P., & Doytch, N. (2022). The impact of financial development on ecological footprints of nations. *Journal of Environmental Management*, 322, 116062.
9. Asghar, M. M., Safdar, R., Zubair, M., & Hanif, M. (2024). Exploring the Influence of Financial Development, Institutional Quality and Trade Openness on Inclusive Growth in SAARC Countries. *Pakistan Journal of Humanities and Social Sciences*, 12(2), 1450-1461.
10. Asghar, M. M., Arshad, Z., Yousaf, S., e Ali, M. S., & Tariq, M. (2024). Environmental Degradation in BRI Countries: Navigating the Role of Natural Resources, Green Energy and Green Finance. *Pakistan Journal of Humanities and Social Sciences*, 12(3), 2705-2716.

11. Baloch, M. A., Zhang, J., Iqbal, K., & Iqbal, Z. (2019). The effect of financial development on ecological footprint in BRI countries: evidence from panel data estimation. *Environmental Science and Pollution Research*, 26, 6199-6208.
12. Balsalobre-Lorente, D., Topaloglu, E. E., Nur, T., & Evcimen, C. (2023). Exploring the linkage between financial development and ecological footprint in APEC countries: A novel view under corruption perception and environmental policy stringency. *Journal of Cleaner Production*, 414, 137686.
13. Boikos, C., Ioannidis, G., Rapkos, N., Tsegas, G., Katsis, P., & Ntziachristos, L. (2025). Estimating daily road traffic pollution in Hong Kong using CFD modelling: Validation and application. *Building and Environment*, 267, 112168.
14. Cafaro, P., & Crist, E. (2012). *Life on the brink: environmentalists confront overpopulation*. University of Georgia Press.
15. Charfeddine, L., & Mrabet, Z. (2017). The impact of economic development and social-political factors on ecological footprint: A panel data analysis for 15 MENA countries. *Renewable and sustainable energy reviews*, 76, 138-154.
16. Chen, S., Saud, S., Saleem, N., & Bari, M. W. (2019). Nexus between financial development, energy consumption, income level, and ecological footprint in CEE countries: do human capital and biocapacity matter? *Environmental Science and Pollution Research*, 26, 31856-31872.
17. Chudik, A., & Pesaran, M. H. (2015). Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors. *Journal of econometrics*, 188(2), 393-420.
18. Destek, M. A., & Sarkodie, S. A. (2019). Investigation of environmental Kuznets curve for ecological footprint: the role of energy and financial development. *Science of the total environment*, 650, 2483-2489.
19. Dogan, E., Taspinar, N., & Gokmenoglu, K. K. (2019). Determinants of ecological footprint in MINT countries. *Energy & Environment*, 30(6), 1065-1086.
20. Ehrlich, P. R., & Holdren, J. P. (1971). Impact of Population Growth: Complacency concerning this component of man's predicament is unjustified and counterproductive. *Science*, 171(3977), 1212-1217.
21. Godil, D. I., Sharif, A., Rafique, S., & Jermisittiparsert, K. (2020). The asymmetric effect of tourism, financial development, and globalization on ecological footprint in Turkey. *Environmental Science and Pollution Research*, 27, 40109-40120.
22. Guha-Khasnobis, B., & Bari, F. (2003). Sources of growth in South Asian countries. *The South Asian experience with growth*, 13-79.
23. Harte, J. (2007). Human population as a dynamic factor in environmental degradation. *Population and Environment*, 28, 223-236.
24. Islam, M. S. (2022). Does financial development cause environmental pollution? Empirical evidence from South Asia. *Environmental Science and Pollution Research*, 29(3), 4350-4362.
25. Islam, S. M., Munasinghe, M., & Clarke, M. (2003). Making long-term economic growth more sustainable: evaluating the costs and benefits. *Ecological Economics*, 47(2-3), 149-166.
26. Iram, M., Zameer, S., & Asghar, M. M. (2024). Financial Development, ICT Use, Renewable Energy Consumption and Foreign Direct Investment Impacts on Environmental Degradation in OIC Countries. *Pakistan Journal of Humanities and Social Sciences*, 12(2), 1303-1315.
27. Javid, M. Q., Ximei, K., Irfan, M., Sibte-Ali, M., & Shams, T. (2023). RETRACTED ARTICLE: Exploring the nonlinear relationship among financial development, human

- capital and CO2 emissions: a comparative study of South and East Asian emerging economies. *Environmental Science and Pollution Research*, 30(37), 87274-87285.
28. Khan, A. G., Hossain, M. A., & Chen, S. (2021). Do financial development, trade openness, economic development, and energy consumption affect carbon emissions for an emerging country? *Environmental Science and Pollution Research*, 28, 42150-42160.
  29. Kihombo, S., Ahmed, Z., Chen, S., Adebayo, T. S., & Kirikkaleli, D. (2021). Linking financial development, economic growth, and ecological footprint: what is the role of technological innovation? *Environmental Science and Pollution Research*, 28(43), 61235-61245.
  30. Klasen, S., & Nestmann, T. (2006). Population, population density and technological change. *Journal of Population Economics*, 19, 611-626.
  31. Kongbuamai, N., Zafar, M. W., Zaidi, S. A. H., & Liu, Y. (2020). Determinants of the ecological footprint in Thailand: the influences of tourism, trade openness, and population density. *Environmental Science and Pollution Research*, 27, 40171-40186.
  32. Kuznets, S. (1955). Economic growth and income inequality. In *The gap between rich and poor* (pp. 25-37). Routledge.
  33. Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the national academy of sciences*, 108(9), 3465-3472.
  34. Leon, D. A. (2011). Trends in European life expectancy: a salutary view. In (Vol. 40, pp. 271-277): Oxford University Press.
  35. Majeed, M. T., & Mazhar, M. (2019). Financial development and ecological footprint: a global panel data analysis. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, 13(2), 487-514.
  36. Malthus, T. R. (1798). *An essay on the principle of population: The 1803 edition*. Yale University Press.
  37. Mancini, M. S., Galli, A., Niccolucci, V., Lin, D., Bastianoni, S., Wackernagel, M., & Marchettini, N. (2016). Ecological footprint: refining the carbon footprint calculation. *Ecological indicators*, 61, 390-403.
  38. Ngoc, B. H., & Awan, A. (2022). Does financial development reinforce ecological footprint in Singapore? Evidence from ARDL and Bayesian analysis. *Environmental Science and Pollution Research*, 29(16), 24219-24233.
  39. Omer, A. M. (2008). Energy, environment and sustainable development. *Renewable and sustainable energy reviews*, 12(9), 2265-2300.
  40. Panayotou, T. (2000). Globalization and environment. *CID Working Paper Series*.
  41. Pandey, A., & Asif, M. (2022). Assessment of energy and environmental sustainability in South Asia in the perspective of the Sustainable Development Goals. *Renewable and sustainable energy reviews*, 165, 112492.
  42. PARAJULI, R. R. (2007). TESTING BOSERUP. *Making World Development Work: Scientific Alternatives to Neoclassical Economic Theory*, 192.
  43. Pata, U. K., & Yilanci, V. (2020). Financial development, globalization and ecological footprint in G7: further evidence from threshold cointegration and fractional frequency causality tests. *Environmental and Ecological Statistics*, 27(4), 803-825.
  44. Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. *Journal of econometrics*, 68(1), 79-113.
  45. Rahman, M. M., Rana, R. H., & Barua, S. (2019). The drivers of economic growth in South Asia: evidence from a dynamic system GMM approach. *Journal of Economic Studies*, 46(3), 564-577.

46. Rozelle, S., Huang, J., & Zhang, L. (1997). Poverty, population and environmental degradation in China. *Food policy*, 22(3), 229-251.
47. Sarker, S., Khan, A., & Mamur Mannan, M. (2016). Urban population and economic growth: South Asia perspective. *European Journal of Government and Economics*, 5(1), 64-75.
48. Saud, S., Chen, S., & Haseeb, A. (2020). The role of financial development and globalization in the environment: accounting ecological footprint indicators for selected one-belt-one-road initiative countries. *Journal of Cleaner Production*, 250, 119518.
49. Sethi, P., Chakrabarti, D., & Bhattacharjee, S. (2020). Globalization, financial development and economic growth: Perils on the environmental sustainability of an emerging economy. *Journal of Policy Modeling*, 42(3), 520-535.
50. Sharma, S. S. (2011). Determinants of carbon dioxide emissions: empirical evidence from 69 countries. *Applied energy*, 88(1), 376-382.
51. Sivakumar, M. V., & Stefanski, R. (2011). Climate change in South Asia. *Climate change and food security in South Asia*, 13-30.
52. Sun, Y., Al-Tal, R. M., Bakkar Siddik, A., Khan, S., Murshed, M., & Alvarado, R. (2023). The non-linearity between financial development and carbon footprints: the environmental roles of technological innovation, renewable energy, and foreign direct investment. *Economic research-Ekonomska istraživanja*, 36(2).
53. Tahir, T., Luni, T., Majeed, M. T., & Zafar, A. (2021). The impact of financial development and globalization on environmental quality: evidence from South Asian economies. *Environmental Science and Pollution Research*, 28, 8088-8101.
54. Usman, M., & Hammar, N. (2021). Dynamic relationship between technological innovations, financial development, renewable energy, and ecological footprint: fresh insights based on the STIRPAT model for Asia Pacific Economic Cooperation countries. *Environmental Science and Pollution Research*, 28(12), 15519-15536.
55. Van, T. H., Lichang, L., & Quoc, T. D. T. (2024). Sustainable development in Southeast Asia: The nexus of tourism, finance, and environment. *Heliyon*.
56. Weber, H., & Sciubba, J. D. (2019). The effect of population growth on the environment: evidence from European regions. *European Journal of Population*, 35, 379-402.
57. Woolf, S. H., & Schoomaker, H. (2019). Life expectancy and mortality rates in the United States, 1959-2017. *Jama*, 322(20), 1996-2016.
58. Xu, B., Li, S., Afzal, A., Mirza, N., & Zhang, M. (2022). The impact of financial development on environmental sustainability: a European perspective. *Resources Policy*, 78, 102814.
59. Yang, S., Khang, Y.-H., Harper, S., Davey Smith, G., Leon, D. A., & Lynch, J. (2010). Understanding the rapid increase in life expectancy in South Korea. *American journal of public health*, 100(5), 896-903.