NEAR EAST UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BANKING AND FINANCE PROGRAM

AN INVESTIGATING THE IMPACT OF ECONOMIC GROWTH, FINANCE AND TRADE NEXUS ON ENVIRONMENTAL DEGRADATION (CAPTURE FISHERIES PRODUCTION) IN SELECTED 14 EMERGING COUNTRIES

MOHAMMAD RAHSDAN

PhD THESIS

NICOSIA
2021

AN INVESTIGATING THE IMPACT OF ECONOMIC GROWTH, FINANCE AND TRADE NEXUS ON ENVIRONMENTAL DEGRADATION (CAPTURE FISHERIES PRODUCTION) IN SELECTED 14 EMERGING COUNTRIES

MOHAMMAD RASHDAN

NEAR EAST UNIVERSITY GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BANKING AND FINANCE PROGRAM

PhD THESIS

ASSOC.PROF.DR. TURGUT TÜRSOY

NICOSIA
2021

ACCEPTANCE/APPROVAL

We as the jury members certify the 'An investigating the impact of economic growth,finance and trade nexus on Environmental degradation(capture fisheries production) in selected 14 emerging countries' prepared by the Mohammad Othman Jamil Rashdan defended on 16/6/2021 has been found satisfactory for the award of degree of Phd.

JURY MEMBERS

.....

Assoc. Prof. Dr. Turgut Türsoy
(Supervisor)
Near East University
Faculty of Economics and Administrative Sciences Department of Banking and Finance

.....

Assoc. Prof. Dr. Veclal Gündüz
(Head of Jury)
Bahçeşehir Cyprus University
Faculty of Economics, Administrative and Social Sciences Department of Banking and Finance

.....

Assoc. Prof. Dr. Faisal Saher
Abdul Wali Khan University
Faculty of Business and Economices Department of Institute of Business Studies and Leadership

.....

Assist. Prof. Dr.Kemal çek
Near East University
Faculty of Economics and Administrative Sciences Department of International Business

.....

Assist. Prof.Dr. Ahmad Samour
Near East University
Faculty of Economics and Administrative Sciences Department of Banking and Finance

.....

Assist. Prof.Dr. Wagdi Khalifa
Near East University
Faculty of Economics and Administrative Sciences Department of Banking and Finance

.....

Prof. Dr. K.HÜSNÜ Can Başer
Director of Inistitute of Graduate
studies

DECLARATION

Im Mohammad Othman Jamil Rashdan, hereby declare that this dissertation entitled ‘An investigating the impact of economic growth,finance and trade nexus on invironmental degradation(capture fisheries production) in selected 14 emerging countries’ has been prepared myself under the guidance and supervision of ‘Assoc.Prof.Dr Turgut Türsoy’ in partial fulfilment of the Near East University, Graduate School of Social Sciences regulations and does not to the best of my knowledge breach and Law of Copyrights and has been tested for plagiarism and a copy of the result can be found in the Thesis.

- The full extent of my Thesis can be accesible from anywhere.
- My Thesis can only be accesible from Near East University.
- My Thesis cannot be accesible for two(2) years. If I do not apply for extention at the end of this period, the full extent of my Thesis will be accesible from anywhere.

Date

Signature

Name Surname

DEDICATION

In the name of Allah the Beneficent and the Merciful,my thesis is dedicated to:

My lovely wife ,Wonderful wife who supported me each step of the way.

My beloved mother; who always support me emotionally with prayer, love, and patience. You are the biggest spirit for me.

My beloved dad,The man who taught me to perform all of life's tasks no matter how big or small,To the beast of my ability and without complaint he is the man i will always aspire to be.

ACKNOWLEDGEMENTS

I would like to thank Dr. Faisal Saher for his continuous encouragement throughout my study .he supported gave me always the power to proceed with this study. my great thanks to all the staff of our department the chairman Assoc. Prof. Turgut Tursoy.

I would like also to thank my family, my father,my waif, my mother, my brothers and sisters for their love and faithfulness. Without forgetting all my friend in Palestine, Algeria, Jordan, Syria, Cyprus, and all over the world , thank you all with my love.

ABSTRACT

AN INVESTIGATING THE IMPACT OF ECONOMIC GROWTH, FINANCE AND TRADE NEXUS ON ENVIRONMENTAL DEGRADATION (CAPTURE FISHERIES PRODUCTION) IN SELECTED 14 EMERGING COUNTRIES

The majority of studies investigating the environmental Kuznets curve predominantly focus on atmospheric indicators, thereby neglecting other environmental indicators such as land, sea, coastal, coral reefs, freshwater, and biodiversity indicators. This study aims to examine the environmental Kuznets curve by using capture fisheries production as a biodiversity indicator. The study uses a panel of 14 countries, of which 10 are newly industrialized and the other 4 are fast-emerging countries. The study applies the CADF and CIPS unit root tests to identify the integration order as proposed by Pesaran (2007). After identifying the unique order of integration, the Westerlund (2007) panel cointegration is applied. A long-run relationship is confirmed among the variables. The study revealed that an N-pattern relationship exists between capture fisheries production (CFP) and growth of the economy in the panel of selected countries. The industry focuses on achieving a cleaner environment and promotes the sustainable development of the fisheries. Financial development has a negative and significant effect on CFP. This reflects that domestic credit is not only used for the capture of fish but also for conservation purposes. The exports of goods and services have a positive relationship with CFP, while imports have a negative and significant effect on CFP. Policies to promote investments in the conservation of fisheries should be implemented, and credit creation should be directed by appropriate legislation to ensure the conservation of biodiversity and environmental sustainability.

Keywords : nvironmental Kuznets curve, Economic growth, Fish biodiversity, Sustainability ,N-shaped EKC.

ÖZ

AN INVESTIGATING THE IMPACT OF ECONOMIC GROWTH, FINANCE AND TRADE NEXUS ON ENVIRONMENTAL DEGRADATION (CAPTURE FISHERIES PRODUCTION) IN SELECTED 14 EMERGING COUNTRIES

Çevresel Kuznets eğrisini araştıran çalışmaların çoğu, ağırlıklı olarak atmosferik göstergelere odaklanır ve bu nedenle kara, deniz, kıyı, mercan resifleri, tatlı su ve biyolojik çeşitlilik göstergeleri gibi diğer çevresel göstergeleri ihmal eder. Bu çalışma, yakalama balıkçılığı üretimini bir biyoçeşitlilik göstergesi olarak kullanarak çevresel Kuznets eğrisini incelemeyi amaçlamaktadır. Çalışmalarin, 10'u yeni sanayileşmiş ve diğer 4'ü hızla gelişen ülkeler olan 14 ülkeden oluşan bir panel kullanıyor. Çalışma, Pesaran (2007) tarafından önerilen entegrasyon sırasını belirlemek için CADF ve CIPS birim kök testlerini uygular. Benzersiz entegrasyon sırasını belirledikten sonra, Westerlund (2007) paneli eşbütünleşme uygulandı. Değişkenler arasında uzun dönemli bir ilişki doğrulanmıştır. Çalışma, seçilen ülkeler panelinde yakalama balıkçılığı üretimi (CFP) ile ekonominin büyümesi arasında bir N-modeli ilişkisinin olduğunu ortaya koydu. Endüstri, daha temiz bir çevre elde etmeye odaklanır ve balıkçılığın sürdürülebilir gelişimini destekler. Finansal gelişme, CFP üzerinde olumsuz ve önemli bir etkiye sahiptir. Bu, yerli kredinin sadece balık avı için değil, aynı zamanda koruma amacıyla da kullanıldığını yansıtmaktadır. Mal ve hizmet ihracatı CFP ile pozitif bir ilişki içindeyken, ithalatın CFP üzerinde negatif ve anlamlı bir etkisi vardır. Balıkçılığın korunmasına yönelik yatırımları teşvik etmeye yönelik politikalar uygulanmalı ve kredi oluşturma, biyoçeşitliliğin ve çevresel sürdürülebilirliğin korunmasını sağlamak için uygun mevzuatla yönlendirilmelidir.

Anahtar Kelimeler: çevresel Kuznets eğrisi, Ekonomik büyüme, Balık biyoçeşitliliği, Sürdürülebilirlik, N-şekilli EKC.

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

INTRODUCTION

Environmental degradation and climate change have attracted the attention of governments, policymakers, researchers, and development cooperation around the world. The Paris Agreement of 12 December 2015 represents a notable attempt by the global community to arrest climate change where economies are required to commit to meeting specific targets. There is multiplicity of factors that play a role in degrading the environment and cause climate change such as population growth, economic growth, urbanization, trade, technology, choice of infrastructure, and behavior. Among them is the ocean, which possesses extensive natural resources that not only provide the necessities of life to humans due to its regenerative capacity but also facilitate human wealth. However, Halpern et al. (2012) argued that this regenerative capacity has been degraded due to coastal development, pollution, and overexploitation. This has been experienced over the past few decades with a significant decreases in fisheries production, which is on the verge of serial depletion (Worm et al. 2006, 2007). Further, Srinivasan et al. (2010) and Worm et al. (2006, 2007) argued that if the same level of overexploitation of fish continues over time, then the global marine fisheries production will collapse by 2048.

Bruinsma (2003) highlighted the importance of agricultural products and considered it as the backbone of economic development. The agriculture sector makes a significant contribution to the GDP of an economy. The BRICS countries are heavily dependent on the agricultural sector, and these countries account for more than 40% of the entire world population. This results in an

overall contribution of 20% to the global GDP. This has been quite evident as the BRICS contribute more than one-third of the global cereal and wheat production. The impressive growth in the agriculture sector is because of the advancement in biotechnology as well as the use of information and communication technology (ICT). Further, Goldman Sachs (2015) identified the N-11 countries as the world largest economies, which include Mexico, Indonesia, Nigeria, Turkey, Bangladesh, Egypt, Iran, Pakistan, Philippines, South Korea, and Vietnam1 (Raza et al. 2020). Moreover, it is further argued that by the end of 2050, the N-11 countries could reach two-thirds the size of the G-7 economies in terms of GDP. The reason for this impressive growth is the technological and industrial integration of the N-11 countries with the rest of the world in the emerging stage (Sinha et al. 2017). Additionally, these countries were then further categorized as the N-11 or next 11 countries (Eghbal 2008). Among agricultural products, the fisheries sector is one of the most valuable commodities that has significant importance as it is exported to the rest of the world. This results in the generation of up to 80 billion USD in revenue, with the sales of fish showing an increasing trend each year (FAO, Fish Stat 2006). This indicates that fish exports are not only considered as a source of revenue but also as a source of employment and livelihood, particularly for lower-income groups. Moreover, the BRICS countries have experienced impressive growth, which has been quite evident with the total GDP of 37.5 trillion dollars that is far more than 30% global GDP of the world with 42% population in BRICS countries (Central Intelligence Agency, 2017). Further, several studies have argued that due to their sound industrial structure, the BRICS countries are positioning themselves as potential global

leaders both economically and technologically (Danish et al. 2019; Azevedo et al. 2018). However, at the same time, these countries are also focusing on the promotion of stricter environmental regulations to maintain their GDP by improving environmental quality. Overfishing has been on the rise in the N-11 countries, and fishing rates have been particularly increasing in Indonesia, Nigeria, Mexico, Philippines, and Pakistan in terms of the catch trend for the period 2007–2016. Thus, this has resulted in the contribution of 58.7 percentage to the global marine fisheries catch. However, a lower fish catch rate has been identified for the period 2007–2016 for Turkey, which amounts to 5.9% of the global marine fisheries catch. The majority of studies that have focused on the environmental Kuznets hypothesis have concentrated on the atmospheric indicators of environmental degradation; however, there is minimal research involving other environmental factors like land, freshwater, coast, ocean, sea, as well as biodiversity indicators (Sarkodie and Strezov 2019). The present study will examine the environmental Kuznets curve (EKC) hypothesis for Brazil, Russia, China, South Africa, Mexico, Indonesia, Nigeria, Turkey, Bangladesh, Egypt, Iran, Pakistan, Philippines, and South Korea. To the best of the authors' knowledge, only Sugiawan et al. (2017) have investigated the capture fisheries production (CFP) model using population and economic growth as regressors. However, this study investigates the question on how to control overexploitation of fish over time by investigating the N-shaped EKC? Further this study is different in the sense that it included financial development (FD), imports, exports, and industry value added to assess the CFP-GDP nexus. This study is the first of its kind to investigate this nexus using FD, imports, exports, and industry value added.

Background

The global economy have been under a multiplicity of economic crises such as the 2008-2009 financial crisis, the 2010-2012 debt crisis in Europe and the 2014-2016 global commodities realignment period. The end of these crises brought some relief to the global economy which was dragged to its knees by these avenging crises and this have given room for public policies to be realigned in line with the new social, economic and environmental issues of sustainability, UN (2018). The United Nations further noted that in the year 2017, the global economy realized a 3.0% growth rate, 2.4% in 2016 and this was the largest growth rate ever recorded since 2011; in addition global economic growth rate in the years 2018 and 2019 was expected to hover around 3%. The rapid economic growth rate for the global economy in the recent past years was mainly due to strengthening growth in advanced economies, however, East and South Asia were considered highly dynamic; while Argentina, Brazil and Nigeria made significant contribution to global economic growth for the years 2016 and 2017. However, in other parts of the global economy, economies have not yet realized any sustainable economic growth since inequalities are evident on different economies and economic regions around the globe. A stronger global macroeconomic environment brings favorable economic conditions for investment as a result of low risks on financial assets, reduced banking system weaknesses and a strengthening commodities sector in the global economy. Furthermore, world trading improved in 2017 as a result of growing demand for imports from East Asia because of good public policy initiatives in this economic region, as well, imports of capital goods increased in developed countries as a result of sound

investment conditions. On the other hand trade restrictions and trade wars impose some uncertainties on world trading and this was worsened by a decision made by the UK and Northern Ireland to exit the European Union and also a renegotiation of the North American Free Trade Agreement by the United States of America. Climatic changes and environmental degradation specially on aqua ecosystem needs to be urgently addressed since rapid global economic growth leads to a plethora of environmental costs such as pollution. The adoption of renewable energy is progressing at a faster pace worldwide, and China is the “big brother” investor in renewable energy; however, Africa is most hit with energy shortages. Notwithstanding all these challenges and opportunities confronting the global economic system, there is an urgent need strengthen environmental sustainability growth initiatives through the introduction of sound and robust public policies and regulatory initiatives.

Statement Of The Problem

Climatic changes as well as the degradation of the environment specially on the aqua ecosystem have become a global issue and it have drawn the attention of development cooperation, governments, policy makers, investors and academia; although the global financial crisis of 2008-2009 is seemingly over, there are great uncertainties; the global economy is on the verge of missing on the pledge for Sustainable Development Goals, since very few emerging economies will be able to fulfil their pledge on SDGs and also climatic changes are rampant on the global economy due to massive environmental degradation(capture fisheries production).

So, how we can maintain sustainable level of capture fisheries that's can contributes to the economy in general and by improving the export and decreasing the import of catch fishes?

Aim Of The Study

The study is aimed at an investigating the impact of economic growth, finance and trade nexus on capture fisheries production in selected 14 emerging economies with a view to unleashing sound public policy and regulatory interventions for sustainable development. Other specific objectives will include to:

a. investigate the nexus between economic growth and environmental degradation (CFP) in selected emerging economies.
b. empirically examine the relationship between trade and environmental degradation (CFP) in selected emerging economies.
c. explore the environment-finance nexus in selected emerging economies.
d. analyze the impact of institutions supporting growth and development in selected emerging economies; and
e. reveal the nature of causalities which exist between economic growth, environmental degradation (capture fisheries production), finance and trade in selected emerging economies in order to develop sound public policy and regulatory interventions.

Significance Of The Study

The research study will widen the scope of public policy reorientation in selected 14 emerging economies across the domains of sustainable economic

growth, environmental sustainability, finance and trade. The main contribution of the study being to investigate the impact of economic growth, finance and trade in the environmental Kuznets context, specifically the cubic polynomial function, in the process considering the Sustainable Development Goals. In the same way, the research study will delve into the turning points of the environmental Kuznets curve and compare the 7% growth target under the SDGs with the average growth which is achieved at the turning points. The study will consider capture fisheries production indicators in selected emerging economies environmental Kuznets curve analysis. To the best of my knowledge, this will be the unique contribution of this work since there is no available research has investigated the nexus between CFP and GDP in the presence of financial development, imports, exports, and industry value added. Therefore, this study is the first of its kind to study the nexus between capture fisheries and economic growth in the presence of financial developments, imports, exports, and industry value added using the secondgeneration panel techniques.

Research Questions

The study will answer the following questions:

(a) Does the environmental Kuznets curve hold in selected emerging economies?

(b) Is there any relationship between trade and environmental degradation (CFP) in selected emerging economies?

(c) What is the nexus between environmental degradation (CFP) and finance in the context of selected emerging economies?

(d) Are institutions and the financial systems in selected emerging economies strong enough to support Sustainable Development Goals?

(e) Do we have any causality relationships between economic growth, environmental degradation (CFP), finance and trade in selected emerging economies?

Hypothesis

The research study will test three alternative hypotheses given as:

- **H_1**: The environmental Kuznets curve is significant in selected emerging economies.
- **H_1**: A significant relationship exists among economic growth, environmental degradation (CFP), finance and trade in selected emerging economies.
- **H_1**: Causality relationships between economic growth, environmental degradation (CFP), finance and trade are significant.

Limitations And Delimitations

The research study will only consider an investigation of the impact of economic growth, finance and trade nexus on capture fisheries production (environmental degradation) in selected 14 emerging economies. The study will consider data from the year 1992 up to 2016. However, since the study will consider all emerging economies which are members of the United Nations (UN) it is likely that some countries will not have relevant data for our selected variables. In such a case the researcher proposes to include only economies

which have the data availability for a reasonable period of time and in the event that too many economies are showing some data deficiencies, Among the selected BRICS and N-11 countries, Russia and Vietnam have been excluded because of the data unavailability for some parameters. Therefore, the BRICS without Russia and N-11 without Vietnam has been used in the study, I will consider unbalanced panel data analysis. In the same vain, the generalizability of the findings of this study may be jeopardised by too many missing values in some countries but the researcher will consider a multiplicity of interventions on a case by case basis, including interpolation and extrapolation to fill the missing values. This will be done in such a way that will not make the study lose its traction of appealing to selected emerging economies. Another issue is about obtaining data for recent years, though the various data series will be somewhat balanced, there is no recent update of data for the 2020 on the World Development Indicator series, however this will not jeopardise our findings since our variables have a long series dating back to the year 1992 and at the time of actual data analysis, the series could have been updated.

Conclusion

This section have introduced the research study by providing the background, statement of the problem, aim of the study, significance of the study, research questions, hypothesis, limitations and delimitations. The next chapter will review a multiplicity of related literature.

CHAPTER 1

1. Introduction

This chapter provides a lengthy and detailed empirical evidences relating to the relationship that is between economic growth, trade, finance and environmental degradation. Sustainable development goals are also explored in depth relating to financial systems of developing countries.

1.1 Environmental Degradation

Due to increasing economic activities, during the past few decades all trends of environmental degradation have accelerated for example deforestation, greenhouse gas emissions and loss of biodiversity. Looking at developing countries, environmental degradation is a major concern in developing countries because environmental quality has become on stake while in the process of achieving sustained economic growth, poverty alleviation and employment creation. Environmental quality has deteriorated due to high levels of fossil fuels consumption and human greenhouse gases emission and this also led to global warming and depletion of non-renewable natural resources.

Keeping in mind the idea that, economic growth on any nation depends on various factors especially the potentially available natural resources and

economies of scale. According to Phimphanthavong, (2013) economic growth may produce negative effects on the environment through environmental pollution, natural resources exploitation, climate change, loss of wildlife habitat and degradation. In support, CEF (2016) state that environmental degradation occur when the earthly natural resources are exhausted and the environment is compromised due to extinction of species, population rapid growth and pollution in air, water and soil. So this study is attempted to investigate the powerful impact of economic growth, finance and trade nexus on environmental degradation in the emerging countries.

1.2 Economic Growth And Environmental Degradation

In this modern day era, the major determining factor of environmental degradation is economic activities. As economic activity of a nation increases, also its income levels increases, however this comes at the cost of natural resources depletion which is environmental quality degradation. Since the industrial revolution many economies across the globe has bared witness to higher economic development and growth through the use of non-renewable natural resources. This development has negatively affected the quality of the environment through the increase of greenhouse gases emissions particularly carbon dioxide. Emissions of the greenhouse gases have amplified the process of ozone layer depletion and global warming (Conceicao, 2003). Increased economic growth requires more energy, higher energy consumption leads to more Carbon emissions into the atmosphere which affects the environment negatively. The economic growth and environmental degradation has been empirically explored by many studies.

According to Heilbroner and Thurow (1987) economic growth is a function of population and per-capita consumption. It is an increase in the production and consumption of goods and services. Even if economic development is successfully performed, it is coupled with various problems and this includes also environmental degradation. The revolutionary study of Grossman and Krueger, (1991) examined the relationship between income level and environmental degradation based on the Kuznets (1955) which recognized an inverted U-shaped relationship between income inequality and growth. The Environmental Kuznets curve (EKC) thus non-linear relationship between environmental degradation and income level states that during the early stages of economic growth the environment depletes with the increase in economic activities as resources are exhausted. Conversely at the later stages of economic growth, environmental quality also improves as the income levels of the nation increases because government and people starts to promote issues like public health and environmental awareness. This hypothesis of an Inverted U-shaped relationship between income level and environmental degradation is also supported by Nasir and Rehman (2011) and Shahbaz et al (2014).

In addition, the causality between environmental degradation and economic growth was demonstrated by Selden and Song (1994) based on the EKC hypothesis. Their study proved that the causality between economic growth and environmental degradation is high and positively significant. This study indicated that an increase in economic growth also increases environmental degradation as measured by the level environmental degradation.

Apart from Grossman and Krueger (1991) and Selden and Song (1994), looking at the empirical evidence there are several studies that examined the

validity of the EKC hypothesis which states that there is a U-shaped relationship between environmental degradation and economic growth. For example,Saboori et al. (2012),Saboori et al. 2012, Lean and Smyth, 2010Fodha and Zaghdoud (2010), Ozturk and Acaravci (2010), Heil and Selden (1999), Stern et al. (1996),Jaunky (2010),Managi and Jena (2008),(Azomahou et al, 2006) tested the EKC hypothesis. Studies showed a range of inconsistent results. Some show an inverted U-shaped relationship (Saboori et al., 2012; Lean and Smyth, 2010) while others presented a linear relationship between environmental degradation and economic growth (Azomahou et al, 2006). Shafik, (1994) and Friedl and Getzner.(2003) even argued that the two variables have an N-shaped relationship while Richmond and Kaufmann, (2006) expressed that there is no relationship.However all these studies are based on a model which is bivariate and is likely to suffer from this limitation because other variables are omitted. Nonetheless, there are several studies that included other variables in order to establish the relationship and managed to find an inverted-U shaped curve between economic growth and CO2 emissions, Ang (2007), Iwata et al. (2010), Jalil and Mahmud (2009), Nasir and Rehman (2011), and Omri (2013).Some studies included other potential determinants of CO2 emissions such as trade openness in order to test the EKChypothesis for example Nasir and Rehman(2011), urbanization by Hossain (2011), and financial development by Ozturk and Acaravci (2013). However, the multivariate studies also produce conflicting results on the existence of EKC.

Another, active impact was displayed by Zhang and Lin (2012) when they developed a study to examine the impact of economic indicators on pollution

in China during the period 1995–2010. The study employed fixed effects model and the method of least square generalized linear regression. In their study, they utilized urbanisation, industrial production, energy consumption, demographic intensities, GDP, production of services as economic indicators. The study showed that variables have an impact on pollution. In another study, Bloch, Rafiq, and Salim (2012) utilized pollution and energy as indicators of CO2 emissions and labor, consumption, GDP and capital as indicators for economic activities. The study, implemented co-integration Johansen and variance decomposition for China from 1977 to 2008 and according to their findings energy consumption and GDP have a positive impact on pollution.

In addition, Acaravci and Akalin (2017) examined the interaction between carbon emissions, income, and trade openness in developing and developed countries from 1980 to 2010 by employing developed panel data econometric methods. The study showed evidence of long term relationship between variables and the validity of the environmental Kuznets curve (EKC) hypothesis in developed countries only and not valid in developing countries.

1.2.1 Economic Growth And Water Pollution

Liu and Zhang (2018) looked at the relationship between water pollution and economic development of the Shandong Province. The study focused on the Shandong Province watershed economic development and the relationship between the discharge of pollutants over a period of 2002-2015 per capita GDP and wastewater, COD, ammonia nitrogen(AN) pollutant emissions. SPSS was used to analyze the data, and the cubic equation model between various pollutants and economic indexes was fitted. It is found that only the

relationship between industrial wastewater discharge and per capita GDP is most coordinated, that is, industrial wastewater emissions is linked with the continuous development of the basin economy, showing a tendency to rise first and then fall.

Using the Environmental Kuznets Curve (EKC) hypothesis in South Korea,Choi (2012) revied the relationships between economic growth and water pollution.In thus study both national perspective (pooled data) and regional perspective (each river) are used to reveal the EKC theory during the period of 1985-2009 and Fixed-effects model with a standard error is employed for removing econometric problems. Empirical results demonstrate that the EKC theory explains water quality change in South Korea, depending on the types of water pollutants and their generated regional characteristics. At the national perspective, Biochemical Oxygen Demand and Chemical Oxygen Demand might show inverted-U shapes; therefore, the EKC relationship cannot always be generalized between economic growth and environmental pollution. In addition, Hauff and Mistri (2014) also reveal that there is no EKC relationship in India and income growth has no significant effect on of access to safe drinking water, ground water development and utilisation, and waterborne diseases during 2001-2012. Moreover, rapid expansions of irrigated agriculture and obsoleted regulation have led to the exploitation of ground water. Besides, lack of proper technological investment in Indian industry has resulted in deteriorating the indicators of environmental quality. Apart from these, climatic and geomorphological heterogeneity widely influence the distribution and utilisation of water resources. The huge population pressure also exerts a negative effect on the environment.

1.3 Trade And Environmental Degradation

Grossman and Krueger (1991) disputed that trade liberalization may lead to lesser environmental damages due to the application of modern technologies.Trade liberalization encourages foreign direct investment and this might result in modern technologies being transfers between economies. Moreover, trade liberalisation can result in high income levels therefore improving personal and national wealth which might result in an advocate for a better and cleaner environment. Therefore, implementation of cleaner and modern production technologies that is environmentally friendly.

Nasir and Rehman (2011) claimed that trade structure is of detrimental importance to consider when looking at environmental quality of a nation. The study denoted that trade structure has a negative impact on the environment. Haq et al. (2016) also supported the Nasir and Rehman's argument regarding the nexus between trade structure and environment. However, they also posed an argument saying that trade may also improve the quality of the environment if the traded commodities are environmentally friendly. This was explained on the basis of technique, scale and composite effects (Haq et al, 2016; Hossain, 2012). The study concluded that scale effect enhances environmental degradation because trade liberalization results in extensive depletion of resources for more production. Yet, the technique effect promotes the environment since there is transfer of technologies between countries and production is made in an environmentally friendly manner through efficient technologies. In addition, the composition effect looked at the composition of imports and exports, whereby if the country's trade exceeds in cleaner and better industries then trade will decrease emissions levels and conversely if

dirty industries dominate trade, then the environment will deteriorate. Furthermore, trade enriches local competition therefore improving production of domestic producers through the use of efficient techniques which are environmentally conscious. Hence the relationship between trade and environmental degradation is not certain.

In addition, the study of Grossman and Krueger (1991) is considered a pioneering work on the effects of trade on the environment. The study expresses that trade liberalization affects pollution level in three separate mechanisms in the economy. Initially, trade liberalization leads to increase in the economic activity, and this will lead to enhanced pollution especially if there is no change in the production technique in the local economy. This effect of trade on pollution can be referred as scale effect. Secondly, there will be a composition effect from trade liberalization. Under the composite effect, economiesfocuses mainly on the sectors which have economies of scaletherefore intensifying the use of its abundant factors and the net effect of trade on environmental pollution will depends on whether trade liberalization expand or contract pollution-intensive activities. Finally, is the technique effect of trade liberalization and this is very important because trade liberalization policies will put less pressure on the environment. Due to relaxation in the foreign investment some of the modern technologies will be transferred from developed economies to less developed economies resulting in a change in the production techniques in the economy. Thus, the generation of pollution per unit of production also falls in less developed economies.

1.4 Trade And Financial Development

Various researchers have taken interest in the relationship between international trade and financial development investigation in the recent years. Menyah et al. (2014) investigated the causal relationship between financial development, trade openness and economic growth for 21 African countries. From the study, he found out that there is a unidirectional causality running from financial development to trade openness in the case of Niger, Burundi, Senegal, Malawi and Sudan. The opposite causality running from trade openness to financial development was supported only in Gabon. For the other remaining sixteen (16) countries, which are more than 75% of the sample, there was no causality relationship between financial development and trade openness implying that financial development and trade openness do not have predictive power on each other.

In addition, Yucel (2009) examined the causality relations between financial development, trade openness and economic growth in the Turkia. With the use of Granger causality test results revealed the presence of bidirectional causal relationship between financial development, trade openness and growth. These resultsalso explained that economic policies designed for financial development and trade openness have a statistically significant impact on economic growth.

1.5 Trade, Energy And CO2 emissions

The study by Antonakakis, Chatziantoniou, and Filis (2017) looked at the link between CO2 emissions per capita growth, energy consumption per capita growth and real GDP per capita growth using panel VAR. This analysis was based on 106 countries classified by different income groups over the period

1971–2011 showed that the effects of the various types of energy consumption on economic growth and emissions are heterogeneous on the various groups of countries. Moreover, causality between total economic growth and energy consumption is bidirectional. Renewable energy consumption had no significant effect on economic growth and there was no evidence in support of the EKC hypothesis. From three (3) selected North African countries, Kais and Ben Mbarek (2017) investigated the causal relationship between energy consumption, carbon dioxide (CO2) emissions and economic growth looking at panel data from 1980–2012. Using a panel co-integration test they found interdependence between energy consumption and economic growth in the long run. Using panel Vector Error Correction Model, they detected a unidirectional relationship from economic growth to energy consumption, a unidirectional causality running from economic growth to CO2 and a unidirectional causal relationship from energy consumption to CO2 emissions.

In addition, Ahmed, Rehman, and Ozturk (2017) explored the relationship between CO2 emission, energy consumption, income, trade openness and populationfrom five selected countries of South Asia. Through employing all the panel cointegration tests the research confirmed that all the variables under study are co-integrated. By Akpor

employing FMOLS (Fully Modified Ordinary Least Square), the study showed that energy consumption, trade openness and population increases have negative impact on environmental degradation. Furthermore, results indicated that there is uni-directional causality running from energy consumption, trade openness and population to CO2 emission.

Coleet al. (2011) examined industrial water pollution and industrial air pollution indicators in Chinese cities to assess the link between income and pollution and they found out that water pollution and air pollution rises with the increase in economic growth. In support of this another study found out that there is negative impact of financial development on environment in China, Jalil and Feridun, 2009). In contrast, Jayantha Kumaran et al. (2012) compared China and India by using ARDL approach while testing the relationship between economic growth, carbon emissions, trade, energy consumption and structural breaks. The CO2 emission, in Chinese economy, was influenced by income, structural changes and energy consumption. The authors confirmed existence of EKC hypothesis in India but there was no direct relationship between structural changes and CO2emission on economic growth. Overally, the authors argued that China and India were transitional and developing economies but their economies are different in terms of trade, energy use and structural change in growth.

In a multivariate analysis, Boutabba (2013), explored causality links between carbon emission, growth, energy consumption, openness of trade and financial sector development in India and found a long run and causal relationship between the variables. They also confirmed an existence of EKC hypothesis. The study concluded a unidirectional causality running from real income, energy consumption, and financial development to CO2 emissions. However, Ozturk and Acaravci (2013) found no significant impact of financial development on carbon emission in Turkey but the results of the study confirmed the existence of EKC hypothesis over the sampled period. Shahbaz et al. (2013) explored the relationship between growth, energy consumption,

financial development and carbon emissions in Indonesia and confirmed long run link between the variables. Economic growth and energy consumption increased carbon emission in long run but financial development and trade openness reduced environmental degradation in the economy in long run. There was bidirectional causality between energy consumption and economic growth in Indonesian. Islam et al. (2013) explored long run association between energy consumption, total production, financial development and population in Malaysia. Alam et al. (2007) assessed the impact of population growth, GDP growth, energy intensity and urbanization on environmental degradation in Pakistan. Moreover, the authors also simultaneously investigated the impact of population growth, energy consumption, urbanization and environmental degradation on sustainable growth in the economy. The empirical results revealed that energy intensity, GDP per capita, population and urbanization has positive and significant on carbon emissions in Pakistan. The conclusion of the study supported the argument that economic growth, urbanization, and population growth increases the demand for energy. The increased energy demand leads to significant increase in CO2 emissions. Energy consumption and carbon emission were positively related to GDP whereas population and urbanization showed negative impact on growth in Pakistan over the sampled period. Shahbazet al.(2010) investigating the impact of energy consumption, economic growth and trade openness on CO2 emissions in Pakistan found long run association between the variables included in the model. The results of the study supported the EKC hypothesis for the Pakistan economy. Unidirectional causal relationship from energy consumption to CO2 emissions was found. Energy consumption affected

carbon emission both in short run and long run but trade opens caused CO2 emissions in long run. Energy consumption Granger causes economic growth in Pakistan (Asghar and Rahat, 2011).Energy consumption adversely affects environmental quality in Pakistan both in long run and short run (Shahbaz et al. 2012).

1.6 Finance And Environmental Degradation

Financial development is also analysed in the environmental degradation-growth nexus. Financial development and environmental quality related literature provides mixed results. Using a multivariate framework Gokmenoglu and Sadeghieh (2019) investigated the relationships between financial development and environmental degradation in Turkey from 1960 to 2011 and focused on economic growth and fuel consumption as supplementary determinants of environmental degradation. The study showed that in the long-run, economic growth has negative and significant effect on carbon emissions while fuel consumption has positive and elastic impact on carbon emissions.Some studies, such as Tamazian et al. (2009) stressed that financial liberalization and openness would help to attract research and development related foreign direct investment which would be helpful in the reduction of environmental degradation in the economies. Yuxiang and Chen (2010) concluded that there is a relationship between improvement in environment and financial development in Chinese economies. Jalil and Feridun (2011), also confirmed a negative relationship between financial development and environmental degradation and concluded that financial development lowers the carbon emissions and thereby, reduces environmental degradation. Therefore, development of the financial sector

may be helpful to improve environmental quality. Financial development improves environmental conditions by increasing capitalization ad income. Moreover, financial development also assists in utilizing modern environmental techniques of production, exploiting new technology and implementing forcefully the protocols regarding environment.

In contrast, some empirical studies, like Sadorsky (2010) and Zhang (2011), found a positive relationship between financial development and environmental degradation. These studies argue that a sound financial development reduces financial costs and increases the number of financing channels while also diversifying financial risk. As a result, financial development stimulates the industrialization of the economy and pollutes the environment as emissions increase. Additionally, sound financial development attracts foreign investors to the financial market who increase the financial assistance to the corporate sector, which leads to more emissions through increased production. From the consumption point of view, sound financial development gives more incentive and opportunities for consumers to finance consumer durable goods that also further intensify emissions.

Furthermore, financial development showed no significant impact on carbon emission in Turkey Ozturk and Acaravci, (2013). Bautabba (2013) and Shahbaz et al. (2013) found that financial development has positive and significant impact on CO2 emissions in long run and there was unidirectional causality from financial development to carbon emission in India and Indonesia, respectively. According to Zhang (2011) financial development contributed to an increase in environmental degradation in the economy. Since the enterprises in China have easy access to finance so it makes easy for

enterprises to expand their scale of investment. This leads to increase in economic growth and carbon emissions with the expansion of financial sector. Shahbaz (2013) exploring the relationship between financial instability and environmental degradation by using multivariate model found long run relationship between the variables and noted that financial instability increased environmental degradation in Pakistan.

1.7 Financial Systems And Sustainable Development Goals

Generally, public policy authorities should develop sound trade and energy initiatives which aim cleaner production operation processes so as to achieve both Sustainable Development Goals and Environmental Sustainability, Shahbaz et al (2019). Progress towards the adoption of measures contributing to sustainable global development is often measured with regard to the Sustainable Development Goals (SDG) established at the 2015 Sustainable Development Summit, held in New York (United Nations General Assembly, 2015). According to the mandate given to the General Assembly by the Member States at the United Nations (UN) Conference on Sustainable Development, Sustainable development goals should be action-oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries, while taking into account different national realities, capacities and levels of development and respecting national policies and priorities" (United Nations General Assembly, 2014).

Gambetta et al (2019) explores the financing framework for sustainable development in Uruguay, an emerging economy, and examines whether available financing instruments contribute to achieving the sustainable

development goals (SDGs) in which significant progress is still required in the country. Reports, policy documents and academic literature were reviewed to determine the types of sustainable development financing instruments available, and to analyse the challenges facing emerging economies in this regard. In addition, the financing programmes available from the public sector, non-governmental organisations (NGOs), the financial sector and multilateral credit agencies were examined. The results obtained show that the main financing sources for sustainable development are located within the public sector due to the absence of a developed financial market, and that the existing financial instruments do not address the SDGs where most attention is required.

The latter circumstances make it challenging to achieve these SDGs in Uruguay. The study findings highlight the need for greater coordination among all parties to make efficient use of the scarce resources available to an emerging economy and thus enable it to meet its SDGs.

In looking to promote the SDGs within the financial services industry, the United Nations Global Compact and KPMG International (2015) produced the ‘SDG Industry Matrix’ which outlines opportunities for financial services companies to create value for their business whist creating a more sustainable and inclusive path to economic growth, prosperity and well-being. Four sets of opportunities are identified namely, initiatives for increasing financial inclusion, investing in, financing and insuring renewable energy and infrastructure projects; leveraging risk expertise to influence customer behaviour; and positively influencing environmental, social and governance practices of

corporate clients and investment companies. For instance, the following actions target the goal of increasing financial inclusion: facilitating secure payment for goods and services enabling the smoothing of cash flows and consumption over time providing financial protection and supporting efficient allocation of capital. Further, leveraging risk expertise requires the development of innovative pricing models which incentivize more sustainable living and production and sharing non proprietary risk data, risk analysis and risk management expertise to inform public policy and practice (UN Global Compact and KPMG International, 2015). The Matrix addresses each of the seventeen SDGs, particularly in addressing goal number four, namely ensuring inclusive and equitable quality education and promoting lifelong learning opportunities, a number of initiatives for enhancing shared value are identified. These opportunities include collaborating with development financial institutions and governments to invest in innovative educational projects; expanding health, life and livelihood insurance in developing markets; and increasing collaboration across the industry to explore best practices for advancing financial literacy

Eight opportunities for shared value are identified for Goal thirteen which emphasises the importance of taking urgent action to tackle climate change. These opportunities include investing in and raising capital for climate risk mitigation and climate adaptation; increasing the coverage of natural catastrophe schemes; integrating climate risks into underwriting practice, investment analysis and decision making; and taking steps to measure, reduce and report climate exposure.

In looking to ensure sustainable consumption and production patterns, according to goal twelve, just two opportunities for shared value are identified; namely the development of new pricing models designed to incentivise more sustainable living and of innovative products designed to reduce energy use and greenhouse gas emissions from motor vehicles.

Environmental sustainability implies that the quality and protection of the natural environment, as well as successful adaptation to climate change, influence the scope for long-term social progress and economic development. Environmental degradation, waste of non-renewable natural resources and the various impacts of climate change have a direct effect on living conditions. They also raise the risk of social friction and reduce the scope for economic growth and the allocation of public finances. Economic sustainability implies that macroeconomic and financial stability, as well as the prevention of balance-of-payments crises are a basic requirement for sustained economic and social development. It also implies that human and financial resources must be used in a way that ensures continuous and lasting improvements in standards of living. Inappropriate consumption and production patterns and waste of human, natural and financial resources compromise the quality of the natural environment and jeopardize peace.

The economic and environmental pillars of development have various complementary aspects. First, improved access to and better-quality energy and water is crucial for raising overall living standards and increasing production levels in LDCs. It is equally important to promote efficiency and foster environmentally sustainable practices in the use of these resources. In the case of energy, this requires a switch to renewable sources. Secondly, in

the case of agriculture, forestry and fisheries, all activities that provide a major source of income for most LDCs, sustainability hinges on the establishment and maintenance achieving the Sustainable Development Goals in the Least Developed Countries, A Compendium of Policy Options 13 of an ecological balance that allows for the appropriate regeneration of the underlying natural resources and protect biodiversity. Thirdly, a development trajectory that is sustainable in the long run requires the careful management of non-renewable resources. To ensure long-term sustainability, productive activities in all sectors must be organized in a way that reduces resources intensity and support economic growth (Economic Development in Africa Report (EDAR) 2012). For LDCs rich in natural resources, rents from the extraction of minerals and hydrocarbons can be served as a basis for building the productive capacities to develop other economic activities. However, this requires that the depletion of natural capital, rather than fuelling the consumption of mostly imported goods, must be translated into the creation of physical, financial and human capital that creates productive capacities for future generations.

1.8 Economic Growth, Trade, Energy and Environmental Degradation

It is agreed that energy consumption is closely associated with economic growth and development. However, energy is not just responsible for the economic growth but it also garbs attention in the environmental economic literature as it may harm the environment. Thus, some of the studies analysed the casual relationship between energy, economic growth and carbon emissions. For instance, Soytas, Sari and Enwing (2007) argued that energy consumption has some policy implication especially in mitigating environmental degradation thus; to find out the exact relationship and to

address omitted variables problem it is very important to add energy consumption in the economic growth-emissions nexus. They deduced that energy consumption had played vital role in environmental degradation instead of income level in the US. Uddin, Badisha and Ozturk (2016) studied the relationship between energy consumption, economic growth and carbon emissions in Sri Lanka. They considered carbon emissions as proxy for environmental degradation. The results of the study indicate there is long-term relationship among the studied variables. Obradovic and Lojanica (2017) carried out empirical study to examine the relationship between energy consumption, economic growth and carbon emissions in the case of Greece and Bulgaria. The results confirm no causality between energy consumption and growth in both Greece and Bulgaria in the short-term but in the long run causality runs from carbon emissions and energy to GDP in both nations. Similarly, the study of Kais and Mbarek (2017) show a unidirectional causality from GDP to energy consumption and from GDP to carbon emissions. The results furthermore, conclude that there is a considerable interdependence between energy consumption and GDP in the long term. Another study, Aye et al. (2017) observed that economic development positively adds to carbon emissions in the high growth regimes while it indicates negative effects on carbon emissions in low growth regime.

About the Sri Lanka case, Uddin et al. (2016) examined the long term association between energy consumption, economic growth, and carbon emissions using time series data from 1971 to 2006. The study has applied Granger causality and Johansen co-integration analysis tests and established a long term causal relationship between carbon emissions and economic

growth. Moreover, the results confirmed unidirectional causality running from growth to energy consumption and carbon emissions. The aforementioned studies discussed in this section showed that energy consumption has positive impact on carbon emissions, but this is not always true, as some of the studies found that energy has a negative impact on carbon emissions.

To examine the impact of economic activity indicators on environmental degradation, Omri (2013) uses the method of least squares generalized through the period 1990–2011 in the case of countries in the MENA region. He utilizes CO2 emissions as an indicator of pollution and labour, capital, population, financial development, and GDP as indicators of economic activities. Their results show the presence of a positive and significant impact of the GDP and negative impact of financial development and capital on CO2 emissions.

Shahbaz, Hye, Tiwari, and Leitão (2013) employ the model error correction vectors and the GC to study the impact of GDP, energy consumption, foreign direct investment, financial development, and trade openness on environmental pollution during the period 1971–2011 in the case of Malaysia. They show that GDP, energy consumption, foreign direct investment, financial development, and trade openness have a positive effect on CO2 emissions. Additionally, Apergis and Payne (2014) utilize a sample of the countries of Central America over the period 1980–2010 to examine the effect of GDP, consumption of renewable electricity, oil, coal, and population on CO2 emissions. They use the Bai–Perron cointegration for panel data, the modified OLS, and the error correction vector model based on GC. Their study

demonstrates the importance of the economic and energy factors to affect CO2 emissions which explain the existence of a positive causality.

Baek and Pride (2014) develop a survey to a sample of countries in the major nuclear production during the period 1990–2011. Econometrically, these authors use the vector auto regressionco integrated model and Johnsen cointegration. They use CO2 emissions as a pollution indicator. For economic indicators, they use GDP and the production of nuclear electricity. Their results show that economic indicators affect positively the pollution of these countries.

Farhani, Chaibi, and Rault (2014) use GC by the model error correction vectors for the case of Tunisia (1971–2008). They utilize CO2 emissions, GDP, energy consumption, and trade openness to investigate the impact indicators of economic activity on pollution. Their empirical findings prove the presence of a positive causality between CO2 emissions and economic indicators.

Alam et al. (2014) utilize the generalized method of moments (GMM) to analyze the impact of economic indicators (population density, energy resources, energy consumption, and financial development) on pollution (CO2 emissions) over the period 1975–2013 in Malaysia. They conclude that energy consumption and financial development increase CO2 emissions.

Rafindadi, Yusof, Zaman, Kyophilavong, and Akhmat (2014) employ the regression by the ordinary least square on panel data and the fixed effects model on panel data regression by the least squares method of two courses to study the causal relationship between pollution and economic activity indicators in the Asia-Pacific countries for the period 1975–2012. In their study, pollution is measured by CO2 emissions and economic indicators are

measured by GDP, the production of water, the added value of natural resources, and energy consumption. They find the existence of a positive and significant relationship between CO2 emissions and GDP. Also, they conclude that energy consumption affects positively pollution.

Charfeddine and Ben khediri (2015) use the unit root tests with multiple structural breaks and regime-switching cointegration techniques considering for one and two unknown regime shifts to examine the nexus between CO2 emissions, electricity consumption, economic growth, financial development, trade openness, and urbanization for the United Arab Emirates during the period 1975–2011. The empirical findings of their study prove the existence of environmental Kuznets curve (EKC). Additionally, Charfeddine and Ben khediri (2015) show an inverted U-shaped relationship between financial development and carbon dioxide emissions. Also, they find that electricity consumption, urbanization, and trade openness contribute to improve environmental quality.

Youssef et al. (2012) extending the findings of Ang (2007) and Apergis& Payne (2009) implemented bootstrap panel unit root test and cointegration approach to look into the association between carbon emissions, energy consumption and GDP in Middle East and North African economies. Empirical results confirmed GDP to have positive impact on CO2 emissions and confirmed EKC hypothesis in most of economies included in the sample. Furthermore, the authors suggested Middle Eastern and North African economies to follow policy of energy conservation rather than CO2 emissions reduction. Soytas, Sari & Ewing (2007) investigated the impacts of energy consumption and output on CO2 emission in the US by controlling the energy consumption in the model. The Granger causal link was explored between output, energy

consumption, and CO2 emission, labour force in investment in fixed capital. The results of the analysis failed to confirm environmental Kuznets hypothesis in the US economy. The authors suggested energy consumption to be the major cause of increase in carbon emissions. There was no significant evidence of trade-off between carbon emission reduction and economic growth in the economy. In another study, Soytas& Sari (2009) attempted to explore long run causality between growth, CO2 emissions and energy consumption in Turkish economy. The gross fixed capital accumulation and labor were also controlled for. The authors found, interestingly, that carbon emission Granger caused energy consumption. There was no causal link between economic growth and carbon emission implying that Turkish economy would not forgo economic growth while reducing carbon emission levels. Lotfalipur, Falahi and Ashena (2010) investigated the causal links between carbon emission, consumption of fossil fuels and economic growth by using modern technique of Toda-Yamamoto for the Iranian economy. The authors found unidirectional Granger causality running from GDP, petroleum products and natural gas consumption to carbon emissions but total fossil fuels consumption did not found to Grange cause carbon emissions in long run. Moreover, carbon emissions, consumption of fossil fuels and petroleum products showed no growth stimulating impact on economic growth but gas consumption lead to economic growth in Iran. Alam et al. (2011) assessed the dynamic impact of energy consumption, economic growth, labor force and domestic investment measured by gross capital formation on carbon emission Indian economy. Toda-Yamamoto causality test complemented Johansen-Juselius approach was applied for the analysis. The results of the analysis

revealed bidirectional causality between energy consumption and carbon emissions in long run. The study concluded no causality running from energy consumption and CO2 emission to growth.

1.9 Conclusion

The literature reviewed focused more on the relationship between economic growth, finance, trade and environmental degradation. However, no studies have been conducted in developing countries recently explaining the relationship between variables. This study aims to fill that gap by exploring relationship between economic growth, finance, trade and environmental degradation. The next chapter explains the theoretical framework that will be used in the study.

CHAPTER 2

WORLD CONVENTIONS ON CLIMATE CHANGE

2. Introduction

In this chapter additional literature is provided on world conventions in a bid to fight climatic changes, beginning from the United Nations Framework Convention on Climate Change (UNFCCC) on the 9th day of May, in the year 1992. Therefore, this additional literature review will provide some overview with respect to the UNFCCC, Kyoto protocol, and also the Paris agreement. The chapter will further delve into MDGs, SDGs and also EBAFOSA.

2.1 Overview of the UNFCCC

The Framework Convention on Climate Change (FCCC) which is usually known as the United Nations Framework Convention on Climate Change (UNFCCC) environmental treaty was formed in 1992. This treaty was formed by global leaders at the Earth Summit which was held at Brazil's Rio de Janeiro with the agenda to stabilize greenhouse gases concentration in the atmosphere to lower levels which could counter anthropogenic perils on the climatic system. This objective was supposed to be realized in such a time that would make it possible for ecosystems to self-adapt to climatic changes, in the process guaranteeing food security and sustainable economic development.

In order to achieve the objective of the summit parties of the Convention agreed that they would craft periodic updates and publication of greenhouse gases stocks according to their sources and removals by sinks through employing techniques that are agreeable at the Conference of Parties. The parties also agreed to craft, employ, publish and make regular updates on national and regional interventions to promote adaptation to climate changes. Another, mandate by the Convention was that parties should promote and coordinate in developing, improving the use of and sharing technologies, best practises, and techniques which help in controlling, reducing and preventing greenhouse gas emissions from various sectors like energy, agriculture, waste management, forestry and transport. In addition, parties were required to uphold sustainable development, mutual aid in conservation while improving reservoirs and sinks of greenhouse gases.

To achieve better climatic change adaptation, parties in the Convention, had to craft clear and complete roadmaps for the management of coasts, agriculture and water resources, while protecting and rehabilitating their areas, especially in Africa, under the threats of droughts, floods and desertification. Moreover the Convention urged parties to take note of climatic changes in their environmental, social and economic policy. They also had to create suitable and appropriate techniques to assess the impacts not forgetting to keep in mind the agenda to reduce the hazardous impacts to the economy, public health and environmental health so as to foster climate change adaptation. The 1992 Convention also made a call to the parties to support and collaborate in research, systemic observations and development of data storages on climate systems designed to advance the understanding, reduction, and

removal of challenges associated with causes, effects, scale and timing of climatic changes and also socio-economic impacts of these interventions. In addition, the FCCC treaty required the parties to support and cooperate with each other on detailed, clear and quick sharing of scientific, technical, technological, legal, and socio-economic information on climate change and climate systems as well as on social and economic effects on various response initiatives. The Convention also mandated parties to hold up and collaborate on the aspects of research, training and public c awareness on climate change issues and foster greater or broader participation in these initiatives and also consider non-governmental entities. Finally, the parties in the Convention were encouraged to participate at the Conference of Parties and provide feedback and information related to implementation.

However, the United Nations Framework Convention on Climate Change (UNFCCC) has not been able to set concrete greenhouse gas emissions goals and contributions from the parties, but has given away to possibilities for its review through Protocols.

The United Nations Framework Convention on Climate Change (UNFCCC) was a reactive approach to the growing empirical evidence which pointed to the surge in perils associated with an ever increasing greenhouse gases in the atmosphere (Sands; 1992). These greenhouse gases are a threat due to their potential to cause temperature increases on a global scale, with effects of leading to the unsustainable consequences such as rise in sea levels, desertification, hurricanes, droughts, cyclones and also bleaching of coral reefs. UNFCC was described by Greene (2000) as a mechanism for governments to use to resolve the dangers associated with global warming.

Obergassel et al (2015) stated that after 25 years of climate diplomacy among UN members, the UNFCC was born and this was the first time ever to see such an action by all parties under international law to encourage climatic action. A research study conducted by Tompkins and Amundsen (2008) described the way the United Nations Framework Convention on Climate Change is being implemented at national level, the findings revealed that although a multiplicity of people witnessed some changes at national level in the form of research and planning, very few people have witnessed some climate change initiative at their locality.

On the other hand, Ashe et al (1999) noted that the Alliance of Small Island States (AOSIS) had crafted 12 points to base their negotiation at the UNFCCC, however only 10 were accepted. The trio noted that, due to their vulnerability to climate change, AOSIS members were put in discomfort due to the failure of the UNFCCC to the absents of specific targets and/or time for the realization of meaningful reduction of greenhouse gases by developed countries; absence of a dedicated financial plan for supporting climate adaptation responses and the lack of clear mechanisms for implementing coastal zone management initiatives.

2.2 The Kyoto Protocol

The Kyoto protocol, signed on the eleventh of December 1997 in Kyoto, Japan extends the dictates of the United Nations Framework Convention on Climate Change that was signed in 1992 in Rio de Janeiro in Brazil. The protocol came into force on the sixteenth of February 2005 and it has a total of 192 parties, however Canada withdrew in December 2012. The Parties to the Kyoto

Protocol, in a bid to meet their greenhouse gas emission limits and commitments to reduce them have agreed to craft policies and other initiatives in lieu with their national status-quo and coordinate with other parties in order to strengthen their national and combined policy interventions. The parties have further committed to uphold limitations and reductions of greenhouse gases which are not under the purview of the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO). Further, the parties to the Kyoto Protocol agreed to put in place policy initiatives that will reduce the hazards, including harmful impacts of climatic changes, impacts on global trade, socio-economic and environmental impacts on other countries, particularly developing countries. In addition, the parties to the Kyoto Protocol shall allow the Conference of the Parties to make a decision on the need to coordinate policies, however this should follow circumstance of individual parties and associated effects.

The IGBP Terrestrial Carbon Working Group (1998) noted that commendable milestones were achieved by the Kyoto Protocol when it included terrestrial sources of carbon dioxide and sinks into a framework which is legally binding and its effectiveness can be realized by crafting a robust carbon budget. O'Neill and Oppenheimer (2002) mooted that if we consider the relationships with respect to emissions, climatic changes and effects, the Kyoto Protocol is an icebreaker to leverage on to deal with the dangers to the degradation of coral reefs, breaking of the Western Antarctic Ice Sheets and closure of access to oceans. Reilly et al (1999) alluded that in the Kyoto Protocol, reduction of emissions of greenhouse gases is based on the limits of carbon dioxide equivalent and this measure is arrived at by calculating index of the potential

to cause global warming of each greenhouse gas. These researchers suggested that under strict policies, employing the potentials of global warming obtained by an integrated global-systems technique in the Kyoto Protocol way will result in significantly high climate change mitigation using a multiplicity of gases than would be possibly under carbon dioxide only techniques, hence reiterating the use of global warming potentials' weakness as a political tool. Barret (1998) considered the political economy of the Kyoto Protocol and lamented that although it sought to enhance cost effectiveness, the protocol have evidenced that it is too costly. The researcher further noted that, the Kyoto Protocol is on a dilemma of not meeting its promises of reducing emissions due to a multiplicity of reasons, some of which include the possibility of emissions relocating to territories that are not mandated to stay within the confinements of prescribed limits and/or simply because the trading mechanisms will be under the control of the protocol. Furthermore, the researcher noted that the Kyoto Protocol does not prevent the parties from complying with its conditions but it only partially prevents non-participation by the parties. Manne and Richels (1999) observed that the United States of America will incur large abatement costs in the short-term and international trading of rights to emit is key to bringing these costs down and a multiplicity of factors will determine these costs. These factors include the number of traders in this market, the slope of each trader's additional cost and compliance by buyers to the terms of the rights purchased. The duo further lashed that, only and only if the set emissions target goes below 550ppmv, otherwise the Kyoto Protocol will render self not consistent with long-range objective to stabilize the concentration of greenhouse gas emissions. A research study by

Copeland and Taylor (2005) revealed that in an open global economy: one sided reduction of emissions by developed countries in the North may lead to self-serving reduction of emissions by the developing South who are not constrained to emit; the rules on how emissions are allocated should be simple for example same reduction targets should be in place since they are proving to be the best even if international trade of emission permits is not in place; and international trading of emissions permits make parties involved poorer and leads to further increase of global greenhouse gas emissions.

2.3 The Paris Agreement (Accord de Paris)

At the 21st Conference of te parties to the the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement was the culmination of negotiations between 196 countries held in Le Bourget, Paris in France. By consensus the agreement was reached on 12 December 2015 as a global effort to combat greenhouse gas emissions by encouraging mitigation, adaptation and financing. The Paris Agreement aimed at strengthening global initiatives against the dangers of climatic changes, in view of sustainable development and attempts to do away with poverty through: restricting global temperatures to 1.5℃ increase above that before the industrial era, with an aim to reduce vulnerabilities due to climatic changes; strengthening adaptation and enhancing resilience to climatic changes, as well as reducing the emissions of greenhouse gases in ways that will not put the production of food in jeopardy; and fostering the flow of financial resources consistent with the dictates of achieving low emission of greenhouse gas and the realization of climate resilient development of the global economy. The implementation of the Kyoto Protocol was envisioned to ensure equity and commonality of

different responsibilities and capabilities in line with circumstances of different countries.

the Paris Agreement was hailed by Falkner (2016), as a ground breaker in global climate policy by upholding the role of national politics in climatic change and affording countries an opportunity to determine their own climate mitigation targets. On the contrary, Clemencon (2016)complained that the Paris Agreement deserves in the trash, an indication that the agreement was as good as not being crafted, further noting that there is terrifying evidence of global warming and the possibility of achieving below 2 ℃ was very remote. The researcher further lamented that the Paris Agreement could not provide the roadmap as to how the ambitious objective could be achieved. In the same vein, Dimitrov (2016) characterized the Paris Agreement as a political achievement in climatic negotiations and diplomatic issues and it provided important takeaways for the academia. According to Peters et al (2017), pledges that were made at the Paris Agreement were not enough for global temperatures to be restricted to levels 2℃ below the period before the industrial era. Further, these researchers have castigated the lack of clarity with respect to the Paris goal, global stock take and enlargement of the ambitious nationally determined contributions (NDCs). Hale (2016) alluded that the climate summit held in Paris in 2015 have strengthened climate issues from being merely regulatory to becoming catalytic as well as facilitative. The researcher noted the intergovernmental regime embraced climate action by both sub-state and non-state climate actors and the agreement also brought climate transition initiatives to the core. Du Pont et al (2017) lashed that targets to provide guidance to parties to the Paris Agreement to speed-up climate

desire, financing and supporting on equality basis are very important, however these are not yet revealing in the Paris Agreement. Bodansky (2016) used legal lenses to characterize the Paris Agreement as being within the dictates of the Vienna Convention regarding the Law of Treaties, however the researcher noted that the agreement is a mixed bag of binding and non-binding provisions with regards to mitigation and financing by the parties.

2.4 Revisiting Millennium Development Goals (MDGs)

The millennium development goals (MDGs) were agreed upon by 191 member states of the United Nation (UN), in the year 2000 and were supposed to be achieved by the year 2015. These MDGs includes eradicating extreme poverty and hunger; achieving universal primary education; fostering gender equality and women empowerment; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; and expand a global partnership for development.

2.4.1 Eradicate Extreme Poverty and Hunger

The MDGs were a reflection of the globe's dedication to fighting poverty in all its forms; according to Bhat (2013a), however this goal is being challenged by a slow-down of the global economy, food insecurity and climatic changes. The researcher noted that Millennium Development Goals (MDGs) provided a metric for the global commitment to end poverty, although the goals were too ambitious and achieving them require more commitment by individual countries. The researcher further noted significant progress towards their

attainment in a multiplicity of countries and pinned hope on improving quality of life for millions of people globally.

2.4.2 Achieve Universal Primary Education

Bhat (2013b) acknowledged the value of education as a instrument for addressing extreme poverty and inequality, imhealth and social well-being, and creating a stronger foundation for sustainable economic growth and development. The researcher further noted that education is critical in the realization of democracies and the establishment of strong global economies, however this realization is plagued with a plethora of hurdles, the target of the millennium development goal number two, according to Arends and Winnaar (2016), is to make sure that by the end of the year 2015, children, both girls and boys around the globe will have to undergo and complete at least the primary education course.

2.4.3 Promote Gender Equality And Women Empowerment

Labucay and Stations (2016) noted that that women’sempowerment politically translates to enhanced economic opportunities for them, contributing to both human and economic growth. The pair also suggested that women’s political advancement is generally calculated by their inclusion in both the government and legislature. According to McCann (2013), women parliamentarians worldwide are less than one in every five and the quota system is used voluntarily or legally in more than half of global countries as a way to increase women participation in political activities.

2.4.4 Reduce Child Mortality

Hoekstra et al (2006) argued that efforts to administer measles vaccinations internationally over the pastfive years have resulted in a substantial decrease in deaths from measles for children under the age of 5 years. These researchers observed that such a reductions contributes significantly to the millennium development goal number four, a goal to reduce the deaths of children under the age of 5 by as much as two thirds by the year 2015. Appunni and Hamisi (2013) also reiterated that, the millennium development goal number 4 (MDG4) targeted to reduce the deaths of children under the age of five years from ninety three per one thousand births in the year 1990 to thirty one per one thousand births in 2015. This could be realized through increasing number of one year old under immunization against diseases such as measles, diphtheria and BCG.

2.4.5 Improve Maternal Health

Gupta and Gupta (2016) noted the two parallel priorities in the millennium development goal number five namely,to achieve a maternal deaths by seventy five percentage and achieving universal accessibility of reproductive health facilities. The couple noted that significant progress have been made this far, however the goal is still miles from being achieved. In Manilla, WHO (2003) organized a workshop focusing on reducing maternal related deaths where participants were drawn from 7 countries and they agreed that all mothers and new-born babies have the right to survive from pregnancy and childbirth and it is the responsibility of all stakeholders to ensure their survival.

2.4.6 Combat HIV/AIDS, Malaria And Other Diseases

The prevalence of HIV/AIDS and nutritional deficiencies in developing territories is a major stumbling block towards the achievement of the United Nations MDGs and robust initiatives to fight HIV is still needed, Colecraft (2008). In the same vein, the researcher noted the need for concerted efforts to make nutritional improvements specifically targeting vulnerable people living with HIV/AIDS. Lenssen et al (2008) observed the ever growing narrative that public health related challenges have become too complex to the extent that more resources are required and this cannot be done by countries and other parties concerned and this have put the realization of MDGs in jeopardy. Initiatives to achieving the millennium development goals (MDGs) should incorporate robust and wide ranging efforts so as to deal with main health related challenges and these efforts include sound allocation of resources and mobilization, considering an array of disease inter-linkages, Alban and Andersen (2007).

2.4.7 Ensure Environmental Sustainability

Alban and Muchie (2010), there is a multiplicity of strategies which have been deployed for the purpose of achieving the millennium development goal of ensuring environmental sustainability (MDG7) and these have been done at both national and international level. The duo mentioned that there are mainly two techniques that can be employed to remove pollutants from wastewater that is biological and chemical methods. In the same vein, the duo indicated that biological waste water treatment techniques are mostly regarded over chemical techniques. Bauer et al (2012) upheld that the sustainability of the economy depends on environmental sustainability and global environmental

changes have brought firms to the realization that focusing on sharholder value only is a threat to the firm's long-range viability.

2.4.8 Develop A Global Partnership For Development.

According to Barnes and Brown (2011), the word partnership is prevalent when it comes to issues relating to participative global governmentality and it reflects a pledge for the millennium development goals (MDGs). The duo also alluded that the ideal of global partnerships is unclear and how this idea should promote a transition from theory to praxis. Caliari (2014) investigated the standard and verifiable effects of the millennium development goal to develop a global partnership for development's selection of benchmarks on the rights of human beings. The researcher noted that the MDG 8's benchmarks could not have any significant effect on principles for the promotion of human rights, however it was not good for existing partnerships to promote human rights.

2.5 Sustainable Development Goals (SDGs)

In 2015, the member states of the United Nations crafted the Agenda 2030, which is a roadmap to achieve prosperity and peace for both people and the planet, today and tomorrow. At the core of the agenda there are seventeen (17) sustainable development goals (SDGs) and these goals presented an emergency call for global economies (both developed and developing) to collaborate. These goals include: no poverty; zero hunger; good health and wellbeing; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequality; sustainable cities and communities; responsible consumption and production; climate action; life

below water; life on land; peace, justice and strong institutions; and partnerships for the goals, UN (2019). According to the United Nations (2019), sustainable development goals (SDGs) were a culmination of hard work by global economies and the United Nations, particularly the United Nations Department of Social and Economic Affairs (UNDSEA).

2.5.1 No Poverty

Global poverty alleviation requires robust strategies as around 1.2billion people are languishing in the cycle of poverty and development support needs to be intervened at society, nation, and global level Yeates (2014a). The researcher further noted that there is a great potential but regional groupings of countries remain untapped to increase social investment as a way of promoting he elimination of poverty and this needs to significant from support from the United Nations, and the World Bank as well as other development entities. Yeates (2014b) mooted that the political economy of the New South American Regionalism (NSAR) was far from being a true reflection of what is generally thought of it, a reflection of big developmental projects. The researcher investigated the development initiatives of the New South American Regionalism in the context of a dynamic global order, in the process affording due attention to issues relating to regionalism; economic and social developments; regional integration; defence; intelligence and organized crime.

2.5.2 Zero Hunger

According to Nabarro (2016), the Agenda 2030 offers the highest probability of zero hunger, considering the complexity and interconnectedness of the pill ars of poverty and hunger, and this can be accomplished by alliances, exploit

ing technical advances and also incorporating equity and justice throughout a ll initiatives. Konefal (2018) concluded that there are some shortcomings in a gricultural sustainability problems because there are a range of discrepancies with respect to social innovations; technology; expertise; democracy; markets; nature and change itself. Further, governmentality issues and institutionalizations were considered and it was apparent that governance moderates sustainability.

2.5.3 Good Health and Wellbeing

Dadzie et al (2016) shared that human development is focused on good health and wellbeing, further recognising the primacy of interpersonal approaches such as focus group discussions (FGDs); below the line and above the line strategies to enhance good health and wellbeing. Fernandez (2019) noted UN (2015a) to reinforce the role of the SDG 3 in enhancing good health and wellbeing of all the people around the globe and further highlighting that a multiplicity of issues are at stake when it comes to health issues, including both economic and environmental sustainability issues. Ridgway (2018) looked at old people's health and described two dimensions with which they are perceived: that they are resource parasites, hence have no value; and that they are social assets. The researcher could not however, hold on to allude that a large demographic of the elderly is full of a plethora of mixed problems.

2.5.4 Quality Education

Nazar et al (2018) argued that the best thing to do by any government is to have the best minds and with the setting in of sustainable development goals (SDGs), it is necessary to set targets for measuring progress instead of the

new development agenda. Gillies (2010) referred to the intrusion of quality management (QM) models in the European education systems refocusing education and adapting it to business in a way that would improve human growth. Furthermore, Anangisye (2010) further alluded in a study conducted in Tanzania that, the market model of education is the way to go if the aspirations of quality education have to be attained.

2.5.5 Gender Equality

Achievement of gender equality as enshrined in the Sustainable Development Goals of the Agenda 2030 has 9 targets and focuses on the key causes of the gender inequality, such as issues of women's unequal access to resources, Deere (2018). According to Esquivel and Sweetman (2016), the Agenda 2030 provides roadmap for global economies to achieve sustainable growth in the social, economic and environmental domains. Hailed by Rosche (2016) the Agenda 2030 and the culmination of sustainable development goals (SDGs) as being a culmination of broader participation of the civic society as opposed to how the millennial development goals (MDGs) were crafted.

2.5.6 Clean Water and Sanitation

while water is an essential public health commodity, because it is competing, its uses need to be balanced, robust surface water and ground water management need to be deployed, Powers (2019). in addition, the inadequate availability of physical water, usually experienced in arid and desert areas is now a global phenomenon that is creating havoc in large cities and poor communities. Therefore, since water has greater importance as a global commodity, existing property rights should be scrutinized, challenging

democratic control of natural resources should be prioritized and the sovereignty of countries is being put to test in transnational and continental waters. According to von Hirschhausen (2017), lamented that, although there is some progress towards the attainment of the SDG to provide access to clean water, about 800 million people globally face severe shortages of access to clean water for drinking purposes.

2.5.7 Affordable and Clean Energy

Growth and every aspect of existence relies on the usage of the energy and this allows n essential contribution to achieving the sustainable development goals (SDGs), nevertheless, the global distribution of energy resources is not equitable, contributing to disparities of poverty and wealth. in addition, the main cause of anthropogenic emissions and related problems is energy usage, Bruce (2018). Barua et al (2012), stated that because of the ever-expanding market for cleaner sources of energy and renewable energy is becoming increasingly relevant and this is expected to continue up to 2035 if the global economy could meet its pledge and boost investment.

2.5.8 Decent Work and Economic Growth

There are heterogeneous ways in which decent work expresses itself in both economic and social aspects, and have become more significant in modelling both society and business as a whole in modern times, Ferraro et al (2016).there have been problems with retailer operations, according to Soares Oliveira (2018), and to this end due to their poor workmanship and scandalous human rights practices, they faced some boycotts and tough criticism. These issues could be addressed by the implementation of social responsibility

initiatives in host countries and such interventions are in lieu with the dictates of sustainable development goals (SDGs) of the United Nations, specifically the eighthy goal which addresses decent work and economic growth.

2.5.9 Industry, Innovation and Infrastructure

Roy (2019) alluded that sustainable development goals (SDGs) of the United Nations are a roadmap that leads to prosperous, conflict free and a sustainable global future and this cannot be realized without improving the standard of living. However, the researcher noted with concern that coastal dwellers are faced with massive threats to such a realization in the context of goal number nine of the SDGs. Lesnikova and Schmidtova (2019) made an allusion that driving the growth and development of an economy require massive investments in innovative initiatives. Wahab et al (2016) mentioned the then United Nations Secretary General Ban Ki as having alluded to the primacy of innovations in both science and technology as the major ingredients to the attainment of SDGs.

2.5.10 Reduced Inequality

Oliveira (2018) indicated that the equality of benefits and development related obstacles between the current and future generations is not a guarantee of a better life for the generations to come further into the future. Additionally, the researcher recommended a sufficient intergenerational role as the sole technique to ensure that future generations benefits from the achievement of sustainable development goals (SDGs).

2.5.11 Sustainable Cities and Communities

Guneralp (2015) lamented that problems relating to sustainability, the use of energy and emissions of greenhouse gases would punctuate urbanization globally. The explanation for this is that large quantities of raw materials such as wood, concrete, bricks, mortar and steel are needed by growth of urban areas in the form of residential and business centres as well as by infrastructural developments However, as if that is not enough, the built environment rely on energy for maintenance and service. Greyling et al (2016) observed that cities in South Africa aim at issues of sustainability from policy and strategic lenses, in the process alluding that the transformation of cities is rooted in the rhetoric of policies and their deployment.

2.5.12 Responsible Consumption and Production

Sznida (2018) gave a step-by-step account of how the European Union has done to make the achievement of the sustainable development goal number 12 (SDG12) a reality, including the formation of Secular Economy Package, initiatives to minimize wastage of food across the whole value chain, and steps to achieve efficiency in the use of renewable energy.

2.5.13 Climate Action

Robinson et al (2006) observed the existence of a multiplicity of relations with respect to climate change and sustainable developmental issues and lamented the inadequacy of literature relating to climatic change. The available pieces of literature concentrate mainly on viewing sustainability developments from the perspective of climate change, instead of viewing climate change in the perspective of sustainable development. Further, there is too little praxis to

make attempts of marrying these twin issues in real world setups. Shindell et al (2017) hailed the Paris Agreement which was a culmination of the UNFCCC for closely marrying global long-range climatic and short-range poverty alleviation and developmental initiatives. The researchers called for urgent interventions, but however noted the possibility of a multiplicity of channels through which long-range targets could be realized. Janetos et al (2012) envisioned a bootstrap relation in available research studies with respect to development and climate change issues. It was also noted by these researchers that, although there are a multiplicity of initiatives to marry climate action into developmental projects, there is a lot that need to be done with respect to exposing possible synergistic benefits and costs thereof.

2.5.14 Life Below Water

Singh et al (2018) posits that the attainment of sustainable development goals is associated with a multiplicity of socio-economic and ecological effects which are interlinked. In this regard, a framework was crafted as a way of integrating available understanding from both experts and literature to investigate the marriage between one sustainable development goal and another. To be specific these researchers directed their lenses on life below water goal (SDG14) and its target, in the process relating it to other sustainable development goals. It was found that the “life below water” goal make significant contributions to the realization of other sustainable development goals. In the same spirit, Knott and Neis (2017) lamented that the damaging nature of intensive salmon aquaculture and individual transferable quotas (ITQs) on both the natural and marine space users have not received the due attention it deserves in financialization and fisheries context. Keen et al (2018)

observed that governments and agencies regionally in the Pacific are bolstering their pledges to foster sustainability of ocean management by putting in place robust public and private policy interventions. According to Blanchad et al (2017) global food security, livelihoods and nutrition rely to a large extent on aquaculture and fisheries production; but terrestrial and marine ecosystems and food production are separated under sustainable development goals. In order to ensure sustainability in satisfying the increasing global demand for fish, the marriages of goals with respect to aquaculture, agriculture and fisheries should be afforded due attention.

2.5.15 Life on Land

According to Angelov et al (2019), the production of honey in large quantity and excessive use of pesticides threatens the global bee populations with extinction and this has the potential to spill over to the global botanical system. Although there are a multiplicity of micro sanctuaries of bees around the globe, there is little understanding on this initiative and it is therefore appropriate to educate people on bee keeping so that they can preserve and rehabilitate them due to their importance in pollinating crops globally. The conclusion therefore is account for the global bee population since they are the lifeblood of all botanical systems and they also help foster the health of forests and farms. According to Solorzano and Fleischman (2018), there are many reasons for differing effectiveness of protected territories with respect to the attainment of goals for the conservation of nature; however little has been done along this. The duo then argues that institutional development is though neglected notwithstanding that it forms the foundation of protected territories. Sant'Anna and Young (2010) demonstrated the marriage with respect to deforestation

and conflicts in the Amazonia territory, in the process lamenting that violent land acquisition leads to massive deforestation.

2.5.16 Peace, Justice and Strong Institutions

Ginting and Anzela (2019) made a clarity that sustainable development goals (SDGs) are equipped with five major tenants such as planet, people, peace, prosperity and partnerships, and these principles straddle across the dimensions of environment, social and economic. The pair also emphasized that the Peace is a possible initiative in Indonesia for its inclusiveness of all stakeholders, however in the spirit of attaining sustainable development goals.

2.5.17 Partnerships for the Goals

According to Glasbergen (2007) partnerships symbolize marriages of a multitude of parties in a society, with each standing in favour of certain in tests that carry various aspirations, claims and expectations, distinguished by their own limitations and strengths. These characteristics of partnerships are well articulated in a multiplicity of writings and this being the source of their strengths in the realization of sustainable development goals. Graham et al (2018) pointed that Agenda 2030 have been under looked for its enthusiasm and narrowness, and cumbersome sense which is alike to a call for working together globally. However, this message has the possibility to foster significant achievements by 2013 and it is believed that the strength of SDGs is embedded in partnerships for development goal (SDG17).

2.6 Ecosystem Based Adaptation for Food Security Assembly (EBAFOSA)

The United Nations Environment supports sustainability practices according to Munang and Mgendi (2017), by supporting sound policies and practices through provision of technical and other support services to African states implementing the provisions of the Paris Agreement to facilitate the resolution of social and economic problems such as unemployment, food insecurity and economic growth. Munang and Mgendi (2017), stated that ecosystems based adaptation for food security assembly (EBAFOSA) is an action to promote agricultural industrialization, sponsored by the United Nations Environment with the backing of African Union (AU), state actors, non-state actors as well as private sector players. The nature of food security adaptation based on ecosystems includes techniques used in agriculture designed to promote conservation and sustainability by way of integrating land management, living and water resources. Reid (2011) described ecosystem based approaches to adaptation (EBA) as techniques which combine both biodiversity and ecosystems into initiatives to adapt to climatic changes. Mercer et al (2012) alluded that EBA techniques employs internal and external based understanding of an ecosystem for the identification of climatic changes adaptability initiatives.

2.7 Chapter Summary

This chapter delved into an overview of the United Nations Framework Climate Convention on Climate Change (UNFCCC), the Kyoto Protocol, Paris Agreement, Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs). The chapter also closed by taking a quick look at Ecosystem Based Adaptation for Food Security Assembly (EBAFOSA). Chapter 3 will present the theoretical framework of our research study and is the next chapter.

CHAPTER 3
THEORETICAL FRAMEWORK

3. Introduction

In this chapter the researchers presents the theoretical framework of the research study. This chapter will delve into the environmental Kuznets curve theoretical framework, in the process considering scale, techniques and composition effects on environmental quality. There are a multiplicity of indicators under the auspices of the environmental Kuznets curve such as atmospheric indicators, land indicators, oceans, seas, coasts and biodiversity indicators and also freshwater indicators.

3.1 Overview of the environmental Kuznets curve

According to Sarkodie and Strezov (2019), the relationship with respect to the systematic development of an economy and environmental sustainability forms the foundational backbone of the concept of the environmental Kuznets curve hypothesis. The environmental Kuznets curve hypothesis moots that during early economic development stages, there is a higher consumption levels of resources and this reduces the biological capacity of the environment and increase environmental pollutants. Generally during the early stages of

economic development, poverty is the order of the day, hence authorities tend to ignore the enforcement of environmental policies and regulations due to the pursuit of wealth creation and cleaning the environment thereafter. During the later economic development stages, income levels normally go up, supported by a strengthened institutional system, environmental sustainability awareness and highest levels of technological and innovation acceptance, which then contributes to environmental quality in a much more significant way. The robustness of policy measures from the analysis of the environmental Kuznets curve, there is a multiplicity of available literature since it is much topical by its very nature. However there is no agreement among researchers who might have employed similar or even different analytical techniques or basing on same geographical locations. Based on the foregoing, it became appropriate to investigate the conceptual frameworks of the environmental Kuznets curve hypothesis.

3.2 Theoretical framework of the environmental Kuznets curve

The relationship between economic growth and environmental quality is better examined through the environmental Kuznets curve (EKC) hypothesis, which considers the scale, techniques, and composition of the economic activities Fig.1.

The scale effect is characterized by pre-industrial structural changes in the economy, in which limited consumption of natural and biodegradable resources facilitates a reduction in environmental pollution. Over time, as the country's GDP progresses, this causes increased consumption of agricultural and other natural resources such as forests, which exceeds the regeneration rates (Sinha et al. 2017; Panayotou 1993). This causes the economy to enter

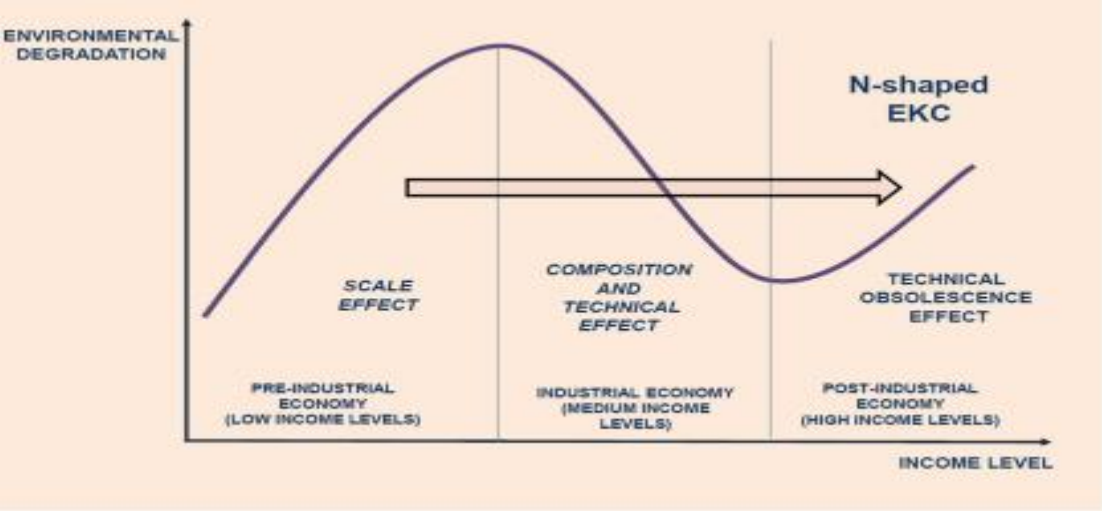
into a new phase with more industrialization and activities that deteriorate the environmental quality. This developing stage of the economy is reinforced with more advancement and output at the cost of environmental degradation. This further suggests that with a rise in the income level, the structure of the economy shifts to a knowledge base economy from a resource-intensive economy2. This phase is generally referred to as the composition effect, which is characterized by more stringent policies implemented by government in order to lessen environmental pollution through the development of cleaner industries. Tamaki et al. (2018) identified that better resource management and efficient utilization of the resources are ensured in this phase of economic development. Moreover, advanced economies with higher income allocate more funding to research and development to replace the old and obsolete technology with the invention of new technologies. This stage is referred to as the technical effect and further improves environmental quality. The aggregate effects of all the above activities generate a relationship between economic growth and environmental quality that takes the form of an inverted Ushaped relationship, which is known as the environmental Kuznets (EKC) hypothesis.

The relationship between economic growth and environmental pollution has been clarified in various studies in the literature. This assumption has been supported by the studies that verify the validity of the environmental Kuznets curve hypothesis (EKC). The EKC states that the relationship between economic growth and environmental pollution is nonlinear. This further implies that in the initial stages of economic development, economic growth, and environmental pollution increase simultaneously. This indicates that development occurs at the cost of environmental degradation in the initial

stages of the economy. However, after reaching the threshold point, environmental pollution declines as economic growth increases. This is the stage where economy has been developed. This situation has been explained in previous studies by predicting the inverted U-shaped relationship between economic growth and environmental pollution, which is reinforced by the validity of the EKC hypothesis (Grossman and Krueger 1991; Sinha et al. 2017; Sinha and Shahbaz 2018). Moreover, in addition to the inverted U-shaped relationship, several studies have also reported an N-shaped relationship between environmental pollution and economic growth. This suggests that in the initial stages of economic development, the economic growth upsurges the level of environmental pollution until the first turning point, and this is followed by a decrease in environmental pollution experienced as the economy improves until the second turning point. However, beyond the second turnaround point, environmental pollution again rises. Economic systems in such situations experience environmental corrections, as the increase in income directly affects environmental pollution. This further suggests that if the policies devised by the government regarding clean energy are not adopted and ensured during the implementation of the energy regulations at the second turnaround point, this will cause environmental pollution to rise again. This final stage requires technological development, which is necessary to generate more efficient products that can facilitate a reduction in environmental pollution (Shahbaz and Sinha 2018; Balsalobre and Alvarez 2016). It is important to identify that the N-shaped relationship between environmental pollution and economic growth has been explained using the scale, composition, and technical effects. Torras and Boyce (1998) in their study suggested that the

scale effect is experienced as economic growth rises in the initial stages of economic development, which deteriorates the environment. Hettige et al. (2000) explained in their study that structural changes occur with economic development as a result of the introduction of heavy industries, which further worsens the environmental quality. At this point, the economy experiences a shift from heavy industry towards light industry. At the same time, the products manufactured are environmentally friendly, thus improving the environmental quality with the rise in economic growth. Thus, the reduction in environmental pollution by the light industries introduces the phase of composition effects to the economy. Álvarez-Herránz et al. (2017) further stated that technological developments enable cleaner technologies to be adopted that are more efficient and reduce pollution at the same time. This improvement in the technological aspect at the later stages of development is linked with the N-shape EKC and confirms the technical effect.

Fig. 1 The above figure demonstrates the N-shaped EKC. Source: (Sinha et al. 2017)



3.4. Empirical literature of the Environmental Kuznets Curve

Several studies have confirmed the validity of the EKC hypothesis. Several recent studies referenced below have determined the relationship between GDP and CO2 emissions. Pontecorvo and Schrank (2012) argued in their study that the global fisheries consumption exhibited significant fluctuations during the period from 1950 to 1989 with 1.67 million tons (mt) average per year. Further, this utilization of global fisheries rose from 16.8 in 1950 to 81.9 mt in 1989. However, overfishing gradually decreased in the early 1990s, as a decrease of 9% was observed between 1990 and 2009.Branch et al. (2011) identified that the amount of fish stocks have collapsed and have been serially depleted by excessive fishing is in the range of 7–13% and 28–33%, respectively. It was further argued that the proportions suggest that resources are being deteriorated due to overfishing, which in turn reduces the regenerative capabilities of the oceans. Identifying the factors that lead to economic development and determining the relationship between the

development of the economy and the environment can be complex tasks. Moreover, resource degradation is due to economic development in the initial stages which is transient. However, after achieving a threshold level, economic development will begin to have a beneficial impact on environmental quality, which will result in the mitigation of damage caused to the ecosystem and nature (Grossman and Krueger 1991, 1995). Therefore, although global fisheries production initially declined, with better management and implementation of institutional policies, the sustainability of the marine fisheries production can be preserved in the long run. The study by Wang et al. (2019) examined the socioeconomic development of China's coastal waters. The study found that the coastal provinces in China possess different qualities along the seawater environmental Kuznets curve. It was noted that the early seawater EKC is due to the pollutionemitting industry compared to the later stage of the seawater EKC. Further, urbanization was also identified as a threat to seawater quality at the middle stage of the EKC. The study suggested various policies for the different stages of the seawater EKC. In another study by Sugiawan et al. (2017), capture fisheries production (CFP) and the estimated amount of stock were used as proxies for marine ecosystem using population and economic growth as regressors. They used data for the period 1961–2010 by applying the mean group estimator method. The findings of their study confirmed that the countries in the initial stages of development initially deteriorate the ecosystem. Further, they argued that an expected decline in caught fish occurs over the next two decades. Thus far, no study has investigated the nexus between CFP and GDP in the presence of financial development, imports, exports, and industry value added. Therefore, this study

is the first of its kind to study the nexus between capture fisheries and economic growth in the presence of financial developments, imports, exports, and industry value added using the second generation panel techniques.

This section is divided in to three sections: 1. Economic growth and environmental dergrediation, 2. U-Shape EKC and 3. N-Shape EKC

3.4.1. Economic growth and environmental dergrediation

To account for the impact of other significant economic determinants on ecological depletion steps, prior EKC analyses usually used linear factor requirements in their frameworks, yielding mixed results. Saidi and Hammami (2017) examined the causal interactions involving freight transportation, economic development, and ecological depletion in 75 nations from 2000 to 2014. They split the world board into 3 sub based on nations' income levels: high-income, middle-income, and low-income. Due to the differentiation among tables, dynamic panel data structures can be used in matrix multiplication calculated using the Generalized Method of Moments. The primary findings indicated the presence of a feedback impact between income and transportation. For the high-income group, there is a bidirectional causal relationship among ecological deterioration and economic development, whereas there is a one-way causal relationship involving transportation and ecological pollution. The results are consistent with the middle- and low-income tables, where we discovered that ecological pollution is primarily caused by economic development and freight transport, whereas the impact in the opposite way is small and relatively irrelevant. This observational analysis firmly confirms the correlation of economic activity and freight

transportation, but denies the feedback impact regarding ecological destruction and economic progress in middle- and low economies. Moreover, Wang and Dong (2019) examined the predictors of ecological deterioration factually, taking into consideration the important functions of economic development, non-renewable and sustainable energy use, and urbanization. They used a structured panel database covering 14 SSA nations from 1990 to 2014. Additionally, the ecological footprint (EF), a further detailed measure of ecological damage was employed as a measure for ecological deterioration The findings demonstrated a high degree of cross-sectional dependence among SSA nations Economic development, non-renewable energy use, and urbanization all have a positive impact on the EF in SSA nations whereas clean energy usage has a negative impact on the EF. Furthermore, bidirectional long-run causality was observed between economic development, non-renewable consumption, urbanization, and the EF; in comparison, unidirectional causality was observed between clean energy usage as well as the EF. As a result, the SSA nations' manufacturing structures must be upgraded and clean energy sources must be progressively improved. Additionally, urbanization was a significant contributor to ecological deterioration, necessitating urgent policy responses in SSA nations. Again, Belaid and Youssef (2017) used Autoregressive Distributed Lag Cointegration to examine the complex causal interaction among CO2 pollution clean energy usage, non-renewable energy usage, and economic expansion in Algeria from 1980 to 2012. The study outcome verified the presence of cointegration between the factors. They concluded that economic expansion and non-renewable power usage have an adverse impact on the

sustainability of the atmosphere in the long run, while clean energy usage has a favorable impact on the ecosystem Additionally, in the short run, findings indicate a unidirectional causal association between GDP and NREC, corroborating the sustainability assumption, according to which energy demand is determined by economic development. The findings indicate that clean energy use will contribute to improving Algeria's ecological sustainability However, clean energy production has not yet attained a scale that enables a meaningful impact to the energy-related greenhouse pollution reduction goal. Nevertheless, Mohsin et al. (2019) examined the combined impact of fossil - based power use, economic growth, as well as overall population on ecological impacts in the transport industry, focusing on ecological deterioration. The findings indicated that economic development, urbanization, and energy use all contributed to a rise in transportation-related ecological damage. Additionally, perhaps most intriguingly, energy usage rose by 13.5 percent within this time, demonstrating a strong reliance on energy usage for economic development. Additionally, the association between CO2 emissions and energy use was favorable for the environment. Eventually, this report made some recommendations to policymakers about how to reduce ecological damage and make the transportation sector more eco - friendly. Moreover, Hassan et al. (2019) investigated the association regarding economic development and environmental footprint in terms of biocapacity and human resources. Income activity raises the ecological footprint, which leads to ecological deterioration, as shown by the autoregressive distributive lag (ARDL) econometric technique with a systemic break based on data spanning 1971 to 2014. Additionally, biocapacity leads to environmental destruction by

increasing the ecological footprint. A causality findings indicate that there is no causal connection regarding economic development as well as ecological footprint.

3.4.2. U-Shape Environmental Kuzent curve

Numerous research have been conducted to determine the conditions that contribute to ecological deterioration or emissions. However, these experiments test the feasibility of the EKC assumption in order to confirm or refute it. However, Sarkodie (2018) analyzed the factors that contributed to ecological deterioration and emissions in 17 African nations between 1971 and 2013. His review of the relationship among ecological degradation and economic expansion in Africa reaffirms the credibility of the EKC concept in Africa at the US$ 5702 GDP pivotal moment. Nevertheless, the relationship among ecological deterioration and economic expansion exhibits a U shape among US$ 101/capita as well as US$ 8050/capita, with a pivotal moment of US$ 7958 GDP, supporting the level impact assumption. The outcomes demonstrated that power use, food supply, economic expansion, perpetual crop yields, farmland use, infant mortality rate, and birth level all contribute significantly to ecological destruction and emissions in Africa, endorsing universal measures for meeting the Sustainable Development Goals by 2030. Mehmood and Tariq (2020) on the other hand investigated the relationship regarding globalization and greenhouse gases (CO2) pollution in South Asian nations from 1972 to 2013. In Nepal, Afghanistan, Bangladesh, and Sri Lanka, both quantitative and visual studies revealed a U-shaped connection among globalization and Carbon pollution while Pakistan and Bhutan revealed an inverted U-shaped connection.

Additionally, findings indicate a bidirectional causal relationship regarding globalization and Carbon pollution in Pakistan, Bangladesh, and Nepal. This demonstrates that globalization increases CO2 pollution and that CO2 pollution have an effect on globalization through economic development. Conversely, after a certain point, globalization is credited with reducing CO2 pollution in Pakistan and Bhutan. Globalization is introduced into economic research for the first time, demonstrating the U-shape as well as inverted U-shape relationships among globalization and Carbon pollution This analysis provides many significant strategy suggestions including that South Asian nations should regard globalization as a cost-effective method for achieving sustained economic development. Moreover, Işk et al. (2019) examined the EKC assumption for the 10 states with the maximum CO2 emissions in the United States of America using the explanatory factors real GDP, population, and clean and fossil power. To accomplish this, data from 1980 to 2015 was used to apply the panel forecasting model with cross-sectional dependence. According to the report's results, the EKC (inverted U-shaped) assumption is only true in Florida, Illinois, Michigan, New York, and Ohio. Surprisingly, despite the fact that Texas is the highest petroleum region, the adverse effects of fossil power usage on CO2 pollution rates were not significantly detectable. Additionally, the benefits of green power use in Florida, formally recognized as the "Sunshine State," are relatively small in comparison to other jurisdictions. Eventually, Tenaw & Beyene's (2021) report examined the ecosystem nexus in 20 Sub-Saharan African (SSA) nations spanning 1990 to 2015. The Popular Correlated Effects version of the Pooled Mean Group Estimator (CCE-PMG) was chosen as the favored prediction method in the sense of an error-

corrected panel Autoregressive Distributed Lag (ARDL) framework supplemented with cross-sectional distributions. Additionally, a suitable U method was utilized to determine the existence of a legitimate inverted U-shaped EKC connection. The findings support the presence of a revised EKC concept in SSA, but the connection was contingent on the degree of natural resource funding. Between the growth-related variables, it is discovered that energy use and trade accessibility had a long-run negative impact on the climate. The analysis concluded that a nation 's economic growth efforts must be supported by policies that promote ecological responsibility. Additionally, Isik et al. (2021) assessed the environmental Kuznets curve (henceforth, EKC) hypothesis's reliability in eight OECD nations To accomplish this, they disintegrate the per capita GDP sequence into rises and falls and design only rises, leaving out declines. As a result, this approach can allow them to further precisely evaluate the EKC concept in line with the existing concept. They used a fixed-effect regression analysis with Driscoll-Kraay standard errors and the typical correlated effects mean group (CCEMG) evaluator during decay. Although the undecomposed system with green waste per capita GDP set accepts the EKC concept for four of the eight nations, the decayed system with decayed per capita GDP sequence has not. As a consequence of these contradictory findings, it was clear that additional approaches namely the data transformation/decomposition used in this analysis, are needed for evaluating the EKC concept. Nevertheless, Ramos et al. (2018) added to the existing relevant work by correlating carbon pollution with the economic conduct of Portugal's operation industries, and also with indicators for technology advancement, such as R&D or TPR&D. (total persons working in R&D). They

do so by evaluating the impact of 11 economic growth segments in Portugal using a mixed panel of information from disparate enterprises around 1996 and 2013. As primary findings of their research, they observed two distinct EKC habits: an inverted U-shaped conduct and an N-shaped conduct, both of which explains in a unique direction the connection among carbon pollution as well as economic expansion in industries worldwide, and also their attitude over the time span studied. The findings of this study demonstrate that Carbon pollution will not be eliminated immediately as a result of economic development. By resistance, it can become more extreme until a specific amount of development has been achieved. Cheikh et al (2021) developed a novel method for examining the complex connections among greenhouse gases (CO2) pollution, energy usage, as well as income in MENA zone. Their research employs a nonlinear panel smooth transition regression (PSTR) method to introduce a collection of regime-switching frameworks. Carbon pollution were estimated in two ways. On the one side, we examine the effect of energy demand on CO2 emissions in relation to per capita income, as nations with comparable energy demand rates would have varying rates of energy output. From the other side, they approximated the effect of demand growth on pollution based on variance in energy consumption, as increased economic expansion does not always imply energy-intensive operations. Their observational results corroborate these intuitions, indicating a nonlinear relationship between emissions as well as energy utilization and GDP expansion. They observe an inverted U-shaped trend in the energy-CO2 relationship, wherein the ecological deterioration declines above a specified income level calculated naturally occurring inside the PSTR framework.

Additionally, their findings demonstrate that GDP expansion has a major effect on carbon pollution only when energy demand increases. Neverthelss, Gil et al. (2018) examined the existence of EKC for global warming (GHGs) as determined by CO2 emissions in Malaysia from 1970 to 2011. Additionally, their research explores the capacity of clean power sources to mitigate GHG emissions. The long-run strongly positive GDP variable shows that GHG emissions were rising in lockstep with productivity expansion, whereas the negligible GDP square coefficient refuses the EKC transformation. These findings suggest that Malaysia's EKC pivotal moment occurred at a strong GDP stage As a result, it could be claimed that only income activity will be able to counteract Malaysia's climate change. The state should be required to propose some action steps to help Malaysia meet the CO2 pollution mitigation goals it committed to in Paris Submit (2015). Clean energy output has a major adverse impact on CO2 emissions, according to the report. Thus, the administration should prioritize clean power generation and establish a separate strategy for sustainable power development. Lastly, Huang (2020) examined the Environmental Kuznets curve (EKC) component of income-driven ecological desire. Between 1995 and 2015, Taiwan's major power consumption-to-GDP proportion (referred to as energy intensity) followed an EKC trend (an inverted "U" form of specific power intake with rising GDP), but the nation's minimum income stayed relatively stable Thus, certain motivating factor may have played a significant influence in the creation of the power EKC model. Therefore, this paper examines significant context involving international crude oil prices in order to gain actual findings for how the power EKC can cause intracellular activities to influence endogenous policies. The

power EKC reached a tipping point in 2002, once the electricity framework began to reduce its reliance on oil power stations. This article proposes an alternate theory for the creation of the EKC model.

3.4.3. N-Shape Environmental Kuzent curve

F. Yang, et al. (2017) examined the complex short- and long-term connections between GDP, power usage, clean power usage, trade accessibility and CO2 pollution in Korea from 1971 to 2017. While rises GDP as well as power usage boost CO2 pollution, renewable power usage as well as trade accessibility decreased CO2 pollution as per results obtained from ARDL bounds evaluation method Additionally, an N-shaped association among CO2 pollution and GDP has been established empirically. This demonstrates that their results obtained in Korea refute the EKC assumption Thus, income activity alone would not suffice to fix ecological damage, as a result, proactive sustainability strategies should be adopted, and Korea's power structure should be restructured in support of clean energy. On the other hand, Ye & Yuan (2017) investigated the associations regarding agricultural water as well as grain yield in various regions of China using panel data from 2009 to 2014 as well as the EKC framework. The findings suggested that: agricultural water intake and grain yield followed a "N" shape in northern areas; agricultural water intake and grain yield followed an inverted-"U" shape in southern regions; but there was a significant gap in agricultural water intake within northern and southern regions. It is worth noting the increasing "rebound impact" of agricultural water usage following its decline. Additionally, it was discovered that agricultural water use peaked faster in southern regions than in northern areas. As a result, distinct interventions need to be developed in northern as

well as southern regions to significantly minimize agricultural water use. However, Özokcu & Özdemir (2017) examined the connection regarding income and CO2 pollution in the sense of the EKC, which postulates an inverted U-shaped association involving ecological deterioration and economic growth. Two analytical frameworks were tested for this reason. In 1980 and 2010, the interaction among income and CO2 pollution and the connection among income, power usage and CO2 pollution was examined utilizing panel data analysis approaches and Driscoll-Kraay Standard Errors for both equations. Nonetheless, the first model examines content for 26 OECD nations with strong income groups, while a model 2 examines details for 52 developing economies. Both frameworks demonstrate that an N-shape as well as an inverted N-shape association exist for cubic structural type Hence, the findings refute the EKC theory which asserts that ecological pollution cannot be resolved immediately by economic development. Moreover, Halkos and Polemis (2018) used Window Data Envelopment Analysis to approximate the performance of the energy production system in the United States of America. They use the composite formula to combine longitudinal and non-radial performance indicators in DEA, thus extending the conceptual approach to consider separable and non-separable outputs. The second stage involves the application of modulation and non-parametric empirical studies to design the connection among the measured ecological cost savings and economic expansion associated with achieving sustainable. Their analytical results suggest a consistent N-shape association among ecological performance and area economic progress when worldwide and total pollution are considered, but an inverted N-shape when localized pollution are considered. This means

that care must be taken when evaluating locally and globally emissions, as well as the derived ecological performance ratings. A strong signal to lawmakers and political figures is that global warming must be evaluated in terms of its scattering and geographic component. Moutinho (2017) in his report analyzed the connection among economic activity as well as climatic influences using two non-linear requirements: a quadratic and a cubic specification . The research covers the years 1975–2012 in Portugal and Spain, utilizing data from 13 industries. GVA serves as a measure for profits, whereas power consumption and carbon emissions serve as indicators of ecological deterioration. There was proof for an EKC with an inverted U shape. Conversely, certain inverted N–shaped structures may also be used to describe the connection among economic progress and pollution. In aggregate, analytical findings suggest distinct variations among the Portuguese and Spanish markets. The findings are not just of concern to scholars, but also to stakeholders. Additionally, institutional mitigating strategies are studied. Allard et al. (2018), however, used panel quantile regression method to test the N-shaped environmental Kuznets curve (EKC). They examined the connection among CO2 pollution as well as GDP in 74 nations from 1994 to 2012. Additionally, they provided independent factors such as green power use, technical advancement, trade, and institutional efficiency. They found strong confirmation for an N-shaped EKC across all income levels, with the exception of upper-middle-income nations. Notwithstanding, heterogeneous properties are identified across the N-shaped EKC. Eventually, they observed a downward correlation regarding green power use and CO2 pollution, emphasizing the critical role of green energy in

combating climate change. However, Gyamfi et al. (2021) examined the environmental effect of economic advancement notably in the emerging-7 economies, which account for a sizable portion of world economic operation Their research examined the N-shaped EKC for the E-7 nations from 1995 to 2018. The research used the PMG-ARDL estimation technique and heterogeneous causality measures to determine the long run, short run, and path of causality for the factors of concern accordingly. As per the report's findings, the long-run outcomes do not support the reality of an N-shaped EKC in the emerging seven nations but do support the presence of an inverted U-shaped EKC in the research nations Although clean power and non-renewable power had a favorable and substantial association with CO2 pollution, short run outcomes indicate that economic growth, clean power non-renewable power, as well as CO2 pollution do not have a substantial association. Causality analyses revealed bidirectional causality among GDP as well as GDP squared and unidirectional causality among CO2 pollution and GDP cubed, as well as causality among non-renewable power and CO2 pollution as well as clean power and CO2 pollution The analysis recommends that the E-7 countries expand their usage of clean power to help reduce pollution levels. Again, Fonchamnyo and Achuo. (2021) investigated the connection involving ecological deterioration as well as economic development, concluding that the environmental Kuznets Curve (EKC) concept is primarily clarified by this connection. This research suggested and tested the presence of a duality method to the EKC concept by using the fundamental postulate of the reference EKC system. Configuration was employed to demonstrate the duality structure that was suggested. Meanwhile,

using a novel dynamic common correlation impact statistical approach, they examine the nature of the duality EKC in a panel of 109 nations spanning 1995 to 2016. The proposed equations demonstrate that the presence of the duality U-shape as well as N-shape EKC hypotheses was confirmed in the general model When the study was subsampled according to income class, the U-shape EKC concept was confirmed for low- and high-income societies, respectively. Besides that, the duality N-shape EKC was primarily identified among high societies.

3.5. Empirical modelling of the environmental Kuznets curve

Heedlessly of the heterogeneity of econometric techniques employed with respect to the environmental Kuznets curve hypothesis follow similar model specifications. The relationship between economic growth and environmental sustainability (capture fisheries production) is given in equation 1 as:

$$y_t = a_t + \beta_1 x_t + \beta_2 {x^2}_t + \beta_3 {x^3}_t + \beta_4 z_t + \epsilon_t \text{.. (1)}$$

Equation 1 above indicates that, α is a constant, y is environmental pollutants, x, x^2 and x^3 indicates economic growth, its square and cubic polynomial function, z represents other environmental determinants, β's are the coefficients, ϵ is the random error term in time t.

Based on hardheaded evidence presented scientifically in equation 1 above, the following elucidation can be prepared amongst economic progress and environmental sustainability cursors:

a. Undoubtedly no association between x and y in the juncture that$\beta_1 = \beta_2 = \beta_3 = 0$.

b. Positive monotonic association amidst x and y in the manifestation that $\beta_1 > \beta_2 = \beta_3 = 0$.

c. Negative monotonic association amidst x and y in the occurrence $\beta_1 < 0, \beta_2 = \beta_3 = 0$.

d. Inverse U-curved association amidst x and y in the event of $\beta_1 > 0, \beta_2 < 0, \beta_3 = 0$.

e. U-curved association amidst x and y in case of $\beta_1 < 0, \beta_2 > 0, \beta_3 = 0$.

f. N-curved association amidst x and y in case $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0$.

g. Inverse N-curved association amidst x and y in the event $\beta_1 < 0, \beta_2 > 0, \beta_3 < 0$.

While approximating the environmental Kuznets curve model, including non-linear expressions in a typical regression model will lead to a supposition of a inverse U-curved relationship in the occurrence that the non-linear term is negative and significant with its whirling point inside the data sequences. Another likelihood is the supposition of an N-curved association in the occurrence that the square of economic progression is negative and significant, and the cubic polynomial of economic progression is positive and significant. Consequently, the environmental Kuznets curve concept is confirmed if $\beta_1 > 0, \beta_2 < 0, \beta_3 = 0$ and $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0$ at turning points calculated using the formulation$x = -0.5\beta_1/\beta_2$.

3.5 Chapter summary

In this chapter the researchers provided the theoretical framework underpinning the research study, to be specific, the environmental Kuznets curve theory and all its variants. The next chapter will delve into the methodological aspect of the study.

CHAPTER 4
METHODOLOGY

4. Introduction

This chapter aims at provide an explicitly explanation of the research design and methodology thereof. In this respect, this section will provide a sanctity restatement of the research questions in order to explicitly elucidate what is being earmarked by the researchers. As if that is not enough, this chapter will further delve into the research population, sample size, research design, data collection and data analytical techniques employed in the research study.

4.1 Research Questions

The research study sought to provide answers to the following research questions:

(a) Does the environmental Kuznets curve hold in selected 14 emerging economies?

(b) Is there any relationship between trade and environmental degradation (capture fisheries production) in selected 14 emerging economies?

(c) What is the nexus between environmental degradation (capture fisheries production) and finance in the context of selected 14 emerging economies?

(d) Are institutions and the financial systems in selected 14 emerging economies strong enough to support Sustainable Development Goals?

(e) Do we have any causality relationships between economic growth, environmental degradation (capture fisheries production), finance and trade in selected 14 emerging economies?

4.2 Research Design

According to Mouton (2007), a research design is the glue which is responsible for holding the whole research study together and indicates some important components of the study, including samples, groups, programs and econometric strategies deployed and demonstrate their compatibility in providing answers to the research questions. Research designs brings together in a logical manner the data to be collected and the outcomes to be extracted from the study to the research study questions (Rowley 2003). Therefore, this research study will make use of a case study research design technique. A case study research design is a unique strategy where certain social elements by making use of some comprehensive explanations and analysis with respect to a single situation and/or case such as sound research on individuals, settings, groups, events and episodes, O'Leary (2010). Based on the foregoing, it has become apparent that in a case study research designs digs deeper due to the fact that it calls for the researcher to dig and dig a little bit deeper. According to Yin (2004) in Saunders et al (2016), a case study is a detailed analysis of an occurrence without disturbing its natural setup. In a

case study research design strategy, a “CASE” may relate to persons, groups, organizations, associations, processes and events. Flyvberg (2011) alluded that the selection of a case for the purposes of investigation and determining the boundaries with respect to the research study is of paramount importance. According to Saunders et al (2016) have alluded that the understanding of some dynamics for given topics depends on relations which exist between the context of a case and its subjects. In a case study research study, it is practically possible for the researchers to delve into quantitative and qualitative domains, O’Leary (2010). In this research study, researchers will employ a single case study research design, considering a sample of emerging economies around the world, our case in question. According to Sunders et al (2016), single case studies are deliberately selected due to their relevance or due to the ability to afford an opportunity to investigate a situation which very few researchers have dared to. However, the most important thing is to choose the correct case study to consider in a research study. Therefore, based on the foregoing, this study will consider a single case study involving emerging economies around the world in order to provide robust public policy interventions so as to foster an environmentally sustainable future.

4.3 Research Philosophy

As Saunders et al (2016) alluded, a research philosophy is employed with respect to a multiplicity of norms and principles which guides the development of knowledge. In this respect, the researchers a multiplicity of assumptions in a consciously or unconsciously during the process of their study. These assumptions include epistemological assumptions, ontological assumptions and axiological assumptions.

Ontological assumptions as those which normally delve into the nature of reality, Saunders et al (2016), while epistemological assumptions relates to the nature of knowledge production, that is, answers questions relating to what makes valid, real and standard gnostic and how it can be shared with others, Burren and Morgan (2016). On the other hand, axiology considers the role of ethics and values considered throughout the research study process. According to Crotty (1998), these assumptions strengthens the understanding with respect to the research questions, methods considered and also results interpretations. In this regard, this research study will employ a positivist research philosophy. In a positivism, scientific knowledge can be positively verified as opposed to dogmatism, speculation and superstition, hence positivist gnostic considers sure and real foundations, Delanty (2005). According to Saunders et al (2016), positivism is a natural science philosophical stance and it involves using observable social realities in order to make law-like generalizations. The trio lamented that positivism leads to unambiguous and accurate knowledge, with the credit being given to Francis Bacon, Auguste Comte and Vienna Circle. The duo, Denicolo and Becker (2012) lamented that a positivist research philosophy, one should include in its design, predetermined measurable variables wherein some will be independent, while its effect on some dependent variables will be subjected to observation. Therefore, in this research study, the researchers will exactly follow this convention in order to foster robust public policy recommendations with respect to selected emerging economies around the world.

4.4 Research Population

The study will considered the Next 11 plus the BRICS economies excluding Russia and Vietnam, since only those economies with data availability with respect to the targeted variables qualified in order to foster robust practical solutions to the research questions.

4.5 Data Collection And Sorting Techniques

The research study employed GDP per capita in 2010 US$, capture fisheries production (CFP) in metric tons, industry value added (IVA) including construction in constant 2010 US$, domestic credit provided by financial sector as a percentage of GDP (DCF), exports of goods and services (EGS), imports of goods and services (IGS) both as a percentage of GDP. The data was retrieved from the World Development Indicators of the World Bank (2020). The research study considered a balanced panel data set, therefore, the beginning and ending period was ensured to be the same with respect to all 14 economies considered in the study. The data was collected from 1992 up to 2016. The researchers employed these variables in order to investigate the existence of an N-shaped pattern was investigated with respect to capture fisheries production, GDP per capita, its square, cubic polynomial function, industry value added, domestic credit provided by the private sector, exports and imports of goods and services. The variables employed in the study were carefully selected to investigate the environmental Kuznets curve using capture fisheries production. Therefor to the best of our knowledge, there is no other research study which delved into this before, hence this amounts to a significant contribution both to literature and best practices. In this research study, capture fisheries production was employed as biodiversity indicator for the degradation of the environment. Therefore, based on the foregoing, thus

far only Sugiawan et al (2017) employed capture fisheries production and stock proxies with respect to marine ecosystems using both population and economic growth as independent variables. Therefore, this research study will extend the model by way of including industry value added, domestic credit provided to the private sector as well as exports and imports of goods and services. Thus, the empirical model is presented with log-log form as follows:

$lnCFP_{it} = \beta_{i1}lnGDP_{it} + \beta_{12}lnGDP^2{}_{it} + \beta_{i3}lnGDP^3{}_{it} + \beta_{i4}lnIVA_{it} + \beta_{i5}lnEGS_{it} + \beta_{i6}lnIGS_{it} + \beta_{i7}lnDCP_{it} + \varepsilon_{it}$ …………………………………….. (1)

In equation 1 above, $lnCFP$ is capture fisheries production, $lnGDP^2$ being the square of GDP per capita, $lnGDP^3$ being the cubic polynomial function of real GDP per capita, $lnIVA$ represents industry value added including construction, $lnEGS$ is showing exports of goods and services, $lnIGS$ imports of goods and services, $lnDCP$ being domestic credit provided to the private sector. These variables were introduced as control variables in the research study and they have been converted into their natural logarithms so as to deal with likely hetroskedasticity. In the equation (1) above, i represents economies, t being time period and ε_{it} representing the disturbance error term for country i for the period t. In this research study, it is hypothesized that the N-shaped capture fisheries Kuznets curve is supported in the selected 14 economies. Therefore, the expected signs with respect to $\beta_1, \beta_2 \; and \; \beta_3$ are positive, negative and positive, in that order.

4.6 Empirical Models

The research study employed a multiplicity of advanced econometric techniques in a way which will foster the development of robust public policy

recommendations. In this regard, the first estimation technique employed was unit root tests and cross-sectional dependence tests, followed by panel cointegration tests which were meant to determine long-term and short-term elasticities.

4.6.1 Unit Root Tests And Cross-Sectional Dependence Tests

The research study first examined the existence of cross-sectional dependence (CD) before conducting any unit root tests with respect to the variables employed in the research study. Due to the fact that first generation unit root tests do not consider the importance of cross-sectional dependence in determining the order of integration for the variables in the study, this study considers second generation unit root testing methods. According to Paramati et al (2016), conventional unit root testing techniques have low power and are not appropriate under conditions where there is some cross-sectional dependence. Therefore based on the above assertions, the researchers employed CIPS and CADF unit root tests which were suggested by Pesaran (2007) and these tests are robust in case of any cross-sectional dependence. Based on the foregoing, the study employed both the CIPS and CADF in determining the order of integration with respect to the variables employed in the research study.

4.6.2 Westerlund Co-integration Tests

The research study employed a bootstrapped panel co-integration technique which was developed by Westerlund (2007) for the purpose of determining the existence of long-run associationship with respect to the variables employed in the study. The Westerlund (2007) panel co-integration technique makes use

of cross-sectional dependence in order to determine the long-run associationship among the variables. Therefore, the based on the importance of CD in the study, a bootstrapped Westerlund co-integration technique was employed due to its ability to consider it in its algorithms. The bootstrapped approach to co-integration is more powerful compared to conventional co-integration techniques since it focuses on structural rather than residual diminuendos. Therefore, it is clearly apparent from the foregoing that the bootstrapped Westerlund (2007) panel co-integration technique is more robust than the residual based Pedroni (2004) co-integration techniques. Therefore, researchers have made a decision to employ the bootstrapped Westerlund (2007) co-integration technique to investigate the long-run associationship with respect to capture fisheries, exports and imports, GDP per capita, industry value added and domestic credit provided to the private sector. In the study, researchers followed Westerlund (2007) panel co-integration technique as suggested by Persyn and Westerlund (2008). Under this technique, the co-integration relationships investigated are two that is panel tests and mean group tests and the foregoing tests are thus categorized as Gt, Ga, Pt and Pa. Where Ga and Pa are adjusted to control hetroskedasticity and autocorrelations. These test are only relevant in the event that the variables are integrated of order one (I(1)). These tests makes an evaluation and confirmations with respect to the error correction for both individual panels and group statistics.

4.6.3 Dynamic Ordinary Least Square (DOLS)

This research examines the nexus between catch fisheries and economic advancement using a panel regression data collection. Using the ordinary least

squares (OLS) approach in this case can introduce bias into the estimation of long-run volatilities. Pedroni (2001a, b) demonstrated that when using regression evaluation to determine long-run outcomes, frustration limitations can lead in serial correlation and endogeneity difficulties between independent factors It has been observed that when non-stationary factors are estimated utilizing OLS, second-order bias occurs due to nuisance coefficient, invalidating the long-run variables centered on the OLS assumption. Projections of the cointegrating vector are obtained using the OLS process. These assumptions are then employed to correct the calculated variables for prejudice. Additionally, endogeneity exists as a result of the interaction among the predictor factors as well as V_t. This issue must be resolved by resolving the association among the t predictor factors as well as the V_t period's lagged meanings. Stock and Watson (1993) suggested this approach, which assumes into consideration the connection among the independent variables as well as V_t through the conditional variance leads and lags which it could no more be associated with. As a result, corrected-bias measurements can be achieved (Banerjee et al. (1993): 250; Dutt and Ghosh (1996); and Crownover et al. (1996)). As a result, this analysis employs DOLS to prevent endogeneity concerns when evaluating long-run elastic properties.

By taking leading and lagging context into consideration, dynamic ordinary least squares solves the issue of association among the response factor as well as the nuisance word. The pivotal factor about DOLS technique is that they can be used to evaluate cointegration vectors when the periods of the factors are different. Another benefit of DOLS is that long-term factor evaluation is consistent and approximations have an equilibrium standard

allocation, however, predicted disorder concepts in this system do not agree with independent factor. The equation for this technique is shown as:

$$lnCFP_{it} = \mu_i + x_{i,t}\Psi_{i,t} + \sum_{j=-p}^{p} \beta_j \, lnCFP_{i.t-j} + \sum_{j=-q0}^{q0} p_{1.j} \, lnGDP_{i.t-j} +$$

$$p_{2.j} \sum_{j=-q1}^{q1} lnGDP2_{i.t-j} + p_{3.j} \sum_{j=-q2}^{q2} lnGDP3_{i.t-j} + p_{4.j} \sum_{j=-q2}^{q3} lnIVA_{i.t-j} +$$

$$p_{5.j} \sum_{j=-q2}^{q3} lnEGS_{i.t-j} + p_{6.j} \sum_{j=-q2}^{q3} lnIGS_{i.t-j} + p_{7.j} \sum_{j=-q2}^{q3} lnDCP_{i.t-j} +$$

$$\varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

In equation 2 above, $lnCFP$ is capture fisheries production, $lnGDP^2$ being the square of GDP per capita, $lnGDP^3$ being the cubic polynomial function of real GDP per capita, $lnIVA$ represents industry value added including construction, $lnEGS$ is showing exports of goods and services, $lnIGS$ imports of goods and services, $lnDCP$ being domestic credit provided to the private sector. The p as well as the q denote the number of leads/lags whiles the ε_{it} denote the error term of the equation.

4.6.4 GRANGER CAUSALITY.

To ascertain the causality relationship involving catch fisheries production and the other independent variables, Dumitrescu and Hurlin (2012) developed the Granger causality in panel results. Granger's (1969) definition of causality is linked to the perception of predicting a factor using the proof of another rather than believing that one factor precedes another in a temporal way. Thus, one factor is the trigger of another factor only if the first factor contains knowledge about the second factor that moves that which would not be generated on an alternate basis. Granger discovered that a factor xt triggers yt only if yt can be effectively predicted using only the knowledge concerning yt and the historical facts of xt rather than the variable's background. For the purposes of this study,

fisheries production improves economic growth, but it is not feasible without sound investment. According to Dumitrescu as well as associates, this method is also effective when the factors are stationary at the stage, i.e. 1(0). In this case, the test will be conducted utilizing the approximation of an autoregressive vector (VAR) involving two parameters, which again is generally more useful for estimating since the factors are not constrained. Additionally, they propose that four distinct forms of causal relationships occur in heterogeneity in the linear framework relatively homogeneous non causality, which implies that no specific causal connection exists among two factors; heterogeneous causality, which implies that no specific causal interaction exists among two factors; and heterogeneous causality, which claims that no specific causal connection exists among two factors. The other is homogeneous causality, which implies that the dependent factors characteristics are consistent across all cross-sections in the panel.

The third feature is the heterogeneous causality assumption, which holds that N causal relationships exist but that the explanatory variable's level of activity has no effect on the production of causality. In this analysis, variations in the catct fisheries production of the countries sampled had little impact on the causality findings, until growth improved the domestic investment. The final aspect is the heterogeneous non causality assumption, which suggests that a causal association exists between x and y for a subset of persons and that there are at least one and up to N-1 non causal relationships. The procedure is also appropriate for this analysis because it allowed us to decide the number of lags to use in our template by reducing the Akaike information criterion, the Bayesian information criterion, or the Hannan-Quinn information criterion, as

well as perform a bootstrap approach to measure p-values and significance value. The equation for this DH causality is shown as:

$$y_t = \delta_i + \sum_{k=1}^{K} \alpha_i^{(k)} x_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} y_{i,t-k} + \mu_{i,t} \quad \forall\, i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T \qquad (3)$$

4.7 Chapter Summary

This chapter presented a restatement of the research questions, research design, research philosophy, research population, data collection and sorting, empirical models where panel unit root tests and co-integration tests techniques were considered. In the next chapter, researchers presented empirical findings from the data analysis performed.

CHAPTER 5

DATA PRESENTATION, ANALYSIS AND DISCUSSION.

5. Introduction

This chapter presents results from the analysis of results from the data to investigate the N-shaped environmental Kuznets curve using capture fisheries as a biodiversity indicator for selected emerging economies. The results presented in this chapter will include definitions and descriptive statistics of variables, cross sectional dependence tests (CD), cross sectional dependence unit root tests (CIPS unit root test), Westerlund error correction model bootstrap panel co-integration tests and the dynamic ordinary least square model (DOLS).

5.1 Definitions and Descriptive Statistics

Table 1 below presents the results with respect to definitions and descriptive statistics of the variables employed in the research study. These results suggest that capture fisheries productions had a mean value of 14.0058 and a standard deviation of 1.0726, GDP per capita had a minimum value of 8.0817 and a standard deviation of 1.0192, industry value added had a minimum of 25.6713 and a standard deviation of 1.1937, domestic credit provided to the private sector had a minimum of 3.6266 and a standard deviation of 1.0726, exports of goods and services had a minimum of 3.0718 and a standard

deviation of 0.4270 and imports of goods and services had a minimum of 3.1100 with a standard deviation of 0.3889.

Table 1 : Definition and Descriptive Statistics.

Variable	Description of Variable	Mean	Std. Deviation	Observations
ln CPF	Capture fisheries production (metric tons)	14.0058	1.0726	350
ln GDP	GDP per capita (constant 2010 US$)	8.0817	1.0192	350
ln IVA	Industry Value Added (constant 2010 US$)	25.6713	1.1937	350
ln DCP	Domestic credit provided to the private sector (% of GDP)	3.6266	1.0726	350
ln EGS	Exports of goods and services (% of GDP)	3.0718	0.4270	350
ln IGS	Imports of goods and services (% of GDP)	3.1100	0.3889	350

Source: Author calculations.

5.2 Cross sectional dependence (CD) tests

Since cross-sectional data have independence and dependence properties, it became more appropriate to consider cross sectional dependence (CD) tests. In this regard, the study employed the Pesaran (2004) cross sectional dependence tests and Breusch-Pagan (1980) have been specifically employed. The results in table 2 below show the cross-sectional dependence test results:

Table 2: Cross Sectional Dependence tests

	Variables					
	In CFP	In GDP	In EVA	In DCF	In EGS	In IGS
Pesaran CD test	7.2505*	44.9086*	44.7487*	8.4224*	9.4224*	9.7584*
Breusch and Pagan CD test	823.0885*	2021.127*	12008.454*	706.8312*	514.5283*	482.1584*

Notes: Cross sectional dependence tests were performed using the Pesaran (2004) and the Breusch and Pagan (1980) tests. * indicate that the probability is significant at 1%. The test results for all the variables rejected the null hypothesis.

The results in table 2 above for cross sectional dependence tests suggested that the null hypothesis of the absence of cross-sectional dependence was rejected in a panel of 14 emerging economies. This finding suggests that there was cross sectional dependence among the variables employed in the study and as such first-generation panel econometric techniques are therefore not applicable since the results may not be robust to the existence of cross-sectional dependence. Therefore, based on the foregoing, the study employed second generation panel unit root test so as to ascertain the integration order of the variables employed in the study.

5.3 CIPS and CADF Unit Root tests

In this section, the researchers present unit root tests as suggested by Pesaran (2007) so as to determine the order of integration for the variables employed in the study. These results with respect to both the CIPS and CADF panel unit root tests are presented in table 3 below:

Table 3: CIPS and CADF unit root tests		
Variables	L	1st Difference
In CFP	-2.505 (1)	-4.679* (1)
In GDP	-1.318 (1)	-3.357* (1)
In IVA	-1.609 (1)	-3.525* (1)
In DCP	-1.947 (1)	-3.933* (1)
In EGS	-2.318 (1)	-4.438* (1)
In IGS	-2.340 (1)	-4.622* (1)
CADF		
In CFP	-2.392 (1)	-3.350* (1)
In GDP	-1.547 (1)	-3.357** (0)
In IVA	-1.747 (1)	-2.720*** (1)
In DCP	-1.947 (0)	-3.933* (0)
In EGS	-2.318 (1)	-3.294* (1)
In IGS	-2.338 (1)	-3.123* (1)

Notes: The series became stationary after taking the first difference. *,** and *** suggests significance at 1%, 5% and 10% in that order. These tests were employed with trend and intercept in both cases.

The unit root tests results presented in table 3 above suggest that the null hypothesis with respect to the first order differential was rejected and this indicates that all the variables were not stationary at their levels. However, the variables employed in the research study have become stationary after taking their first difference. As if that is not enough, similar unit root findings were found with respect to the variables' stationarity were found with respect to the CADF unit root techniques. Therefore, the unit root test results are suggesting that all the variables employed in the study are integrated of order one and the stationarity conditions at first difference should be complimented with evidence of the existence of cointegration in the long term.

5.4 Westerlund cointegration test

Table 4 below show the results with respect to the Westerlund (2007) panel cointegration test which was employed in order to determine the possibility for the existence of long-term relationships among the variables in the study

Table 4: Westerlund (2007) ECM bootstrap panel cointegration test

Statistic	Value	Z-value	Robust p-value
G_t	-3.256	-0.981	0.060*
G_a	-1.778	7.101	0.198
P_t	-10.848	-0.426	0.090*

P_a	-2.123	5.623	0.680

Notes: * Suggests the existence of cointegration at 10% using the robust p-values which were generated using 100 bootstraps. Level lag was employed with 14 series and 5 covariates, thus the null hypothesis of no cointegration was rejected using the p-values for G_t and P_t.

The results in table 4 above are for both with and within dimensions and the bootstrapped p-values have been extracted using 100 bootstrap iterations and its probabilities were employed in order to determine the existence of cointegration among the variables in the study. The findings rejected the null hypothesis of no cointegration, hence testifying to the existence of long-run association ship among the variables. Therefore, the cointegration test result pointed that there is a long-run co-movement among capture fisheries production, GDP, financial development, imports, exports and industry value added, hence they are co-integrated.

5.5 Dynamic Ordinary Least Squares (DOLS)

The results with respect to the DOLS estimator were presented in table 5 below. The DOLS estimation technique was employed due to its ability to take into account of endogeneity.

Table 5: Panel Dynamic Ordinary Least Square (DOLS) estimation results

Variable	Coefficient	Standard Error	t-value
In GDP	29.3894*	1.4516	20.2460
(In GDP)2	-3.6140*	0.1829	-19.7538
(In GDP)3	0.1452*	0.0077	18.8486

In IVA	-0.2654*	0.0282	-9.4047
In DCP	-0.0896*	0.0041	-21.7609
In EGS	0.0563*	0.0066	8.4329
In IGS	-0.0723*	0.0078	-9.1707
R^2	0.991		
Adj.R^2	0.990		

Notes: * indicates 1% level of significance.

The findings in table 5 above suggest that there is a positive and statistically significant relationship between economic growth and capture fisheries production since a 1%increase in the economic growth bring forth a 29.38% increase in fish caught. This finding suggest that rapid economic growth at the initial stages was directly leading to an increase in capture fisheries. Further, this study also considered the possibilities for the existence of an N-shaped environmental Kuznets curve with respect to economic growth and capture fisheries. In order to achieve that, the square and cubic polynomial functions were included in the econometric model. The findings indicates that the square and cubic polynomial functions had coefficients of -3.614 and 0.1452 respectively and these were statistically significant at the 1% level of significance. Such a finding supports the existence of an N-shaped environmental Kuznets curve with respect to capture fisheries production and economic growth in a panel of emerging economies. As if that is not enough, these findings suggest that population increase and higher incomes leads to an increase in capture fisheries at the initial stages of economic growth. This

have a biodiversity effect of overfishing which further leads to aquaculture destruction, hence imposing more pressure on the natural environment. In the environmental Kuznets curve context, the initial stage of economic growth is represented by scale effect and in most cases, the fisheries sector is mainly dominated by traditional methods of fishing which are predominantly large scale and environmentally degrading. Further, at higher levels of economic growth, industrial operation processes improve, resultantly leading to increased fish exports to other countries, thereby boosting economic growth. This will eventually foster more economic development, paving the way for the economy to enter into the next stage of economic growth known in the environmental Kuznets circles as the composition effect. Authorities under the composition effect put in place environmental statutes which support cleaner industrial operation processes and technologies which support the aquatic environment. Under the composition effect, there is improved utilization of natural resources and more resources are being channeled towards research and development and innovative technologies meant to make new discoveries of ne fish species, thereby ensuring a sustainable aquatic environment. Thus, this will deliberately orchestrate the economy to enter a new stage of economic development, thus the technique effects supports the introduction of new technologies, which will further help in the improvement of the environment.

Introducing all the variables in the study have further orchestrated the validation of the existence of the environmental Kuznets curve, to be specific, the N-shaped relationship between economic growth and capture fisheries in a panel of emerging economies. Thus, this finding further suggest the need to put in place strong environmental regulations in emerging economies,

otherwise there will be massive damage inflicted on biodiversity due to over fishing for subsistence, industrial, commercial and recreational reasons. The finding of this study were different from Sugiawan et al (2017), who found the existence of an inverse N-shaped environmental Kuznets curve. However, findings of this study were with Shahbaz et al (2019) and Sinha et al (2017) who exposed the existence of an N-shaped relationship with respect to the emissions of carbon dioxide and the growth of an economy in the MENA countries and N-11 economies respectively. Such findings were attributed to the use of the cubic polynomial function of economic growth and different environmental indicators.

Furthermore, an increase in industrial value addition of 1% will lead to a 0.26% decrease in capture fisheries and this was significant at the 1% level of significance. Industry concentrates on the achievement of a cleaner environment and the promotion of sustainable capture fisheries production. On the other hand, domestic credit provided has a negative relationship with respect to capture fisheries production in a panel of countries. This have an implication that a 1% increase in domestic credit provided leads to a corresponding decrease in capture fisheries production by 0.089% and this was statistically significant at the 1% level of significance. As if that is not enough, this suggests that there is sustainable domestic credit creation in a panel of 14 emerging economies since a negative relationship with respect to domestic credit provided and capture fisheries production. The introduction of domestic credit provided by the financial sector to the private sector have supported the N-shaped environmental Kuznets curve between capture fisheries production and economic growth in a panel of economies. This finding

suggests that a 1% rise in financial developments will provide an opportunity to foster environmental sustainability, to be specific biodiversity and this suggests that domestic credit to the private sector is not only for fisheries production only, but it is also being employed in promoting conservation efforts of these countries. Such findings were consistent with Shahbaz et al (2013) with respect to the Malaysian case. Exports of goods and services had a positive and statistically significant relationship with respect to capture fisheries production. This finding suggests that an increase in exports of goods and services will lead to an increase in capture fisheries production in order to meet the rising export demand for fish products. As exports of goods and services increases by 1%, capture fisheries production will increase by 0.056%. The findings from the study further pointed that the addition of exports of goods and services in the econometric estimations further supported the validity of the environmental Kuznets curve in a panel of selected countries. This implies that the 14 emerging economies have their exports to other countries being dominated by capture fisheries products and environmental sustainability. Imports of goods and services have a negative and statistically significant relationship with respect to capture fisheries production, thus a 1% increase in imports of goods and services will result in a 0.07% decrease in capture fisheries produced. Such a finding suggest that imports of goods and services in a panel of selected countries are predominately fishing equipment and other related services. As if that is not enough, the finding suggest that exports of goods and services dominated biodiversity in a panel of countries. These findings were consistent with the findings of Bellmann et al (2016), who

exposed that capture fisheries dominates the majority of traded and exported goods.

5.6 Causality result.

İdentifying correlation among the coefficients does not represent causality therefore, this thesis addopted the Dumitrescu and Hurlin Causality to solve the problem which is presented in table 6 below.

From the analysis below, it was observed that, there is a uni-directional relationship between economic advancement and capture fisheries production which implies that, as the economy grown, it have direct impact on the dependent variable which is capture fisheries production. This affirms the regression outcome from the DOLS estimation. Again, the square of economic growth also has uni-directional causal connection with the dependent variable i.e. capture fisheries production. The outcome suggested that square of economic advancement have direct impact on capture fisheries production. The cubic of economic advancement in the same way as economic growth and its square also has uni-directional causal connection with capture fisheries production. However, it was identify that, there is a two way causal connection between industry values added including construction and capture fisheries production. Imports of goods and services and capture fisheries production on the other hand also have a two way causal connection. Then the author identify that there was no causality involving exports of goods and services as well as capture fisheries production. Moreover, there is a two way causal connection regarding domestic credit provided to the private sector as well as capture fisheries production. Regarding economic advancement and square of

economic advancement was identify to have a two way causal association. Again, economic advancement as well as cubic of economic advancement also have a tow way causality involving them.

Moreover, imports of goods and services as well as GDP per capita shown a two way causal connection involving them. This implies that, both factors (imports of goods and services as well as GDP per capita) influence each other. Exports of goods and services as well as GDP per capita also shown two way causal connection involving them. However, the result shown a one way causal connection regarding GDP per capita as well as domestic credit provided to the private sector. This outcome implies that, GDP per capita have impact on domestic credit provided to the private sector i.e. as GDP per capita increases, it has direct influence on domestic credit provided to the private sector. The outcome regarding square of GDP per capita and the cubic polynomial function of real GDP per capita have a two way causality involving them. Nevertheless, the square of GDP per capita as well as industry value added including construction shown a one way causal connection involving them which implies that, square of GDP per capita has direct influence on industry value added including construction. Regarding the square of GDP per capita as well as imports of goods and services have two way causal connection regarding them, which implies that, both factors (the square of GDP per capita as well as imports of goods and services) have direct influence on each other. From the other point of view, the result regarding the square of GDP per capita as well as domestic credit provided to the private sector show a one way connection involving them which implies that, as the economy activities increases, it has influence on domestic credit provided to the private

sector. This shows that loan given to private sector by domestic banks increases as the economy grows.

Eventually, there is a two way causal connection regarding imports of goods and services as well as the cubic polynomial function of real GDP per capita which implies that, imports of goods and services as well as the cubic polynomial function of real GDP per capita both influence each other. However, a one way causality was identify regarding the cubic polynomial function of real GDP per capita and industry value added including construction which implies that as the cubic polynomial function of real GDP per capita has influence on industry value added including construction. The outcome then goes on by showing that, imports of goods and services and industry value added including construction has a two way causal connection between them. Moreover, imports of goods and services and industry value added including construction also produce a two way causality between them. Domestic credit provided to the private sector on the other hand, has a two way causality with industry value added including construction whiles, imports of goods and services as well as exports of goods and services show a one way causal connection between them. Again, domestic credit provided to the private sector and imports of goods and services as well as domestic credit provided to the private sector and exports of goods and services all shown a two way causality among them.

Table 6: Dumitrescu and Hurlin Causality result

Null hypothesis	w-stat.	Zbar-stat.	p-value	Decision
lnGDP →lnCFP	3.76344**	2.21961	0.0264	lnGDP →lnCFP
lnCFP → lnGDP	2.46532	0.31578	0.7522	
$lnGDP^2$ → lnCFP	3.84317**	2.33653	0.0195	$lnGDP^2$ → lnCFP
lnCFP →lnGDP2	2.41008	0.23477	0.8144	
$lnGDP^3$ →lnCFP	3.92372**	2.45467	0.0141	$lnGDP^3$ →lnCFP
lnCFP →lnGDP3	2.35797	0.15835	0.8742	
lnIVA →lnCFP	3.57755***	1.94698	0.0515	lnIVA ↔lnCFP
lnCFP →lnIVA	3.74764**	2.19643	0.0281	
lnIGS →lnCFP	3.57493***	1.94314	0.0520	lnIGS ↔lnCFP
lnCFP →lnIGS	3.94754**	2.48960	0.0128	
lnEGS →lnCFP	3.19122	1.38039	0.1675	lnEGS ≠lnCFP
lnCFP →lnEGS	3.01263	1.11847	0.2634	
lnDCP →lnCFP	4.32962*	3.04995	0.0023	lnDCP ↔lnCFP
lnCFP →lnDCP	6.06268*	5.59165	2.E-08	
$lnGDP^2$ →lnGDP	3.45665***	1.76966	0.0768	$lnGDP^2$ ↔lnGDP
lnGDP →$lnGDP^2$	3.42157***	1.71821	0.0858	

$lnGDP^3$ →lnGDP	3.47550***	1.79731	0.0723	$lnGDP^3$ ↔lnGDP
lnGDP →$lnGDP^3$	3.40429***	1.69288	0.0905	
lnIVA →lnGDP	2.81011	0.82145	0.4114	lnGDP →lnIVA
lnGDP →lnIVA	4.62158*	3.47814	0.0005	
lnIGS →lnGDP	6.02977*	5.54338	3.E-08	lnIGS ↔lnGDP
lnGDP →lnIGS	4.92605*	3.92467	9.E-05	
lnEGS →lnGDP	4.69892*	3.59157	0.0003	lnEGS ↔lnGDP
lnGDP →lnEGS	4.75019*	3.66676	0.0002	
lnDCP →lnGDP	3.06050	1.18868	0.2346	lnGDP →lnDCP
lnGDP →lnDCP	29.2113*	39.5412	0.0000	
$lnGDP^3$ →$lnGDP^2$	3.46450***	1.78117	0.0749	$lnGDP^3$ ↔$lnGDP^2$
$lnGDP^2$ →$lnGDP^3$	3.42802***	1.72768	0.0840	
lnIVA →$lnGDP^2$	2.80873	0.81943	0.4125	$lnGDP^2$ →lnIVA
$lnGDP^2$ →lnIVA	4.68793*	3.57545	0.0003	
lnIGS →$lnGDP^2$	6.00298*	5.50410	4.E-08	lnIGS ↔$lnGDP^2$
$lnGDP^2$ →lnIGS	4.92573*	3.92420	9.E-05	
lnEGS →$lnGDP^2$	4.73377*	3.64268	0.0003	lnEGS ↔$lnGDP^2$
$lnGDP^2$ →lnEGS	4.78582*	3.71901	0.0002	

lnDCP →lnGDP^2	3.05291	1.17754	0.2390	lnGDP^2 →lnDCP
lnGDP^2 →lnDCP	28.3959*	38.3453	0.0000	
lnIVA →lnGDP^3	2.81349	0.82641	0.4086	lnGDP^3 →lnIVA
lnGDP^3 →lnIVA	4.77448*	3.70238	0.0002	
lnIGS →lnGDP^3	5.95315*	5.43101	6.E-08	lnIGS ↔lnGDP^3
lnGDP^3 →lnIGS	4.92939*	3.92957	9.E-05	
lnEGS →lnGDP^3	4.77397*	3.70163	0.0002	lnEGS ↔lnGDP^3
lnGDP^3 →lnEGS	4.82330*	3.77398	0.0002	
lnDCP →lnGDP^3	3.04244	1.16219	0.2452	lnGDP^3 →lnDCP
lnGDP^3 →lnDCP	27.4060*	36.8935	0.0000	
lnIGS →lnIVA	6.01412*	5.52043	3.E-08	lnIGS ↔lnIVA
lnIVA →lnIGS	4.05400*	2.64572	0.0082	
lnEGS →lnIVA	5.74142*	5.12049	3.E-07	lnEGS ↔lnIVA
lnIVA →lnEGS	4.58892*	3.43024	0.0006	
lnDCP →lnIVA	3.68000**	2.09723	0.0360	lnDCP↔lnIVA
lnIVA →lnDCP	26.2920*	35.2598	0.0000	
lnEGS →lnIGS	2.61103	0.52948	0.5965	lnIGS → lnEGS
lnIGS → lnEGS	5.46729*	4.71845	2.E-06	

lnDCP →lnIGS	4.62885*	3.48880	0.0005	lnDCP ↔lnIGS
lnIGS →lnDCP	5.85358*	5.28498	1.E-07	
lnDCP →lnEGS	6.62779*	6.42043	1.E-10	lnDCP ↔lnEGS
lnEGS →lnDCP	7.97004*	8.38897	0.0000	

Notes: *, **, *** indicates 1%, 5% and 10% level of significance whiles, ↔, → and ≠ denote bi-directional, uni-directional and no causality respectively.

5.6 Discussion of findings.

This thesis aims to examine the environmental Kuznets curve nexus where the author utilized capture fisheries production (CFP) as the dependent variable whiles factors such as GDP per capita (GDP), square of GDP per capita (GDP^2) and the cubic polynomial function of real GDP per capita (GDP^3) are used to determine the N-Shape curve. Other control variables used were, industry value added including construction (IVA), exports of goods and services (EGS), imports of goods and services (IGS) and domestic credit provided to the private sector (DCP) from the time period of 1992 to 2016.

The author performed the cross-sectional dependency test by utilizing the Pesaran (2004) CD techniques. Both techniques confired the presence of cross-sectional dependency with the understudy factors which implies that, the author then was to utilized the second-generation technique. From there, the CIPS and CADF stationarity technique were utilized to identify if the variable had stationarity among them. From the analysis it was observed that, none of the variable were stationarity at level but all the variable had a unit root at first difference. This implies that, the variables had stationarity among them.

However, the second generation co-cointegration technique in the form of Westerlund (2007) co- cointegration test was utilized to obtain the long run connection among the understudy factors. From the analysis, it was observed that there was cointegration among the variable.

From there, the dynamic ordinary least square (DOLS) which can be used to evaluate cointegration vectors when the periods of the factors are different as well as to prevent endogeneity concerns when evaluating long-run elastic properties was used to predict the long run equilibrium among the variables. The findings then suggested that there was a positive and statistically significant relationship between economic growth and capture fisheries production indicating that a 1% increase in the economic growth bring forth a 29.38% increase in fish caught. This finding suggest that rapid economic growth at the initial stages was directly leading to an increase in capture fisheries. Further, this study also considered the possibilities for the existence of an N-shaped environmental Kuznets curve with respect to economic growth and capture fisheries. In order to achieve that, the square and cubic polynomial functions were included in the econometric model. The findings indicates that the square and cubic polynomial functions had coefficients of -3.614 and 0.1452 respectively and these were statistically significant at the 1% level of significance. Such a finding supports the existence of an N-shaped environmental Kuznets curve with respect to capture fisheries production and economic growth in a panel of emerging economies. As if that is not enough, these findings again suggested that population increase and higher incomes leads to an increase in capture fisheries at the initial stages of economic growth. This have a biodiversity effect of overfishing which further leads to

aquaculture destruction, hence imposing more pressure on the natural environment. In the environmental Kuznets curve context, the initial stage of economic growth is represented by scale effect and in most cases, the fisheries sector is mainly dominated by traditional methods of fishing which are predominantly large scale and environmentally degrading. Further, at higher levels of economic growth, industrial operation processes improve, resultantly leading to increased fish exports to other countries, thereby boosting economic growth. This will eventually foster more economic development, paving the way for the economy to enter into the next stage of economic growth known in the environmental Kuznets circles as the composition effect. Authorities under the composition effect put in place environmental statutes which support cleaner industrial operation processes and technologies which support the aquatic environment. Under the composition effect, there is improved utilization of natural resources and more resources are being channeled towards research and development and innovative technologies meant to make new discoveries of ne fish species, thereby ensuring a sustainable aquatic environment. Thus, this will deliberately orchestrate the economy to enter a new stage of economic development, thus the technique effects supports the introduction of new technologies, which will further help in the improvement of the environment.

Introducing all the variables in the study have further orchestrated the validation of the existence of the environmental Kuznets curve, to be specific, the N-shaped relationship between economic growth and capture fisheries in a panel of emerging economies. Thus, this finding further suggest the need to put in place strong environmental regulations in emerging economies,

otherwise there will be massive damage inflicted on biodiversity due to over fishing for subsistence, industrial, commercial and recreational reasons. The finding of this study were different from Sugiawan et al (2017), who found the existence of an inverse N-shaped environmental Kuznets curve. However, findings of this study were with Shahbaz et al (2019) and Sinha et al (2017) who exposed the existence of an N-shaped relationship with respect to the emissions of carbon dioxide and the growth of an economy in the MENA countries and N-11 economies respectively. Such findings were attributed to the use of the cubic polynomial function of economic growth and different environmental indicators.

Furthermore, an increase in industrial value addition of 1% will lead to a 0.26% decrease in capture fisheries and this was significant at the 1% level of significance. Industry concentrates on the achievement of a cleaner environment and the promotion of sustainable capture fisheries production. On the other hand, domestic credit provided has a negative relationship with respect to capture fisheries production in a panel of countries. This have an implication that a 1% increase in domestic credit provided leads to a corresponding decrease in capture fisheries production by 0.089% and this was statistically significant at the 1% level of significance. As if that is not enough, this suggests that there is sustainable domestic credit creation in a panel of 14 emerging economies since a negative relationship with respect to domestic credit provided and capture fisheries production. The introduction of domestic credit provided by the financial sector to the private sector have supported the N-shaped environmental Kuznets curve between capture fisheries production and economic growth in a panel of economies. This finding

suggests that a 1% rise in financial developments will provide an opportunity to foster environmental sustainability, to be specific biodiversity and this suggests that domestic credit to the private sector is not only for fisheries production only, but it is also being employed in promoting conservation efforts of these countries. Such findings were consistent with Shahbaz et al (2013) with respect to the Malaysian case. Exports of goods and services had a positive and statistically significant relationship with respect to capture fisheries production. This finding suggests that an increase in exports of goods and services will lead to an increase in capture fisheries production in order to meet the rising export demand for fish products. As exports of goods and services increases by 1%, capture fisheries production will increase by 0.056%. The findings from the study further pointed that the addition of exports of goods and services in the econometric estimations further supported the validity of the environmental Kuznets curve in a panel of selected countries. This implies that the 14 emerging economies have their exports to other countries being dominated by capture fisheries products and environmental sustainability. Imports of goods and services have a negative and statistically significant relationship with respect to capture fisheries production, thus a 1% increase in imports of goods and services will result in a 0.07% decrease in capture fisheries produced. Such a finding suggest that imports of goods and services in a panel of selected countries are predominately fishing equipment and other related services. As if that is not enough, the finding suggest that exports of goods and services dominated biodiversity in a panel of countries. These findings were consistent with the findings of Bellmann et al (2016), who

exposed that capture fisheries dominates the majority of traded and exported goods.

Moreover, the author then utilized the Dumitrescu and Hurlin (2012) which developed the Granger causality in panel results. From the outcome, it was observed that, there was a uni-directional relationship between economic advancement and capture fisheries production which implies that, as the economy grown, it have direct impact on the dependent variable which is capture fisheries production. This affirms the regression outcome from the DOLS estimation. Again, the square of economic growth also has uni-directional causal connection with the dependent variable i.e. capture fisheries production. The outcome suggested that square of economic advancement have direct impact on capture fisheries production. The cubic of economic advancement in the same way as economic growth and its square also has uni-directional causal connection with capture fisheries production. However it was identify that, there is a two way causal connection between industry values added including construction and capture fisheries production. Imports of goods and services and capture fisheries production on the other hand also have a two way causal connection. Then the author identify that there was no causality involving exports of goods and services as well as capture fisheries production. Moreover, there is a two way causal connection regarding domestic credit provided to the private sector as well as capture fisheries production. Regarding economic advancement and square of economic advancement was identify to have a two way causal association. Again, economic advancement as well as cubic of economic advancement also have a tow way causality involving them.

Moreover, imports of goods and services as well as GDP per capita shown a two way causal connection involving them. This implies that, both factors (imports of goods and services as well as GDP per capita) influence each other. Exports of goods and services as well as GDP per capita also shown two way causal connection involving them. However, the result shown a one way causal connection regarding GDP per capita as well as domestic credit provided to the private sector. This outcome implies that, GDP per capita have impact on domestic credit provided to the private sector i.e. as GDP per capita increases, it has direct influence on domestic credit provided to the private sector. The outcome regarding square of GDP per capita and the cubic polynomial function of real GDP per capita have a two way causality involving them. Nevertheless, the square of GDP per capita as well as industry value added including construction shown a one way causal connection involving them which implies that, square of GDP per capita has direct influence on industry value added including construction. Regarding the square of GDP per capita as well as imports of goods and services have two way causal connection regarding them, which implies that, both factors (the square of GDP per capita as well as imports of goods and services) have direct influence on each other. From the other point of view, the result regarding the square of GDP per capita as well as domestic credit provided to the private sector show a one way connection involving them which implies that, as the economy activities increases, it has influence on domestic credit provided to the private sector. This shows that loan given to private sector by domestic banks increases as the economy grows.

Eventually, there is a two way causal connection regarding imports of goods and services as well as the cubic polynomial function of real GDP per capita which implies that, imports of goods and services as well as the cubic polynomial function of real GDP per capita both influence each other. However, a one way causality was identify regarding the cubic polynomial function of real GDP per capita and industry value added including construction which implies that as the cubic polynomial function of real GDP per capita has influence on industry value added including construction. The outcome then goes on by showing that, imports of goods and services and industry value added including construction has a two way causal connection between them. Moreover, imports of goods and services and industry value added including construction also produce a two way causality between them. Domestic credit provided to the private sector on the other hand, has a two way causality with industry value added including construction whiles, imports of goods and services as well as exports of goods and services show a one way causal connection between them. Again, domestic credit provided to the private sector and imports of goods and services as well as domestic credit provided to the private sector and exports of goods and services all shown a two way causality among them.

5.7 Chapter Summary

This chapter presents the results and discussion of the study, to be specific descriptive statistics, cross sectional dependence, panel unit root test, cointegration test, dynamic ordinary least squares (DOLS) and Dumitrescu and Hurlin (2012) causality technique. The next chapter concludes the study and provide robust public policy recommendations.

CHAPTER 6

CONCLUSION AND POLICY IMPLICATION

6. Introduction

This chapter presents the conclusion and policy recommendations from the study which aimed at making an investigation of the environmental Kuznets curve with respect to capture fisheries production as a biodiversity indicator in a select of countries. The use of capture fisheries production in the study makes it unique since the majority of studies in the environmental Kuznets curve employ atmospheric indicators.

6.1 Conclusion

The study revealed the existence of a long-term relationship among the variables employed to investigate the N-shaped environmental Kuznets curve by using capture fisheries production as a biodiversity indicator in 14 emerging economies. The findings suggested that there is an N-shaped relationship with respect to capture fisheries production and economic growth in selected emerging economies around the world. Industrial operation processes in these

emerging economies focused much more on attaining a cleaner environment and sustainable fisheries production. Financial development was observed to have a negative and statistically significant relationship with respect to capture fisheries production in these emerging economies, a suggestion that domestic credit to the private sector is not only deployed for the production of capture fisheries, however, but for environmental conservation purposes. As per exports of goods and services, a positive and statistically significant relationship was observed, while imports of goods and services have revealed a negative and statistically significant relationship with capture fisheries production in a panel of emerging economies around the world.

6.2 Policy Implications

Based on the foregoing, the study made the following policy suggestions for practice:

- Industrial value addition activities in emerging economies around the world are targeting the achievement of a cleaner environment in order to promote biodiversity in the long-run and also environmental sustainability. Therefore, policies should be crafted in such a way as to promote environmental sustainability by way of tightening licensing requirements with respect to fishing permits. Promoting sustainable economic growth and development by way of using cleaner energy should be prioritized by industry in these selected emerging economies.
- Domestic credit provided to the private sector supports environmental sustainability in the emerging economies by way of increasing capture fisheries production in the long-range. In this respect, policies which

promotes investments in fisheries conservation should be designed by authorities in these countries and credit creation legislations should be appropriately orchestrated towards promoting biodiversity and also environmental sustainability of the aquatic sector. As if that is not enough, the insurance sector should also come in to provide cover against risk which threaten capture fisheries production within their jurisdictions. Furthermore, financial developments in these selected emerging economies are an opportunity to support environmental sustainability, to be specific biodiversity and this suggests that domestic credit provided to the private sector is employed to support the conservation efforts to ensure biodiversity.

- Appropriate public policy interventions should be crafted and deployed to support trade with respect to capture fisheries in emerging economies since exports of goods and services, and imports of goods and services have imposed a damaging effect on biodiversity. Therefore, trade restrictions and in some instances embargoes should be activated in order to guide and control capture fisheries production in these economies. As if that is not enough, tougher penalties and in some instances heavy fines should be activated by authorities within their jurisdictions so as to curb threats to biodiversity.

- Economic growth in these emerging economies got a lease of life from the current industrialization, while ensuring a carbon free environment. It is therefore appropriate for authorities in these economies to consider the environment and should include it in crafting robust environmental policies so as to achieve a balanced ecosystem and the diversity of

aquatic life. Further, tight environmental policies as well as tax issues should be instituted so as to foster a healthy and safe environment in the future, and this can be realized through mainstreaming sustainability values across economic sectors.

- Authorities in emerging economies should activate systematic monitoring and evaluation in order to jealously protect the environment and biodiversity through fostering a greener and cleaner environment. Strict mesh size controls should be activated in these emerging economies as a way to prevent the extinction of endangered species, while at the same time fostering sustainable economic growth and development in the long-range. As if that is not yet enough, authorities in emerging economies should enforce strict compliance requirements in order to keep beaches cleaner and protect the greater aquatic ecosystem.

- Illegal fishing should be proscribed, to be specific the use of dynamites for fishing should be heavily penalized through the court system. The follow-up processes in this respect should foster the sustainability of capture fisheries production in their jurisdictions. More so, hatcheries should be promoted through incentives like provisioning of quality fish seeds.

- Based on the foregoing, investing in the aquatic ecosystem promotes economic growth and development through job creation to the public. Therefore, the relationship with respect to capture fisheries production, economic growth, domestic credit provided to the private sector,

industry value addition, imports of goods and services, and exports of goods and service is of great importance in crafting sound and robust environmentally related public policies.

6.3 Recommendation for Future Studies

Future studies should therefore take into consideration other environmental sustainability indicators such as land, sea, ocean, freshwater and sea indicators, however, this should be escalated to global levels in the environmental Kuznets context.

6.4 Chapter Summary

This chapter conclude the research study investigating the N-shaped environmental Kuznets curve using capture fisheries as a biodiversity indicator. The chapter also provided practical public policy recommendation to policy authorities in these emerging economies. As if that is not enough, this chapter also made some specific recommendations in order to inform future studies.

REFERENCES

Acaravci, A., & Akalin, G. (2017). Environment–economic growth nexus: a comparative analysis of developed and developing countries. *International Journal of Energy Economics and Policy*, *7*(5), 34-43.

Ahmed, K., Rehman, M. U., & Ozturk, I. (2017). What drives carbon dioxide emissions in the long-run? Evidence from selected South Asian Countries. *Renewable and Sustainable Energy Reviews, 70*, 1142-1153.

Akpor, O. B., & Muchie, M. (2010). Bioremediation of polluted wastewater influent: phosphorus and nitrogen removal. Scientific Research and Essays, 5(21), 3222-3230.

Alam, S., Fatima, A., & Butt, M. S. (2007). Sustainable development in Pakistan in the context of energy consumption demand and environmental degradation. *Journal of Asian Economics*, *18*(5), 825-837.

Alban, A., & Andersen, N. B. (2007). HIV/AIDS'spread and impact on other health-related millennium development goals. Danish medical bulletin, 54(2), 163-166.

Ali, S., Waqas, H., & Ahmad, N. (2015). Analyzing the dynamics of energy consumption, liberalization, financial development, poverty and carbon emissions in Pakistan. *J Appl Environ Biol Sci*, *5*(4), 166-183.

Anangisye, W. A. (2010). Revisiting the alternative responses to the perceived quality" decline" in basic education in Tanzania. KEDI Journal of Educational Policy, 7(1).

Ang, J. B. (2007). CO2 emissions, energy consumption, and output in France. *Energy policy*, *35*(10), 4772-4778.

Angelov, S., Dambrauskas, O., & Haq, H. (2019). Anthrophilia Preservation Initiative.

Antonakakis, N., Chatziantoniou, I., & Filis, G. (2017). Energy consumption, CO2 emissions, and economic growth: An ethical dilemma. *Renewable and Sustainable Energy Reviews*, *68*, 808-824.

Apergis, N., & Payne, J. E. (2014). Renewable energy, output, CO2 emissions, and fossil fuel prices in Central America: Evidence from a nonlinear panel smooth transition vector error correction model. *Energy Economics*, *42*, 226-232.

Appunni, S. S., & Hamisi, H. F. (2013). Is millennium development goal 4 achievable in Tanzania?.

Arends, F., & Winnaar, L. (2016). Millennium Development Goal 2: achieve universal primary education 2015.

Asghar, Z., & Rahat, T. (2011). Energy-GDP causal relationship for Pakistan: a graph theoretic approach. *Appl. Econ. Int. Develop. Euro-Am. Assoc. Econ. Develop*, *11*(1), 20.

Ashe, J. W., Van Lierop, R., & Cherian, A. (1999, August). The role of the alliance of small island states (AOSIS) in the negotiation of the United Nations framework convention on climate change (UNFCCC). In Natural Resources Forum (Vol. 23, No. 3, pp. 209-220). Oxford, UK: Blackwell Publishing Ltd.

Aye, G. C., & Edoja, P. E. (2017). Effect of economic growth on CO2 emission in developing countries: Evidence from a dynamic panel threshold model. *Cogent Economics & Finance*, *5*(1), 1379239.

Azomahou, T., Laisney, F., & Van, P. N. (2006). Economic development and CO2 emissions: a nonparametric panel approach. *Journal of Public Economics*, *90*(6-7), 1347-1363.

Baek, J., & Pride, D. (2014). On the income–nuclear energy–CO2 emissions nexus revisited. *Energy Economics*, *43*, 6-10.

Baldwin, R. (1995). Does sustainability require growth? The economics of sustainable development, 51-78.

Barua, P., Tawney, L., & Weischer, L. (2012). Delivering on the clean energy economy: The role of policy in developing successful domestic solar and wind industries. World Resources Institute Working Paper). World Resources Institute. Retrieved from http://pdf. wri. org/delivering_clean_energy_economy. pdf.)151

Barnes, A., & Brown, G. W. (2011). The Idea of Partnership within the Millennium Development Goals: context, instrumentality and the normative demands of partnership. Third World Quarterly, 32(1), 165-180.

Barrett, S. (1998). Political economy of the Kyoto Protocol. Oxford review of economic policy, 14(4), 20-39.

Bauer, T. N., Erdogan, B., & Taylor, S. (2012). Creating and maintaining environmentally sustainable organizations: Recruitment and on-boarding.

Bellmann, C., Tipping, A., & Sumaila, U. R. (2016). Global trade in fish and fishery products: An overview. *Marine Policy*, *69*, 181-188.

Bhat, S. A. (2013b). Millennium development goals: Eradicate extreme poverty and hunger Indian perspective. ZENITH International Journal of Business Economics & Management Research, 3(9), 59-72.

Blanchard, J. L., Watson, R. A., Fulton, E. A., Cottrell, R. S., Nash, K. L., Bryndum-Buchholz, A., ... & Davidson, L. N. (2017). Linked sustainability challenges and trade-offs among fisheries, aquaculture and agriculture. Nature Ecology & Evolution, 1(9), 1240.

Bloch, H., Rafiq, S., & Salim, R. (2012). Coal consumption, CO2 emission and economic growth in China: Empirical evidence and policy responses. *Energy Economics*, *34*(2), 518-528.

Bodansky, D. (2016). The Paris climate change agreement: a new hope?. *American Journal of International Law*, *110*(2), 288-319.

Boutabba, M. A. (2014). The impact of financial development, income, energy and trade on carbon emissions: evidence from the Indian economy. *Economic Modelling*, *40*, 33-41.

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The review of economic studies*, *47*(1), 239-253.

Bruce, S. (2018). Global Energy Governance and International Institutions. Encyclopedia of the UN Sustainable Development Goals. Affordable and Clean Energy (Springer, 2019).

Burrell, G. (1979) & Morgan. G.(1979) Sociological paradigms and organizational analysis. London: I-Ieinemann.

Caliari, A. (2014). Analysis of Millennium Development Goal 8: A global partnership for development. Journal of Human Development and Capabilities,15(2-3), 275-287.152

Charfeddine, L., & Khediri, K. B. (2016). Financial development and environmental quality in UAE: Cointegration with structural breaks. *Renewable and Sustainable Energy Reviews*, *55*, 1322-1335.

Choi, J. (2012). The Relationship between Water Pollution and Economic Growth Using the Environmental Kuznets Curve: A Case Study in South Korea.

Clémençon, R. (2016). The two sides of the Paris climate agreement: Dismal failure or historic breakthrough?

Cole, M. A., Elliott, R. J., & Zhang, J. (2011). Growth, foreign direct investment, and the environment: evidence from Chinese cities. *Journal of Regional Science*, *51*(1), 121-138.

Colecraft, E. (2008). HIV/AIDS: nutritional implications and impact on human development. Proceedings of the Nutrition Society, 67(1), 109-113.

Conceição, P., Heitor, M. V., & Veloso, F. (2003). Infrastructures, incentives, and institutions: Fostering distributed knowledge bases for the learning society. *Technological Forecasting and Social Change*, *70*(7), 583-617.

Copeland, B. R., & Taylor, M. S. (2005). Free trade and global warming: a trade theory view of the Kyoto protocol. Journal of Environmental Economics and Management, 49(2), 205-234.

Crotty, M. (1998). The foundations of social research: Meaning and perspective in the research process. Sage.

Dadzie, P. S., Martin-Yeboah, E., & Tachie-Donkor, G. (2016). Ensuring healthy lives and promoting well-being for all: the role of Ghanaian academic libraries in achieving the 2030 Agenda for Sustainable Development.

Deere, C. D. (2018). Sustainable Development Goals, Gender Equality and the Distribution of Land in Latin America. cadernos pagu, (52).

Delanty, G. (2005). *Social science*. McGraw-Hill Education (UK).

Denicolo, P., & Becker, L. (2012). Developing research proposals. Sage.153 Dimitrov, R. S. (2016). The Paris agreement on climate change: Behind closed doors. Global Environmental Politics, 16(3), 1-11.

Dimitrov, R. S. (2016). The Paris agreement on climate change: Behind closed doors. *Global Environmental Politics*, *16*(3), 1-11.

Du Pont, Y. R., Jeffery, M. L., Gütschow, J., Rogelj, J., Christoff, P., & Meinshausen, M. (2017). Equitable mitigation to achieve the Paris Agreement goals. Nature Climate Change, 7(1), 38.

Esquivel, V., & Sweetman, C. (2016). Gender and the sustainable development goals. Gender & Development, 24(1), 1-8.

Falkner, R. (2016). The Paris Agreement and the new logic of international climate politics. International Affairs, 92(5), 1107-1125.

Farhani, S., Chaibi, A., & Rault, C. (2014). CO2 emissions, output, energy consumption, and trade in Tunisia. *Economic Modelling*, *38*, 426-434.

Fernandez, R. (2019). SDG3 Good Health and Well-Being: Integration and connection with other SDGs. Springer.

Ferraro, T., Dos Santos, N. R., Pais, L., & Mónico, L. (2016). Historical landmarks of decent work. European Journal of Applied Business and Management, 2(1).

Flyvberg, B. (2011). Case Study', i Denzin, NK och Lincoln, YS (red.).Gillies, D. (2010). Economic goals, quality discourse and the narrowing of European state education. Education, Knowledge & Economy, 4(2), 103-118.

Fodha, M., & Zaghdoud, O. (2010). Economic growth and pollutant emissions in Tunisia: an empirical analysis of the environmental Kuznets curve. *Energy policy*, *38*(2), 1150-1156.

Ginting, M. L., & Anzela, R. L. (2019, August). Implementation "Peace Is Possible" Campaign by Junior Chamber International as a Supporting Part of Sustainable Development Goals. In First International Conference on Administration Science (ICAS 2019). Atlantis Press.

Gambetta, N., Azadian, P., Hourcade, V., & Reyes, M. E. (2019). The financing framework for sustainable development in emerging economies: The case of Uruguay. *Sustainability*, *11*(4), 1059.

Glasbergen, P. (2007). Setting the scene: the partnership paradigm in the making. Partnerships, governance and sustainable development: reflections on theory and practice, 125.

Gokmenoglu, K. K., & Sadeghieh, M. (2019). Financial development, CO2 emissions, fossil fuel consumption and economic growth: the case of Turkey. *Strategic Planning for Energy and the Environment*, *38*(4), 7-28.

Graham, A. (2018). *Managing airports: An international perspective*. Routledge.

Greene, L. A. (2000). EHPnet: United Nations Framework Convention on Climate Change.155

Greyling, S., Patel, Z., & Davison, A. (2017). Urban sustainability disjunctures in Cape Town: learning the city from the inside and out. Local Environment, 22(sup1), 52-65.

Grossman, G. M., & Krueger, A. B. (1991). Environmental impacts of a North American free trade agreement (No. w3914). National Bureau of Economic Research.

Güneralp, B. (2015). Resource use for the construction and operation of built environments. In The Routledge Handbook of Urbanization and Global Environmental Change (pp. 101-116). Routledge.

Gupta, S., & Gupta, N. (2016). Millennium development goals-5 and sexual and reproductive health in post-2015 United Nations global development goals. International Journal of Health & Allied Sciences, 5(1), 60-60.

Hale, T. (2016). "All hands on deck": The Paris agreement and non-state climate action. Global Environmental Politics, 16(3), 12-22.

Heil, M. T., & Selden, T. M. (1999). Panel stationarity with structural breaks: carbon emissions and GDP. *Applied Economics Letters*, *6*(4), 223-225.

Heilbroner, R. L., & Thurow, L. C. (1987). Eonomia.

Hoekstra, E. J., McFarland, J. W., Shaw, C., & Salama, P. (2006). Reducing measles mortality, reducing child mortality. The Lancet, 368(9541), 1050-1052.

Hossain, N., & Miyata, Y. (2012). Municipal solid waste management of Toyohashi city: An analysis by Environmental Kuznets Curve. *Regional Science Inquiry*, *4*(2), 97-110.

Hove, S., & Tursoy, T. (2019). An investigation of the environmental Kuznets curve in emerging economies. Journal of Cleaner Production, 236, 117628. https://sustainabledevelopment.un.org/?menu=1300 (accessed on 11 December 2019 at 14:42pm)

IGBP Terrestrial Carbon Working Group. (1998). The terrestrial carbon cycle: implications for the Kyoto Protocol.

Islam, F., Shahbaz, M., Ahmed, A. U., & Alam, M. M. (2013). Financial development and energy consumption nexus in Malaysia: a multivariate time series analysis. *Economic Modelling*, *30*, 435-441.

Jalil, A., & Feridun, M. (2011). Impact of financial development on economic growth: empirical evidence from Pakistan. *Journal of the Asia Pacific Economy*, *16*(1), 71-80.

Janetos, A. C., Malone, E., Mastrangelo, E., Hardee, K., & de Bremond, A. (2012). Linking climate change and development goals: framing, integrating, and measuring. Climate and Development, 4(2), 141-156.

Jayanthakumaran, K., Verma, R., & Liu, Y. (2012). CO2 emissions, energy consumption, trade and income: a comparative analysis of China and India. *Energy Policy*, *42*, 450-460.

Jaunky, V. C. (2010). Divergence of electric power consumption: Evidence from the SAPP. *The Journal of Developing Areas*, 123-147.

Kais, S., & Ben Mbarek, M. (2017). Dynamic relationship between CO2 emissions, energy consumption and economic growth in three North African countries. *International Journal of Sustainable Energy*, *36*(9), 840-854.

Keen, M. R., Schwarz, A. M., & Wini-Simeon, L. (2018). Towards defining the Blue Economy: Practical lessons from Pacific ocean governance. Marine Policy, 88, 333-341.

Knott, C., & Neis, B. (2017). Privatization, financialization and ocean grabbing in New Brunswick herring fisheries and salmon aquaculture. Marine Policy, 80, 10-18.

Konefal, J. (2018). Fault lines in agricultural sustainability: Contestation, cooptation, reform, and transformation. In Contested Sustainability Discourses in the Agrifood System (pp. 279-286). Routledge.

Kuznets, S. (1955). Economic growth and income inequality. The American economic review, 45(1), 1-28.

Labucay, I. D., & Stations, S. W. Gender Equality in Political Empowerment in Southeast Asia.158

Lean, H. H., & Smyth, R. (2010). CO2 emissions, electricity consumption and output in ASEAN. *Applied Energy*, *87*(6), 1858-1864.

Lenssen, G., Arenas, D., Lacy, P., Pickard, S., & Sturchio, J. L. (2008). Business engagement in public programs: the pharmaceutical industry's contribution to public health and the millennium development goals. Corporate Governance: The international journal of business in society.

Lesníková, P., & Schmidtová, J. (2019, May). Performance of Enterprise Sector of Slovakia in Achieving Sustainable Development Goal Related to Industry and Innovation. In Economics, Management and Technology in Enterprises 2019 (EMT 2019). Atlantis Press.

Liu, Y., & Zhang, Z. (2018, February). Analysis on the relationship between economic development and water environment pollution in Shandong province. In *IOP Conference Series: Earth and Environmental Science* (Vol. 113, No. 1, p. 012229). IOP Publishing.

Managi, S., & Jena, P. R. (2008). Environmental productivity and Kuznets curve in India. *Ecological Economics*, *65*(2), 432-440.

Manne, A. S., & Richels, R. G. (1999). The Kyoto Protocol: a cost-effective strategy for meeting environmental objectives? The Energy Journal, 20(Special Issue-The Cost of the Kyoto Protocol: A Multi-Model Evaluation).

McCann, J. (2013). Electoral quotas for women: An international overview. Parliamentary Library.

Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, *37*, 386-394.

Mercer, J., Kelman, I., Alfthan, B., & Kurvits, T. (2012). Ecosystem-based adaptation to climate change in Caribbean small island developing states: integrating local and external knowledge. Sustainability, 4(8), 1908-1932.159

Munang, R., & Mgendi, R. (2017). Paris Agreement on climate change: One year later, how is Africa faring?. Africa Renewal, 31(1), 32-33.

Mouton, J. (2007). Approaches to programme evaluation research. *Journal of Public Administration*, *42*(6), 490-511.

Nabarro, D. (2016). Transforming our world: How the Sustainable Development Goals will help us achieve zero hunger. IFPRI book chapters, 22-27.

Nasir, M., & Rehman, F. U. (2011). Environmental Kuznets curve for carbon emissions in Pakistan: an empirical investigation. *Energy policy*, *39*(3), 1857-1864.

Nazar, R., Chaudhry, I. S., Ali, S., & Faheem, M. (2018). Role Of Quality Education For Sustainable Development Goals (SDGS). PEOPLE: International Journal of Social Sciences, 4(2).

Obergassel, W., Arens, C., Hermwille, L., Kreibich, N., Mersmann, F., Ott, H. E., & Wang-Helmreich, H. (2015). Phoenix from the ashes: an analysis of the Paris Agreement to the United Nations Framework Convention on Climate Change; part 1.

Obradović, S., & Lojanica, N. (2017). Energy use, CO2 emissions and economic growth–causality on a sample of SEE countries. *Economic research-Ekonomska istraživanja*, *30*(1), 511-526.

O'Leary, Z. (2011). The essential guide to doing your research project. Sage.

Omri, A. (2013). CO2 emissions, energy consumption and economic growth nexus in MENA countries: Evidence from simultaneous equations models. *Energy economics*, *40*, 657-664.

O'Neill, B. C., & Oppenheimer, M. (2002). Dangerous climate impacts and the Kyoto Protocol. Outlook, B. E. 2019 edition. London, United Kingdom2019.

Ozturk, I., & Acaravci, A. (2013). CO2 emissions, energy consumption and economic growth in Turkey. *Renewable and Sustainable Energy Reviews*, *14*(9), 3220-3225.

Panayotou, T. (1993). Empirical tests and policy analysis of environmental degradation at different stages of economic development (No. 992927783402676). International Labour Organization.

Paramati, S. R., Ummalla, M., & Apergis, N. (2016). The effect of foreign direct investment and stock market growth on clean energy use across a panel of emerging market economies. *Energy Economics*, *56*, 29-41.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 597-625.

Persyn, D., & Westerlund, J. (2008). Error-correction–based cointegration tests for panel data. *The STATA journal*, *8*(2), 232-241.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross- section dependence. *Journal of applied econometrics*, *22*(2), 265-312.

Pesaran, M. H. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics*, *60*, 13-50.

Peters, G. P., Andrew, R. M., Canadell, J. G., Fuss, S., Jackson, R. B., Korsbakken, J. I., ... & Nakicenovic, N. (2017). Key indicators to track current progress and future ambition of the Paris Agreement. Nature Climate Change, 7(2), 118.

Phimphanthavong, H. (2013). The impacts of economic growth on environmental conditions in laos. *International Journal of Business Management and Economic Research*, *4*(5), 766-774.

Powers, M. (2013). Water, Justice, and Public Health. In The Oxford Handbook of Public Health Ethics.

Rafindadi, A. A., Yusof, Z., Zaman, K., Kyophilavong, P., & Akhmat, G. (2014). The relationship between air pollution, fossil fuel energy consumption, and water resources in the panel of selected Asia-Pacific countries. *Environmental Science and Pollution Research*, *21*(19), 11395-11400.

Reid, H. (2011). Improving the evidence for ecosystem-based adaptation. Sustainable development opinion paper.

Reilly, J., Prinn, R., Harnisch, J., Fitzmaurice, J., Jacoby, H., Kicklighter, D., …. & Wang, C. (1999). Multi-gas assessment of the Kyoto Protocol. Nature,

401(6753), 549.

Robinson, J., Bradley, M., Busby, P., Connor, D., Murray, A., Sampson, B., & Soper, W. (2006). Climate change and sustainable development: realizing the opportunity. AMBIO: A Journal of the Human Environment, 35(1), 2-9.

Rosche, D. (2016). Agenda 2030 and the sustainable development goals: Gender equality at last? An Oxfam perspective. Gender & Development, 24(1), 111-126.

Rowley, J. (2003). Knowledge management–the new librarianship? From custodians of history to gatekeepers to the future. *Library management*.

Roy, S. (2019). Living standards: re-examining the standard of living of the people of the Southwest coastal areas of Bangladesh: evidences from the Sustainable Development Goal 9. Encyclopedia of the UN Sustainable Development Goals: Industry, Innovation and Infrastructure, 1-11.

Ridgway, V. (2018). Elderly Persons Health and Wellbeing.

Saboori, B., Sulaiman, J., & Mohd, S. (2012). Economic growth and CO2 emissions in Malaysia: a cointegration analysis of the environmental Kuznets curve. *Energy policy*, *51*, 184-191.

Sadorsky, P. (2010). The impact of financial development on energy consumption in emerging economies. *Energy policy*, *38*(5), 2528-2535.

Sarkodie, S. A., & Strezov, V. (2019a). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. Science of the Total Environment, 646, 862-871.

Sarkodie, S. A., & Strezov, V. (2019b). A review on Environmental Kuznets Curve hypothesis using bibliometric and meta-analysis. Science of the total environment, 649, 128-145.162

Sarkodie, S. A., & Strezov, V. (2018a). Assessment of contribution of Australia's energy production to CO2 emissions and environmental degradation using statistical dynamic approach. Science of The Total Environment, 639, 888-899.

Sarkodie, S. A., & Strezov, V. (2018b). Empirical study of the environmental Kuznets curve and environmental sustainability curve hypothesis for Australia, China, Ghana and USA. Journal of cleaner production, 201, 98-110.

Saunders, M., Lewis, P., & Thornhill, A. (2015). Research Methods for Business Students (7th New ed).

Sands, P. (1992). The United Nations framework convention on climate change. Review of European Community & International Environmental Law, 1(3), 270-277.

Sant'Anna, A. A., & Young, C. E. F. (2010). Property rights, deforestation and rural conflicts in Amazonia. Economia Aplicada, 14(3), 381-393.

Selden, T. M., & Song, D. (1994). Environmental quality and development: is there a Kuznets curve for air pollution emissions?. *Journal of Environmental Economics and management*, *27*(2), 147-162.

Shafik, N. (1994). Economic development and environmental quality: an econometric analysis. *Oxford economic papers*, 757-773.

Shahbaz, M., Balsalobre-Lorente, D., & Sinha, A. (2019). Foreign direct Investment CO2 emissions nexus in Middle East and North African countries: Importance of biomass energy consumption. Journal of cleaner production, 217, 603-614.4

Shahbaz, M., Jalil, A., & Islam, F. (2010). Real exchange rate changes and trade balance in Pakistan: A revisit.

Shahbaz, M., Lean, H. H., & Shabbir, M. S. (2012). Environmental Kuznets curve hypothesis in Pakistan: cointegration and Granger causality. *Renewable and Sustainable Energy Reviews*, *16*(5), 2947-2953.

Shahbaz, M., Sbia, R., Hamdi, H., & Ozturk, I. (2014). Economic growth, electricity consumption, urbanization and environmental degradation relationship in United Arab Emirates. *Ecological Indicators*, *45*, 622-631.

Shahbaz, M., Hye, Q. M. A., Tiwari, A. K., & Leitão, N. C. (2013). Economic growth, energy consumption, financial development, international trade and CO2 emissions in Indonesia. *Renewable and Sustainable Energy Reviews*, *25*, 109-121.

Shahbaz, M., Haouas, I., & Van Hoang, T. H. (2019). Economic growth and environmental degradation in Vietnam: Is the environmental Kuznets curve a complete picture?. Emerging Markets Review, 38, 197-218.163

Shindell, D., Borgford-Parnell, N., Brauer, M., Haines, A., Kuylenstierna, J. C. I., Leonard, S. A., ... & Srivastava, L. (2017). A climate policy pathway for near and long-term benefits. Science, 356(6337), 493-494.

Singh, G. G., Cisneros-Montemayor, A. M., Swartz, W., Cheung, W., Guy, J. A., Kenny, T. A., ... & Sumaila, R. (2018). A rapid assessment of co-benefits and trade-offs among Sustainable Development Goals. Marine Policy, 93, 223-231.

Soares Oliveira, T. (2018). Businesses, the UN and decent work promotion: a case study of H&M, ILO and Sida's engagement in Cambodia.

Solarin, S. A., Al-Mulali, U., Musah, I., & Ozturk, I. (2017). Investigating the pollution haven hypothesis in Ghana: an empirical investigation. *Energy*, *124*, 706-719.

Solorzano, C. R., & Fleischman, F. (2018). Institutional legacies explain the comparative efficacy of protected areas: Evidence from the Calakmul and Maya Biosphere Reserves of Mexico and Guatemala. Global Environmental Change, 50, 278-288.

Soytas, U., Sari, R., & Ewing, B. T. (2007). Energy consumption, income, and carbon emissions in the United States. *Ecological Economics*, *62*(3-4), 482-489.

Stern, D. I., Common, M. S., & Barbier, E. B. (1996). Economic growth and environmental degradation: the environmental Kuznets curve and sustainable development. *World development*, *24*(7), 1151-1160.

Sugiawan, Y., Islam, M., & Managi, S. (2019). Global marine fisheries with economic growth. In *Wealth, Inclusive Growth and Sustainability* (pp. 87-134). Routledge.

Sun, Y., Lei, C., Khan, E., Chen, S. S., Tsang, D. C., Ok, Y. S., ... & Li, X. D. (2017). Nanoscale zero-valent iron for metal/metalloid removal from model hydraulic fracturing wastewater. *Chemosphere*, *176*, 315-323.

Sznida, E. (2018). The EU's Path Toward Sustainable Development Goals Responsible Consumption and Production. Available at SSRN 3292067.

Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. *Energy policy*, *37*(1), 246-253.

Tompkins, E. L., & Amundsen, H. (2008). Perceptions of the effectiveness of the United Nations Framework Convention on Climate Change in advancing national action on climate change. Environmental Science & Policy, 11(1), 1-13.

Uddin, M. G. S., Bidisha, S. H., & Ozturk, I. (2016). Carbon emissions, energy consumption, and economic growth relationship in Sri Lanka. *Energy Sources, Part B: Economics, Planning, and Policy*, *11*(3), 282-287.

ul Haq, R., Anderson, M., Liotta, A., Shafiq, M., Sherkheli, M. A., & Heinemann, U. (2016). Pretreatment with β- adrenergic receptor agonists facilitates induction of LTP and sharp wave ripple complexes in rodent hippocampus. *Hippocampus*, *26*(12), 1486-1492.

United Nations (UN) (2018) World Economic Situation and Prospects, United Nations, New York.

United Nations General Assembly (2015) International Trade and Development. Report of the Secretary General, A/70/277. 4 August

Von Hauff, M., & Mistri, M. A. (2015). Environmental Kuznets curve (EKC): Implications on economic growth, access to safe drinking water and ground water utilisation in India. *Global Journal of Human Social Science*, *15*(1), 1-15.

von Hirschhausen, C., Flekstad, M., & Meran, G. (2017). Clean drinking water as a Sustainable Development Goal: fair, universal access with increasing block tariffs. DIW Economic Bulletin, 7(28/29), 292-298.

Wahab, S. A., Zawawi, N. F. M., & Fazal, S. A. Sustainable Development and Innovation: Defining the Concept and Malaysian Participation.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and statistics*, *69*(6), 709-748.

World Health Organization. (2003). Progress of maternal mortality reduction in the Western Pacific Region.

Yeates, N. (2014a). Global Poverty Reduction: What can regional organisations do?

Yeates, N. (2014b). Global contexts and challenges of building a regional governance of social policy: Implications for South America.

Yin, R. K. (2017). Case study research and applications: Design and methods. Sage publications.

Youssef, A. B., Hammoudeh, S., & Omri, A. (2016). Simultaneity modeling analysis of the environmental Kuznets curve hypothesis. *Energy Economics*, *60*, 266-274.

Yucel, F. (2009). Causal relationships between financial development, trade openness and economic growth: the case of Turkey. *Journal of Social sciences*, *5*(1), 33-42.

Yuxiang, K., & Chen, Z. (2010). Government expenditure and energy intensity in China. *Energy Policy*, *38*(2), 691-694.

Zhang, Y. J. (2011). The impact of financial development on carbon emissions: An empirical analysis in China. *Energy policy*, *39*(4), 2197-2203.

Zhang, C., & Lin, Y. (2012). Panel estimation for urbanization, energy consumption and CO2 emissions: A regional analysis in China. *Energy policy*, *49*, 488-498.

Zhang, L., Pang, J., Chen, X., & Lu, Z. (2019). Carbon emissions, energy consumption and economic growth: Evidence from the agricultural sector of China's main grain-producing areas. *Science of the Total Environment*, 665, 1017-1025

Álvarez-Herranz A, Balsalobre-Lorente D, Cantos JM, Shahbaz M (2017) Energy innovation and renewable energy consumption in the correction of air pollution levels. Energy Policy 105:386–397

Álvarez-Herránz A, Balsalobre D, Cantos JM, Shahbaz M (2017) Energy innovations-GHG emissions nexus: fresh empirical evidence from OECD countries Energy Policy. Energy Policy 101:90–100

Azevedo VG, Sartori S, Campos LMS (2018) CO2emissions: a quantitative analysis among the BRICS nations. Renew Sust Energ Rev 81:107–115

Balsalobre D, Alvarez A (2016) An approach to the effect of energy innovation on environmental Kuznets curve: an introduction to inflection point. Bull Energy Econ 4(3):224–233

Banerjee A, Dolado JJ, Galbraith JW, Hendry DF (1993) Co-integration, error correction, and the econometric analysis of non-stationary data. Oxford

University Press, Oxford Bellmann C, Tipping A, Sumaila UR (2016) Global trade in fish and fishery products: an overview. Mar Policy 69:181–188

Bhattacharya M, Paramati SR, Ozturk I, Bhattacharya S (2016) The effect of renewable energy consumption on economic growth: evidence from top 38 countries. Appl Energy 162:733–741

Branch TA, Jensen OP, Ricard D, Ye Y, Hilborn R (2011) Contrasting global trends in marine fishery status obtained from catches and from stock assessments. Conserv Biol 25:777–786

Breusch TS, Pagan AR (1980) The Lagrange multiplier test and its applications to model specification in econometrics. Rev Econ Stud 47:239–253

Bruinsma, J. (Ed.). (2003). World agriculture: towards 2015/2030: an FAO perspective. Earthscan.

Central Intelligence Agency (2017) Country profiles, World factbook. Fairfax, USA: Central Intelligence Agency

Crownover C, Pippenger J, Steigerwald DG (1996) Testing for absolute purchasing power parity. J Int Money Financ 15:783–796

Danish BMA, Mahmood N, Zhang JW (2019) Effect of natural resources, renewable energy and economic development on CO2 emissions in BRICS countries. Sci Total Environ 678:632–638

Dutt SD, Ghosh D (1996) Purchasing power parity doctrine: an unrestricted cointegration test. Stud Econ Financ 16:22–45

Eghbal, M, (2008). The Next 11 Emerging Economies. Euromonitor International. Retrieved from: http://blog.euromonitor.com/2008/ 02/the-next-11-emerging-economies.html.

Faisal F, Tursoy T, Pervaiz R (2020) Does ICT lessen CO2 emissions for fast-emerging economies? An application of the heterogeneous panel estimations. Environ Sci Pollut Res 27:10778–10789 1-12

FAO, Fish Stat (2006), Fisheries Databases and Statistics (FishStat)http:// www.fao.org/fi/statist/statist.asp

Goldman Sachs (2015) Beyond the BRICs: a look at the Next 11 [Online]. Available: http://www.goldmansachs.com/our-thinking/ archive/archive-pdfs/brics-book/brics-chap-13.pdf

Grossman GM, Krueger AB (1991). Environmental impacts of a North American free trade agreement (No. w3914). Natl Bur Econ Res.

Grossman GM, Krueger AB (1995) Economic growth and the environment. Q J Econ 110:353–377

Halpern BS, Longo C, Hardy D, McLeod KL, Samhouri JF, Katona SK, ..., Rosenberg A.A (2012). An index to assess the health and benefits of the global ocean. Nature, 488: 615-620.

Hettige H, Mani M, Wheeler D (2000) Industrial pollution in economic development: the environmental Kuznets curve revisited. J Dev Econ 62:445–476 Panayotou T (1993)

Empirical tests and policy analysis of environmental degradation at different stages of economic development. Int Labour Organ.

Paramati SR, Ummalla M, Apergis N (2016) The effect of foreign direct investment and stock market growth on clean energy use across a panel of emerging market economies. Energy Econ 56:29–41

Pedroni, P (2001a) Fully modified OLS for heterogeneous cointegrated panels. In Nonstationarypanels, panel cointegration, and dynamic panels (pp.93-130). Emerald Group Publishing Limited.

Pedroni P (2001b) Fully modified OLS for heterogeneous cointegrated panels. Advances in Econometrics 15:93–130

Pedroni P (2004) Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econ Theory 20(03):597–625

Persyn D, Westerlund J (2008) Error-correction–based cointegration tests for panel data. Stata J 8:232–241

Pesaran MH (2004) General diagnostic tests for cross section dependence in panels .

Pesaran MH (2007) A simple panel unit root test in the presence of crosssection dependence. J Appl Econ 22:265–312 .

Pontecorvo G, Schrank WE (2012) The expansion, limit and decline of the global marine fish catch. Mar Policy 36:1178–118

Raza SA, Shah N, Khan KA (2020) Residential energy environmental Kuznets curve in emerging economies: the role of economic growth, renewable energy consumption, and financial development. Environ Sci Pollut Res 27:5620–5629

Sarkodie SA, Strezov V (2019) Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. Sci Total Environ 646:862–871

Shahbaz M, Balsalobre-Lorente D, Sinha A (2019) Foreign direct Investment–CO2 emissions nexus in Middle East and North African countries: Importance of biomass energy consumption. Journal of Cleaner Production 217:603–614

Shahbaz M, Sinha A (2018) Environmental Kuznets curve for CO2 emission: a literature survey. J Econ Stud 46(1):106–168

Shahbaz M, Solarin SA, Mahmood H, Arouri M (2013) Does financial development reduce CO2 emissions in Malaysian economy? A time series analysis. Econ Model 35:145–152

Sharif A, Raza SA, Ozturk I, Afshan S (2019) The dynamic relationship of renewable and non renewable energy consumption with carbon emission: a global study with the application of heterogeneous panel estimations. Renew Energy 133:685–691

Sinha A, Shahbaz M (2018) Estimation of environmental Kuznets curve for CO2 emission: role of renewable energy generation in India. Renew Energy 119:703–711

Sinha A, Shahbaz M, Balsalobre D (2017) Exploring the relationship between energy usage segregation and environmental degradation in N-11 countries. J Clean Prod 168:1217–1229

Sinha A, Shahbaz M, & Balsalobre D (2019). Data selection and environmental Kuznets curve models-environmental Kuznets curve models, data choice, data sources, missing data, balanced and unbalanced panels. In Environmental Kuznets Curve (EKC) (pp. 65- 83). Academic Press.

Srinivasan UT, Cheung WW, Watson R, Sumaila UR (2010) Food security implications of global marine catch losses due to overfishing. J Bioecon 12:183–200

Stock JK, Watson M (1993) A simple estimator of cointegrating vectors in higher order integrated systems. Econometrica 61:783–820 Sugiawan Y, Islam M, Managi S (2017) Global marine fisheries with economic growth. Econ Anal Policy 55:158–168

Tamaki T, Shin KJ, Nakamura H, Fujii H, Managi S (2018) Shadow prices and production inefficiency of mineral resources. Econ Anal Policy 57:111–121

Torras M, Boyce JK (1998) Income, inequality, and pollution: a reassessment of the environmental Kuznets curve. Ecol Econ 25:147–160 Westerlund J (2007) Testing for error correction in panel data. Oxf Bull Econ Stat 69:709–748

World Bank (2020) World Development Indicators. Online Edition. Washington: Retrieved from https://www.worldbank.org Accessed 28 May 2020

Worm B, Barbier EB, Beaumont N, Duffy JE, Folke C, Halpern BS et al (2006) Impacts of biodiversity loss on ocean ecosystem services. Science 314:787–790

Worm B, Barbier EB, Beaumont N, Duffy JE, Folke C, Halpern BS, Jackson JB, Lotze HK, Micheli F, Palumbi SR (2007) Response to comments on “Impacts of biodiversity loss on ocean ecosystem services”. Science 316:1285d

Wang Z, Bu C, Li H, Wei W (2019) Seawater environmental Kuznets curve: Evidence from seawater quality in China’s coastal waters. Journal ofCleaner Production 219:925–935.

Saidi, S., & Hammami, S. (2017). Modeling the causal linkages between transport, economic growth and environmental degradation for 75

countries. *Transportation Research Part D: Transport and Environment*, *53*, 415-427.

Wang, J., & Dong, K. (2019). What drives environmental degradation? Evidence from 14 Sub-Saharan African countries. *Science of the Total Environment*, *656*, 165-173.

Belaid, F., & Youssef, M. (2017). Environmental degradation, renewable and non-renewable electricity consumption, and economic growth: Assessing the evidence from Algeria. *Energy Policy*, *102*, 277-287.

Mohsin, M., Abbas, Q., Zhang, J., Ikram, M., & Iqbal, N. (2019). Integrated effect of energy consumption, economic development, and population growth on CO 2 based environmental degradation: a case of transport sector. *Environmental Science and Pollution Research*, *26*(32), 32824-32835.

Hassan, S. T., Baloch, M. A., Mahmood, N., & Zhang, J. (2019). Linking economic growth and ecological footprint through human capital and biocapacity. *Sustainable Cities and Society*, *47*, 101516.

Sarkodie, S. A. (2018). The invisible hand and EKC hypothesis: what are the drivers of environmental degradation and pollution in Africa?. *Environmental Science and Pollution Research*, *25*(22), 21993-22022.

Mehmood, U., & Tariq, S. (2020). Globalization and CO 2 emissions nexus: evidence from the EKC hypothesis in South Asian countries. *Environmental Science and Pollution Research*, *27*(29), 37044-37056.

Işık, C., Ongan, S., & Özdemir, D. (2019). Testing the EKC hypothesis for ten US states: an application of heterogeneous panel estimation method. *Environmental Science and Pollution Research*, *26*(11), 10846-10853.

Tenaw, D., & Beyene, A. D. (2021). Environmental sustainability and economic development in sub-Saharan Africa: A modified EKC hypothesis. *Renewable and Sustainable Energy Reviews*, *143*, 110897.

Isik, C., Ongan, S., Ozdemir, D., Ahmad, M., Irfan, M., Alvarado, R., & Ongan, A. (2021). The increases and decreases of the environment Kuznets curve (EKC) for 8 OECD countries. *Environmental Science and Pollution Research*, 1-9.

Ramos, A. H., Madaleno, M., & Varum, C. A. (2018, June). An analysis of the environmental Kuznets curve (EKC) hypothesis in Portugal: Sector data and innovation effects. In *2018 15th International Conference on the European Energy Market (EEM)* (pp. 1-6). IEEE.

Cheikh, N. B., Zaied, Y. B., & Chevallier, J. (2021). On the nonlinear relationship between energy use and CO2 emissions within an EKC framework: Evidence from panel smooth transition regression in the MENA region. *Research in International Business and Finance*, *55*, 101331.

Gill, A. R., Viswanathan, K. K., & Hassan, S. (2018). A test of environmental Kuznets curve (EKC) for carbon emission and potential of renewable energy to reduce green house gases (GHG) in Malaysia. *Environment, Development and Sustainability*, *20*(3), 1103-1114.

Huang, W. J. (2020). Driving Force of Environmental Kuznets Curve (EKC) Pattern on Energy Intensity in Taiwan at 1995-2015: Empirical Evidence of Exogenous Event

Transformed to Endogenous Polices Effect. *Review of Integrative Business and Economics Research*, *9*, 333-339.

Wang, S., Yang, F., & Song, J. (2017). A Microeconomics Explanation of the Environmental Kuznets Curve (EKC) and an Empirical Investigation. *Polish Journal of Environmental Studies*, *26*(4).

Ye, Y., & Yuan, Y. (2017). Argument of relationship between agricultural water and grain yield based on EKC. *Acta Agriculturae Jiangxi*, *29*(9), 147-150.

Gyamfi, B. A., Adedoyin, F. F., Bein, M. A., & Bekun, F. V. (2021). Environmental implications of N-shaped environmental Kuznets curve for E7 countries. *Environmental Science and Pollution Research*, 1-11.

Özokcu, S., & Özdemir, Ö. (2017). Economic growth, energy, and environmental Kuznets curve. *Renewable and Sustainable Energy Reviews*, *72*, 639-647.

Fonchamnyo, D. C., & Achuo, E. D. (2021). Primal-Dual Approach to Environmental Kuznets Curve Hypothesis: A Demand and Supply Side Analyses of Environmental Degradation.

Halkos, G. E., & Polemis, M. L. (2018). The impact of economic growth on environmental efficiency of the electricity sector: A hybrid window DEA methodology for the USA. *Journal of environmental management*, *211*, 334-346.

Allard, A., Takman, J., Uddin, G. S., & Ahmed, A. (2018). The N-shaped environmental Kuznets curve: an empirical evaluation using a panel quantile regression approach. *Environmental Science and Pollution Research*, *25*(6), 5848-5861.

Moutinho, V., Varum, C., & Madaleno, M. (2017). How economic growth affects emissions? An investigation of the environmental Kuznets curve in Portuguese and Spanish economic activity sectors. *Energy Policy*, *106*, 326-344.

APPENDIX

Pairwise Dumitrescu Hurlin Panel Causality Tests
Date: 05/21/21 Time: 09:48
Sample: 1992 2016
Lags: 2

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
LGDP does not homogeneously cause LCFP	3.76344	2.21961	0.0264
LCFP does not homogeneously cause LGDP	2.46532	0.31578	0.7522
LGDP2 does not homogeneously cause LCFP	3.84317	2.33653	0.0195
LCFP does not homogeneously cause LGDP2	2.41008	0.23477	0.8144
LGDP3 does not homogeneously cause LCFP	3.92372	2.45467	0.0141
LCFP does not homogeneously cause LGDP3	2.35797	0.15835	0.8742
LIVA does not homogeneously cause LCFP	3.57755	1.94698	0.0515
LCFP does not homogeneously cause LIVA	3.74764	2.19643	0.0281
LIGS does not homogeneously cause LCFP	3.57493	1.94314	0.0520
LCFP does not homogeneously cause LIGS	3.94754	2.48960	0.0128
LEGS does not homogeneously cause LCFP	3.19122	1.38039	0.1675
LCFP does not homogeneously cause LEGS	3.01263	1.11847	0.2634
LDCP does not homogeneously cause LCFP	4.32962	3.04995	0.0023
LCFP does not homogeneously cause LDCP	6.06268	5.59165	2.E-08
LGDP2 does not homogeneously cause LGDP	3.45665	1.76966	0.0768
LGDP does not homogeneously cause LGDP2	3.42157	1.71821	0.0858
LGDP3 does not homogeneously cause LGDP	3.47550	1.79731	0.0723
LGDP does not homogeneously cause LGDP3	3.40429	1.69288	0.0905
LIVA does not homogeneously cause LGDP	2.81011	0.82145	0.4114
LGDP does not homogeneously cause LIVA	4.62158	3.47814	0.0005
LIGS does not homogeneously cause LGDP	6.02977	5.54338	3.E-08
LGDP does not homogeneously cause LIGS	4.92605	3.92467	9.E-05
LEGS does not homogeneously cause LGDP	4.69892	3.59157	0.0003
LGDP does not homogeneously cause LEGS	4.75019	3.66676	0.0002
LDCP does not homogeneously cause LGDP	3.06050	1.18868	0.2346
LGDP does not homogeneously cause LDCP	29.2113	39.5412	0.0000
LGDP3 does not homogeneously cause LGDP2	3.46450	1.78117	0.0749
LGDP2 does not homogeneously cause LGDP3	3.42802	1.72768	0.0840
LIVA does not homogeneously cause LGDP2	2.80873	0.81943	0.4125
LGDP2 does not homogeneously cause LIVA	4.68793	3.57545	0.0003
LIGS does not homogeneously cause LGDP2	6.00298	5.50410	4.E-08
LGDP2 does not homogeneously cause LIGS	4.92573	3.92420	9.E-05
LEGS does not homogeneously cause LGDP2	4.73377	3.64268	0.0003
LGDP2 does not homogeneously cause LEGS	4.78582	3.71901	0.0002

LDCP does not homogeneously cause LGDP2	3.05291	1.17754	0.2390
LGDP2 does not homogeneously cause LDCP	28.3959	38.3453	0.0000
LIVA does not homogeneously cause LGDP3	2.81349	0.82641	0.4086
LGDP3 does not homogeneously cause LIVA	4.77448	3.70238	0.0002
LIGS does not homogeneously cause LGDP3	5.95315	5.43101	6.E-08
LGDP3 does not homogeneously cause LIGS	4.92939	3.92957	9.E-05
LEGS does not homogeneously cause LGDP3	4.77397	3.70163	0.0002
LGDP3 does not homogeneously cause LEGS	4.82330	3.77398	0.0002
LDCP does not homogeneously cause LGDP3	3.04244	1.16219	0.2452
LGDP3 does not homogeneously cause LDCP	27.4060	36.8935	0.0000
LIGS does not homogeneously cause LIVA	6.01412	5.52043	3.E-08
LIVA does not homogeneously cause LIGS	4.05400	2.64572	0.0082
LEGS does not homogeneously cause LIVA	5.74142	5.12049	3.E-07
LIVA does not homogeneously cause LEGS	4.58892	3.43024	0.0006
LDCP does not homogeneously cause LIVA	3.68000	2.09723	0.0360
LIVA does not homogeneously cause LDCP	26.2920	35.2598	0.0000
LEGS does not homogeneously cause LIGS	2.61103	0.52948	0.5965
LIGS does not homogeneously cause LEGS	5.46729	4.71845	2.E-06
LDCP does not homogeneously cause LIGS	4.62885	3.48880	0.0005
LIGS does not homogeneously cause LDCP	5.85358	5.28498	1.E-07
LDCP does not homogeneously cause LEGS	6.62779	6.42043	1.E-10
LEGS does not homogeneously cause LDCP	7.97004	8.38897	0.0000

Table 1 Definitions and descriptive statistics of variables

Variable	Description of variable	Mean	Std.Dev.	Obs.
ln CFP	Capture fisheries production (metric tons)	14.0058	1.0726	350
ln GDP	GDP per capita (constant 2010 US$)	8.0817	1.0192	350
ln IVA	Industry value added (constant 2010 US$)	25.6713	1.1937	350
ln DCP[a]	Domestic credit provided to the private sector (% of GDP)	3.6266	1.0726	350
ln EGS	Exports of goods and services (% of GDP)	3.0718	0.4270	350
ln IGS	Imports of goods and services (% of GDP)	3.1100	0.3889	350

Table 2 CD tests

	Variables					
	ln CFP	ln GDP	ln IVA	ln DCF	ln EGS	ln IGS
CD test proposed by Pesaran	7.2505*	44.9086*	44.7487*	8.6944*	9.4224*	9.7584*
CD test suggested by Breusch and Pagan	823.0885*	2021.127*	12008.454*	706.8312*	514.5283*	482.1584*

Note: To investigate the CD, Breusch and Pagan (1980) and Pesaran (2004) CD tests are applied. The * shows the *p-values* significant at 1%. The null hypothesis was rejected for all variables at 1%

Table 3 CIPS unit root test

Variables	*L*	1st difference
ln CFP	−2.505 (1)	−4.679* (1)
ln GDP	−1.318 (1)	−3.357* (1)
ln IVA	−1.609 (1)	−3.525* (1)
ln DCP	−1.947 (1)	−3.933* (1)
ln EGS	−2.318 (1)	−4.438* (1)
ln IGS	−2.340 (1)	−4.622* (1)
CADF		
ln CFP	−2.392 (1)	−3.350* (1)
ln GDP	−1.547 (1)	−3.357**(0)
ln IVA	−1.747 (1)	−2.720*** (1)
ln DCP	−1.947 (0)	−3.933 *(0)
ln EGS	−2.318 (1)	−3.294* (1)
ln IGS	−2.338(1)	−3.123* (1)

Conclusion: series are stationary after the first difference, so they are regarded as I(1)

*, **, and *** show significance at 1%, 5%, and 10%, respectively. The tests are applied with both trend and intercept. CVs for CIPS: 1%, 5%, and 10% are −2.89, −2.70, and −2.6, respectively. CVs for CADF: 1%, 5%, and 10% are −2.960, −2.760, and −2.660, respectively

Table 4 Westerlund (2007) ECM boot strap panel cointegration test

Stat.	Value	*z*-value	Robust probability value
G_t	−3.256	−0.981	0.060*
G_a	−1.778	7.101	0.198
P_t	−10.848	−0.426	0.090*
P_a	−2.123	5.623	0.680

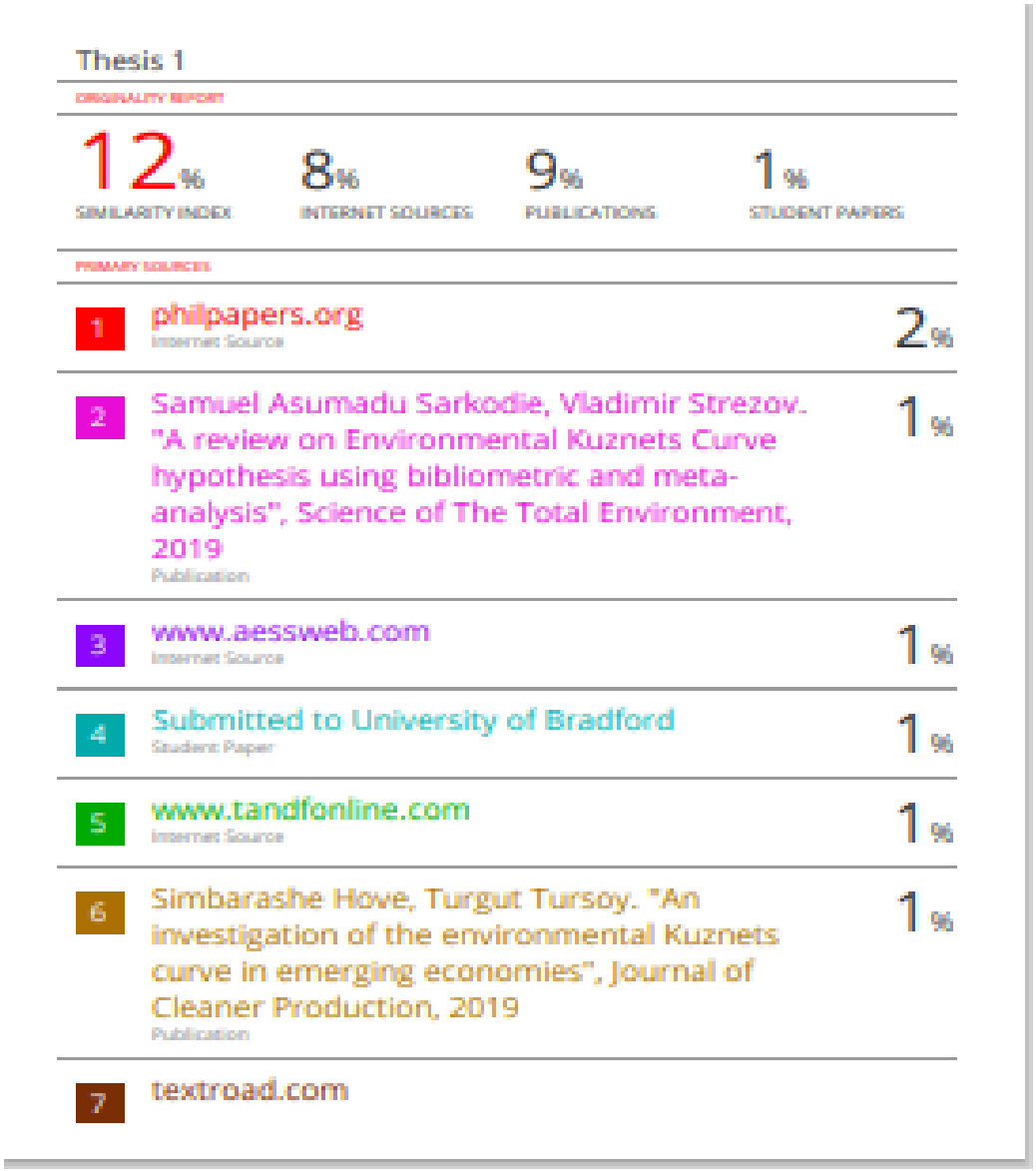
*Confirms the decision of a long-run relationship at 10% considering the robust *p*-values. These robust *p*-values are generated using 100 bootstrap replications. Level lag is used with 14 series and 5 covariates. The null hypothesis of no cointegration is rejected using the robust *p* values of G_t and P_t.

Table 5 Results of DOLS

Panel dynamic ordinary least square			
Variable	Coefficient	Standard error	*t*-value
ln GDP	29.3894*	1.4516	20.2460
$(\ln GDP)^2$	−3.6140*	0.1829	−19.7538
$(\ln GDP)^3$	0.1452*	0.0077	18.8486
ln IVA	−0.2654*	0.0282	−9.4047
ln DCP	−0.0896*	0.0041	−21.7609
ln EGS	0.0563*	0.0066	8.4329
ln IGS	−0.0723*	0.0078	−9.1707
R^2	0.991		
Adj. R^2	0.990		

*Shows significance at 1%. PDOLS represent panel dynamic ordinary least squares. Further, the N-shaped coefficients have also been verified by fulfilling the conditions as proposed in the study of Sinha et al. (2019)

AN INVESTIGATING OF THE DYNAMIC IMPACT OF ECONOMIC GROWTH, FINANCE AND TRADE NEXUS ON ENVIRONMENTAL DEGRADATION (CAPTURE FISHERIES PRODUCTION) IN SELECTED EMERGING COUNTRIES



Thesis 1

ORIGINALITY REPORT

12%	8%	9%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	philpapers.org Internet Source	2%
2	Samuel Asumadu Sarkodie, Vladimir Strezov. "A review on Environmental Kuznets Curve hypothesis using bibliometric and meta-analysis", Science of The Total Environment, 2019 Publication	1%
3	www.aessweb.com Internet Source	1%
4	Submitted to University of Bradford Student Paper	1%
5	www.tandfonline.com Internet Source	1%
6	Simbarashe Hove, Turgut Tursoy. "An investigation of the environmental Kuznets curve in emerging economies", Journal of Cleaner Production, 2019 Publication	1%
7	textroad.com	