# The Role of Tourism Development on $CO^2$ Emission Reduction in an Extended Version of the Environmental Kuznets Curve: Evidence from Top Tourist Destination Countries

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# ABSTRACT

The link among energy consumption, environmental pollution, and economic growth has been long investigated. Nevertheless, the trade off between energy consumption and environment quality needs more attention, especially tourism development based on the concept of International tourism. Tourism development is center of economic growth across the countries.

This thesis empirically investigates the role of tourism development in an extended version of Environmental Kuznets Curve (EKC) for top 50 tourist destination countries. Panel data on annual basis that range from 1996 to 2016 have been used through employing CADF, CIPS and PANKPSS unit root tests, DSUR cointegrating test as well as DH panel dynamic causality test. The Results explain that tourism development exerts significant long-term effects on the extended version of EKC whereas carbon emissions level significantly move over years through tourism development. Energy is an important indicator of development in national economies. The fact that energy needs are consumed from fossil energy sources is an important factor that increases carbon dioxide (CO2) emissions, an indicator of environmental pollution. Especially in developed countries, with the widespread use of renewable energy sources, the damage caused by industrialization to the environment is minimized, but developing countries consume energy without considering the damage they cause to the environment. Our findings also indicate that tourism development has positive effects on the level of CO2 emissions in the case of Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunisia, Egypt, Iran, Georgia, Hong Kong, India

and Malaysia. Developing countries have higher carbon emissions than developed countries. This result suggests that these countries should not use traditional fuel oil consumption methods and such methods need to be abandoned for reduction of carbon dioxide in terms of environmental quality and sustainability. It is seen that technological progress increases $CO^2$ emissions in China.

**Keywords:** Tourism development; Carbon emissions, EKC model, Panel data analysis, Top 50 Tourist Destinations.

# ÖZ

Enerji tüketimi, çevre kirliliği ve ekonomik büyüme arasındaki bağlantı uzun süredir araştırılmaktadır. Bununla birlikte, enerji tüketimi ve çevre kalitesi arasındaki dengeye, özellikle de Uluslararası turizm kavramına dayalı turizm gelişimine daha fazla dikkat edilmesi gerekmektedir. Turizm gelişimi, ülkeler arasında ekonomik büyümenin merkezidir.

Bu tez, en iyi 50 turistik destinasyon ülkesi için Çevresel Kuznets Eğrisinin (EKC) genişletilmiş bir versiyonunda turizm gelişiminin rolünü ampirik olarak araştırmaktadır. CADF, CIPS ve PANKPSS birim kök testleri, DSUR eşbütünleşme testi ve DH panel dinamik nedensellik testi kullanılarak 1996 ile 2016 yılları arasında değişen yıllık bazda panel veriler kullanılmıştır. Sonuçlar, turizm gelişiminin EKC'nin genişletilmiş versiyonu üzerinde önemli uzun vadeli etkiler uyguladığını, ancak karbon emisyonlarının yıllar içinde turizm gelişimi yoluyla önemli ölçüde hareket ettiğini açıklamaktadır. Ülke ekonomilerinde kalkınmanın önemli bir göstergesi enerjidir. Enerji ihtiyaçlarının fosil enerji kaynaklarından tüketiliyor olması önemli bir çevre kirliliğinin göstergesi karbondioksit (CO2) emisyonunu artıran önemli bir unsurdur. Özellikle gelişmiş ülkelerde yenilenebilir enerji kaynaklarının kullanımının yaygınlaşması ile sanayileşmenin çevreye verdiği zarar minimize edilmektedir ancak gelişmekte olan ülkeler çevreye verdikleri zararı dikkate almadan enerji tüketimi yapmaktadırlar. Bulgularımız aynı zamanda turizm gelişiminin Türkiye, Tayland, Rusya, Yunanistan, Suudi Arabistan, Makao, Endonezya, Brezilya, Dominika, Filipinler, Bulgaristan, Tunus, Mısır, İran, Gürcistan, Hong Kong, Hindistan ve Malezya örneğinde $CO^2$ emisyonları düzeyi

üzerinde olumlu etkileri olduğunu göstermektedir. Gelişmekte olan ülkelerin karbon emisyon düzeyi gelişmiş ülkelere göre yüksek olmaktadır. Bu ülkelerin geleneksel akaryakıt tüketim yöntemlerini kullanmamaları gerektiğini ve çevresel kalite ve sürdürülebilirlik açısından karbondioksitin azaltılması için bu tür yöntemlerin terk edilmesi gerektiğini göstermektedir.

**Anahtar kelimeler:** Turizm gelişimi; Karbon emisyonları, EKC modeli, Panel veri analizi, En iyi 50 Turist Destinasyonu.

# DEDICATION

*To My Family*

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| | |
|---|---|
| $CO_2$ | Carbon Dioxide |
| CSD | Cross Sectional Dependent |
| DSUR | Dynamic Seemingly Unrelated Regression |
| E | Energy Use |
| ECM | Error Correction Model |
| ECT | Error Correction Term |
| EKC | Environmental Kuznets Curve |
| EU | European Union |
| GDP | Gross Domestic Product |

# Chapter 1

# INTRODUCTION

## 1.1 Brief Introduction

The link among energy consumption, environmental pollution, and economic growth has been long investigated. Nevertheless, the trade off between energy consumption and environment quality needs more attention, especially tourism development based on the concept of International tourism. Tourism development is center of economic growth across the countries. As long as Tourism growth gradually increases, this makes air pollution expansion in tourism. This makes demand for energy to rise for different activities such as transportation, catering, and accommodation (Becken, Frampton, & Simmons, 2001; Becken, Simmons, & Frampton, 2003; Gössling, 2002), which may create environmental deprivation (Xuchao, Priyadarsini, & Eang, 2010). Xuchao et al. (2010) also pointed out that tourism sectors needed more energy for building in tourism sectors. In this regard, policy makers might get benefits to develop crucial policies for ease the concept of pollution within tourism sector across the countries. This would be an important point for the relevant tourism literature.

## 1.2 Purpose of the Thesis

One of the most important problems of developing and developed countries is the increase of environmental pollution. The most obvious result of economic growth is environmental degradation. Countries have to give importance to the environment while supporting economic growth. Interest in the concept of 'low carbon and green growth' shows a significant increase from year to year (Hwang ve Yoo 2014).The

deterioration of environmental quality, governments have to follow policies to prevent environmental degradation. Economic growth is a fundamental goal, especially for developing and underdeveloped countries. The realization of economic growth by preserving basic natural resources cannot be denied in terms of sustainable growth (Munasinghe, 2001). There is a relationship between economic growth and deterioration of environmental quality. There are many studies in the literature examining economic growth and carbon emissions. Developing countries, whose greenhouse gas emissions have reached serious levels, will play an important role in preventing global climate change in the future. Climate change is also an important factor affecting tourism. For this reason, the relationship between economic development and international climate policies has an extremely important place. CO2 emission is accepted as the main driver of pollutant emissions (Farhani ve Rejeb, 2012). In order to overcome this problem, all countries of the world have started to give more importance to renewable energy sources. It is seen that researchers focus on studies that empirically examine the causal relationship between renewable energy consumption, economic growth and CO2.(Anis Omri vd. 2015; Jebli & Youssef 2015; Jaforullah & King 2015; Apergis & Payne 2014; Sebri & BenSalha 2014; Shafiei ve Salim 2014; Lin ve Moubarak 2014; Bölük ve Mert 2014; Zeb vd. 2014; Al-Mulali vd. 2013). There are many studies in the literature examining economic growth and carbon emissions. These studies discuss whether economic growth and carbon emissions are in line with what is known in the literature as the Environmental Kuznets Curve (EKC). According to the EKC hypothesis, initially environmental pollution increases with economic development, but after income reaches a certain level, environmental pollution begins to decrease. (Dinda, 2004). This hypothesis determines the relationship between economic

growth and the density of greenhouse gases, which is a component of environmental pollution. Different methods can be used to measure environmental pollution. Unlike other studies, this thesis examines the top 50 countries with the highest growth in world tourism. The relationship between energy demand and consumption as a result of tourism expansion, growth in tourism and carbon emissions is the focus of this thesis. Initially, environmental degradation increases faster than income, then economic deterioration slows down. There is an inverse u-shaped relationship between environmental quality and income (Dinda, 2004). Furthermore, under the environmental Kuznets Curve hypothesis, a rise in income is a raise in CO2 emissions. The majority of the literature on EKC explains that the CO2 emissions level generally raises with energy consumption. I examined the relationship between energy consumption, carbon emission and economic growth of the top 50 tourist destination countries. The inverted U-shaped relationship between income inequality and economic growth is first expressed by Simon Kuznets EKC (1955). Then, studies of Grossman and Krueger (1991) conducted in order to test the validity of EKC hypothesis used in testing the relationship between environmental pollution and economic growth are frequently encountered in the literature. The present thesis shows that there is a positive relationship between energy consumption and carbon emission according to the inverted-U shaped EKC hypothesis. The impact of climate changes on tourism growth was investigated by adapting it to the EKC framework in top tourist destinations. According to the empirical results obtained, it is concluded that while growth has an effect on carbon emissions, tourism has a negative effect on environmental pollution, in other words, tourism increases environmental quality by reducing carbon emission (Katırcıoğlu (2014). Tourism growth in developing and underdeveloped countries has a positive impact on emission stages. (De Vita et al.

2015) examined the relationship between the number of tourist arrivals, economic growth and carbon emissions for the period 1960-2009 and determined that the EKC concept was binding, they stated that the increase in the number of tourists caused environmental pollution. Carbon emission has an impact on economic growth, total tourist arrivals and energy consumption. According to the relationship between tourism growth and carbon emission in the EKC hypothesis, it is seen that carbon emission falls faster in developed countries than in undeveloped countries.

## 1.3 Contribution of the Thesis

Increasing environmental pollution due to climate change and greenhouse gas emissions, especially carbon (CO2), maintains its importance all over the world. The aim of the thesis is to select the top 50 countries ranked by the world trade organization (2017), and to empirically investigate the effect of tourism growth on environmental quality in the extended form of the EKC Hypothesis and the relationship between energy consumption and carbon emissions as of 1996-2016. The development of tourism in the economy causes an increase in the demand for energy use. In this thesis, the carbon emission of developed countries decreases in the long term. The reason is that with the increase in income, the government develops policies to protect the environmental quality. Such a large thesis has not been conducted before. In this thesis, we can see more clearly the effects of developed and developing countries' energy consumption in tourism and environmental degradation. The increase in prosperity in developed countries and an increase in the awareness of consumers to environmental quality occur. For this reason, there is an increase in the number of legal regulations and sanctions regarding environmental quality in developed countries. In an underdeveloped economy, there is no environmental pollution since agriculture-based production is

generally made. The tourism growth has positive effects on carbon emission levels such as Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunusia, Egypt, Iran, Georgia, Hong Kong, India and Malaysia. As the growth increases after a certain income level, environmental pollution will decrease. On the other hand, Deacon and Norman (2004) stated that EKC can also be interpreted as increasing pollution in low-income countries, decreasing pollution in high-income countries, and reversed-U in middle-income countries. It is seen that carbon emissions fall faster in developed countries than in undeveloped countries. Energy consumption has a positive effect on carbon emissions. This result confirmed the evidence of Halıcıoglu (2009) and Katırcıoglu (2014a). As a result of the empirical findings obtained from the panel data analysis, according to the expanded Kuznets Curve in long term period, CO2 emissions will also increase in the early stages of economic growth, but after a certain income level, CO2 emissions will decrease as economic growth continues such as France, USA, United Kingdom, Germany, Spain, China and other countires. The variables in this thesis are found at the same level. Therefore, cointegration tests are needed to investigate the model used further. It would be appropriate to use this test in future studies.

## 1.4 Structure of the Thesis

The remainder of this thesis is organized as follows. Chapter 2 presents the concept of the relevant literature. Chapter 3 gives information on the case of global tourism development. Chapter 4 explains 'the role of tourism development in environmental Kuznets curve: evidence from the 50 top tourist destinations.' Chapter 5 concludes these studies and provides some policy implications.

# Chapter 2

# LITERATURE REVIEW

## 2.1 Introduction

The relationship between environmental pollution and energy consumption has been widely inspected in the relevant literature (Alam, Begum, Buysse, Rahman, & Huylenbroeck, 2011; Ang, 2008; Soytas et al., 2007; Xing-Ping & Xiao-Mei, 2009). Many papers show that the presence of empirical relationships between pollution and energy consumption indicates the direction of causality remains uncertain. Alternatively, some papers empirically investigated whether the validity of the Environmental Kuznets Curve (EKC) hypothesis exists in considering a link among Ecological contamination, toursim and GDP (Coondoo & Dinda, 2002; Dinda, 2004; Grossman & Krueger, 1991; Luzzati & Orsini, 2009; Stern 2004). Energy expansion provives a positive channel on carbon emission level whereas investment in hotel industry boosts carbon emissions result in development of tourism sectors. As far as the relevant literature is concerned, the studies on the link between international tourism and carbon dioxide are too little[1]. Furthermore, Katircioglu et al. (2014) examined the impact of the development in tourism for the Cyprus economy and points out that energy consumption and carbon emissions are the key factors for tourism development[2]. In a nutshell, tourism development can indicate significant

[1] See Katircioglu (2014) and De Vita et al. (2015) for more information on the relationship between air pollution and energy consumption.

[2] See Lee & Brahmasrene (2013) to see tourism has negative impact on CO2 emissions for EU coutries.

impact on environment quality basen on the relevant literatue. The previous research has generally mainly focused on tourism effects on environmental quality in individual countries. However, there is gap in the literature that such results need to be generalized for different regions and the other major tourist destinations. The current thesis may provide an important step in terms of tourism development on environmental quality for the top tourist arrival countries. Previous research has also documented that tourism expansion results in additional energy demand and consumption; and therefore, it is likely to affect environmental quality. This argument should be stronger in the major tourist destination countries where tourism is major activity and contributes significantly to the economies of those countries. Therefore, top 10 countries in tourism as ranked by World Tourism Organization as of 2017 have been selected as the main focus of this research thesis. The list of these countries is provided in Table 1.1 (Appendix). Furthermore, examinning the effect of tourism in environmental quality, that theoretical framework of Environmental Kuznet's Curve (EKC) has been taken into consideration as a research model which is introduced in the next section.

## 2.2 Global Tourism Development

Along with globalization, as a result of the opening of the economies of the countries that are in the position of tourism destinations, the competitiveness of these countries in the sector and their share from tourism has increased accordingly (Croes, 2005).

The tourism sector is seen by economists as an economic activity, especially in developing countries. The justification is that its direct or indirect results contribute positively to the country's economy (Kar et al., 2004: 96). In particular, there exists

an influence of toursm service, national income and the balance of payments in a country. It is necessary to look at the increase in income (Hazar, 2010: 186).

Tourism creates positive results in the economies of developing countries in a short time. The increase in tourism activities in a country will enable new investments to be made in this field, and increasing investments will allow the development of other sectors that provide input to the tourism sector.

With the effect of the globalization process, the removal of geographical borders between countries, the spread of international investments, the recognition of each other by nations with different cultures, the use of common languages all over the world and liberalization in transportation have been the driving force in the rapid development of international tourism.

While developed countries take a share in tourism, today, depending on the globalization process, developments in the speed, comfort, capacity and price factors in transportation vehicles, democratization of global travel, increases in tourism investments, strengthening of finance and banking sectors with the tourism industry, innovations in communication technologies, developments that have emerged globally, are developing. The touristic supply sources of different and developed countries have caused developing countries as well as developed countries to get a share from international tourism (Çeken, 2003: 16).

Tourism is an important factor in reducing poverty and ensuring economic development for developing economies. It depends on how well it is linked to energy and environmental policies to make the development of tourism sustainable.

The rapid developments in communication technology, the speed, comfort, capacity and price factors of transportation vehicles that have occurred with globalization have played a major role in the development of international tourism (Mullings, 1999).

While the tourism sector is an important source of income for countries, it has experienced significant developments with the increase in travel trend due to the development of international trade and the increase in living standards (Clark, T., Gill, A., & Hartmann, R. 2006).

## 2.3 The Effect of Kuznets Curve on Global Tourism Sector

The tourism industry has become one of the major players in international trade, as well as representing one of the main sources of income for many developing countries with its increasing variety of destinations and the level of competition. In developed countries, the tourism sector has contributed to economic and employment in many related sectors, from construction to agriculture or telecommunications. In addition, international tourism plays an important role in generating household income as well as being a source of foreign currency that facilitates the acquisition of capital goods and technologies that can be used in other production processes (Brida et al., 2009).

Due to these factors, the relationship between tourism and economic growth has been closely followed in the academic literature. Balaguer and Cantavella-Jorda (2002) presented various arguments suggesting that a tourism-induced growth hypothesis, as in the export-led growth hypothesis, will be the main determinant of long-term economic growth in tourism in general. The tourism-based growth model approach is an economic strategy followed by developing countries and some developed countries seeking a suitable place for a particular export activity in the world economy in the past (Nissan et al., 2011: 1568).

Considering the role and contributions of tourism in the economic growth process, it is necessary to demonstrate to what extent this sector affects income inequality in both developed and developing countries. In particular, it is recognized that tourism activities in socio-economically underdeveloped regions of the countries are a driving force in reducing these development disparities and contribute to increasing the level of welfare. However, at the macroeconomic level, whether tourism has the same effect on economic growth is a controversial issue.

This issue has become even more important when the relationship between economic growth and income inequality is included in the process. In this respect, if a tourism-based growth hypothesis is accepted and it is taken into account that tourism is the locomotive of growth, the effect of tourism on income inequality will emerge through two different channels. The first is the direct effect of tourism on income inequality, the second is the effect of tourism on income inequality through the growth channel. The foundations of the relationship between economic growth and income inequality are based on the seminal work of Kuznets (1955).

According to the Kuznets curve, income inequality increases in the initial stage of economic growth and decreases in the later stages. The same may be the case for the impact of tourism on income inequality. It has shown that tourism revenues positively affect economic growth and income inequality. Accordingly, international tourism activities and the resulting increase in income stimulated economic growth in research countries. According to the Kuznets curve, income inequality increases in the initial stage of economic growth and decreases in the later stages.

As economic growth continues, people's quality of life improves and they use their income in favour of clean water, improved air quality and cleaner living. . Economic growth also enables technological progress, so countries with higher income levels transfer more resources towards research and development expenditures. This often causes environmentally friendly technologies that improve environmental quality to replace old technologies that pollute the environment. This situation, which recalls the Environmental Kuznets curve, is the technology effect (Borghesi, 1999: 6-7).

Turner and Witt (2001) stated that globalization also affect the tourism sector and contribute to controlling carbon emissions. Other evidence confirms that globalization has a direct impact on the environment. For example, Cavlovic et al. (2000) state that there is a relationship between globalization and economic efficiency that helps control carbon emissions in the long run.

Globalization prevents carbon emissions by managing innovation and knowledge, this possibility confirms the effect of the inverted U-shaped EKC hypothesis between

globalization and carbon emission on environmental quality. On the other hand, while tourism development contributes to economic growth, it also compensates for environmental degradation.

One of the most important findings of the Kuznet model is that, with development of tourism in the early stages of growth, globalization worsens the environmental quality, and in the later stage, the driving force of economic growth and the increase in environmental quality. In this process, it also prevents the negative effects of increased energy consumption.

## 2.4 Empirical Evidences

International tourism activities and the resulting increase in revenues stimulated economic growth in research countries. Considering the role and contributions of tourism in the economic growth process, it is necessary to demonstrate to what extent this sector affects income inequality in both developed and developing countries. In particular, it is recognized that tourism activities in socio-economically underdeveloped regions of the countries are a driving force in reducing these development disparities and contribute to increasing the level of welfare.

The foreign exchange that comes with tourism revenues has a positive effect on economic growth. The positive effects of tourism on economic growth are important for the country's economy. Globalization has a positive relationship, promoting economic growth (Chang and Lee 2010; Gurgul and Lach 2014). The relationship between the development of tourism and carbon emissions is explained by energy consumption and economic activities. The transportation sector, which is the main

factor in the development of tourism, is important for tourism destination (Yeoman et al., 2007).

Empirical results prove that the development of tourism with globalization, transportation by accelerating the flow of tourists, and the revival of the services sector, the increase in energy consumption and real incomes, and the decrease in carbon emissions (Shafik 1994; Halicioglu 2009). Our empirical results suggest a globalization of the Tourism-based EKC proposition in tourism countries. Globalization contributes to the development of technology, increases tourist destinations and provides low-carbon economic growth by controlling energy (Tamazian et al. 2009). Otherwise, a large part of the economics literature says that the relationship between climate change and energy consumption triggers economic growth, and globalization is the driving force of social and economic growth (Aitken et al. 1997, Hsiao and Shen 2003, Tamazian, et al. 2009, List and Co 2000, Turner and Witt 2001). For instance, Katircioglu (2014) states that there is an important relationship between turim and the energy sector and economic growth. In this sense, it is inevitable that the activities resulting from the development of tourism will lead to energy use and environmental degradation. However, when we look at the long-term result of the EKC hypothesis, while there is an increase in energy consumption and environmental pollution at the beginning, the increase in revenues at the later stage allows more attention to environmental policies and the application of environmental protection policies.

Finally, Last development in the relationship between economic growth and Carbon ($CO^2$) emissions can be summurized using some recent articles. It is observed that

economic growth in South Africa reduces $CO^2$ emissions. This situation can be expressed as reducing $CO^2$ emissions by increasing the use of environmentally friendly production techniques and clean energy together with economic growth in South Africa. Economic growth can increase the demand for energy as well as $CO^2$ emissions (Temelli and Şahin, 2019). The thesis's results support the findings of Temelli and Şahin. On the other hand, non-renewable energy resources are used as fuel in Pakistan and cause environmental degradation with increasing energy consumption. For this reason, long-term environmental degradation can be controlled by using environmentally friendly resources instead of these resources (Khan et. al, 2020). Some countries' findings within this thesis support Khan et. al, (2020) results whereas the number of international tourists increases environmental pollution. (Özsoy, 2021) also points out that tourism revenues reduce environmental pollution up to a certain point, but then cause environmental destruction. From this point of view, the thesis results provide mix evidence about the trade off between tourism proxy (i.e., revenue) and environmental pollution. Yu Sun et., al (2021) also found out that the relationship between economic growth and carbon emissions is inverted "U" which suggest that there is a turning point of carbon emissions, where the carbon emissions first increase with economic growth and then gradually decrease. This finding supports the results estimated within this thesis.

## 2.5 Conclusion

In this thesis, whether there is a relationship between environmental pollution and tourism development as mentioned in the Environmental Kuznets Curve hypothesis has been questioned for top tourist destination countries. As a result of empirical findings obtained by panel data analysis, inverted U-shaped EKC was estimated.

Empirical results show us that globalization between CO2 emissions and international tourism growth leads to a long-term decrease in CO2 emission levels by increasing real income per capita with energy consumption and international tourism arrivals in the long run. It is seen that international tourism growth through globalization, energy consumption and real income, and environmental protection policies adversely affect carbon emissions in touristic destination countries. Globalization has a positive effect on CO2 emission by increasing the efficient use of natural resources (Leitao and Shahbaz 2013). With the development of tourism, tourism increases the energy demand in activities such as transportation, food, accommodation and water supply (Gössling 2002). Globalization takes measures to regulate environmental policy by encouraging the use of clean technologies and increasing competitiveness and efficiency in the tourism industry. Economic decision-making units in developing countries do not take into account environmental degradation caused by industrialization. Economic growth harms nature and reduces the quality of life of the society, especially through air pollution and environmental degradation. Economic decision-making units should take environmental sustainability into account while guiding energy policies. Developing countries are observed to be unable to produce information and technology-oriented, environmentally compatible energy, especially due to their low-income levels, and rapidly increasing their carbon dioxide emission rates. It is stated that the countries in question can not provide environmental sustainability in energy due to reasons such as preferring energy sources with high carbon dioxide emission such as coal instead of environmentally friendly resources, not ensuring diversity in energy resources, not paying enough attention to technological developments required for renewable energy use.

# Chapter 3

# THE CASE OF GLOBAL TOURISM DEVELOPMENT

## 3.1 Introduction

Globalization has facilitated the freedom of travel in the tourism sector and has enabled the tourism sector to develop significantly and more people to participate in tourism movements than before (Johnson & Iunius, 1999).

Tourism has become important not only for developed countries, which have a significant share in tourism movements, but also for developing countries, due to its economic and political effects on country economies. In this context, with the position it has reached in the international arena, tourism has gained a structure that can affect economic, social and cultural life. In addition, tourism emerges as an area that should be given importance in terms of national economies, as it has a role that can facilitate the realization of politically important social functions (Bulut, 2009).

Globalization has brought significant changes in all areas of social, political and economic life. Global economy, as a result of globalization, primarily the liberalization of international trade has led to changes in the free movement of capital, labor and goods.

Globalization has a strong impact on the development of tourism in the fields of transportation, communication, new technologies and the internet. This effect has increased tourism revenues with the increase in the number of tourists.

The growing importance of the tourism industry, changes in tourist expectations and a more customized tourist service, and the ability to adapt quickly to these changes depend on how tourism responds to climate change (Scott 2011, Weaver 2011).

Globalization increases economic efficiency by promoting new technologies, thus facilitating the control of CO2 emissions (Tisdell 2001) as a result of indirect effects on environmental quality (Cavlovic et al. 2000). In line with the literature, globalization promotes energy efficiency by controlling environmental degradation (List and Co 2000).

Globalization processes provide low-carbon economic growth by increasing technological innovation and energy efficiency. (Tamazian et al. 2009). Other effects of globalization include facilitating access to international markets, services and trading companies by accelerating the development of the tourism industry (Keintz 1968, Turner and Witt 2001). Tourism contributes to foreign trade as an effect of globalization (Summers and Heston 1991, Dwyer et al. 2000).

Many studies in economics literature acknowledge that globalization is the locomotive of economic and social development, revealing how energy use and climate change affect economic growth development (Aitken et al. 1997, Hsiao and Shen 2003, Tamazian, et al. 2009, List and Co 2000, Turner and Witt 2001)

The increase in energy consumption as a result of globalization encourages the use of clean technologies and ensures that the necessary policies are implemented to increase competition and efficiency in the tourism industry.

## 3.2 Historical Background

Tourism is at the top of the traditional service activities that fall within the scope of international trade. Today, tourism in many developed and developing countries; It is seen as one of the most important sources of economic growth and development (Jayawardena and Ramajeesingh, 2003: 176; Boxill, 2004: 269) and is accepted as a leading sector in economic development. The major contribution of tourism to economic development is to overcome national borders, increase the educational and cultural levels of people, achieve a higher level of prosperity, and promote tourism as the fundamental human right of everyone (Bahar and Kozak 2005: 15). Therefore, International tourism affects and concerns all countries with its economical foreign currency earning feature. As a matter of fact, tourism, in many countries with tourism potential, especially developing countries; It contributes significantly to employment, income level, reduction of foreign and domestic debt burden, balance of payments and consequently increase of human welfare level (Marcouiller et al., 2004: 1031-1050; Göymen, 2000: 1025-1048).

While the tourism movement initially appealed to only a certain part of the society, today, with the acceleration of the globalization process, the increase in the income levels of the majority of the inhabitants of the city, the widening of social security coverage, the improvement of working conditions, the rapid and comfortable means of transportation and the increase in communication opportunities. It started to concern large masses (Ceken, Karadag and Dalgın, 2007: 6). Tourism today; for

developed and developing countries due to their contributions such as ensuring world peace, creating a positive atmosphere in the field of people and international relations, improving the balance of foreign payments, employment and regional development. It has become an indispensable element (Gökdeniz, 2004: 30).

Globalization directly or indirectly supports economic growth. Many scholars show that there is an important relationship between globalization and economic growth and that they make policy recommendations regarding this. (Chang and Lee 2010; Gurgul and Lach 2014). Globalization has a technical impact due to technologies for reducing carbon emissions (Tisdell 2001).

On the other hand, the increase in tourism destinations in the world with the effect of globalization also develops international tourism. For example, Nowak et al. (2010), with the advancing technology of tourism services (transportation, accommodation, natural resources, etc.) in the globalizing world, now enables tourists to benefit from and use many destinations.

One of the biggest problems caused by the development of tourism for tourism countries is that it causes environmental pollution by increasing the level of carbon emission. The economic growth brought about by globalization and the increase in environmental pollution, policies aimed at taking the necessary precautions to prevent carbon emissions have enabled the development of tourism. In addition to real income, energy consumption and tourist arrivals, it contributes to carbon emissions in globalization (Katircioglu 2014 b).

## 3.3 Top Tourist Destinations Countries

Globalization removes the borders of international trade and causes the development of new technologies by increasing competition and cooperation. With the globalization process, commercial and economic cooperation has increased and the income levels of the countries have improved. We see that environmental awareness is developing more in high-income countries. Environmentally friendly production and less polluting methods are adopted and the country's environmental standards are increasing. However, despite these positive effects, its negative effect causes environmental degradation. The use of environmentally damaging methods, international transportation, energy consumption and careless consumption of natural resources cause environmental quality to deteriorate. In contrast, severe and strict measures for environmental protection in developed countries encourage large companies to transfer their activities to developing countries with little or no environmental awareness. Many studies investigated the relationship between environmental degradation and tourism development and used tourism revenues to test the accuracy of the EKC hypothesis. Countries with high national income are defined as developed countries whereas developed countries have negative correlation experiences. Another economic criterion is the level of industrialization. Economies dominated by industry are considered developed. Environmental pollution was first seen in Asian countries (Dam and Karakaya, 2013). Economic growth provides more qualified goods, labor and productivity (Ugurlu, 2010). However, it also causes environmental problems. The fact that China's energy resources are largely dependent on coal has led China, which has the world's largest coal reserves, to excessive coal consumption and this has led to high pollution in the region (Karabıcak and Armağan, 2004).

Environmental quality begins to increase with the replacement of old and pollution-emitting technologies with new and environmentally friendly technologies obtained as a result of technological developments (Borghesi, 1999, pp. 6–7).

## 3.4 Conclusion

This thesis investigates the impact of tourism development in environmental quality in top tourist destinations. The findings confirm that the greater tourism growth leads to grater CO2 emissions. In addition, the thesis refers to a positive correlation between the relevant variables mentioned above. According to the inverse u-shaped kuznet model, there is more environmental pollution in the first stage of economic growth, but after reaching a certain income level, we see that there is an inverse relationship between carbon emission and economic growth. With this increase in real incomes, we see that these countries apply environmentally friendly policies that prevent environmental degradation. It is seen that the findings obtained according to the models examining the relationship between economic development and income inequality provide evidence supporting Kuznets' (1955) inverse-U hypothesis. Most of the coefficients of the variables have expected signs, they are statistically significant. Economic development plays a decreasing role in low- and low-middle-income, upper-middle-income and high-income countries that increase income inequality in panels where all countries are used. While inequality has increased in low- and low-middle-income and upper-middle-income countries against economic development; Its decrease in high-income countries confirms the existence of an inverse-U-shaped relationship. Therefore, income inequality follows a reverse-U shaped movement in the face of a continuous process of economic development in countries.

When the results obtained in the analysis are evaluated; The initial income level of the society determines the direction of inequality in the face of economic development. For this reason, policy makers should not separate the concepts of economic development and income inequality; It should pay attention not only to economic growth but also to income distribution policies. In addition to these, variables that are thought to affect income inequality and are used as control variables in the analysis can be considered when making policy decisions to improve income inequality.

# Chapter 4

# THE ROLE OF TOURISM DEVELOPMENT IN ENVIRONMENTAL KUZNETS CURVE: EVIDENCE FROM THE 50 TOP TOURIST DESTINATIONS

## 4.1 Introduction

The link among energy consumption, environmental pollution, and economic growth has long been investigated. Several papers have investigated the link among the relevant variables based on EKC framework[3]. Though, the nexus between environment quality and energy consumption with sectors in the economy earns more commitment, and tourism development is one of those sectors. Tourism development boost energy capacity and this causes a rise for a pollution whereas oil dependency of energy sector is a major reason behind pollution[4]. Thus, an examination of the link between tourism development (i.e., international tourism) and pollution is an important issue for government policies in tourism sector and would be a positive addition in the tourism literature.

Tourism at international level has solely been inspected as a locomotive of growth for a few economies regardless of environmental sustainability, energy efficiency and air pollution. In addition to this, international tourism helps to develop the

[3] See Katircioglu & Taspinar, 2017; Anatasia, 2015; Heidari et al., 2015; Kapusuzoglu, 2014 for more information.

[4] See Gokmenoglu et al., 2016; Memis & Kapusuzoglu, 2015; Al-Abdulhadi, 2014; Jumadilova, 2012 for more detail.

countries' social welfare as well. Mainly, Energy demand for different segments such as transportation, catering, accommodation have been generated by tourism activities. In this respect, development in tourism sector can rekindle level of infrastructure, the improvement of technology and capacity of human capital (see Shahzad et. al, 2017). However, rapid growth of the tourism sector may bring some concerns about sustainable standard of living in such countries by considering the reduction of environmental pollution (see, Ozturk and Acaravci, 2010).

The present thesis contributes to the literature by investigating the role of tourism development on carbon dioxide reduction in terms of environmental quality in top 50 tourist destination countries (as the major tourist destinations). For this purpose, top 50 countries in tourism as ranked by World Tourism Organization as of 2017 have been selected as main focus of this thesis. The reasons chosen these countries are their contribution to carbon dioxide in environmental impact, and their ability to invest in tourism sector[5]. In the line of the model used in this paper, tourism development concept is expected to improve environmental performance and operation by reducing carbon emission and energy consumption.

Whilst numerous papers have previously investigated on CO2-growth relationship within a new EKC model which includes indicators such as energy consumption, trade, financial development, population and tourism development (Akbostanci et al. 2009; De Vita et al. 2015), this thesis is the first of its kind to the best of our knowledge to employ 50 tourist destination countries for analyzing the concept of tourism development in the case of extended version of EKC model.

[5] World Tourism Organization (2017), http://www2.unwto.org/. The list of these countries is provided in Table 1.1 and Table 1.2. See appendix.

The rest of the chapter is organised as follows: introduction section is displayed in first section and Second section explains the relevant literature review that emphasizes the nexus between $CO_2$ emission and tourism development and the other important issues. Third section defines data, the model and methodology. Fourth section interprets empirical results and Final section includes concluding remarks as well as some policy implications.

## 4.2 The Nature of Tourism Development in Environmental Kuznets Curve

Most of the economists have long been interested in examining validity of the EKC hypothesis across countries as well as in individual countries (Grossman and Krueger; 1991, Shafik and Bandyopadhyay 1992; Coondoo and Dinda 2002; Dinda2004; Stern 2004; Luzzati and Orsini2009). First time, U-shaped relationship between pollution and GDP was mentioned by Grossman and Krueger (1991). Panayotou (1993) developed a similar model in which shows relationship between GDP inequality and economic growth. The Kuznets curve, hence, may be observed to give attention for a strategic plan which stresses tourism development where many developing economies can play as a role of locomotive of growth at the cost of short run ecological precaution. On the other hand, the validity of EKC hypothesis may be wrong where developing countries enhance environmental protection policies at the cost of GDP income. This situation cannot provide the reduction of the environmental damage (Shafik and Bandyopadhyay 1992).

Karakaya et al. (2019) examined the factors affecting carbon emission change in Turkey between the years 1990-2016, and it was concluded that economic growth led to an increase of approximately 76% in carbon emissions.

On the other hand, Sghaier et al. (2018) examined the relationship between tourist numbers and carbon emissions for Tunisia, Egypt and Morocco in the period 1980-2014. As a result of the findings, no statistically significant relationship was found between carbon emission and the number of tourists in Morocco. However, while the number of tourists in Egypt reduces environmental pollution, it causes environmental damage in Tunisia.

Asumadu-Sarkodie and Owusu (2017a, 2017b) specified that long-term equilibrium relationships include between environmental degradation, electricity use, economic growth and industrialization. Sinha and Shahbaz (2018) explained that the development of renewable energy requires high costs at the initial stage, thus reducing the willingness to invest in renewable energy sources in developing countries. It appears that promoting renewable energy in some low-income countries may limit their economic progress in the short term.

Yang and Li (2017) revealed that environmental degradation is caused by the emission of large amounts of greenhouse gases, including carbon dioxide, nitrous and methane. Inglesi-Lotz and Doğan (2018) argued that it is a challenge for developing countries to shift their energy consumption from fossil fuels to renewable energy sources due to the different energy structures technological and economic conditions between developing and developed countries.

It is important to note that evidence on the EKC hypothesis is still mixed and controversial. Some important studies found that environmental degradation has a linear link with real GDP (Shafik and Bandyopadhyay 1992; Akbostanci et al. 2009) whereas the others provide a support for the inverted U-shaped nexus according to the EKC prediction (Lindmark, 2002). List and Gallet (1999) also found out an inverted U- shaped EKC for the USA economy. On the other hand, the findings of other studies indicated an 'N-shaped relationship' which recommends that any reduction of ecological deprivation is tiny within the rapid period (Friedl and Getzner 2003; He and Richard 2010).

The trade-off between tourism development and the EKC hypothesis is not an old but controversial issue. The issue has traditionally been one of the central concerns in interpreting the relationship between tourism and $CO_2$ emissions. Many researchers showed an effort to construct the conventional EKC framework by adding different policy variables such as energy (Ozturk and Acaravci, 2010), trade (Ang 2008; Halicioglu 2009), population (Akbostanci et al. 2009), urbanization and financial development, (Dogan E Turkekul B; 2016) and research & development (R&D) (Aggeri 1999; Lee and Min 2015).

Notwithstanding the different extension versions of the conventional EKC framework, a tiny concern has been paid to the nexus between $CO_2$ emissions and tourism issue (De-Vita et al. 2015, Katircioglu et al. 2014; Lee and Brahmasrene;

2013). Some papers on a single country have rekindled analysis of the link between tourism and $CO_2$ emissions[6] whereas some studies used panel data analysis and estimated the nexus for group of emissions[7]

In the light of these experiences, there is a mixed evidence or on the link between tourism and CO2 emissions as well as no consensus about the direction of causality between this concept.

In the relevant literature, it is suggested by many authors that tourism sector provided a positive effect on $CO_2$ emissions whereas Katircioglu (2014b) as well as Lee and Brahmasrene (2013) found a negative relationship, so both papers reached the same concluding remark. They also estimated that the direction of causality was found from tourism and $CO_2$ emissions[8].

Some conclusions can be drawn regarding the link between tourism and CO2 emissions. Although voluminous studies exist on the nexus, the debate is not yet resolved for the EKC framework. First, tourism development as an additional policy variable can contribute to $CO_2$ emissions. Second, the relevant studies showed that results have both signs effects on pollution. Third, the inclusion of policy variables

[6] Solarin (2014) used an extension version of the conventional EKC framework by testing financial development, urbanization and tourism arrivals on CO2 emissions for Malaysian economy. In this thesis, tourism sparked pollution and one-way causality found from tourist arrivals to pollution. See also Durbarry and seetahnah (2015) and Sharif et al. (2017) who also testes the link between tourism and $CO_2$ emissions a single country framework for more information.

[7] Solarin (2014) used an extension version of the conventional EKC framework by testing financial development, urbanization and tourism arrivals on CO2 emissions for Malaysian economy. In this thesis, tourism sparked pollution and one-way causality found from tourist arrivals to pollution. See also Durbarry and seetahnah (2015) and Sharif et al. (2017) who also testes the link between tourism and $CO_2$ emissions a single country framework for more information.

[8] See also Akadiri et al. (2017) for more details about a negative effect between tourist arrivals and pollution.

such as tourism development may find a theoretical justification to be used within the EKC framework.

## 4.3 Theoretical Modelling, Data and Methodology

### 4.3.1 Theoretical Modelling

For inspecting the impact of tourism in environmental quality, the theoretical framework of Environmental Kuznets's Curve (EKC) has been taken into consideration as a research model. Besides, tourism development came into literature to test the effects for enviromantal qualityinto the traditional EKC model to investigate the influences of tourism on weather conditions (Kapusuzoglu, A., 2014). Hence, the EKC growth equation will be employed as below in this paper:

$$\ln CO2_{i,t} = \beta_0 + \beta_1 \ln y_{i,t} + \beta_2 \ln y^2{}_{i,t} + \beta_3 \ln E_{i,t} + \beta_4 \ln T_{i,t} + \varepsilon_{i,t} \quad (1)$$

where i and t are countries and time, ln is the natural log, CO2carbon emissions, y is real GDP, $y^2$ is squared real income, lnE is energy consumption, lnT is the tourism proxy, and ε is the error disturbance.

Error correction equation (1) can be defined in the following equation. Short run daynamics such as error correction term are held by the model as below (see equation 2).

$$\Delta \ln CO2_{i,t} = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln CO2_{i,t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln y_{i,t-j}$$

$$+ \sum_{i=0}^{n} \beta_3 \Delta \ln y^2{}_{i,t-j} + \sum_{i=0}^{n} \beta_4 \Delta \ln E_{i,t-j} + \sum_{i=0}^{n} \beta_5 \Delta \ln T_{i,t-j} + \beta_6 \varepsilon_{i,t-1} + u_{i,t} \quad (2)$$

where Δ represents changes in the CO2, y, $y^2$, E, and T variables and $\varepsilon_{i,t-1}$ is the one period lagged error correction term (ECT), which is estimated from equation (1).

### 4.3.2 Data

The thesis examines the EKC framework in the top tourist destination countries; therefore, those top 50 countries as of 2016 and presented in Appendix:1 to be used in the thesis have been extracted from World Tourism Organization (2017). The data used for thesis are over the period 1996–2016, and the parameters of the thesis are carbon emissions (CO2) (kt), energy use (E) (kt of oil equivalent), GDP (base year 2010 = 100) (y), squared GDP ($y_2$), and tourist destinations (T)[9].

Several alternatives have been recommended in the literature in order to investigate the proxy for tourism development as also stated by Katircioglu (2010). These are mainly tourism, the number of international tourist arrivals. The parameter in this chapter has been proxied by the number of international tourists who visit the relevant countries. Also, the energy consumption parameter is used by energy use (kt of oil equivalent) and climate change by carbon emissions (kt) within this chapter.

Selection of tourism variable in this thesis has been done according to the suggestion in Katircioglu (2014). Data were extracted from the WB and WTO Indicators (2017)[10].

Figure 1 shows the trends of carbon dioxide emissions based on each country under inspection. The trends in tourism volume show positive effect in the countries such as Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunisia, Egypt, Iran, Georgia, Hong Kong, India

[9] The relevant data were extracted from the World Bank Development Indicators (2014).

[10] Data set were extracted from World Tourism Organization (2017) and World Bank (2017). The data set also were chosen based on the availability. Data for each country on five variables are available for the period 1996–2016. Thus, there are 50 cross-sectional units and 21-time periods. In all, therefore, we have 1150 observations.

and Malaysia. This means that tourism growth exerts positively effects on their carbon emission levels.


Figure 1: Carbon Dioxide Emissions (ln $CO^2$)

Notes: The carbon dioxide emissions figures are drawn by Authors for top 50 tourist arrivals countries over the period 1996-2016.

The overall picture of tourism development's patterns in figure 2 are that the countries such as France, USA, United Kingdom, Germany, Spain, China control tourism development in which these countries support the extended version of the Environmental Kuznets curve.

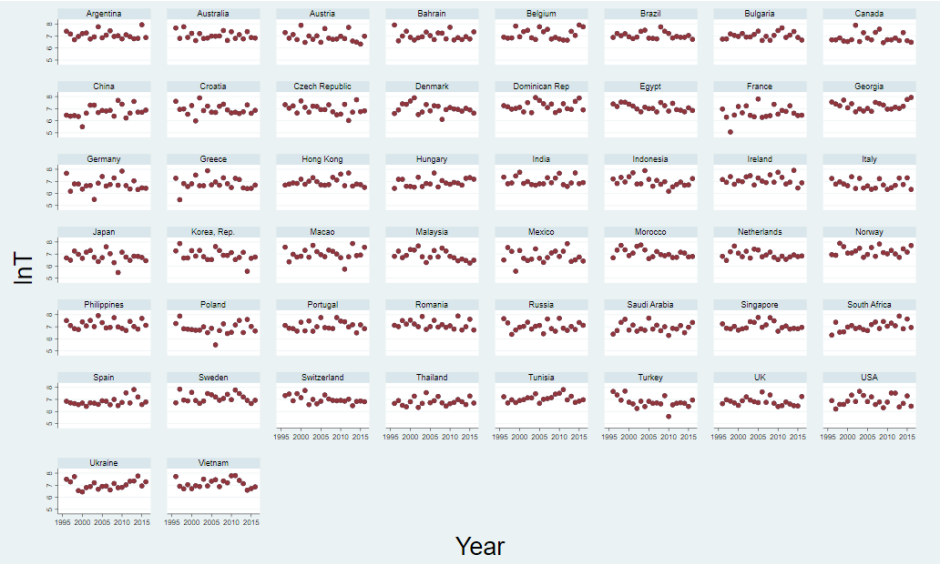


Figure 2: International Tourist Arrivals (LnT)

Notes: The number of tourist arrivals figures are drawn by Authors for top 50 tourist arrivals countries over the period 1996-2016.

### 4.3.3 Methodology

Prior to panel unit root tests and further analyses, it is necessary to investigate if there is any cross-section dependency (CSD) in the panel data. Such test (here after, CSD) used by Pesaran (2004) to inspect the parameters whether based on dependency test. This test also will enable us to observe if, for example, tourist arrivals and energy sector are inter-related. A decline in tourists in a country might be a reason for increases in tourists in another country (Katircioglu et al., 2014). The approach of "Bias-Adjusted LM test of Error Cross Section Dependence ($LM_{adj}$)" as available from Pesaran et al. (2008) will be adapted in this thesis with this respect in addition to the approaches in Breusch-Pagan (1980) and Pesaran (2004). Thereafter, panel unit root test of PANKPSS (panel KPSS) approach has been adapted for testing the stationarity of series under consideration. This also enables us to check the stationarity of series country by country (see Pesaran, 2007)[11].

[11] CADF and CIPS unit root tests are conducted.

Panel cointegration test which was established by Basher & Westerlund (2009) will be used in this thesis to investigate a possible cointegration in equation (1) which allows multiple breaks both in intercept and trend. Consistent long run estimates in equation (1) will be estimated by the Dynamic Seemingly Unrelated Regression (DSUR) approach, which was developed by Mark et al. (2005) and takes cross-section dependency into account. Finally, the short-term coefficients with error correction term (ECM) which will be used under the framework of panel and time series data based on Granger-Causality will be conducted to find out the direction of Granger Causality[12] between the variables through equation (2). Similar to long-run models, structural break points as obtained from cointegration tests will be added to equation (2) by dummy variables in order to estimate the effects of structural break years on dependent variable in the short-run period as well.

## 4.4 Results and Discussion

Table 4.1 shows the information about basic statistics of the variables used in this thesis[13]. Within the same Table, all variables have positive mean value except squared real income and Tourism development.

[12] Granger-Causality test of Dumitrescu and Hurlin (2012) is generally employed to track the direction of Causality between the variables in an equation (Hoeffler, 2002).

[13] Empirical results are estimated by using both Stata 15.1 and Gauss 16.0.

Table 4.1: Descriptive Statistics Results

| Variable | Obs | Mean | Std. Dev. | Min | Max | Skew | IQR |
|---|---|---|---|---|---|---|---|
| $lnco_2$ | 1,050 | 5.17 | 0.71 | 3.07 | 8.24 | 0.13 | 0.72 |
| Lny | 1,050 | 11.55 | 0.66 | 9.72 | 13.22 | 0.11 | 0.68 |
| $lny^2$ | 1,050 | -1.43 | 1.73 | -2.03 | -1.04 | -0.07 | 1.89 |
| lnE | 1,050 | 3.38 | 0.90 | 1.90 | 5.49 | 0.38 | 0.96 |
| lnT | 1,050 | -6.97 | 0.40 | -7.92 | -5.06 | -0.92 | 0.46 |

Notes: The data employed within this paper holds evidence for 50 cross section and 21 time period between 1996-2018.

Table 4.2 demonstrates the association for the variables under inspection. As stated in the table, the correlations between $CO_2$ emission and its determinants are great enough. The explanatory parameters are not extremely associated. Thus, multicollinearity problem does not exist. In other words, high correlation is expected between 0.40-0.90 dependent and independent variables. Low correlation is expected between 0.30-0.10 independent variables.

Table 4.2: Correlation Matrix Results

| | $lnco_2$ | lny | $lny^2$ | lnE | lnT |
|---|---|---|---|---|---|
| $lnco_2$ | 1.000 | | | | |
| Lny | 0.8205 | 1.000 | | | |
| $lny^2$ | -0.6223 | 0.6897 | 1.000 | | |
| lnE | 0.2728 | 0.1303 | 0.0753 | 1.000 | |
| lnT | -0.5115 | 0.6238 | 0.3683 | 0.1503 | 1.000 |

Notes: There is no multicollinearity problem detected based on pair wise correlations (Gujarati, 2003).

After the descriptive statistics and correlation matrix were estimated, we applied the cross-sectional dependence test (here after, CSD) to investigate the relevant parameters. The results in Table 4.3 indicate the coefficients referring to CSD test and the associated p values. The Table also leads to a conclusion that there exists independency in the cross-sections suggesting that changes in the volume of tourists in one country might not be reason for changes in the volume of tourists in another country.

Table 4.3: CSD Test Results

| Variable | CD-test | p-value | Av. joint T | mean ρ | mean abs(ρ) |
|---|---|---|---|---|---|
| $lnco_2$ | -0.094 | 0.925 | 21 | 0.00 | 0.18 |
| Lny | -0.615 | 0.539 | 21 | 0.00 | 0.18 |
| $lny^2$ | -0.902 | 0.367 | 21 | -0.01 | 0.18 |
| lnE | -0.353 | 0.724 | 21 | 0.00 | 0.18 |
| lnT | -1.060 | 0.289 | 21 | -0.01 | 0.18 |

Notes: all cd test results show that results are not statistically significant at any conventional level. This test was proposed by Pesaran (2007).

Now we can apply the CIPS and the CADF unit root tests to find out properties of unit roots for the relevant variables under inspection. Results estimated from the tests are presented in Table 4.4. The tests display that the relevant variables are integrated at the same level (i.e., I (1)).

Table 4.4: CIPS and CADF Unit Root Tests Results

| | CIPS | | CADF | |
|---|---|---|---|---|
| Variable | Level | Difference | Level | Difference |
| $lnco_2$ | -1.456 | -5.913* | - 1.636 | - 4.466* |
| Lny | -1.340 | -5.922* | - 1.949 | -4.383* |
| $lny^2$ | -1.200 | -5.761* | - 1.873 | -4.557* |
| lnE | -1.223 | - 5.615* | -1.951 | -4.835* |
| lnT | -1.273 | - 5.908* | -1.649 | -4.514* |

Notes: * indicates both 1% and 5% significance level.

We also use Pankpss unit root test to confirm the results[14] country by country. In Table 4.5 and Table 4.6, the variables can be seen at both level and difference whereas the variables are stationary at difference. In other words, all of the series in the present thesis are integrated of the same order; therefore, cointegration test is needed to detect further investigation of the model employed.

[14] Critical values are generated by the Bootstrap approach after 1000 simulations. * indicates 5% significance level. Model that allows break in intercept has been selected in unit root tests.

Table 4.5: Panel Unit Root Test (PANKPSS) Results: (At levels)

| *Variables* | $lnco_2$ | | Lny | | lnE | | lnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| France | 0.371 | 1.897 | 0.353 | 2.700 | 0.192 | 2.858 | 0.826 | 1.743 |
| United States | 0.089 | 2.054 | 0.224 | 2.628 | 0.079 | 1.810 | 4.835 | 2.616 |
| Spain | 0.761 | 1.821 | 0.121 | 2.735 | 0.156 | 2.002 | 0.125 | 2.176 |
| China | 0.168 | 1.781 | 5.983 | 2.602 | 0.291 | 1.646 | 14.005 | 0.935 |
| Italy | 0.098 | 0.744 | 0.325 | 1.952 | 0.685 | 1.849 | 0.100 | 2.901 |
| United Kingdom | 0.509 | 2.405 | 1.056 | 0.885 | 0.553 | 2.554 | 6.968 | 2.412 |
| Germany | 0.186 | 1.363 | 4.676 | 2.419 | 0.329 | 1.652 | 0.813 | 3.662 |
| Mexico | 1.356 | 14.073 | 0.098 | 2.506 | 0.210 | 1.517 | 0.099 | 1.380 |
| Thailand | 2.783 | 1.982 | 0.537 | 1.796 | 4.691 | 2.361 | 2.626 | 1.555 |
| Turkey | 3.846 | 2.298 | 0.693 | 2.430 | 0.739 | 1.997 | 0.604 | 2.213 |
| Austria | 2.01 | 2.09 | 2.01 | 4.38 | 0.280 | 0.860 | 3.10 | 3.22 |
| Malaysia | 0.271 | 1.897 | 0.353 | 1.700 | 0.192 | 2.658 | 0.726 | 1.743 |
| Hong Kong | 0.089 | 2.054 | 0.224 | 2.628 | 0.079 | 1.810 | 4.835 | 2.616 |
| Greece | 0.761 | 1.821 | 0.121 | 2.735 | 0.156 | 2.002 | 0.125 | 2.176 |
| Russia | 0.158 | 1.681 | 2.783 | 5.502 | 0.391 | 1.616 | 0.005 | 0.835 |

Table 4.5: Panel Unit Root Test (PANKPSS) Results: (At levels) (continued)

| *Variables* | $lnco_2$ | | Lny | | lnE | | lnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| Japan | 0.068 | 0.714 | 0.321 | 1.652 | 0.585 | 1.749 | 0.101 | 3.901 |
| Canada | 0.509 | 2.405 | 1.056 | 0.885 | 0.553 | 2.554 | 6.968 | 2.412 |
| Saudi Arabia | 0.186 | 1.363 | 1.676 | 2.419 | 0.329 | 1.652 | 0.813 | 3.662 |
| Poland | 1.356 | 4.073 | 0.098 | 2.006 | 0.210 | 1.517 | 0.099 | 1.380 |
| Korea, Rep. | 1.783 | 1.982 | 0.537 | 1.796 | 1.691 | 2.361 | 0.626 | 1.555 |
| Netherlands | 1.846 | 2.298 | 0.693 | 2.430 | 0.739 | 1.997 | 0.604 | 2.213 |
| Macao | 0.211 | 0.422 | 5.310 | 6.38 | 0.251 | 1.860 | 3.710 | 4.222 |
| Hungary | 0.371 | 1.897 | 0.353 | 2.700 | 0.192 | 2.858 | 0.826 | 1.743 |
| India | 0.089 | 2.054 | 0.224 | 2.628 | 0.079 | 1.810 | 4.835 | 2.616 |
| Croatia | 0.761 | 1.821 | 0.121 | 2.735 | 0.156 | 2.002 | 0.125 | 2.176 |
| Ukraine | 0.168 | 1.781 | 1.983 | 2.602 | 0.291 | 1.646 | 1.005 | 2.935 |
| Singapore | 0.098 | 0.744 | 0.325 | 1.952 | 0.685 | 1.849 | 0.100 | 2.901 |
| Czech Rep | 0.509 | 2.405 | 1.056 | 1.885 | 0.553 | 2.554 | 0.968 | 2.412 |
| Bahrain | 0.186 | 1.363 | 2.176 | 2.419 | 0.329 | 1.652 | 0.813 | 3.662 |
| Portugal | 1.356 | 1.773 | 0.098 | 2.506 | 0.210 | 1.517 | 0.099 | 1.380 |
| Denmark | 1.783 | 1.982 | 0.537 | 1.796 | 2.691 | 2.761 | 2.626 | 2.755 |
| Indonesia | 1.846 | 2.298 | 0.693 | 2.430 | 0.739 | 1.997 | 0.604 | 2.213 |
| Switzerland | 0.186 | 1.363 | 1.676 | 2.419 | 0.329 | 1.652 | 0.813 | 3.662 |
| Morocco | 0.371 | 1.897 | 0.353 | 2.700 | 0.192 | 2.858 | 0.826 | 1.743 |
| South Africa | 0.089 | 2.054 | 0.224 | 2.628 | 0.079 | 1.810 | 1.835 | 2.616 |
| Vietnam | 0.761 | 1.821 | 0.121 | 2.735 | 0.156 | 2.002 | 0.125 | 2.176 |

Table 4.5: Panel Unit Root Test (PANKPSS) Results: (At levels) (continued)

| *Variables* | $lnco_2$ | | Lny | | lnE | | lnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| Ireland | 0.168 | 1.781 | 1.983 | 2.602 | 0.291 | 1.646 | 1.005 | 1.935 |
| Australia | 0.098 | 0.744 | 0.325 | 1.952 | 0.685 | 1.849 | 0.101 | 2.501 |
| Bulgaria | 0.509 | 2.405 | 0.056 | 0.885 | 0.553 | 2.654 | 1.968 | 2.412 |
| Belgium | 0.183 | 1.463 | 1.576 | 2.619 | 0.328 | 1.352 | 0.813 | 3.262 |
| Brazil | 1.353 | 2.073 | 0.092 | 2.106 | 0.210 | 1.517 | 0.099 | 1.380 |
| Sweden | 1.783 | 1.982 | 0.537 | 1.796 | 1.691 | 2.361 | 0.626 | 1.555 |
| Dominica | 1.846 | 2.298 | 0.693 | 1.430 | 0.739 | 1.997 | 0.604 | 2.213 |
| Philippines | 0.098 | 0.744 | 0.325 | 1.952 | 0.685 | 1.849 | 0.104 | 1.901 |
| Tunisia | 0.271 | 1.597 | 0.343 | 2.500 | 0.182 | 0.758 | 1.726 | 1.943 |
| Argentina | 0.089 | 2.054 | 0.224 | 1.628 | 0.079 | 1.810 | 1.835 | 2.916 |
| Norway | 0.561 | 1.821 | 0.121 | 1.735 | 1.156 | 2.002 | 2.125 | 2.376 |
| Egypt | 0.168 | 1.781 | 1.983 | 2.602 | 0.292 | 1.646 | 1.005 | 1.935 |
| Iran | 0.091 | 0.544 | 0.321 | 1.852 | 0.585 | 1.749 | 0.102 | 2.401 |
| Georgia | 0.505 | 3.405 | 2.056 | 2.885 | 0.333 | 1.154 | 1.768 | 2.312 |
| PANEL | 23.21 | 27.00 | 72.21 | 62.38 | 15.28 | 9.86 | 21.71 | 20.22 |

Table 4.6: Panel Unit Root Test (PANKPSS) Results: (At 1st Differences)

| *Variables* | Dlnco$_2$ | | Dlny | | DlnE | | DlnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| France | 2.119* | 1.058 | 1.088* | 0.714 | 1.777* | 1.156 | 1.293* | 1.028 |
| United States | 1.221* | 1.044 | 1.263* | 1.155 | 1.496* | 0.676 | 1.993* | 1.259 |
| Spain | 1.382* | 1.061 | 2.202* | 1.683 | 1.237* | 1.084 | 1.122* | 0.888 |
| China | 1.101* | 0.717 | 2.131* | 1.032 | 1.117* | 0.630 | 2.222* | 1.586 |
| Italy | 1.053* | 0.738 | 2.126* | 1.504 | 2.157* | 1.577 | 1.134* | 0.942 |
| United Kingdom | 2.269* | 1.263 | 0.180* | 0.019 | 0.922* | 0.707 | 1.285* | 1.035 |
| Germany | 1.474* | 0.874 | 1.226* | 1.123 | 2.182* | 1.485 | 1.394* | 1.063 |
| Mexico | 1.433* | 1.366 | 0.921* | 0.510 | 0.874* | 0.644 | 0.929* | 0.793 |
| Thailand | 0.956* | 0.692 | 0.815* | 0.788 | 1.428* | 1.208 | 0.283* | 0.141 |
| Turkey | 1.143* | 0.973 | 0.994* | 0.780 | 0.210* | 0.112 | 2.106* | 1.229 |
| Austria | 0.129* | 1.068 | 0.878* | 0.614 | 0.078* | 0.046 | 1.193* | 1.022 |
| Malaysia | 1.321* | 1.034 | 1.253* | 1.155 | 0.396* | 0.276 | 1.183* | 1.159 |
| Hong Kong | 1.282* | 1.051 | 2.102* | 1.583 | 1.234* | 1.074 | 1.112* | 0.653 |
| Greece | 0.906* | 0.716 | 0.121* | 1.022 | 0.111* | 0.030 | 0.333* | 0.286 |
| Russia | 1.023* | 0.738 | 2.126* | 1.504 | 2.157* | 1.577 | 1.134* | 0.942 |
| Japan | 0.369* | 0.263 | 0.180* | 0.119 | 1.122* | 0.707 | 1.285* | 1.035 |
| Canada | 1.474* | 0.874 | 1.226* | 1.123 | 1.682* | 1.485 | 1.394* | 1.063 |
| Saudi Arabia | 1.433* | 1.366 | 0.321* | 0.110 | 1.074* | 0.644 | 0.829* | 0.793 |
| Poland | 1.256* | 0.692 | 0.715* | 0.688 | 0.428* | 0.208 | 0.283* | 0.141 |
| Korea, Rep. | 0.143* | 0.973 | 1.094* | 0.780 | 0.610* | 0.512 | 2.106* | 1.229 |

Table 4.6: Panel Unit Root Test (PANKPSS)Results: (At 1st Differences),(continued)

| *Variables* | Dlnco$_2$ | | Dlny | | DlnE | | DlnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| Netherlands | 0.974* | 0.874 | 0.693* | 0.430 | 1.739* | 1.597 | 2.604* | 2.213 |
| Macao | 0.801* | 0.717 | 0.131* | 0.032 | 0.217* | 0.130 | 0.222* | 0.186 |
| Hungary | 1.053* | 0.738 | 1.126* | 1.504 | 0.157* | 1.577 | 1.134* | 0.942 |
| India | 1.269* | 1.263 | 0.180* | 0.019 | 1.122* | 0.707 | 1.285* | 1.035 |
| Croatia | 1.474* | 0.874 | 1.226* | 1.123 | 1.582* | 1.485 | 1.394* | 1.063 |
| Ukraine | 1.433* | 1.366 | 0.321* | 0.210 | 1.074* | 0.644 | 1.129* | 0.793 |
| Singapore | 1.256* | 0.692 | 1.715* | 0.788 | 1.428* | 1.208 | 1.283* | 0.941 |
| Czech Rep | 1.143* | 0.973 | 1.094* | 0.780 | 1.210* | 0.512 | 1.106* | 1.029 |
| Bahrain | 1.474* | 0.874 | 2.693* | 2.430 | 1.939* | 1.897 | 2.604* | 2.213 |
| Portugal | 1.356* | 0.073 | 3.098* | 2.506 | 2.210* | 1.517 | 1.099* | 1.080 |
| Denmark | 2.783* | 1.982 | 2.537* | 1.796 | 4.691* | 2.361 | 2.626* | 1.555 |
| Indonesia | 3.846* | 2.298 | 2.693* | 2.430 | 2.739* | 1.997 | 2.604* | 2.213 |
| Switzerland | 1.486* | 1.363 | 4.676* | 2.419 | 1.729* | 1.652 | 4.813* | 3.662 |
| Morocco | 2.371* | 1.897 | 3.353* | 2.700 | 3.192* | 2.858 | 1.826* | 1.743 |
| South Africa | 2.089* | 2.054 | 2.724* | 2.628 | 2.079* | 1.810 | 4.835* | 2.616 |
| Vietnam | 1.861* | 1.821 | 2.121* | 2.035 | 3.156* | 2.002 | 3.125* | 2.176 |
| Ireland | 1.868* | 1.781 | 5.983* | 2.602 | 2.291* | 1.646 | 4.005* | 0.935 |
| Australia | 1.098* | 0.744 | 2.325* | 1.952 | 1.685* | 1.549 | 3.100* | 2.901 |
| Bulgaria | 2.509* | 2.405 | 1.056* | 0.885 | 3.553* | 2.654 | 3.968* | 2.412 |
| Belgium | 1.383* | 1.363 | 4.576* | 2.419 | 2.329* | 1.652 | 3.813* | 3.662 |
| Brazil | 1.356* | 1.073 | 3.098* | 2.506 | 2.210* | 1.517 | 1.999* | 1.380 |

Table 4.6: Panel Unit Root Test (PANKPSS) Results:(At 1st Differences),(continued)

| *Variables* | $Dlnco_2$ | | Dlny | | DlnE | | DlnT | |
|---|---|---|---|---|---|---|---|---|
| *Country* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* | *Test Statistic* | *Critical Values* |
| Sweden | 2.783* | 1.982 | 2.537* | 1.796 | 4.691* | 2.761 | 2.626* | 1.555 |
| Dominica | 3.846* | 2.298 | 2.693* | 2.430 | 2.739* | 1.997 | 2.604* | 2.213 |
| Philippines | 1.098* | 0.744 | 2.325* | 1.952 | 2.685* | 1.849 | 3.100* | 2.901 |
| Tunisia | 2.271* | 1.597 | 3.343* | 2.500 | 3.182* | 2.758 | 1.726* | 1.643 |
| Argentina | 2.089* | 2.054 | 3.224* | 2.628 | 2.079* | 1.810 | 4.835* | 2.616 |
| Norway | 2.561* | 1.821 | 3.121* | 2.735 | 2.156* | 2.002 | 2.225* | 2.176 |
| Egypt | 2.168* | 1.781 | 5.983* | 2.602 | 2.291* | 1.646 | 4.005* | 0.935 |
| Iran | 1.091* | 0.544 | 1.921* | 1.852 | 2.585* | 1.749 | 3.102* | 2.401 |
| Georgia | 1.505* | 1.405 | 2.056* | 0.885 | 1.333* | 1.154 | 5.768* | 2.312 |
| PANEL | 5.68* | 2.98 | 6.343* | 6.210 | 5.426* | 5.049 | 7.836* | 7.065 |

Table 4.7 shows that cointegration test results which are based on the LM tests give different conclusions in the existence and absence of considering structural break points in the series between asymptotic and bootstrap approaches. In the absence of break points, the LM tests confirm the existence of cointegration whereas cointegration is not confirmed in the existence of break points according to asymptotic probability distributions. However, cointegration is confirmed according to bootstrap probability distributions no matter break points in the series are considered or not. Therefore, the LM test results of this thesis confirm cointegration in equation (1).

Table 4.7: Results of Panel Cointegration Tests Allowing Multiple Structural Break Points

| | LM Test Statistic | Asymptotic Prob. Value | Decision | Bootstrap Prob. Value | Decision |
|---|---|---|---|---|---|
| Without Breaks | | | | | |
| With Intercept | -0.749 | 0.702 | Cointegration | 0.997 | Cointegration |
| With Trend & Intercept | 1.415 | 0.078 | Cointegration | 0.946 | Cointegration |
| With Breaks | | | | | |
| With Intercept | 63.281 | 0.000 | No cointegration | 0.640 | Cointegration |
| With Trend and Intercept | 118.42 | 0.000 | No cointegration | 0.165 | Cointegration |

Notes: Critical values are generated by the Bootstrap approach after 1000 simulations.

Long-term coefficients[15] as presented in equation (1) are estimated through the DSUR approach and presented in Table 4.8. It is seen that coefficient of lny (GDP) is positive while that of squared GDP ($lny^2$) is negative in the cases of all countries as expected and they are all statistically significant. This finding is consistent with the inverted U-shaped EKC hypothesis. Our results support the findings provided by Grossman and Krueger (1991), and List and Gallet (1999) as well as Lindmark (2002) who provided a support for an inverted U-shaped EKC framework. However, our findings are not consistent with the results estimated by Shafik and Bandyopadhyay 1992; Akbostanci et al. 2009). Energy consumption, conversely, provides positive effects on carbon emissions as seen in Table 4.8. This finding supports the evidence provided by Halicioglu (2009) and Katircioglu (2014a).

[15] Newey-West Heteroskedastic Standard Error has been used in order to compute t-statistics. Stars *, **, and *** indicate 1%, 5%, and 10% significance levels.

Most importantly, the coefficient of tourism volume is negatively significant in the countries other than Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunisia, Egypt, Iran, Georgia, Hong Kong, India and Malaysia. This means that tourism growth provides positively significant impacts on emission levels in the cases of the countries above mentioned. It is crucial to emphasize that the results of the countries are in accordance with the findings of Durbarry and Seetanah (2015) who found a positive effect on CO2 emissions in Mauritius[16]. Finally, it is seen that the coefficients of tourism volume in the overall panel and individual countries are inelastic but statistically significant. It is very important to mention that conventional EKC theory, which has an inverted U-shaped curve, has also been confirmed in the overall panel as well as in individual countries as can be seen in Table 8. This result is justified the evidence provided by Dogan et al. (2015) who examined the nexus for some panel studies.

The empirical results for the long run period also support a different form of the EKC model which are the determinants of tourism development, income, and energy consumption in the case of France, USA, United Kingdom, Germany, Spain, China and the other countries. This finding is in line with the evidence provided by Lee and Brahmasrene (2013) and Katircioglu (2014b) who reached a same result for the EU countries and Singapore respectively.

Next step, we run the ECM regressions associated with cointegration model in equation (2) and results of ECM regressions are provided in Table 5.9[17]. The ECT

[16] See also Chen et al. (2018), Shakouri et. al (2017) and De Vita at al. (2015) for the similar results.

[17] Newey-West Heteroskedastic Standard Error has been used in order to compute t-statistics Stars *, **, and *** indicate 1%, 5%, and 10% significance levels.

from equation (2), where $lnco_2$ is the dependent variable, are statistically significant, and negative as expected not only in the overall panel but also in individual countries other than China, Italy, Mexico, Poland, Korea Rep, Macao, India, Indonesia, Morocco, Brazil, Bulgaria, Dominica, Tunisia, Philippines, Iran, Georgia and Egypt. The ECT in the model of the overall panel is -0.355 ($\beta = -0.355$, $p < 0.05$) which is negative and statistically significant. This means that carbon emissions in this thesis convergence to its long run equilibrium path by 35.5% speed of adjustment via the channels of tourism development, real income and energy consumption.

Table 4.8: Long-run Coefficients in Equation (1) - Dependent Variable: $lnco^2$

| Country | Lny | t-stat | $Lny^2$ | t-stat | lnE | t-stat | lnT | t-stat |
|---|---|---|---|---|---|---|---|---|
| France | 0.241 | 1.786** | -2.161 | -2.179* | 1.780 | 11.056* | -0.034 | -3.164* |
| United States | 0.132 | 4.323* | -1.297 | -4.53* | 1.829 | 28.138* | -0.285 | -9.391* |
| Spain | 0.137 | 3.133* | -0.650 | -3.393* | 1.248 | 7.829* | -0.221 | -3.524* |
| China | 0.057 | 5.071* | -0.470 | -4.917* | 0.801 | 6.409* | -0.127 | -4.130* |
| Italy | 0.108 | 1.459*** | -0.899 | -1.63*** | 1.027 | 4.524* | -0.108 | -0.635 |
| U. Kingdom | 0.127 | 12.700* | -1.306 | -4.196* | 1.831 | 10.005* | -0.287 | -4.556* |
| Germany | 0.198 | 6.548* | -0.811 | -6.815* | 0.930 | 11.078* | -0.181 | -1.454*** |
| Mexico | 0.234 | 8.401* | -0.702 | -3.013* | 0.436 | 10.111* | -0.094 | -1.405*** |
| Thailand | 0.078 | 2.600* | -1.005 | -2.714* | 1.712 | 4.957* | 0.312 | 5.778* |
| Turkey | 1.472 | 4.34* | 1.711 | -1.59*** | 2.797 | 1.81** | 0.125 | 1.502*** |
| Austria | 0.154 | 8.500* | -1.546 | -3.075* | 1.251 | 5.531* | -0.046 | -4.600* |
| Malaysia | 4.250 | 1.710*** | -6.701 | -1.690** | 4.815 | 9.048* | 0.084 | 3.968* |
| Hong Kong | 9.280 | 1.505*** | -0.780 | -3.670* | 0.552 | 12.530* | 0.003 | 4.867* |

Table 4.8: Long-run Coefficients in Equation (1) - Dependent Variable: $lnco^2$ (continued)

| Country | Lny | t-stat | $Lny^2$ | t-stat | lnE | t-stat | lnT | t-stat |
|---|---|---|---|---|---|---|---|---|
| Greece | 1.236 | 1.845** | -3.901 | -4.990* | 3.291 | 4.414* | 0.006 | 3.201* |
| Russia | 1.654 | 1.546*** | 2.380 | 0.485 | 6.245 | 7.757* | 0.001 | 5.875* |
| Japan | 0.145 | 4.500* | -1.345 | -8.117* | 1.027 | 9.019* | -0.054 | -2.700* |
| Canada | 0.321 | 1.421*** | -2.781 | 2.115* | 0.389 | 2.474* | -0.022 | -3.215* |
| Saudi Arabia | 0.881 | 2.864* | -1.432 | -2.229* | 0.991 | 4.118* | 0.015 | 2.914* |
| Poland | 0.419 | 1.524*** | -5.211 | -2.582* | 0.115 | 2.463* | -0.006 | -2.078* |
| Korea, Rep. | 0.325 | 2.591* | -6.332 | -4.072* | 0.662 | 4.205* | -0.008 | -1.853** |
| Netherlands | 0.138 | 2.810* | -1.68 | -1.577*** | 1.160 | 8.201* | -0.003 | -4.049* |
| Macao | 0.703 | 2.42* | -1.82 | -2.283* | 0.042 | 7.429* | 0.001 | 2.177* |
| Hungary | 0.382 | 1.96** | -0.599 | -1.523*** | 0.895 | 3.564* | -0.005 | -2.128* |
| India | 0.252 | 1.641*** | -0.823 | -1.811** | 0.834 | 1.43*** | 0.001 | 3.224* |
| Croatia | 0.208 | 2.493* | -0.486 | -1.646 | 0.283 | 7.79* | -0.009 | -1.930* |
| Ukraine | 0.117 | 2.528* | -2.231 | -2.521* | 0.821 | 1.852** | 0.022 | 3.392* |

Table 4.8: Long-run Coefficients in Equation (1) - Dependent Variable: $lnco^2$ (continued)

| Country | Lny | t-stat | $Lny^2$ | t-stat | lnE | t-stat | lnT | t-stat |
|---|---|---|---|---|---|---|---|---|
| Singapore | 0.395 | -2.022* | -1.243 | -1.617*** | 1.86 | 8.010* | -0.009 | -8.561* |
| Czech Rep | 1.264 | 3.615* | -2.713 | -3.024* | 0.616 | 1.819** | -0,021 | -7.311* |
| Bahrain | 2.011 | 3.428* | -0.533 | -3.235* | 1.233 | 7.000* | -0.004 | -3.200* |
| Portugal | 2.721 | 2.615* | -0.011 | -4.215* | 0.651 | 3.409* | -2.902 | -5.004* |
| Denmark | 2.690 | 3.319* | -0.129 | -1,69*** | 0.378 | 2.505* | -0.003 | -1.828** |
| Indonesia | 1.204 | 4.48* | -0.228 | 4.203* | 3.372 | 9.617* | 0.006 | 2.128* |
| Switzerland | 1.008 | 3.823* | -0.167 | -3.101* | 0.324 | 2.523* | -0.004 | -1.891** |
| Morocco | 0.177 | 2.39* | -2.609 | -2.421* | 1.800 | 6.495* | 0.007 | 1.931** |
| South Africa | 2.510 | 2.809* | -1.511 | -3.516* | 0.417 | 3.890* | -0.009 | -1.889** |
| Vietnam | 1.670 | 2.231* | -1.590 | -4.956 | 1.401 | 7.217* | -0.008 | -1.954** |
| Ireland | 1.931 | 2.812* | -1.925 | -2.519* | 0.484 | 1.901** | -0.002 | -1.929** |
| Australia | 1.712 | 5.012* | -3.113 | -4.721* | 1,462 | 11.323* | -0.005 | -1.666*** |
| Bulgaria | 0.422 | 4.229* | -1.101 | -1.913** | 1.981 | 4.918* | 0.024 | 4.612* |

Table 4.8: Long-run Coefficients in Equation (1) - Dependent Variable: $lnco^2$ (continued)

| Country | Lny | t-stat | $Lny^2$ | t-stat | lnE | t-stat | lnT | t-stat |
|---|---|---|---|---|---|---|---|---|
| Belgium | 0.376 | 2.603* | -1.773 | -2.191* | 2.761 | 11.115* | -0.002 | -2.722* |
| Brazil | 0.878 | 4.000* | -0.878 | -3.436* | 2.421 | 10.00* | 0.005 | 2.120* |
| Sweden | 0.442 | 3.220* | -0.215 | -2.465* | 5.246 | 6.233* | -0.008 | -2.329* |
| Dominica | 0.903 | 1.811** | -1.101 | -3.900* | 1.200 | 5.320* | 0.002 | 1.911** |
| Philippines | 0.569 | 2.433* | -1.403 | -1.655*** | 1.429 | 4.000* | 0.004 | 2.606* |
| Tunisia | 0.765 | 4.033* | -1.196 | -2.201* | 1.804 | 5.110* | 0.003 | 2.680* |
| Argentina | 0,200 | 5.083 | -0.822 | -2.233* | 2.151 | 4.739* | -0.001 | -1.99** |
| Norway | 0.137 | 3.925 | -0.332 | -1.929** | 1.882 | 6.926* | -0.007 | -3.176* |
| Egypt | 0.221 | 4.901 | -0.251 | -1.812** | 2.512 | 10.555* | 0.001 | 2.808* |
| Iran | 1.650 | 2.522* | -0.388 | -1.912** | 1.340 | 2.296* | 0.002 | 2.193* |
| Georgia | 0.502 | 1.305 | 2.256* | 0.885 | 1.833* | 1.194 | 5.342* | 2.212 |

Table 4.9: ECM and Short-run Coefficients in Equation (2) - Dependent Variable: $lnco^2$

| Country | $ECT_{t-1}$ | t-stat | Dlny | t-stat | $Dlny^2$ | t-stat | DlnE | t-stat | DlnT | t-stat |
|---|---|---|---|---|---|---|---|---|---|---|
| France | -0.588 | -1.521*** | 1.978 | 1.630*** | -0.714 | -1.26 | 1.554 | 4.15* | -0.242 | -2.523* |
| United States | -0.486 | -2.200* | 0.169 | 1.861** | -3.150 | -1.871** | 1.323 | 7.25* | -0.119 | -2.451* |
| Spain | -0.570 | 2.515* | 1.132 | 1.725*** | -0.930 | -1.27 | 1.318 | 3.906* | -0.659 | -2.128* |
| China | -0.102 | -0.170 | 3.914 | 1.482*** | -0.552 | -1.861** | 1.433 | 13.83* | -0.168 | -3.125* |
| Italy | -0.069 | -0.381 | 7.732 | 2.322* | -16.430 | -2.320* | 0.642 | 2.660* | -0.133 | -1.94** |
| U. Kingdom | -0.805 | -2.830* | 0.142 | 2.228* | -0.330 | -2.216* | 1.092 | 12.151* | -0.117 | -2.699* |
| Germany | -0.199 | -0.542*** | 0.192 | 1.844** | -0.118 | -1.901** | 0.919 | 6.633* | -0.081 | -0.901** |
| Mexico | -0.213 | -0.031 | 1.735 | 2.825* | 0.687 | 2.875* | 1.177 | 7.886* | -0.075 | -1.933** |
| Thailand | -0.123 | -1.481*** | 1.542 | 1.852** | -0.312 | -1.836** | 1.062 | 8.012* | 0.019 | 1.811** |
| Turkey | -0.148 | -1.612*** | 1.642 | 1.415*** | -0.212 | -1.516*** | 1.052 | 9.012* | 0.015 | 0.621*** |
| Austria | -0.122 | -1.883** | 1.735 | 2.725* | -0.287 | -2.651* | 1.197 | 6.816* | -0.085 | -1.464*** |
| Malaysia | -0.411 | -2.903* | 4.281 | 8.301* | -3.714 | -6.005* | 0.646 | 1.944** | 0.025 | 3.291* |
| Hong Kong | -0.231 | -2.802* | 0.964 | 1.461* | -0.188 | -1.848** | 0.220 | 1.886** | 0.139 | 3.262* |
| Greece | -0.323 | -1.918** | 0.245 | 5.961* | -3.502 | -5.402* | 0.725 | 4.012* | 0.086 | 1.982** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Russia | -0.610 | -3.38* | 4.880 | 0.631*** | -1.990 | -0.627** | 0.894 | 4.09* | -0.072 | -0.93 |
| Japan | -0.211 | -2.425* | 0.915 | 2.629* | -0.011 | -2.018 | 0.056 | 2.335* | -0.181 | -3.323* |
| Canada | -0.423 | -1.998** | 0.145 | 3.961* | -2.502 | -3.402* | 0.625 | 5.012* | -0.126 | 1.815** |
| Saudi Arabia | -0.311 | -2.203* | 0.281 | 2.301* | -1.714 | -2.105* | 0.346 | 1.842** | 0.015 | 2.591* |
| Poland | -0.111 | -0.191 | 1.135 | 3.825* | 0.187 | 3.875* | 1.107 | 4.886* | -0.075 | -2.133* |
| Korea, Rep. | -0.029 | -0.281 | 2.732 | 2.922* | -1.430 | -4.320* | 0.842 | 3.660* | -0.143 | -2.942* |
| Netherlands | -0.139 | -0.445*** | 0.162 | 1.941** | -0.158 | -1.821** | 0.219 | 2.633* | -0.011 | -0.971** |
| Macao | -0.121 | -0.111 | 0.732 | 3.922* | -1.230 | -2.320* | 0.142 | 2.660* | 0.103 | 1.909** |
| Hungary | -0.311 | -1.904*- | 1.281 | 2.101* | -0.714 | -2.565* | 0.446 | 1.894** | -0.035 | -2.491* |
| India | -0.099 | -0.230 | 0.914 | 1.622*** | -0.312 | -1.931** | 0.233 | 6.683* | 0.018 | 2.285* |
| Croatia | -0.142 | -1.913** | 0.135 | 1.925** | -0.087 | -2.306* | 0.117 | 3.316* | -0.091 | -1.524*** |
| Ukraine | -0.123 | -2.018* | 0.215 | 2.261* | -0.302 | -2.202* | 0.425 | 3.012* | -0.106 | 1.915** |
| Singapore | -0.129 | -0.942** | 0.592 | 1.941** | -0.148 | -1.801** | 0.319 | 2.433* | -0.034 | -0.996** |
| Czech Rep | -0.291 | -2.604* | 0.201 | 1.910** | -0.514 | -3.565* | 0.146 | 1.824** | -0.031 | -4.891* |
| Bahrain | -0.370 | -2.915* | 1.012 | 1.800** | -0.230 | -1.731*** | 0.218 | 2.306* | -0.059 | -3.228* |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Portugal | -0.160 | -2.315* | 0.012 | 1.819** | -0.140 | -1.621*** | 0.113 | 2.606* | -0.062 | -3.001* |
| Denmark | -0.491 | -1.801* | 0.331 | 1.713*** | -0.114 | -2.565* | 0.116 | 1.934** | -0.023 | -1.943** |
| Indonesia | -0.131 | -1.204 | 0.101 | 1.750*** | -0.014 | -2.165* | 0.196 | 1.899** | 0.014 | 3.028* |
| Switzerland | -0.120 | -1.985** | 0.312 | 1.909** | -0.140 | -1.671*** | 0.318 | 3.306* | -0.016 | -1.991** |
| Morocco | -0.099 | -0.185 | 0.915 | 1.604*** | -0.120 | -1.741*** | 0.218 | 2.402* | 0.018 | 2.331* |
| South Africa | -0.136 | -2.225* | 0.011 | 1.698*** | -0.163 | -1.821** | 0.513 | 3.306* | -0.019 | -2.389* |
| Vietnam | -0.167 | -2.565* | 1.019 | 1.588*** | -0.231 | -2.021* | 0.113 | 2.106* | -0.034 | -1.999** |
| Ireland | -0.608 | -2.435* | 2.011 | 1.413*** | -0.342 | -3.321* | 0.212 | 3.107* | -0.052 | -1.701** |
| Australia | -0.132 | -2.085* | 1.411 | 1.642*** | -0.443 | -2.351* | 0.912 | 4.206* | -0.075 | -1.585*** |
| Bulgaria | -0.181 | -1.885** | 0.301 | 1.922** | -0.622 | -2.561* | 0.503 | 2.401* | 0.021 | 2.732* |
| Belgium | -0.292 | -2.335* | 1.201 | 2.144* | -0.210 | -1.611** | 0.213 | 1.416*** | -0.092 | -3.024* |
| Brazil | -0.171 | -1.332 | 0.101 | 3.209* | -0.440 | -1.713** | 0.314 | 1.532*** | 0.015 | 3.561* |
| Sweden | -0.322 | -1.568*** | 1.231 | 4.106* | -0.560 | -1.843** | 0.456 | 1.772*** | -0.018 | -2.575* |
| Dominica | -0.176 | -1.219 | 0.902 | 1.555*** | -0.019 | -3.265* | 0.319 | 1.844** | 0.012 | 1.819** |
| Philippines | -0.100 | -1.104 | 0.192 | 1.489*** | -0.023 | -4.455* | 0.416 | 1.944** | 0.014 | 3.401* |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Tunisia | -0.320 | -1.391 | 0.256 | 1.493*** | -0.041 | -3.435* | 0.226 | 1.766*** | 0.033 | 1.980** |
| Argentina | -0.412 | -1.422*** | 0.531 | 2.706* | -0.219 | -1.873** | 0.356 | 1.682*** | -0.041 | -2.09* |
| Norway | -0.345 | -2.578* | 0.301 | 1.796** | -0.499 | -2.793* | 0.621 | 1.991** | -0.017 | -5.203* |
| Egypt | -0.088 | -1.199 | 0.107 | 2.202* | -0.523 | -1.543*** | 0.604 | 1.622*** | 0.011 | 6.305* |
| Iran | -0.067 | -1.313 | 1.203 | 3.107* | -0.333 | -1.449*** | 0.254 | 1.452*** | 0.012 | 3.423* |
| Georgia | -0.035 | 1.205 | 1.056 | 0.685 | 1.938* | 1.171 | 0.368 | 1.312 | 0.092 | 1.673* |
| PANEL | -0.355 | -2.184* | 1.736 | 1.889** | -0.379 | -2.662* | 0.172 | 6.004* | -0.019 | -4.440* |

It is important to mention that the conventional EKC theory, which has an inverted U-shaped curve, has again been confirmed as far as the overall panel is concerned in the short-term estimations of this thesis.

In addition, individual countries such as Thailand, Russia, Greece, Brazil, Morocco, Saudi, Macao, Indonesia, Dominica, Philippines, Bulgaria, Tunisia, Malaysia, Egypt, Iran, India, Hong Kong and Turkey which fit to that theory in the ECM. However, tourism volume in the case of the country above mentioned does not exert statistically significant reduction effect on $CO_2$ emissions in the short-term period. On the other hand, France, USA, United Kingdom, Germany, Spain, China and the others fit to the extended version of the Environmental Kuznets curve whereas an increase in tourism reduce carbon emissions in short run period. This shows that tourism led growth hypothesis is effectively linked with the kuznet model. This concluding remark is supported by Katircioglu (2014a) who tested tourism induced EKC hypothesis.

Finally, we employ the panel Granger causality test developed by Dumitrescu and Hurlin's (2012) which is usually applied in panel data studies. The results about the causality test are reported in Table 4.10. There exists one way causality running from tourism development to $CO_2$, to real GDP (lny) and to energy consumption (lnE). Our results support the evidence provided by Solarin (2014) who found out one-way causality running from tourism development to carbon emissions for Malaysian economy (see also Sharif et al., 2017). Thus, Tourism development seems a valuable predictor of $co_2$ emission, real income and energy consumption within the extended version of EKC. In contrast, there is also a unidirectional causality running from

level of real income (lny) and squared real income ($lny^2$) to carbon emissions ($lnco_2$). For this nexus, Ozturk and Acaravci, 2010 and Halicioglu (2009) reached a similar output. It is important to note that there is no causality relationship found between the other pairwise. Our causality results provide that increasing the level of tourism development may reduce the level of carbon emission and level of energy consumption whereas carbon emissions ($lnco_2$) may be diminished by exponential level of income growth ($lny^2$). Overall, rising carbon emission and real income can boost Tourism development and diminish energy consumption. One can infer that tourism development and the level of income appear to play a vital role in determining the level of carbon emission, so this indicate that environmental conservation policies can be supported.

Table 4.10: Dumitrescu and Hurlin's (DH) Panel Dynamic Causality Test

| Null Hypothesis | W-Stat | Z-Bar Stat | P-values | Causality |
|---|---|---|---|---|
| $lny \rightarrow lnco_2$ | 0.789[v] | 1.051[v] | 0.292 | No |
| $lnco^2 \rightarrow lny$ | 0.704[v] | 1.480[v] | 0.130 | No |
| $lnco^2 \rightarrow lny^2$ | 1.209 [v] | 1.046[v] | 0.295 | No |
| $lny^2 \rightarrow lnco_2$ | 1.661*** | 1.692*** | 0.090 | Yes |
| $lnco^2 \rightarrow lnE$ | 1.051 [v] | 0.255 [v] | 0.798 | No |
| $lnE \rightarrow lnco_2$ | 0.733 [v] | 1.332 [v] | 0.182 | No |
| $lny \rightarrow lnE$ | 2.457 * | 2.287* | 0.022 | Yes |
| $lnE \rightarrow lny$ | 0.895 [v] | 0.542 [v] | 0.600 | No |
| $lnco^2 \rightarrow lnT$ | 0.726 [v] | 0.629 [v] | 0.528 | No |
| $lnT \rightarrow lnco_2$ | 2.512* | 2.401* | 0.012 | Yes |
| $lny \rightarrow lnT$ | 1.057 [v] | 0.285 [v] | 0.775 | No |
| $lnT \rightarrow lny$ | 2.333* | 2.422* | 0.011 | Yes |
| $lnT \rightarrow lnE$ | 2.620* | 2.039** | 0.041 | Yes |
| $LnE \rightarrow lnT$ | 1.874 [v] | 0.626 [v] | 0.531 | No |
| $lny^2 \rightarrow lnT$ | 0.838 [v] | 0.807 [v] | 0.419 | No |
| $lnT \rightarrow lny^2$ | 0.875[v] | 0.621[v] | 0.534 | No |

Notes: * **and *** display at 1%, 5% and 10% significance level. [v] symbolizes non conventional level. W-bar and Z-bar are indicators for the DH test statistics. H0: does not granger cause (Dumitrescu and Hurlin, 2012).

# Chapter 5

# CONCLUSION, POLICY IMPLICATION AND LIMITATION

## 5.1 Conclusion

In industrializing countries, economic decision-makers do not take into account the environmental degradation caused by industrialization in order to ensure high growth and income increase. Economic growth harms nature, especially through air pollution and environmental degradation, while environmental degradation increases the cost of economic development and reduces the quality of life of the society. Global measures are taken through the agreements drawn up and it is aimed to reduce the greenhouse gas emissions that arise as a result of meeting the energy needs with fossil fuels. Therefore, economic decision-makers should also consider environmental sustainability while guiding energy policies. In this thesis, it was investigated with the help of the Environmental Kuznets Curve hypothesis whether environmental sustainability in energy was achieved for the top 50 countries between 1996 and 2016.

The economic growth-environmental pollution relationship revealed by the EKC hypothesis was analyzed with the panel data method. Results confirm that energy consumption, tourism development and real income growth have a long run impact on carbondioxide emissions. The effects of tourism on emissions are significant and negative, mainly in the cases of France, USA, United Kingdom, Germany, Spain,

China whereas the tourism development is positively significant in the cases of Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunisia, Egypt, Iran, Georgia, Hong Kong, India and Malaysia. The findings recommended that traditional way should have not conducted by the countries mentioned above. This helps environmental to be free from pollution.

Since fossil fuels increase air pollution, Turkey, Thailand, Russia, Greece, Saudi Arabia, Macao, Indonesia, Brazil, Dominica, Philippines, Bulgaria, Tunisia, Egypt, Iran, Georgia, Hong Kong, India and Malaysia should use cleaner energy sources such as natural gas and higher quality coal to reduce air pollution levels. In addition, it is essential to encourage effective projects and investments that develop and increase the role of renewable energy sources, especially from wind and solar sources.

Findings in the short-run period indicate that individual countries such as Thailand, Russia, Greece, Brazil, Morocco, Saudi, Macao, Indonesia, Dominica, Philippines, Bulgaria, Tunisia, Malaysia, Egypt, Iran, India, Hong Kong and Turkey fit the conventional EKC theory. However, tourism volume does not exert statistically significant reduction effect on $co_2$ emissions in the short-term period. On the other hand, France, USA, United Kingdom, Germany, Spain, China, Italy, Mexico, Canada, Australia, Japan, Singapore and the others fit to the different form of EKC whereas an increase in tourism reduce carbon emissions in the same period. This shows that tourism led growth hypothesis is effectively linked with EKC framework. The conventional EKC theory, which has an inverted U-shaped curve, has again been

confirmed as far as the overall panel is concerned in the short-term estimations of this thesis.

Our causality results provide that increasing the level of tourism development may reduce the level of carbon emission and level of energy consumption whereas carbon emissions ($lnco_2$) may be diminished by exponential level of income growth ($lny^2$). In other words, mounting carbon emission and real income can stimulate Tourism development and reduce energy consumption. One can infer that tourism development and the level of income appear to play a vital role in determining the level of carbon emission, so this indicate that environmental conservation policies can be supported.

It is seen that developed economies tend towards energy production methods that are compatible with the environment, based on information and technology, due to their high income levels. These countries, especially in recent years, have been increasing the use of renewable energy sources and developing new policies on waste management.

The findings reveal that the EKC approach is valid and sustainability in energy is provided in developed countries, while the EKC approach is not valid in developing countries, so sustainability in energy cannot be achieved. For this, it is necessary to reduce the dependence on fossil fuels by reducing carbon dioxide emissions and to increase the use of renewable energy sources in this context.

In a nutshell, recent progress in the relationship between economic growth and CO2 emissions can be summurized using some recent articles. It is observed that economic growth in South Africa reduces CO2 emissions. This situation can be expressed as reducing CO2 emissions by increasing the use of environmentally friendly production techniques and clean energy together with economic growth in South Africa. Economic growth can increase the demand for energy as well as CO2 emissions (Temelli and Şahin, 2019). The thesis's results support the findings of Temelli and Şahin. On the other hand, non-renewable energy resources are used as fuel in Pakistan and cause environmental degradation with increasing energy consumption. For this reason, long-term environmental degradation can be controlled by using environmentally friendly resources instead of these resources (Khan et. al, 2020). Some countries' findings within this thesis support Khan et. al, (2020) results whereas the number of international tourists increases environmental pollution. (Özsoy, 2021) also points out that tourism revenues reduce environmental pollution up to a certain point, but then cause environmental destruction. From this point of view, the thesis results provide mix evidence about the trade off between tourism proxy (i.e., revenue) and environmental pollution. Yu Sun et., al (2021) also found out that the relationship between economic growth and carbon emissions is inverted "U" which suggest that there is a turning point of carbon emissions, where the carbon emissions first increase with economic growth and then gradually decrease. This finding supports the results estimated within this thesis.

## 5.2 Policy Implication

The findings of this thesis recommend that energy policies and alternative energy usage in such a case which provides negative relationship between carbon emission and tourism development are better adapted with environment quality targets.

Therefore, it can be suggested that those countries, have an opposite direction, are in tune with macroeconomic targets. This means that including transportation needs to be better balanced with green energy targets and energy efficiency planning[18].

In order to ensure environmental sustainability in energy, it is necessary to support the necessary incentives and technological investments in order to reduce the dependence on fossil fuels by reducing carbon dioxide emissions with strict environmental policies, taxes and, in this context, to increase the use of renewable energy sources.

The fact that energy is dependent on fossil fuels, public transportation is scarce, and the use of renewable energy is not fully implemented, increasing the amount of emissions to today's levels. Encouraging the use of wind and solar energies in order to reduce energy dependence significantly reduces carbon dioxide emissions. In addition, by increasing forest areas, the amount of carbon dioxide in the atmosphere can be reduced by natural photosynthesis. Considering the efficiency results when all these are taken into account, it is seen that the amount of carbon dioxide emissions is high in countries with high energy production and consumption due to industrialization. In countries with low population and industrialization, it is seen that the amount of emissions is low.

An innovative strategy that encourages a low carbon economy should have some limitations for real income growth, energy usage and tourism development. This points out that the importance of tuning environmental protection policies can be

[18] Katircioglu (2014a) points out that ecological protection policies need to be stable with macroeconomics objectives in the case of Singapore.

achieved by implementing tourism led growth. Concisely, our empirical findings approve that regulating environmental protection policies along with international tourism policies, specifically for the larger tourist arrivals countries. This proposes that countries need to amalgamate better in political arena to improve their own tourism policies and contribute to the sector under the extended version of EKC whereas environmental degradation is expected to be diminished.

## 5.3 Limitation

Some limitations may influence the interpretation of the findings in many research papers so we may consider some important issues as follows. First, our results for both individual as well as country groups are not necessarily generalizable, since prediction of EKC model might be against the evidence of different practises of individual countries as well as panel countries. This means that it will be a benefit if we repeat our extended EKC model for the different countries, especially, in tourism areas such as small island economies where they may have different experiences in terms of growth led by tourism whereas ecological conservation exists at the same time. Second, another drawback in an empirical investigation of the link between tourism and $CO_2$ is that there are some other proxies for tourism development measures that can be employed to get more insights about the link. Third, the other main sectors which trigger tourism development can be considered if air pollution stems from the sectors such as industry, transportation, and urban development.

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# APPENDIX

Table 1.1 Top Tourist Destinations

| No | Country | Region | Number of tourist Arrivals (mn) |
|---|---|---|---|
| 1 | France | Europe | 82,6 |
| 2 | United States | North America | 75,6 |
| 3 | Spain | Europe | 75,6 |
| 4 | China | Asia | 59,3 |
| 5 | Italy | Europe | 52,4 |
| 6 | United Kingdom | Europe | 35,8 |
| 7 | Germany | Europe | 35,6 |
| 8 | Mexico | North America | 35 |
| 9 | Thailand | Asia | 32,6 |
| 10 | Turkey | Europe | 31,3 |
| 11 | Austria | Europe | 28,1 |
| 12 | Malaysia | Asia | 26,7 |
| 13 | Hong Kong | Asia | 26,5 |
| 14 | Greece | Europe | 24,8 |
| 15 | Russian Federation | Europe | 24,5 |
| 16 | Japan | Asia | 24 |
| 17 | Canada | North America | 19,9 |
| 18 | Saudi Arabia | Middle East | 18 |
| 19 | Poland | Europe | 17,4 |
| 20 | Korea, Rep. | Asia | 17,2 |
| 21 | Netherlands | Europe | 15,8 |
| 22 | Macao | Asia | 15,7 |
| 23 | Hungary | Europe | 15,2 |
| 24 | India | Asia | 14,5 |
| 25 | Croatia | Europe | 13,8 |

. *Source: World Tourism Organization (2017)*

Table 1.1: Top Tourist Destinations (continue)

| No | Country | Region | Number of tourist Arrivals (mn) |
|---|---|---|---|
| 26 | Ukraine | Europe | 13,3 |
| 27 | Singapore | Asia | 12,9 |
| 28 | Czech Republic | Europe | 12 |
| 29 | Bahrain | Middle East | 11,6 |
| 30 | Portugal | Europe | 11,4 |
| 31 | Denmark | Europe | 10,4 |
| 32 | Indonesia | Asia | 10,4 |
| 33 | Switzerland | Europe | 10,4 |
| 34 | Morocco | North Africa | 10,3 |
| 35 | South Africa | Africa | 10 |
| 36 | Vietnam | Asia | 10 |
| 37 | Ireland | Europe | 9,5 |
| 38 | Australia | Asia | 8,2 |
| 39 | Bulgaria | Europe | 8,2 |
| 40 | Belgium | Europe | 7,4 |
| 41 | Brazil | South America | 6,5 |
| 42 | Sweden | Europe | 6,4 |
| 43 | Dominican. Rep | Caribbean | 5,9 |
| 44 | Philippines | Asia | 5,9 |
| 45 | Tunisia | Africa | 5,7 |
| 46 | Argentina | South America | 5,5 |
| 47 | Norway | Europe | 5,3 |
| 48 | Egypt, Arab Rep. | Middle East | 5,2 |
| 49 | Iran, Islamic Rep. | Asia | 4,9 |
| 50 | Georgia | Europe | 2,7 |

*Source: World Tourism Organization (2017)*