ANALYZING THE ENVIRONMENTAL IMPACT OF THE HOSPITALITY INDUSTRY USING THE CONSUMPTION FOOTPRINT APPROACH

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Analyzing the Environmental Impact of the Hospitality Industry

Using the Consumption Footprint Approach

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DECLARATION OF ORIGINALITY

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ABSTRACT

Analyzing the Environmental Impact of the Hospitality Industry Using the Consumption Footprint Approach

The hospitality industry, being a major part of the global economy, has negatively impacted the environment and caused sustainability issues. The environmental impacts of the industry are displayed through various pressure indicators, and there are numerous exogenous factors that can potentially mitigate or worsen these pressures, ranging from economic to political. This study aims to analyze the environmental impact of the hospitality industry by utilizing the consumption footprint method, i.e. ; using the data for the environmental pressure indicators of the industry including land use, raw material use, and blue water consumption. These indicators are examined for their relationship with factors concerning governance, economic development, employment, and foreign direct investment. The data collected and used for this research is in panel format, centered around three major groupings consisting of the OECD, EU-27, and Global data. Panel data analysis is then conducted on the gathered data in order to analyze the relationships between the indicators and the potentially mitigating factors if such relationships exist. The findings of the research show that the quality of governance and economic development affect the environmental impact of the hospitality industry in a mitigating manner; whereas employment proves to be the opposite. Foreign direct investment, on the other hand, yielded mixed findings for this matter.

ÖZET

Konaklama Endüstrisinin Çevreye Olan Etkisinin Tüketim Ayakizi Yaklaşımı Kullanımı Aracılığıyla Analizi

Küresel ekonominin önemli bir parçası olan konaklama endüstrisi, doğayı olumsuz yönde etkilemektedir ve sürdürülebilirlik problemlerine sebep olmaktadır. Sektörün çevresel etkileri çeşitli baskı göstergeleri aracılığıyla belirtilmektedir, ve bu baskıları potansiyel olarak azaltabilecek veya kötüleştirebilecek çok sayıda dış faktör vardır. Bu dış faktörler siyaset veya ekonomi gibi alanlardan gelebilir. Bu çalışma, konaklama endüstrisinin çevreye olan etkisini tüketim ayakizi yaklaşımını kullanarak analiz etmeyi hedeflemektedir. Bu amaçla arazi kullanımı, hammadde kullanımı, ve mavi su tüketimi gibi endüstrinin çevresel baskı göstergelerinin verileri kullanılmıştır. Bu göstergelere yönetişim, ekonomik kalkınma, istihdam, ve doğrudan yabancı yatırımların etkileri incelenmektedir. Bu araştırma için toplanan ve kullanılan veriler panel formatındadır; veriler OECD, AB-27 ve Küresel olarak tanımlanan üç ana grup etrafında toplanmaktadır. Sonrasında göstergeler ile potansiyel azaltıcı faktörler arasındaki ilişkileri analiz etmek amacıyla toplanan veriler üzerinde panel veri analizi gerçekleştirilmiştir. Araştırmanın bulguları; yönetim kalitesi ve ekonomik kalkınmanın konaklama sektörünün çevresel etkisini azaltıcı faktörler olarak değerlendirilebileceğini göstermektedir; oysa istihdam ise bunun tam tersini göstermektedir. Diğer yandan, dolaysız yabancı yatırım bu konuda karışık sonuçlar vermiştir.

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CHAPTER 1

INTRODUCTION

The hospitality industry has been rapidly growing over the course of the 21st century, with advances in technologies within relevant areas (e.g. transportation, communication) helping expedite this process. However, such growth is not without consequences, and one of these consequences is the toll it takes on the environment. There are significant concerns over the negative impacts of the hospitality industry on the environment, starting with the excessive amount of degradation the industry causes through the consumption of natural resources such as energy and water at a significant rate, as well as various harmful emissions and a substantial volume of waste production (Khatter, 2023; Akhtar & Najar 2020). The potential damage such issues can cause to the surrounding environment if left unchecked is quite considerable. Furthermore, the hospitality industry is a contributor towards exacerbating a number of environmental problems, stemming from high amounts of water consumption and accounting for a significant chunk of worldwide emissions (Voukkali et al., 2023).

In order to understand and analyze the gravity of the aforementioned environmental impacts, they must be streamlined into various categories and measured properly. The impacts of the hospitality industry can be observed in areas such as resource consumption, where it can boast up to a significant 10% of a country's water consumption, especially if the country is strong in tourism (Gössling et al.,2012). This makes it quite important to dive deep into this issue from the perspective of the hospitality industry and understand how to mitigate the problems arising from it. One avenue of achieving environmental impact measurement is

making use of the consumption footprint method. This particular approach employs a holistic overview of the entire supply chain of a country (including external consumption activities) to take a look at the final consumption of products and services in order to determine the environmental impacts and pressures for said country (SCP-HAT, 2022). Utilizing the consumption footprint approach can allow for a more precise analysis of the environmental impact, which in turn can facilitate better policy-making and data collection in environmental sustainability efforts (Liu et al., 2022).

The goal of this study is to analyze the environmental impact of the hospitality industry, backed by theories such as tourism carrying capacity (Wang et al., 2021) and tourism ecological footprint (Wang et al., 2017); as well as to delve into some of the phenomena that affect negative environmental impact and could be utilized as potentially mitigating factors in sustainability efforts, like policy-making (Schönherr et al., 2023). As a significant part of the global economy, the hospitality industry needs to be held in check to ensure the damage it causes to the environment is not beyond the point of no return. This study also aims to make use of the increased understanding of the environmental impact of the hospitality industry in order to facilitate policy-making that can help mitigate related problems. The flow of this study is as follows: initially, an in-depth review of the relevant literature is conducted and explained, followed by the conceptual framework this study utilizes and the hypotheses developed for it. Afterward, the data and the methodology are explained, and accordingly analyzed, and the results are discussed; which are followed by policy implications and closing remarks.

CHAPTER 2

LITERATURE REVIEW

It has been noted that the hospitality industry has significantly and negatively impacted the environmental degradation phenomenon, appearing to be responsible for exorbitant levels of consumption in terms of natural resources, various emissions, etc. (Voukkali et al., 2023). According to Xiong et al. (2023), the aforementioned environmental degradation is in a cause-and-effect relationship with hospitality ventures that facilitate energy consumption and economic growth. Variables such as land use, gas emissions, and water consumption have previously been examined in regard to discovering the environmental impact of tourism (Gössling & Peeters, 2015). While the viability of tourism - and hospitality for that matter - as an easily expandable industry might seem to be an attractive prospect, especially with the structural change European countries are going through in recent times, the environmental downsides are a major cause for concern. Ventures such as accommodation, food, leisure activities, and transport put undue pressure on the environment; culminating in ecological damages in various avenues (Bhuiyan et al., 2024). Similar negative environmental implications can be reached by looking at the ecological destruction caused by the tourism industry's overconsumption and overexploitation, as argued by Jaz et al. (2023). Furthermore, development within the industry is capable of altering the ecological footprint; increased by tourism receipts in some cases while decreased by tourism arrivals in others (Nathaniel & Adedoyin, 2022).

Gössling (2002) delves into some of the major factors with potential influence on the environment; two of the headliners being the use of land and the use

of energy. That particular study reveals land use (or alteration) to be the most vital factor in terms of affecting the environment, with special emphasis being laid upon the development of related infrastructure and geographical situation as mitigating or facilitating elements. On the other side of the scale, there are variables that can affect land use and other similar indicators of impact, such as Gross Domestic Product Per Capita (GDPPC) and employment within the industry.

An integral part of this study is the concept of consumption footprint. Nuss et al. (2023) define consumption footprint as the numeric appraisal of human-caused pressure on the environment; notably focusing on things such as material resources, emissions of GHGs, freshwater, and other pollutants. Another approach is making a holistic overview of the entire supply chain of a country (including external consumption activities) to take a look at the final consumption of products and services in order to determine the environmental impacts and pressures for said country (SCP-HAT, 2022). The Global Footprint Network, an NGO with a focus on sustainability, has put a significant effort towards calculating and tracking the overall footprint of nations for the past two decades (Lin et al., 2018). While footprint is rather popular in academic material concerning sustainability and the environment, there is pushback present on its suitability within the context of tourism and hospitality at the current juncture. In particular, Casals Mirales et al. (2023) posit the absence of clear-cut consensus in terms of relevant data, methodologies, and perimeters that could be used for estimations within tourism. Therefore, strict calculation boundaries are necessary in order to validate consumption footprint as a viable resource to be integrated into academic works.

A framework that can be utilized to determine environmental impacts within the tourism industry is the Driver-Pressure-State-Impact-Response (DPSIR) model, a

framework that has become increasingly influential in the research of sustainable tourism (Ruan et al., 2019). The model can potentially be utilized in order to sort out the differences that arise between the theoretical evaluation of sustainability within the industry and practical possibilities (Xu et al., 2022). Furthermore, it is possible to derive indicators of environmental impacts and explanatory variables about these impacts if the DPSIR framework is applied correctly. In the table in Appendix A, there is an overview of various academic studies that examine tourism's environmental impact through the perspective of the DPSIR model. The table summarizes the indicators for impacts of tourism in the areas of study, the drivers behind those impacts (e.g. employment, GDP per capita, policy-making), and the overall findings of the researchers; spanning a multitude of locations across the globe with differing characteristics such as China, Chile, and The Mediterranean. The presence of such different locations is important for helping the impact drivers in terms of being generalizable.

The studies in Appendix A reveal a multitude of impact indicators that were factors concerning environmental pressure, with the most frequently present ones being various gas emissions, land use, and water consumption. On the drivers side of the fence; the foremost variables appear to be GDP per capita, government effectiveness/governance, and urbanization rate. The overall findings of the studies in Appendix A also emphasize the importance of high-quality government policies regarding environmental impacts and sustainable-minded development planning. The environmental impact of the industry is significant, but mitigation of degradation is possible through various strategies, some of which are mentioned in the table in Appendix A through the use of the DPSIR model. This study will diverge from existing academic literature by putting more emphasis on less explored impact

drivers such as governance and policy-making, analyzing the environmental impact of the hospitality industry through well-defined consumption footprint indicators, and making panel analyses of drivers and impacts at the OECD, EU-27, and Global levels.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

3.1 Conceptual framework

The conceptual framework for this study is an adaptation of the framework from the work of Li et al. (2023), created for what the authors refer to as the tourism resources and environmental carrying capacity (TRECC), utilizing the outlook of support and pressure. The TRECC is a combination of two concepts, the first of which is the resources and environmental carrying capacity (RECC). The RECC is a scientific premise that aims to take account of the utmost amount of resources and environment for analysis purposes and has reportedly been in circulation for over a century, having its roots in the U.S. Department of Agriculture (Zhang et al., 2022). Initially, within the academic premises, researchers have delved into the topic of carrying capacity through individual factors, such as the resources of water (Cheng et al., 2018) or soil (Tian et al., 2022). Over time, however, the shortcomings of such an approach became apparent and caused researchers to look into more holistic perspectives regarding the matter of carrying capacity (Feng et al., 2018).

The assessment of the resources and environmental carrying capacity has two overall steps: the determination of relevant indicators in order to create a system of assessment, followed by using various avenues of appraisal to make the concept quantifiable from a statistical perspective. The creation of the aforementioned systems has commonly been achieved through two approaches: one approach is establishing it to the backdrop of other systems such as society and economy; while the other approach is utilizing models such as pressure-state-response (PSR) or

driver-pressures-state-impacts-response (DPSIR) as mentioned by the likes of Castellani et al. (2007).

In its existing state, the RECC concept encapsulates some common notions. Firstly, the integration of multiple resource and/or environmental indicators, rather than the earlier single-factor approach. The analysis of the concept has progressed into a more holistic process, which has made the scope of it significantly more comprehensive, allowing for relevant research to be more beneficial towards policy-making and environmentally conscious planning. Secondly, the interaction between humankind and the environment is expressed strongly. The concept of RECC relies significantly on the harmonic evolution of the relationship between the aforementioned entities. To that end, a holistic analysis of various resource and environmental factors is required, as well as social and economic assessment. These are utilized in order to analyze the interactions between humans and land with a methodical outlook. Lastly, emphasizing the differences in social and economic development within the regions that are being scrutinized with the use of this concept. These differences become important denominators of carrying capacity when multiple regions are being analyzed according to RECC, and they can prove valuable towards relevant policy-making efforts.

The other part of the TRECC comes from the concept of tourism carrying capacity (TCC). A concept that is utilized in order to represent the utmost number of humans that can be present at any given tourism destination simultaneously without causing issues to the environmental, social, economic, or cultural well-being of the area; it is considered a strong implement for policy-making and governance of hospitality destinations (Zelenka & Kacetl, 2014). Tourism carrying capacity has been explored from two different perspectives by researchers: a model of tourism

calculation referred to as the Gifuentes method that is utilized to determine the utmost amount of people that an area can hold (Adrianto et al., 2021), and a holistic model of appraisal for the indicators that are represented by methods such as footprint or system dynamics model (Phumalee et al., 2018).

However, the tourism carrying capacity concept does come with some limitations. Firstly, the external factors at the macro level (e.g. social and technological aspects) tend to get ignored due to increased attention towards the internal factors such as hospitality products and enterprises, focusing too much on the micro level (Pásková et al., 2021). The aforementioned factors are significant in terms of sustainability planning, and a holistic approach that combines both of them should be utilized. Another issue is a lackluster prioritization of the interaction between humans and land. The research within the academic literature prioritizes focusing on the calculation of the number of people associated with the carrying capacity of a given region, aiming to establish thresholds. However, the resources and environment associated with the TCC can be resilient enough to withstand some of the negative impacts of hospitality, allowing for the concept to be a more dynamic phenomenon that can evolve alongside processes such as economic growth.

Combining these two overlying concepts, Li et al. (2023) created a framework for TRECC that took into account the pre-existing dynamic of supply-demand within the concept of carrying capacity, utilizing a system consisting of "support" and "pressure". The system for "support" consists of resources, environment, and industry; whereas the system for "pressure" includes tourism, development, consumption, and pollution. These systems are then analyzed within the context of their relationship from a supply and demand perspective. The culmination of this results in the analysis of the tourism resources and environmental

carrying capacity, which can afterward be utilized to determine the suitability of a "support" system for its ability to maintain balance when faced with the system of "pressure". The conceptual framework for TRECC can be found in Figure 1.

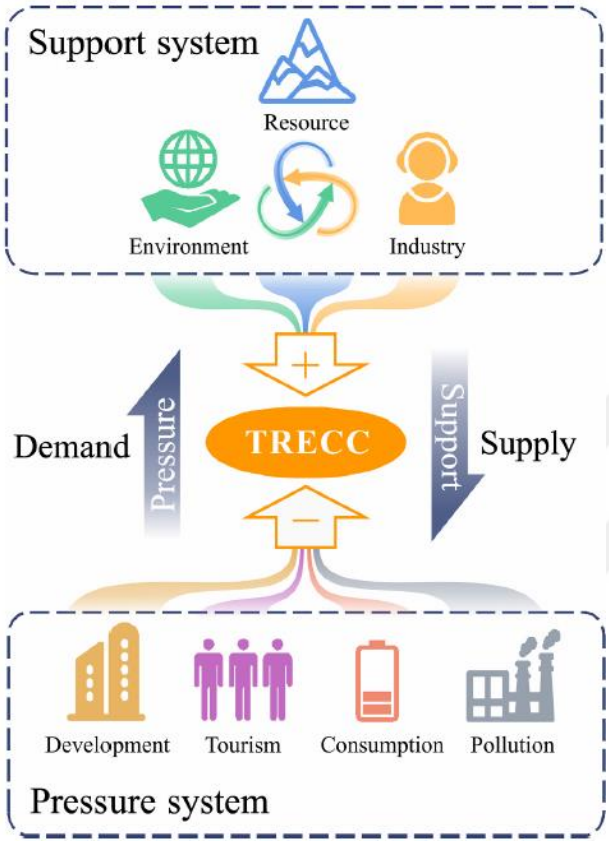


Figure 1. Conceptual framework for TRECC (Li et al., 2023)

In this study, the aforementioned framework by Li et al. (2023) is adapted in order to measure the environmental impact of the hospitality industry from a consumption footprint perspective. The study of TRECC does not utilize governance or institutional quality as factors, even though these factors are very important for environmental stability, as pointed out by Bennett & Satterfield (2018). Variables such as GDP per capita, control of corruption, employment within the industry, foreign direct investment, monitoring of sustainable tourism, and protected areas are analyzed in this study in order to determine the interactions between them

concerning environmental impact. The parts from the framework concerning resources, development, consumption, and environment, along with their relationships were adapted into this study in order to develop hypotheses and a more suitable framework that tied in the dependent variables of raw material use, land use, and blue water consumption (displayed as consumption footprint). The framework of this study is visualized in Figure 2.

The framework for tourism resources and environmental carrying capacity, while including various factors to keep things comprehensive, lacked indicators regarding the government, policies/legislations, and relevant institutions. Variables regarding policy-making and institutions - represented by control of corruption (government efficiency), monitoring of sustainable tourism, and protected areas - were thus included in the study to make up for this gap, aiming to discover more about the relationship between the hospitality industry and its environmental impact through an empirical lens. Policies regarding tourism can have an effect on the supply and demand metrics for the industry, including environmental regulations that directly impact the numbers - even potentially in a positive manner for tourism demand by raising the attractiveness of a destination despite the presence of strict oversight (Shimizu & Okamoto, 2024). If promotional policies are designed in a way that is complementary to environmental protection regulations and enforced in tandem, the mitigation of the environmental impact of the hospitality industry can be achieved without compromising long-term revenue for institutions (Sirilersuang & Pongkijvorasin, 2018). The existence of strong political and institutional infrastructure is important to support a hospitality industry that can operate sustainably and be successful at mitigating its negative environmental impacts. The conceptual framework of the current study can be found in Figure 2.

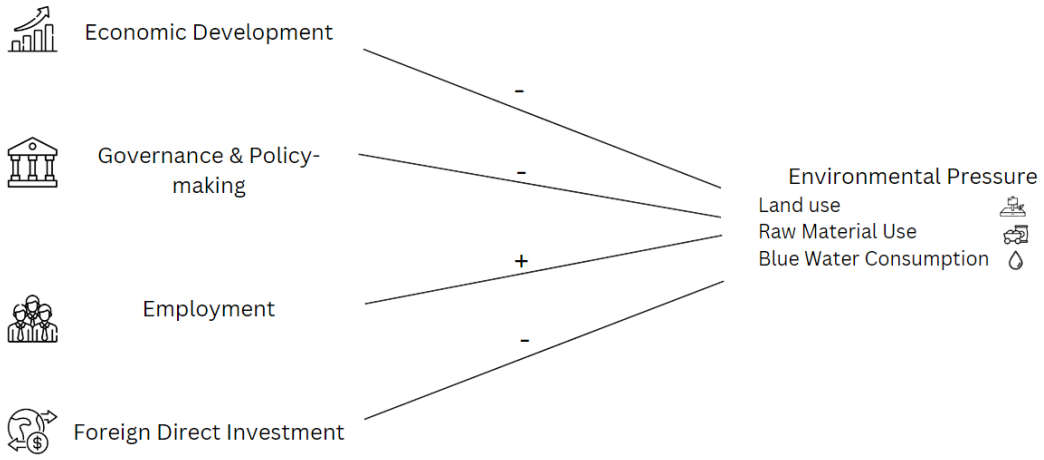


Figure 2. Conceptual framework of the current study

3.2 Hypothesis development

The strength of any given country in terms of economic development, and the subsequent policy-making and infrastructure opportunities this strength grants, has been theorized to have a significant effect on how the tourism industry can impact the environment by authors such as Öztürk et al. (2016). Furthermore, the economic development of a country is also argued to potentially start mitigating the negative environmental impacts of the industry, which is in line with the thought process of the Environmental Kuznets Curve hypothesis. Some studies posit that institutional quality and policy-making are control variables on EKC that can mitigate environmental degradation further (Hussain et al.,2023). Furthermore, EKC does not automatically prove a relationship between income and environment at an all-encompassing level (Moosa & Burns, 2022). To that end, this study is not interested in proving the existence of EKC**.** Hao et al. (2022) also suggest that the quality of economic strength, correlated to GDP per capita, is correlated with the mitigation of

the industry's environmental pressure. Following such an academic backdrop, this study proposes the following hypothesis:

H1: Higher economic development measured by GDPPC is expected to mitigate the environmental pressure of the hospitality industry.

Another topic to be discussed surrounding the environmental impact of the hospitality industry is the relationship it has with employment within the industry, and whether it significantly affects it. Xiaobin et al. (2021) argue that employment within the aforementioned industry would have a significant relationship with the ecology around the regions that the industry has a strong presence in. In a similar vein, Fernández & Rivero (2009) suggest that the number of employees within the industry is considered to be an important driver of environmental impact and pressure on surrounding natural areas. The employment within the hospitality industry comes across as an indicator of the potential environmental impact of the industry, therefore the following hypothesis is proposed:

H2: Higher employment in tourism is an indicator of the size of the hospitality industry. Hence, higher tourism employment is expected to trigger environmental pressure of the hospitality industry.

The hospitality industry and foreign direct investment can be theorized to cross paths in terms of the environmental impact of the industry. Bokpin (2017) posits that FDI can prove to be a mitigating factor of environmental degradation if the quality of governance is high enough. While FDI would stimulate the economy of a country and provide some measure of growth, Soylu et al. (2023) argue that the negative impacts of said growth can be mitigated if the investment is towards tourism. This is supported by the research of Pan et al. (2023) that showcases FDI in the service industry as being an environmentally positive determinant. The mitigation

of environmental impacts from FDI does make some sense, as an investment into a service industry such as hospitality would put less strain on the environment compared to the investments going into more resource and production-heavy industries. As such, the following hypothesis is proposed:

H3: Depending on the characteristics of FDI, FDI can mitigate or trigger environmental pressure of the hospitality industry. If FDI is mainly attracted to resource-intensive activities, it will trigger pressure; whereas if it is attracted to less resource-intensive service sectors it will mitigate pressure.

One last important factor that can affect the severity of the environmental impact created by the hospitality industry is the quality of governance. Researchers such as Hao et al. (2022) claim that the performance of a government is strongly linked to the success of a sustainable approach to tourism. Even in other industries, studies have shown the impact high quality governance can have on mitigating negative environmental impacts (Darimani et al., 2013; Gani & Scrimgeour, 2014). Similarly, Liu & Yin (2022) posit that governance is a significant part of mitigating the potential environmental impact of the hospitality industry, and could be considered more important than even economic factors in this matter. With governments holding the keys for better policy creation and implementation of sustainable practices within a country, governance competency can be argued to be a significant factor in the mitigation of environmental impacts. To that end, the following hypothesis is proposed:

H4: Governance quality is expected to affect the environmental pressure of the hospitality industry. However, governance specifically focused on environmental preservation is more important for the mitigation of pressure compared to overall governance competency.

CHAPTER 4

DATA AND METHODOLOGY

4.1 Data

The analysis of this research was conducted on countries within three groupings: OECD, EU-27, and Global. The timeframe for the analyzed data is between 1990 and 2018. The data for consumption footprint indicators and hospitality industry employment is collected from SCP-HAT (2023). The data for control of corruption and foreign direct investment is collected from the World Bank (2024). The data for GDP per capita and the monitoring of sustainable tourism is collected from Our World in Data (2023), while the data for protected areas is collected from OECD (2023). Lastly, the data for the country of Luxembourg provided to be too big of an outlier that disrupted the analysis of the rest of the dataset heavily, therefore it was decided to take the data of Luxembourg out of all three datasets. The metadata for the study can be found in Table 1.

Table 1. Metadata of the Study

	Indicator	Abbr.	Unit	Definition	Data Source
Dependent Variable	Blue water consumption	BWC	m3 H2O/capita	The SCP-HAT presents data on national blue water consumption. Blue water is defined as water stemming from surface water (e.g. rivers or lakes) or groundwater. Water consumption is defined as the difference between overall water withdrawals and direct return flows. Blue water consumption hence encompasses water withdrawn from surface water or groundwater that is either incorporated into products or evaporated during either the growth period of a crop or the production process of goods	SCP-HAT
	Land use	LAND	ha/capita	Land use is the total arrangements, activities, and inputs that people undertake in a certain land cover.	SCP-HAT
	Raw material use	RAW	tonnes/capita	Raw material extraction is the exploitation of biomass, fossil fuels and minerals for the production of goods and services directly from the natural environment. This includes activities such as fishing, mining, harvesting, drilling, etc.	SCP-HAT
Independent Variable	Control of Corruption	CC	country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	World Bank
	Employment	I_EMP	million workers	Persons in employment are defined as all those of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit. They comprise employed persons "at work", i.e. who worked in a job for at least one hour; and employed persons "not at work" due to temporary absence from a job, or to working-time arrangements (such as shift work, flextime and compensatory leave for overtime). The SCP-HAT covers employment data differentiating for gender and different levels of skill	SCP-HAT
	Foreign direct investment	FDI	net inflows (% of GDP)	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments	World Bank
	GDP per capita (constant 2015 US$)	GDPPC	$	the sum of gross value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output, divided by mid-year population.	OurWorldInData (per World Bank and OECD)
	Monitoring of Sust Trm	MONITOR	the implementation of the most relevant Tourism Satellite Account (TSA) and System of Environmental Economic Accounting (SEEA) tables / Per number, min=0, max=551 for World (2016), 11 for Colombia/Australia etc.	Tourism that considers the current and future needs of visitors, the industry, the environment, and host communities	OurWorldInData (per World Bank and OECD)
	Protected Areas	PROAREA	Percent of total land/EEZ area	Protected areas are implemented for biodiversity conservation, often providing habitat and protection from hunting for threatened and endangered species.	OECD

Moving onto the variables, the first group (dependent variables) consists of the pressure indicators for the consumption footprint of the hospitality industry: Land use (represented as LAND), raw material use (represented as RAW), and blue water consumption (represented as BWC). These variables make up the backbone of this research, as they provide comprehensive data on consumption footprint from varying sources for a timeframe of 29 years, applicable to over 150 countries in per capita format.

Land use is an important indicator for the study of consumption footprint concerning environmental impacts: it can be utilized for pretty much any sector,

region, or country on the planet, it can be displayed as numerical data without much issue, and it is an indicator of something governments keep track of religiously - land - which ensures a healthier than usual access and reliability metrics for the data. This proves true for the hospitality industry as well and is one of the main reasons it is utilized in this study. Through enterprises such as resorts and hotels, the hospitality industry is well known for committing crimes against the environment by means of misutilization of natural territory and aggressive and/or unnecessary touristic expansion. Involving such a crucial factor in this study was a foregone conclusion. Moving onto raw material use; while the conventional targets of this consumption footprint source (e.g. mining, fishing) do not necessarily overlap with the hospitality industry, there is an undeniable presence of biomass and fossil fuel exploitation within it: the former mainly connected to the aforementioned land use and the facilitation of some touristic activities (artificial beaches etc.), while the latter has a significant relationship with the industry through hospitality's strong existence as a facilitator of travel - both local and international. This premise resulted in the utilization of raw material use within this study. Lastly, blue water consumption is a great metric for taking into account the amount of freshwater an industry or a country wastes at any given moment, easily visualized through a m^3H2O/capita formula. The hospitality industry can be egregious in terms of wasting water if given the slightest chance; with the existence of extravagant premises such as artificial snow, multi-layered water parks, and golfing being rather notorious for their spectacular and unnecessary misuse of freshwater. Compounded by the usual high amounts of water use within the hospitality industry through cleaning/laundry etc., it was an obvious choice to include a pressure indicator such as blue water consumption as a dependent variable for this research.

As for the independent variables, the choices were made among indicators that were not too similar in nature but provided a good connection to both the hospitality industry and the aforementioned pressure indicators. Starting off, GDP per capita (represented as GDPPC) is a core representative of the economic development level of a nation, and is also a big part of the previously mentioned academic literature concerning the consumption footprint of the hospitality industry; on top of being easily applicable to all three major data groupings of this study (Global, EU-27, OECD). GDP per capita would also enable the option for commenting on potential trends within consumption footprint variables and their relationship to the strength of economies. Employment in tourism is also a very necessary variable; with its direct ties to economics, environmental studies, and sociology it can be utilized as a bridge to connect hospitality and consumption footprint while opening up avenues of analysis into other, more specific independent variables to generate more extensive results for this study. Furthermore, employment provides a variable that can display the size of the hospitality industry in a given country. Tourism employment in any given country lives and dies by the existence of the hospitality industry, especially as entry-level employment at low salaries, therefore complimenting the aforementioned GDP per capita variable nicely for this study. The next independent variable is foreign direct investment (represented as FDI). This variable was chosen primarily because it can support two contrasting schools of thought. The hospitality industry reaps a lot of financial benefits from FDI, so what kind of effect does this phenomenon have on the consumption footprint: does it cause more of it due to an increase in economic output that results in more resources being used, or does it actually mitigate resource waste due to the strengthening of the hospitality industry causing a shift from more production-heavy

sectors to a service-focused one? The result of this inquiry can potentially be reached through this study if the impact of FDI on the three pressure indicators turns out to be significant enough. Up next, control of corruption (represented as CC) is yet another independent variable chosen for this study. It was paramount to provide the existence of a variable that would represent government effectiveness, and control of corruption can fill that role nicely. The role of an effective - or ineffective, as the case may be - is undeniable for the mitigation of consumption footprint and sustainability efforts, and the hospitality industry can be exploited by government-side corruption through practices such as rent-seeking. As an independent variable, control of corruption can provide an insight into the effect government effectiveness has on the consumption footprint of the aforementioned three indicators, therefore it is included as a variable. Lastly, we have two variables that serve similar purposes. Protected areas (represented as PROAREA) and the monitoring of sustainable tourism (represented as MONITOR) are used to investigate the commitment of countries across the globe towards sustainability efforts. Unfortunately, the first one only has enough applicable data for EU-27, therefore the latter is used for the analysis of Global and OECD datasets. While individually these variables might seem too different on the surface to use for similar avenues of analysis, they were chosen to be substitutes for each other due to one crucial underlying reason: they are both excellent at gauging the importance a country puts upon the concept of sustainability and the mitigation of consumption footprint. The conservation of protected areas should result in fewer consumption possibilities for the hospitality industry, as it is denied an obvious area of expansion that would also diminish the environmental presence of a given country.

4.2 Descriptive statistics

Taking a look at the gathered data prior to the analysis, it is possible to infer some connections between the dependent and independent variables of this study. Putting the variables in a line graph in matched pairs for all three of the main groups (Global, EU-27, OECD) allows for the scrutiny of some trends in the correlation between the aforementioned variables; as well as potentially noticing some crucial points in time in which there has been drastic shifts in data, and that can allow for further extrapolation of events/activities that significantly affect consumption footprint in consequent studies. The summary statistics provided in Appendix I show that the data values in the sets are within the expected parameters, and that the outliers did not affect the averages too much. Examining the graphics in appendixes B, C, and D provides some context on the nature of the relationships between some of the variables before seeing whether those are significant or not.

For the global data graphics (Appendix B), it appears that the consumption footprint from raw material use and tourism employment tend to grow in the same direction at a similar pace, whereas GDP per capita is ostensibly a mitigating factor for it after a certain threshold. The graphics for land use show a sharp decrease in consumption footprint that coincides with increases in year-over-year GDP per capita and the monitoring of sustainable tourism. Curiously enough, the decrease in land use consumption footprint mirrors a similarly decreasing line for control of corruption, creating questions about how the decrease in government effectiveness might actually have a positive impact on sustainability if that particular relationship proves to be a significant one. As for the graphics of blue water consumption, monitoring of sustainable tourism has its line trending in the opposite direction as

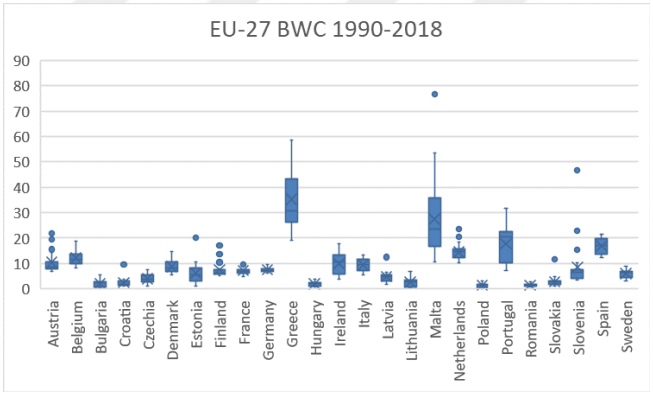
consumption footprint, while control of corruption remains as a mirroring line, compounding on the questions from the aforementioned land use graphics.

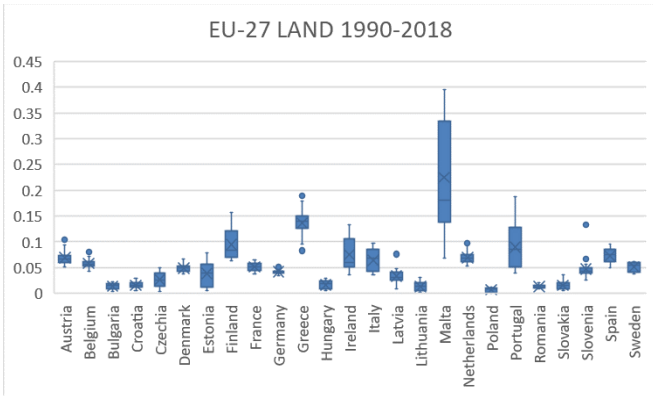
The graphics of OECD (Appendix C) are quite a bit harder to infer conclusions from. In all three consumption footprint types, control of corruption presents a line that is at least partially conflicting with those of land use, raw material use, and blue water consumption, which would indicate a deduction of government effectiveness having a good effect on the mitigation of consumption footprint if a significant relationship turns out to be present amongst these variables. The graphics regarding the OECD data display no clearly noticeable relationships concerning land use or blue water consumption, though raw material use is seemingly kept stagnant throughout the given timeframe.

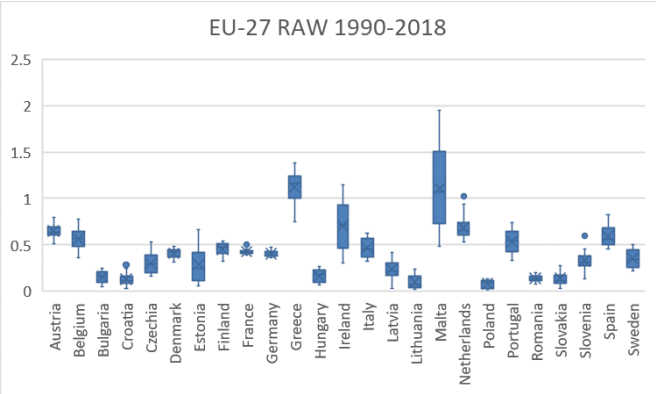
Lastly, there are the EU-27 graphics (Appendix D). The differing variable of protected areas showcase a line that is slightly conflicting at best (land use & blue water consumption), and a straight-up mirroring one at worst (raw material use). If a significant relationship is indeed present with this particular independent variable, the result may actually end up conflicting with the initially theorized premise in the case of raw material use. Land use displays mirroring lines with foreign direct investment and employment, which is rather unsurprising if there indeed is a significant relationship present. The line of blue water consumption trends opposingly to GDP per capita and protected areas, implying the potential of those two variables as consumption footprint mitigation factors.

The boxplots (figures 3, 4, and 5) of the dependent variables for the EU show that Greece and Malta are far and away the frontrunners when it comes to consumption footprint within the hospitality industry, possibly owing to being tourism-heavy Mediterranean countries with low population numbers and density.

Another country that is a very high outlier is Slovenia, displaying favourable footprint numbers in all three pressure indicators. On the other end of the spectrum, Poland showcases a considerably more sustainable consumption footprint than the previously mentioned countries, potentially caused by a significant amount of its tourism stemming from cultural heritage and national parks (Duda-Seifert et al., 2017). Eastern European countries such as Bulgaria, Croatia, and Romania are similarly at the lower end of the spectrum in consumption footprint; though it is unclear from this graphic whether that is due to a strong consciousness over sustainability or their hospitality industries simply not being developed/sizeable enough. Western Europe appears to be middle of the pack in terms of consumption, with Spain and Portugal leading the lot as the countries closest to the worst offenders of Greece and Malta.







Figures 3, 4, and 5. Boxplots for EU-27

4.3 Methodology

The data collected and used for this research is in the panel format, which leads to the facilitation of easier analysis for the consumption footprint of the hospitality industry in terms of both varying time spans and locations. Panel data analysis proves to be more advantageous when aiming to regulate individual heterogeneity through its ability to deal with variability, on top of being a great choice for limiting the possibility of collinearity between the variables within the dataset. However, making use of approaches like this does carry potential drawbacks. Examples of this would be errors in measurement that could lead to the distortion of the models; or biases in selectivity that stems from issues such as insufficient reply rates, non-random sampling etc.

The overall model for this method can be written as such:

$$y_{it} = \alpha + X_i'\beta + u_{it}$$

for $i = 1,\ldots, N$ and $t = 1,\ldots, T$, where is the dependent variable, is the vector of independent variables, is the coefficient vector of independent variables, is the composite error, in the form of:

$$u_{it} = \mu_i + v_{it}$$

Where μ_i stands for the *unobservable* individual-specific effect and v_{it} stands for the remainder disturbance. μ_i is the time-invariant parameter which takes care of any individual-specific effects that are not stemmed from the variation in explanatory variables. v_{it} changes with individuals and time, and it can be viewed as the regular disturbance within the regression. Each μ_i is an independent constant which is related to a particular group or cross-section. Therefore, the real constant term for each of these cross-sections becomes $\alpha + \mu_i$ .The other disturbances v_{it} are defined to be stochastic, independent and identically distributed (*iid*). Explanatory variables are observed under the assumption that they are independent of v_{it}. In case all the independent variables are exogenous to the random individual effects, the use of the random effects model could also be contemplated. On the other side of the coin, the fixed effects model encompasses endogeneity of all the included regressors with the aforementioned individual effects (Mundlak, 1978). Random effects model would be a suitable blueprint if the sample was made out of *N* observations - chosen randomly - from a big population. In this specific research, the Hausman (1978) test (results of which are provided in Appendix E) was relied upon on account of the distinction between the fixed and random effects estimators, and as a result fixed effects estimators are the subsequent choice.

This research made use of Drukker's (2003) robust estimator of the covariance matrix in order to estimate the standard errors that were heteroskedasticity-corrected. This method enables the expansion of the traditional fixed effects model in order to encompass random heteroskedasticity within the groups, and that in turn allows for a more precise process of estimating the standard errors when the variance of residuals is not constant and autocorrelation exists.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Results

The results of the panel data analysis for the three country groupings can be found below. Table 2 showcases the results for the Global data grouping, Table 3 showcases the results for the OECD data grouping, and Table 4 showcases the results for the EU-27 data grouping.

Table 2. Results for the Global Data Grouping

	GLOBAL					
Dependent	LAND Coefficient (St. error)	LAND Coefficient (St. error)	RAW Coefficient (St. error)	RAW Coefficient (St. error)	BWC Coefficient (St. error)	BWC Coefficient (St. error)
const	−0.035*** (-0.01)	−0.019 (-0.013)	−0.362*** (-0.049)	−0.6001*** (-0.079)	−11.198*** (-3.887)	−0.435 (-4.924)
GDPPC	−2.386*** (-2.757)	−5.962*** (-2.983)	−3.443** (-1.358)	−8.931 (-1.8)	0.00029*** (-0.0001)	−0.000201* (-0.0001)
l_EMP	0.022*** (-0.0019)	0.014*** (-0.0024)	0.139*** (-0.0096)	0.178*** (-0.014)	3.284*** (-0.757)	2.293** (-0.909)
FDI	6.749 (-4.152)	5.708 (-4.071)	−0.00087*** (-0.0002)	−0.00021 (-0.00024)	−0.0096 (-0.016)	0.0208 (-0.015)
CC	-0.0013 (-0.0033)		−0.055*** (-0.016)		2.062 (-1.299)	
MONITOR		−0.0008*** (-0.00025)		−0.0027* (-0.0015)		−0.162* (-0.095)
OBSERVATIONS	2985	1364	2985	1364	2985	1364
LSDV R-SQ	0.797588	0.934024	0.85401	0.943199	0.615702	0.803331

The results of the fixed effect panel models used for the analysis of the three datasets start with the global data (detailed regression outputs of the Global data are provided in Appendix F). In terms of land use, both scenarios of the analysis show that GDP per capita significantly and negatively affects land use, indicating more sustainable practices in countries with stronger economies; whereas employment significantly and positively affects the dependent variable. Control of corruption (government effectiveness) or FDI are not shown to have significant relationships with land use on a global scale; however, the monitoring of sustainable tourism does significantly and negatively affect land use, showing the potential of such practices for sustainability efforts. In terms of raw material use, only one of the scenarios shows a significant effect from the GDP per capita variable, whereas both scenarios show strong relationships with employment similar to the results for land use in the global data. Control of corruption and FDI both show significant and negative relationships with material use when analyzed together. The former indicates a decrease in raw material wastefulness by the more effective governments, while the latter indicates that FDI into tourism - a sector that does not heavily rely on raw material use compared to non-service industries - would have a positive effect on sustainable material use as a whole. The monitoring of sustainable tourism, when analyzed in conjunction with FDI, shows a significantly negative relationship with raw material use while causing FDI to become an insignificant variable within the fixed effects model. Lastly for the global data, in terms of blue water consumption, both analysis scenarios showcase significant impacts by GDP per capita and employment, although with an unexpected twist. In the scenario that includes control of corruption as a variable, GDP per capita is positively related to blue water consumption rather than negative. Drastically differing from every other result - including the results from the other two datasets -

in this capacity, it can be theorized that some countries in the global dataset are excessively wasteful of water despite having strong economic bases that would enable more sustainable approaches; and looking at the dataset supports this theory through countries such as the United Arab Emirates. Similar to the results for land use, FDI and control of corruption do not significantly affect blue water consumption one way or the other; whereas the monitoring of sustainable tourism does significantly and negatively affect it.

Table 3. Results for the OECD Data Grouping

	OECD					
Dependent	LAND Coefficient (St. error)	LAND Coefficient (St. error)	RAW Coefficient (St. error)	RAW Coefficient (St. error)	BWC Coefficient (St. error)	BWC Coefficient (St. error)
const	−0.390*** (-0.044)	−0.372*** (-0.043)	−2.992*** (-0.236)	−2.928*** (-0.228)	−48.9002*** (-5.714)	−46.441*** (-5.349)
GDPPC	−5.629*** (-1.242)	−5.129*** (-1.289)	−1.482*** (-2.315)	−1.486*** (-2.384)	−0.00032*** (-5.6)	−0.00029*** (-5.58)
l_EMP	0.097*** (-0.0076)	0.096*** (-0.0078)	0.665*** (-0.0407)	0.667*** (-0.041)	11.4300*** (-0.985)	11.354*** (-0.975)
FDI	0.00027*** (-7.636)	0.00026*** (-7.698)	0.00057 (-0.00041)	0.00054 (-0.00041)	0.0368941*** (-0.0099)	0.033*** (-0.0098)
CC	0.014* (-0.0073)		0.041 (-0.039)		1.141 (-0.96)	
MONITOR		−0.0011*** (-0.00038)		-0.0027 (-0.0021)		−0.259*** (-0.049)
OBSERVATIONS	418	406	418	406	418	406
LSDV R-SQ	0.92432	0.92536	0.926086	0.92626	0.90318	0.909139

Moving onto the fixed effects panel model results for the OECD dataset (detailed regression outputs of the OECD data are provided in Appendix G), both analysis scenarios for land use display a significant relationship for GDP per capita, employment, and FDI. The former affects land use negatively, while the latter two affect it positively. The last of these results indicates that FDI for tourism can trigger land grabs and construction efforts at a massive scale, leading to unsustainable practices for the country. Control of corruption is shown to be a significant but negative factor for land use in OECD, contrary to the monitoring of sustainable tourism which is indicated to cause significant decreases in land use. In terms of raw material use, GDP per capita and employment are significant factors in both analysis scenarios, with the relationships being negative and positive respectively. None of the other three variables - FDI, control of corruption, and monitoring of sustainable tourism - have shown a significant relationship within this particular analysis, indicating a tourism approach largely detached from raw material use within the OECD. Finally, in terms of blue water consumption, the results indicate the exact same situation as the OECD land use results: significant factors are GDP per capita, employment, FDI, and monitoring of sustainable tourism, with the first and the last decreasing blue water consumption while the other two increase it. Control of corruption, as with every other OECD dataset result, shows a lack of significant impact.

Table 4. Results for the EU-27 Data Grouping

	EU-27					
Dependent	LAND Coefficient (St. error)	LAND Coefficient (St. error)	RAW Coefficient (St. error)	RAW Coefficient (St. error)	BWC Coefficient (St. error)	BWC Coefficient (St. error)
const	−0.235*** (-0.029)	−0.292*** (-0.033)	−1.506*** (-0.167)	−2.072*** (-0.204)	−36.620*** (-4.057)	−46.621*** (-4.415)
GDPPC	−5.058*** (-9.978)	−5.473*** (-1.175)	−1.041*** (-2.778)	−1.308*** (-3.674)	−0.000306*** (-6.721)	−0.00028*** (-7.946)
l_EMP	0.0744*** (-0.0067)	0.094*** (-0.0074)	0.430*** (-0.036)	0.590*** (-0.045)	9.678*** (-0.877)	13.240*** (-0.982)
FDI	0.00011*** (-4.157)	9.719** (-4.112)	−0.00075*** (-0.00023)	−0.00081*** (-0.0015)	0.0092 (-0.0056)	0.0117** (-0.0054)
CC	0.022*** (-0.0084)		0.1003** (-0.047)		5.160*** (-1.146)	
PROAREA		−0.00045* (-0.00025)		−0.0039*** (-0.00025)		−0.183*** (-0.032)
OBSERVATIONS	537	511	537	511	537	511
LSDV R-SQ	0.809647	0.822242	0.823313	0.809454	0.816597	0.829069

Lastly, the results for the fixed effects panel model for the EU-27 dataset (detailed regression outputs of the EU-27 data are provided in Appendix H). In terms of land use, every single variable is shown to be a significant factor. GDP per capita has a negative relationship, continuing the trend of strong economies having more sustainable land use practices within the context of tourism. Employment and FDI are displayed as factors that increase land use, unsurprisingly indicating a strong connection between the numbers of workers/workplaces in the tourism industry and the land use within it. Control of corruption is a significantly positive factor towards land use, showing the connection of more effective governance leading to more

economic ventures (and drawing more foreign investment) resulting in an increased land usage for tourism, though at the detriment of sustainability efforts. Increases in protected areas show a correlation with decreases in land use, indicating the establishment and conservation of protected areas as a worthwhile investment for sustainability efforts. The results for raw material use are almost identical to those for land use, with the notable exception of FDI being a negative factor for raw material use. As indicated above, investment in tourism is a lot less raw material intensive than production industries and the like. As for the results of blue water consumption, GDP per capita and employment are again significant with relationships of negative and positive respectively. FDI is only a significant factor when paired with protected areas within the analysis scenario, positively at that. Control of corruption is related in a positive and significant manner, once again indicating a bond between a more effective government and the strength of economic activities, even at the detriment of the environment. As expected, increases in protected areas result in decreased blue water consumption, displaying the connection between sustainability-minded practices and their beneficial impacts on reducing consumer footprint.

GDP per capita, and subsequently economic development, has proven itself to be a mitigating factor in terms of the environmental pressure of the hospitality industry according to the results of this research, therefore Hypothesis 1 is supported. Employment within the hospitality industry did not prove itself to be a mitigating factor in terms of environmental pressure - in fact, it appears to exacerbate the pressure - therefore Hypothesis 2 is supported. The significant relationships of foreign direct investment with the pressure indicators are varied in nature, appearing as a mitigator with raw material use and the opposite with the other two. Though it

does bolster the idea of FDI that is attracted to less resource-intensive industries taking the burden off raw material use, the added pressure towards blue water consumption and land use is a negative impact, thus Hypothesis 3 can only be considered partially supported. Monitoring of sustainability and protected areas are displayed as significant mitigating factors; and control of corruption is a mitigating factor in some parts and the opposite in others, with potential reasons for it being explained above. Governance and policy-making that is specifically environment-focused do prove to be a mitigating influence on the consumption footprint of the hospitality industry, therefore Hypothesis 4 is supported.

5.2 Discussion

The above-mentioned panel data analysis results make it clear that the most important ways of mitigating the consumption footprint of the tourism industry are, unsurprisingly, through the strong design, implementation, and monitoring of sustainability processes - with protected areas being a frontrunner within this aspect. The presence and establishment of protected areas have proven to be extremely valuable difference makers when it comes to ensuring the sustainability of tourism ventures and keeping consumption footprint under control, as their presence heavily influences a decrease in all three consumption footprint metrics this study delves into: land use, raw material use, and blue water consumption. Their importance within tourism has been stated before by the likes of Newsome & Hughes (2016), as protected areas are meant to stem the bleeding of natural resource exploitation by design, and the results of the panel data analysis support such claims. Furthermore, the coefficients of the protected areas variable are not exceptionally high; which implies that while they are a strong tool against the increase of consumption

footprint, they certainly are not enough by themselves to make a significant dent in a country's tourism-based natural resource consumption. Although it is unfortunate that only some countries can be relied upon for enough data on the topic to create a comprehensive dataset, it is nonetheless remarkable to see the impact protected areas can have on the consumption footprint of the tourism industry - even if it is for a non-global sample group.

The sustainable tourism overtures by countries worldwide are also having an effect in combating the overflow of consumption footprint, both globally and within the OECD. Similar to protected areas, this variable also does not boast extraordinarily strong numbers despite the significant effect it has on reducing the three footprint categories this study analyses to some extent. Unlike protected areas, however, this variable encompasses all the sustainable tourism efforts by the countries of the world; therefore, the lack of stronger numbers can be considered a cause for alarm. While not unremarkable by any stretch of the imagination, a stronger statistical effect of sustainable tourism ventures is necessary to be observed if the world wants to make a compelling headway toward dragging the consumption footprint of tourism to more manageable levels. As things stand the way they are right now, it is difficult to imagine that natural resources will be adequately managed or protected by the tourism industry.

As is custom when scrutinizing any avenue of sustainability, one would have to take the competency and effectiveness of the governments that are applying sustainability measures in order to gauge their potential efficiency. The effect of corruption and good governance is alleged to strongly affect tourism related environmental problems (Haseeb et al., 2018). The government effectiveness metric chosen for this study, control of corruption, has not been as strong of a variable as

one might expect despite proving to have a significant relationship with the consumption footprint of tourism in some analysis scenarios. Additionally, within the context of the EU-27, control of corruption has actually shown a positive relationship with consumption footprint. Brainstorming about this phenomenon inside the constraints of the EU-27 and its characteristics; the conclusion that can be reached is that the countries with less corruption and more effective governance partake in bigger economic endeavours (potentially aided by the European Union's economic and trade regulations, as well as the low corruption levels of the countries helping their investment ratings to make them more appealing), resulting in a sharp increase in the resources used for tourism that offsets the benefits less corruption can bring to the mismanagement of consumption footprint.

With the status of foreign direct investment as the instrument that drives tourism development, especially in countries that do not have the industry fully developed yet; it was almost a foregone conclusion that FDI would be a significant factor concerning the increase and decrease of the consumption footprint of tourism. In an interesting twist to this equation, observing the significant relationships of FDI with the three footprint variables demonstrate same-direction increases with land use and blue water consumption, but the contrary for raw material use. The inverse relationship between FDI and raw material use likely stems from the footprint FDI brings through fossil fuels and the like being offset by the reduction it causes towards resource use of non-service industries via the shift it causes within the economic sphere of the recipient country. With the European Union member countries deviating from production-heavy sectors into service-related sectors bit by bit, this particular effect FDI has on the consumption footprint should be more prevalent in the upcoming years.

The effect GDP per capita has on the consumption footprint of tourism is rather straightforward. Most tend to refer to countries with high GDP per capita as more developed and better governed in terms of resource allocation; therefore, it is not much of a surprise that such countries are more successful in designing and implementing countermeasures against rising consumption footprint, as shown by the results of the above analysis. Continuing that train of thought, it is easy to work out the more moderate levels of resource use inside the EU-27 compared to some of the excesses in other parts of the world, as the countries that are a part of this group have a higher-than-average GDP per capita distribution compared to the rest. The variable of employment is similarly straightforward. More tourism employees mean more tourism enterprises, which in turn provides the baseline for increased allocation of resources towards tourism in that country; culminating in a boost towards the consumption footprint of the industry. Combining this with the data from GDP per capita, it can be argued that countries with high numbers in tourism employment - a sector not usually known for high wages, especially at the entry and medium levels - gravitate towards the lower end of the GDP per capita totem pole.

CHAPTER 6

CONCLUSION AND POLICY IMPLICATIONS

6.1 Conclusion

This study utilized the TRECC framework as a theoretical base and employed panel data analysis to the data of consumption footprint within the hospitality industry and the potentially associated factors in order to determine significant relationships; evaluated within groups of Global, EU-27, and OECD. The findings of this research are as follows:

Firstly, GDP per capita has a significant relationship with the consumption footprint of the hospitality industry, for all three of the aforementioned evaluation groups, for all three of the consumption footprint categories (Raw material use, Blue water consumption, Land use). The relationship was significantly negative, implying a rise in consumption footprint per capita as GDP per capita fell. Employment within the industry was also proven to have a significant relationship with all three consumption footprint categories in all three country groupings, though the relationship was positive. Higher employment within the hospitality industry is shown to result in an increase in the consumption footprint as well.

Secondly, government effectiveness (through control of corruption) was revealed to be a significant variable in some cases - relevant in all cases for EU-27, only applicable to raw material for Global, and low significance with land use for OECD. The relationship is positive, and shows that increased government effectiveness is actually detrimental towards sustainability in terms of consumption footprint; though this phenomenon is likely explained by better governance enabling more economic ventures, therefore increasing the consumption footprint of the

hospitality industry. Foreign direct investment is shown to be a significant factor in all three country groupings in some capacity, with the majority of the cases from EU-27 and OECD displaying significant results, in contrast to the Global data which only has one specification that is significant between consumption footprint and FDI. In cases where significance is present, raw material use is negatively related to FDI whereas the other two categories show a positive relation. This implies that FDI facilitates a shift from production-based industries to service industries, granting positive sustainability effects in terms of raw materials but worsening the situation for the other two due to increased economic output.

Lastly, when the sustainability practices employed by the countries involved are analyzed, significantly negative relationships are observed in all three country groupings with the consumption footprint variables. The variables (protected areas for EU-27, monitoring of sustainable tourism for OECD and Global) display significant and negative relationships with the consumption footprint of the hospitality industry in all three country groupings, for all three categories of footprint. This denotes the importance of commitment towards sustainable practices by governments to ensure environmental preservation and keep consumption footprint at manageable levels.

6.2 Policy implications

The results show that the presence of protected areas has a significant influence in mitigating the consumption footprint of the hospitality industry. To that end, efforts should be made by countries for protected areas to be expanded as much as possible within their borders, and additional legislation and/or funding to be directed towards them. Furthermore, hospitality ventures that already exist within the scope of areas

that can be classified as “protected areas” could be decommissioned and relocated, enabling those areas to be utilized for sustainability purposes as intended by legislation. At the bare minimum, the utilization of places that could be classified as protected areas for the purposes of hospitality (or other economic ventures) should be made completely illegal with no exceptions, or at least be greatly limited to a small amount. International cooperation for the designation and creation of protected areas that can encompass multiple sides of a border should also be a matter of interest.

Another factor that proved to be significantly important in curtailing the consumption footprint of the hospitality industry is the monitoring of sustainable tourism. To that end, additional attention should be given to the utilization of related Tourism Satellite Account (TSA) and System of Environmental Economic Accounting (SEEA) tables by policymakers in order to maximize the benefits that could be accrued from them within the hospitality industry. The SEEA in particular delves deep into the relationship of the environment and economic development, taking into account several factors such as the flows of natural resources, and outlining that GDP on its own can be a misleading statistic without control variables. Furthermore, fundamental sustainable tourism practices such as water filtration, recycling management, etc. should become standard rules for all hospitality ventures, and legislation can be drafted to that effect.

Control of corruption, specifically in regard to the hospitality industry, is a notion that needs to be monitored closely as it can affect rent-seeking behaviour within a country - something that can have disastrous consequences on the environmental impact of the hospitality industry if left unchecked. Governance of good quality should seek to uplift all stakeholders including the environment, and

mediocre control of corruption would just lead to policies aimed at profit maximization.

The results of the study show that the growth of GDP per capita in line with the Environmental Kuznets Curve hypothesis does not always necessarily function in major nations. Environmentally conscious economic development is necessary if mitigation of environmental impacts is a focus, as rampant income growth will not magically solve sustainability related issues. To that end, any future legislation or policies concerning the economic development of the hospitality industry should be drafted with environmental preservation as one of the priorities. In regards to foreign direct investment, nations should try to prioritize attracting FDI opportunities that are environmentally conscious rather than solely focusing on economic growth. The composition of foreign direct investment is quite important if the mitigation of environmental impacts is the goal, therefore FDI with a sustainable scope in hospitality areas that are not resource-intensive is preferable. Not curtailing foreign direct investment in regards to environmental impacts can result in the situation deteriorating towards hypotheses such as pollution haven or race to the bottom.

The size of the hospitality industry in any given country, indicated by the employment variable, is connected to the consumption footprint of the industry. The bigger the size of the industry, the bigger the footprint. To that end, initiatives could be undertaken to reduce the size of the industry or at least limit the growth. A philosophy that follows this train of thought is degrowth (Hall, 2009), a strategy that aims to move tourism away from its current avenue of unlimited, reckless growth. Utilizing degrowth as a core philosophy, policy-makers can focus their efforts into limiting the potential damage the industry causes to the environment by keeping growth and development in check. This would also pair well with the aforementioned

focus on environmentally conscious decision making in regards to drafting new legislation, as controlling and limiting the growth of the industry is a common theme for both of these approaches.

Furthermore; while employment within the industry is a significant driver of increased consumption footprint, the way of getting in front of this issue is not through propagating a general loss of employment. The aim of future policy-making about this should be to keep the volume of employees within the industry contained at a reasonable level and apply environmentally responsible employment practices. A way of potentially achieving this is by creating an artificial bottleneck to the number of hospitality businesses that can exist in one place at a time. Very few establishments get full occupancy or even close to it, so legislation and regulations - such as environmentally responsible employment, stringent human resources practices, and more efficient employee training - can be created to limit the opening of hospitality businesses in already saturated areas; and exceptions can be made within the law for areas that are not capable of supporting the incoming guests due to being underdeveloped in terms of hospitality or guest congestion.

CHAPTER 7

LIMITATIONS AND FUTURE RESEARCH

Even though the findings of this research display some key aspects of the consumption footprint of the hospitality industry, there are limitations present within that open up avenues of exploration in terms of further research on the topic. Firstly, this study has some constraints regarding the availability of data in certain timeframes for some of the countries included, early 1990s for Baltic countries as an example. The study encapsulates data from pre-Covid era, and the effect of the pandemic on the consumption footprint can also be studied. Another limitation is the inability of this study to measure all individual aspects of the TRECC framework. If this type of research is conducted within a smaller region compared to the global/international approach of this study, this particular limitation can be overcome. Thirdly, the lack of sector specific data caused the use of generalized proxy variables to measure institutional quality of a country (control of corruption). One last major issue is the absence of data that is specific to the hospitality industry that would enable more concise analysis. Foreign direct investment data was not available in a tourism-specific format, therefore this study resorted to using the overall national data. Similarly, the data to measure the size of the hospitality industry in a given country had to be accrued through employment levels, caused by the lack of sector specific GDP per capita data at a global scale.

APPENDIX A

TOURISM ENVIRONMENTAL IMPACT STUDIES UTILIZING THE DPSIR MODEL

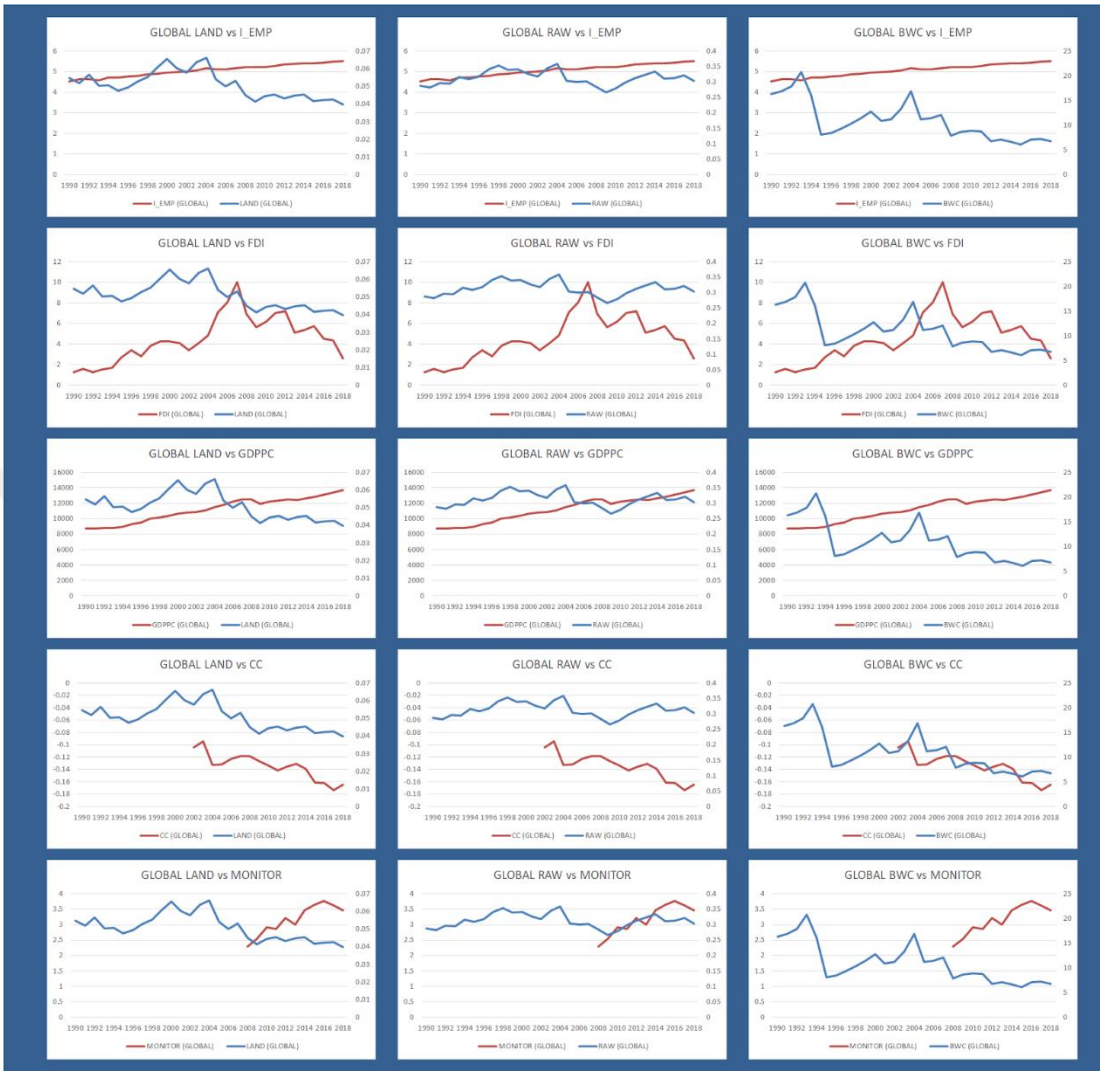
Reference	Impact Indicators/Area of Study	Drivers/Explanatory Variables	Findings
Adiego et al. (2023)	• Changes in land use • Pressures from the surrounding territory for the area's natural resources • Area: Chile	• Growing visitation • Lack of legal framework for PAs • Disjointed public policies for PAs	• Initiatives concerning effective resource management are paramount • PA management needs detailed planning • Improved institutional capacity and local community alliances would have an effect on conservation
Fernández & Rivero (2009)	• Pressure on natural areas • Consumption of urban drinking water attributable to tourism • Urban waste production attributable to tourism • Area: Spain	• Percentage of employees in the hotel restaurant sector • Number of bed places in tourist accommodations per 100 inhabitants • Total annual tourism expenditure	• A structured index for sustainable growth would create more robustness and consistency in planning • Better classification should ensure decision-makers having more usable information
Gao & Cheng (2020)	• Environmental pollution • Land desertification • Area: China	• Government performance • Regional planning	• It is necessary to have flexibility in land use legislation • Planning regarding land use should be scientific • All relevant processes should be closely monitored, including economic restructuring
Hao et al. (2022)	• Water consumption per capita • Solid waste generation • Soot emissions • Area: China	• GDP per capita • Growth rate of tourist arrivals • Tourism revenue growth rate • Tertiary sector growth rate	• Quality government input and economic strength are correlated with ecological protection • Policies regarding the development of ecotourism should be established by governments • The awareness of local communities about ecological protection can

			be raised by improving tourism income
Lin et al. (2023)	• Tourism space index • Population density • Area: China	• GDP per capita • Urbanization rate	• Government interventions are a key factor that significantly impacts the ecological security of tourism • Income levels strongly correlate with tourism ecological security
Liu & Yin (2022)	• Tourism space index • Energy consumption • SO2 and smoke emission • Wastewater discharge • Area: China	• GDP per capita • Growth rate of tertiary industry • Agglomeration degree in the tourism industry	• Coordinated tourism development is much more effective in terms of ecological security • Factors such as governance, environmental protection, and system response-ability are more important than economic ones
Mandic (2020)	• Strengthening or flexibility of the protection system • Negative effects on protected resources • (non)Achievement of the objectives of establishing protection • Area: Global	• Protected area management efficiency • Monitoring • Adaptability of the strategic document and organization structure • Globalization	• Monitoring is critical for the resilience of PAs • Good tourism governance requires a holistic, bottom-up strategic method to succeed • Institutional flexibility and adaptability are required for successful PA management
Mejjad et al. (2022)	• Land occupation and use change • Environmental state • Area: The Mediterranean	• Economic growth • Demographic expansion	• Spatial management planning is critical to curtail land use • Sustainable growth needs strengthened governance in order to succeed
Molina et al. (2023)	• Land use for construction • Land use for economic/recreational activities • River basin regulation • Area: Spain	• Need for growth • Tourism and recreation demand	• Environmental issues need to be characterized properly in order for the correct responses to be applied • The adoption of a well-structured framework would strengthen stakeholder mapping and decision-making

Navarro Jurada et al. (2012)	• Increase in water consumption • Land use changes • Increase of urban solid waste production • Area: Spain	• Increase of the capacity of tourist and residential lodging • Human pressure	• Advanced statistical analysis could be applied towards establishing growth limits • Sustainability should become a development factor rather than something achieved by development
Ruan et al. (2019)	• Water consumption • Soot emissions • Area: China	• GDP per capita • Urbanization rate • Tertiary industry growth rate	• Tertiary industry growth rate has an effect on ecological security • An Imbalance in the supply-demand relationship of tourism will result in an ecological downturn
Xiaobin et al. (2021)	• Water consumption • Sulfur dioxide emissions • Population density • Area: China	• GDP per capita • Tourist growth rate • Tourism income growth rate	• Employment and GDP in regional tourism are important factors in the ecological security of tourism • Policies and governance can create unnecessary agglomeration of tourism, which can prove harmful
Zhang et al. (2023)	• Tourism spatial index • Population density • Emissions from tourism • Area: China	• GDP per capita • Urbanization rate • Natural population growth rate	• Economic development level impacts the ecological sustainability of destinations • Comprehensive policies are necessary for uplifting ecological security

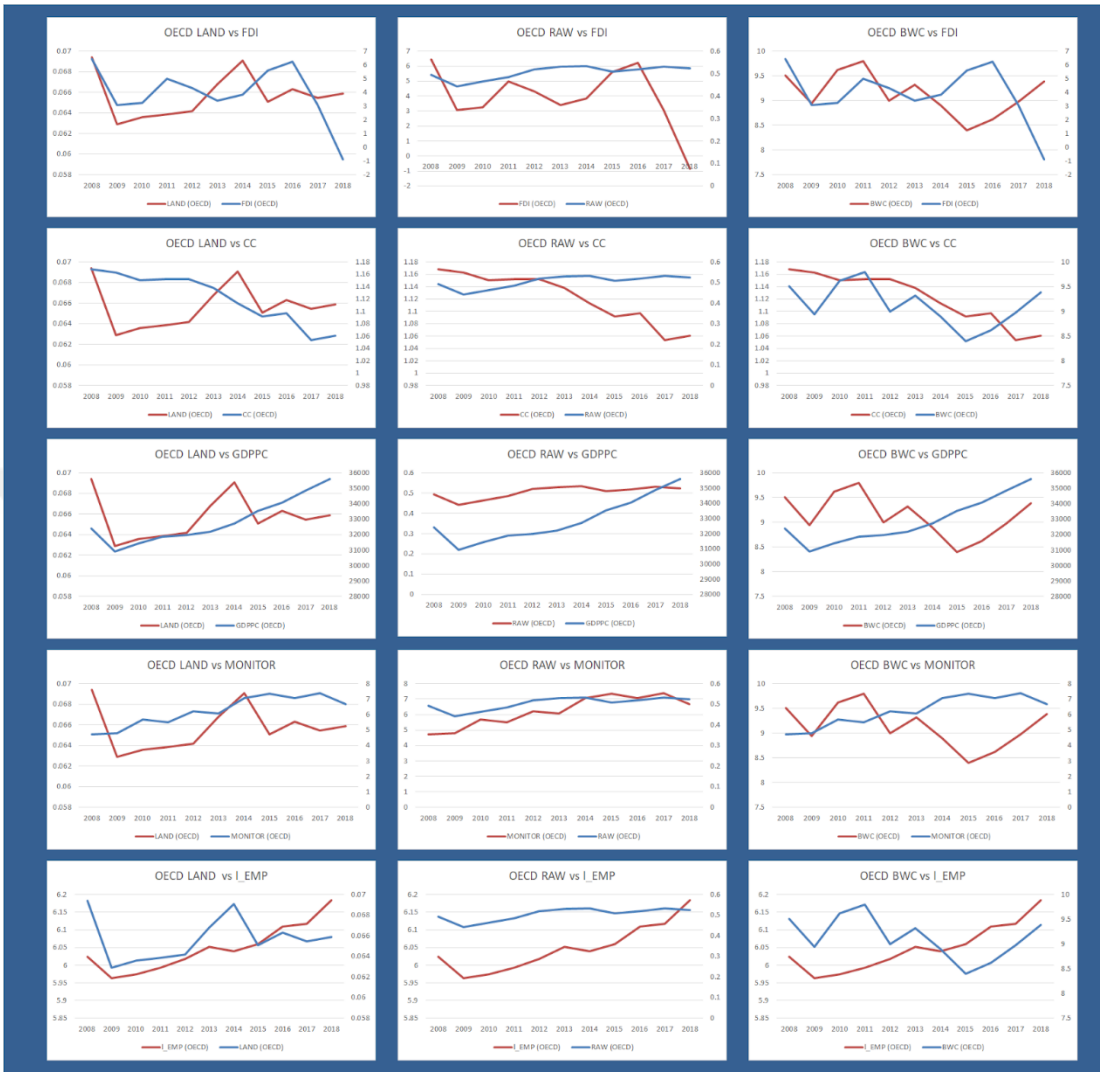
APPENDIX B

GRAPHICS FOR GLOBAL DATA GROUPING



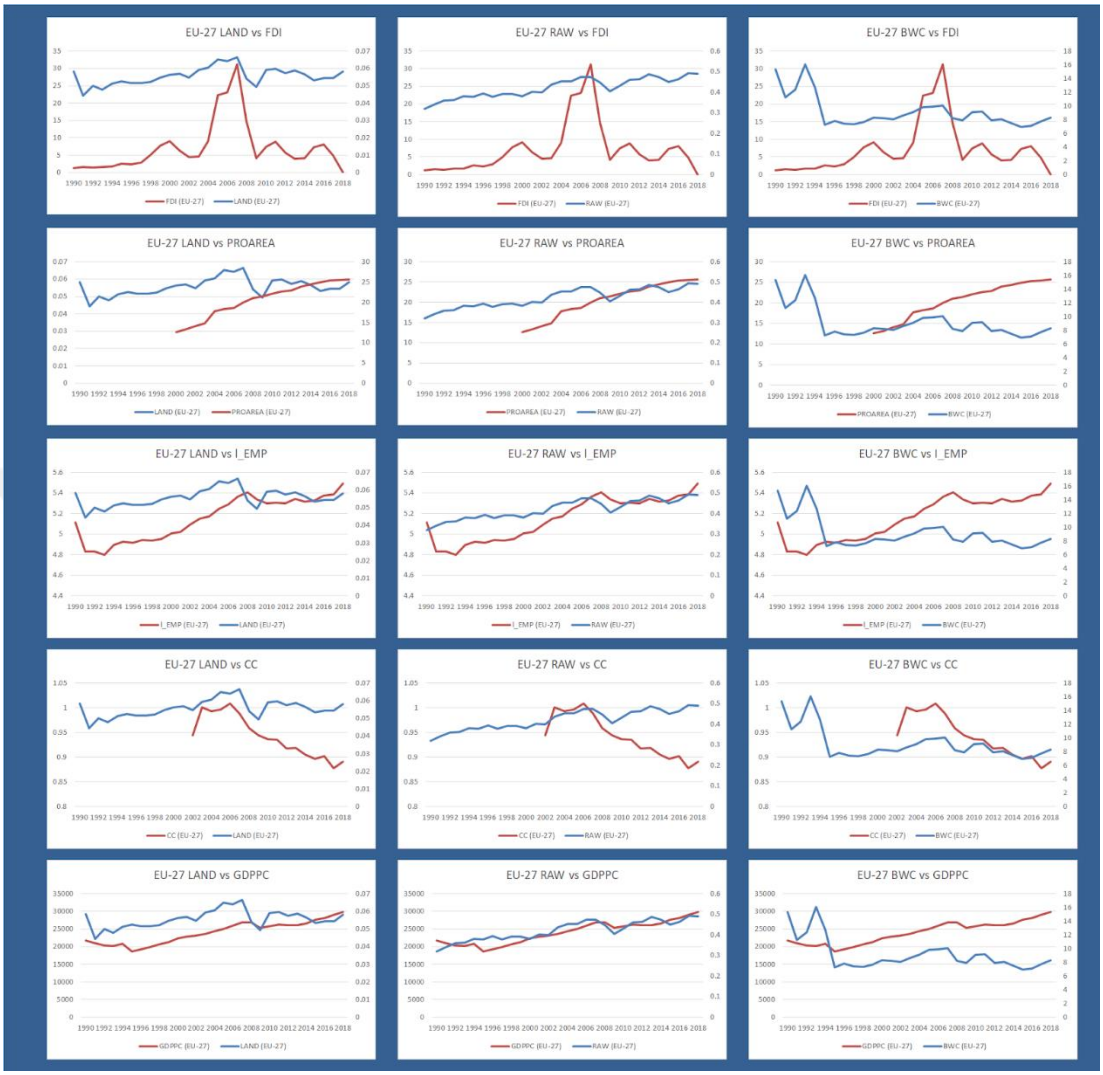
APPENDIX C

GRAPHICS FOR OECD DATA GROUPING



APPENDIX D

GRAPHICS FOR EU-27 DATA GROUPING



APPENDIX E

UNIT ROOT TEST AND HAUSMAN TEST

UNIT ROOT TEST

Dickey-Fuller test for LAND
  with constant and trend
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -2.73466
                10%   5%   1%
Critical values: -2.40   -2.47   -2.61

Choi meta-tests:
  Inverse chi-square(74) = 118.676 [0.0008]
  Inverse normal test = -2.96176 [0.0015]
  Logit test: t(189) = -2.99014 [0.0016]

Dickey-Fuller test for RAW
  with constant and trend
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -2.57217
                10%   5%   1%
Critical values: -2.40   -2.47   -2.61

Choi meta-tests:
  Inverse chi-square(74) = 105.923 [0.0088]
  Inverse normal test = -1.74839 [0.0402]
  Logit test: t(189) = -2.00019 [0.0235]

Dickey-Fuller test for BWC
  with constant and trend
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -2.21742
                10%   5%   1%

Critical values: -2.40 -2.47 -2.61

Choi meta-tests:
Inverse chi-square(74) = 81.3236 [0.2619]
Inverse normal test = -0.0855558 [0.4659]
Logit test: t(189) = -0.102264 [0.4593]

Dickey-Fuller test for GDPPC
with constant and trend
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -5.03282
10% 5% 1%
Critical values: -2.40 -2.47 -2.61

Choi meta-tests:
Inverse chi-square(74) = 275.799 [0.0000]
Inverse normal test = -8.22458 [0.0000]
Logit test: t(189) = -10.2322 [0.0000]

Dickey-Fuller test for l_EMP
with constant and trend
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -2.55281
10% 5% 1%
Critical values: -2.40 -2.47 -2.61

Choi meta-tests:
Inverse chi-square(74) = 109.572 [0.0046]
Inverse normal test = -1.14729 [0.1256]
Logit test: t(189) = -1.27042 [0.1027]

Dickey-Fuller test for FDI
with constant and trend
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e

H0: all groups have unit root

N,T = (37,10)
Im-Pesaran-Shin t-bar = -3.41664
10% 5% 1%

Critical values: -2.40 -2.47 -2.61

Choi meta-tests:
  Inverse chi-square(74) = 171.744 [0.0000]
  Inverse normal test = -6.31128 [0.0000]
  Logit test: t(189) = -6.56013 [0.0000]

HAUSMAN TEST – GLOBAL DATASET

LAND / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 210.431 with p-value = 2.14591e-44
LAND / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 88.8672 with p-value = 2.2915e-18
RAW / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 217.126 with p-value = 7.78699e-46
RAW / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 154.639 with p-value = 2.06232e-32
BWC / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 14.9927 with p-value = 0.00471634
BWC / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 29.5397 with p-value = 6.0725e-06

HAUSMAN TEST – EU-27 DATASET

LAND / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 125.537 with p-value = 3.50361e-26
LAND / PROAREA	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 148.689 with p-value = 3.88667e-31
RAW / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 112.196 with p-value = 2.47455e-23
RAW / PROAREA	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 127.031 with p-value = 1.67985e-26
BWC / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 54.0945 with p-value = 5.02834e-11
BWC / PROAREA	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 68.716 with p-value = 4.23641e-14

HAUSMAN TEST – OECD DATASET

LAND / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 87.3457 with p-value = 4.82143e-18
LAND / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 88.2934 with p-value = 3.03354e-18
RAW / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 182.976 with p-value = 1.71139e-38
RAW / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 180.44 with p-value = 5.99935e-38
BWC / CC	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 84.1149 with p-value = 2.33741e-17
BWC / MONITOR	Hausman test - Null hypothesis: GLS estimates are consistent Asymptotic test statistic: Chi-square(4) = 82.79 with p-value = 4.46366e-17

APPENDIX F

REGRESSION OUTPUTS FOR GLOBAL DATA

GLOBAL – LAND

Model 1: Fixed-effects, using 2985 observations
Included 153 cross-sectional units
Time-series length: minimum 4, maximum 20
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.0356994	0.0100303	−3.559	0.0004	***
GDPPC	−2.38644e-06	2.75717e-07	−8.655	<0.0001	***
l_EMP	0.0222344	0.00195558	11.37	<0.0001	***
FDI	6.74981e-05	4.15225e-05	1.626	0.1042	
CC	−0.00139506	0.00335198	−0.4162	0.6773	

Mean dependent var	0.051186	S.D. dependent var	0.073326
Sum squared resid	3.247497	S.E. of regression	0.033887
LSDV R-squared	0.797588	Within R-squared	0.056854
LSDV F(156, 2828)	71.43278	P-value(F)	0.000000
Log-likelihood	5948.498	Akaike criterion	−11583.00
Schwarz criterion	−10640.78	Hannan-Quinn	−11244.00
rho	0.703813	Durbin-Watson	0.638622

Joint test on named regressors -
Test statistic: F(4, 2828) = 42.6186
with p-value = P(F(4, 2828) > 42.6186) = 9.23429e-35

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(152, 2828) = 44.525
with p-value = P(F(152, 2828) > 44.525) = 0

Model 2: Fixed-effects, using 1364 observations
Included 126 cross-sectional units
Time-series length: minimum 4, maximum 11
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.0192651	0.0131445	−1.466	0.1430	
GDPPC	−5.96257e-07	2.98300e-07	−1.999	0.0458	**
l_EMP	0.0146374	0.00242820	6.028	<0.0001	***
FDI	5.70898e-05	4.07160e-05	1.402	0.1611	

MONITOR	−0.000833310	0.000255460	−3.262	0.0011	***

Mean dependent var	0.049023	S.D. dependent var	0.059598
Sum squared resid	0.319404	S.E. of regression	0.016088
LSDV R-squared	0.934024	Within R-squared	0.036895
LSDV F(129, 1234)	135.4245	P-value(F)	0.000000
Log-likelihood	3765.730	Akaike criterion	−7271.461
Schwarz criterion	−6593.098	Hannan-Quinn	−7017.544
rho	0.453633	Durbin-Watson	0.852265

Joint test on named regressors -
Test statistic: F(4, 1234) = 11.818
with p-value = P(F(4, 1234) > 11.818) = 2.00755e-09

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(125, 1234) = 86.3307
with p-value = P(F(125, 1234) > 86.3307) = 0

GLOBAL – RAW

Model 3: Fixed-effects, using 2985 observations
Included 153 cross-sectional units
Time-series length: minimum 4, maximum 20
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.362587	0.0494384	−7.334	<0.0001	***
GDPPC	−3.44304e-06	1.35898e-06	−2.534	0.0113	**
l_EMP	0.139256	0.00963888	14.45	<0.0001	***
FDI	−0.000877134	0.000204661	−4.286	<0.0001	***
CC	−0.0553619	0.0165216	−3.351	0.0008	***

Mean dependent var	0.324185	S.D. dependent var	0.425565
Sum squared resid	78.89542	S.E. of regression	0.167027
LSDV R-squared	0.854010	Within R-squared	0.079428
LSDV F(156, 2828)	106.0464	P-value(F)	0.000000
Log-likelihood	1187.067	Akaike criterion	−2060.134
Schwarz criterion	−1117.921	Hannan-Quinn	−1721.136
rho	0.683957	Durbin-Watson	0.657411

Joint test on named regressors -
Test statistic: F(4, 2828) = 61.0011
with p-value = P(F(4, 2828) > 61.0011) = 1.70484e-49

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(152, 2828) = 55.4165
with p-value = P(F(152, 2828) > 55.4165) = 0

Model 4: Fixed-effects, using 1364 observations
Included 126 cross-sectional units
Time-series length: minimum 4, maximum 11
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.600181	0.0793166	−7.567	<0.0001	***
GDPPC	−8.93102e-07	1.80000e-06	−0.4962	0.6199	
l_EMP	0.178013	0.0146522	12.15	<0.0001	***
FDI	−0.000214474	0.000245688	−0.8730	0.3829	
MONITOR	−0.00277134	0.00154149	−1.798	0.0724	*

Mean dependent var	0.348337	S.D. dependent var	0.387580

Sum squared resid	11.62995	S.E. of regression	0.097080
LSDV R-squared	0.943199	Within R-squared	0.110456
LSDV F(129, 1234)	158.8438	P-value(F)	0.000000
Log-likelihood	1314.020	Akaike criterion	−2368.041
Schwarz criterion	−1689.678	Hannan-Quinn	−2114.124
rho	0.544088	Durbin-Watson	0.721287

Joint test on named regressors -
Test statistic: F(4, 1234) = 38.3068
with p-value = P(F(4, 1234) > 38.3068) = 2.99354e-30

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(125, 1234) = 85.0237
with p-value = P(F(125, 1234) > 85.0237) = 0

GLOBAL - BWC

Model 5: Fixed-effects, using 2985 observations
Included 153 cross-sectional units
Time-series length: minimum 4, maximum 20
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−11.1987	3.88731	−2.881	0.0040	***
GDPPC	0.000297133	0.000106856	2.781	0.0055	***
l_EMP	3.28476	0.757898	4.334	<0.0001	***
FDI	0.00963279	0.0160924	0.5986	0.5495	
CC	2.06260	1.29908	1.588	0.1125	

Mean dependent var	9.659913	S.D. dependent var	20.62420
Sum squared resid	487776.5	S.E. of regression	13.13321
LSDV R-squared	0.615702	Within R-squared	0.012801
LSDV F(156, 2828)	29.04409	P-value(F)	0.000000
Log-likelihood	−11841.70	Akaike criterion	23997.39
Schwarz criterion	24939.60	Hannan-Quinn	24336.39
rho	0.525632	Durbin-Watson	0.934990

Joint test on named regressors -
Test statistic: F(4, 2828) = 9.16774
with p-value = P(F(4, 2828) > 9.16774) = 2.34011e-07

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(152, 2828) = 24.9896
with p-value = P(F(152, 2828) > 24.9896) = 0

Model 6: Fixed-effects, using 1364 observations
Included 126 cross-sectional units
Time-series length: minimum 4, maximum 11
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.435268	4.92446	−0.08839	0.9296	
GDPPC	−0.000201006	0.000111755	−1.799	0.0723	*
l_EMP	2.29360	0.909699	2.521	0.0118	**
FDI	0.0208557	0.0152538	1.367	0.1718	
MONITOR	−0.162364	0.0957051	−1.697	0.0900	*

Mean dependent var	8.549064	S.D. dependent var	12.93204
Sum squared resid	44829.73	S.E. of regression	6.027337

LSDV R-squared	0.803331	Within R-squared	0.010250
LSDV F(129, 1234)	39.07362	P-value(F)	0.000000
Log-likelihood	−4317.283	Akaike criterion	8894.566
Schwarz criterion	9572.929	Hannan-Quinn	9148.483
rho	0.384565	Durbin-Watson	1.119904

Joint test on named regressors -
Test statistic: F(4, 1234) = 3.19489
with p-value = P(F(4, 1234) > 3.19489) = 0.0127055

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(125, 1234) = 31.153
with p-value = P(F(125, 1234) > 31.153) = 1.86323e-301

APPENDIX G

REGRESSION OUTPUTS FOR THE OECD DATA

OECD- LAND

Model 1: Fixed-effects, using 418 observations
Included 38 cross-sectional units
Time-series length = 11
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.390263	0.0449816	−8.676	<0.0001	***
GDPPC	−5.62938e-06	1.24242e-06	−4.531	<0.0001	***
sq_GDPPC	3.34457e-011	1.15209e-011	2.903	0.0039	***
l_EMP	0.0970734	0.00766605	12.66	<0.0001	***
FDI	0.000277941	7.63647e-05	3.640	0.0003	***
CC	0.0142066	0.00738036	1.925	0.0550	*

Mean dependent var	0.067550	S.D. dependent var	0.059505
Sum squared resid	0.111745	S.E. of regression	0.017262
LSDV R-squared	0.924320	Within R-squared	0.305305
LSDV F(42, 375)	109.0498	P-value(F)	4.7e-184
Log-likelihood	1126.331	Akaike criterion	−2166.661
Schwarz criterion	−1993.136	Hannan-Quinn	−2098.063
rho	0.502732	Durbin-Watson	0.791824

Joint test on named regressors -
Test statistic: F(5, 375) = 32.9611
with p-value = P(F(5, 375) > 32.9611) = 7.26986e-28

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(37, 375) = 82.0496
with p-value = P(F(37, 375) > 82.0496) = 2.01669e-156

Model 2: Fixed-effects, using 406 observations
Included 37 cross-sectional units
Time-series length: minimum 10, maximum 11
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.372169	0.0436930	−8.518	<0.0001	***
GDPPC	−5.12945e-06	1.28958e-06	−3.978	<0.0001	***
sq_GDPPC	2.90439e-011	1.17829e-011	2.465	0.0142	**

l_EMP	0.0965323	0.00781014	12.36	<0.0001	***
FDI	0.000265357	7.69873e-05	3.447	0.0006	***
MONITOR	−0.00112363	0.000389575	−2.884	0.0042	***

Mean dependent var	0.068324	S.D. dependent var	0.060170
Sum squared resid	0.109443	S.E. of regression	0.017340
LSDV R-squared	0.925360	Within R-squared	0.317402
LSDV F(41, 364)	110.0666	P-value(F)	1.1e-179
Log-likelihood	1092.307	Akaike criterion	−2100.615
Schwarz criterion	−1932.348	Hannan-Quinn	−2034.018
rho	0.488389	Durbin-Watson	0.816264

Joint test on named regressors -
Test statistic: F(5, 364) = 33.8514
with p-value = P(F(5, 364) > 33.8514) = 2.23335e-28

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(36, 364) = 86.4488
with p-value = P(F(36, 364) > 86.4488) = 1.12865e-155

OECD- RAW

Model 3: Fixed-effects, using 418 observations
Included 38 cross-sectional units
Time-series length = 11
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−2.99281	0.236273	−12.67	<0.0001	***
GDPPC	−1.48242e-05	2.31583e-06	−6.401	<0.0001	***
l_EMP	0.665700	0.0407631	16.33	<0.0001	***
FDI	0.000571063	0.000413288	1.382	0.1679	
CC	0.0417983	0.0397030	1.053	0.2931	

Mean dependent var	0.514606	S.D. dependent var	0.326778
Sum squared resid	3.291299	S.E. of regression	0.093560
LSDV R-squared	0.926086	Within R-squared	0.416477
LSDV F(41, 376)	114.9022	P-value(F)	5.4e-187
Log-likelihood	419.3213	Akaike criterion	−754.6426
Schwarz criterion	−585.1524	Hannan-Quinn	−687.6396
rho	0.493696	Durbin-Watson	0.733716

Joint test on named regressors -
Test statistic: F(4, 376) = 67.0905
with p-value = P(F(4, 376) > 67.0905) = 8.2825e-43

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(37, 376) = 82.4619
with p-value = P(F(37, 376) > 82.4619) = 4.73878e-157

Model 4: Fixed-effects, using 406 observations
Included 37 cross-sectional units
Time-series length: minimum 10, maximum 11
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−2.92833	0.228645	−12.81	<0.0001	***
GDPPC	−1.48630e-05	2.38493e-06	−6.232	<0.0001	***
l_EMP	0.667000	0.0417029	15.99	<0.0001	***
FDI	0.000545808	0.000419026	1.303	0.1935	
MONITOR	−0.00278009	0.00210508	−1.321	0.1874	

Mean dependent var	0.517552	S.D. dependent var	0.330711
Sum squared resid	3.266303	S.E. of regression	0.094598
LSDV R-squared	0.926260	Within R-squared	0.415059
LSDV F(40, 365)	114.6205	P-value(F)	1.1e-181
Log-likelihood	402.9179	Akaike criterion	−723.8359

Schwarz criterion	−559.5754	Hannan-Quinn	−658.8248
rho	0.492084	Durbin-Watson	0.736070

Joint test on named regressors -
Test statistic: F(4, 365) = 64.7488
with p-value = P(F(4, 365) > 64.7488) = 2.41523e-41

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(36, 365) = 80.5135
with p-value = P(F(36, 365) > 80.5135) = 5.54996e-151

OECD- BWC

Model 5: Fixed-effects, using 418 observations
Included 38 cross-sectional units
Time-series length = 11
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−48.9002	5.71420	−8.558	<0.0001	***
GDPPC	−0.000326181	5.60077e-05	−5.824	<0.0001	***
l_EMP	11.4300	0.985846	11.59	<0.0001	***
FDI	0.0368941	0.00999528	3.691	0.0003	***
CC	1.14192	0.960208	1.189	0.2351	

Mean dependent var	9.429006	S.D. dependent var	6.905168
Sum squared resid	1925.090	S.E. of regression	2.262724
LSDV R-squared	0.903180	Within R-squared	0.273934
LSDV F(41, 376)	85.54835	P-value(F)	3.7e-165
Log-likelihood	−912.3109	Akaike criterion	1908.622
Schwarz criterion	2078.112	Hannan-Quinn	1975.625
rho	0.613031	Durbin-Watson	0.557135

Joint test on named regressors -
Test statistic: F(4, 376) = 35.4647
with p-value = P(F(4, 376) > 35.4647) = 3.83448e-25

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(37, 376) = 67.3544
with p-value = P(F(37, 376) > 67.3544) = 1.07135e-142

Model 6: Fixed-effects, using 406 observations
Included 37 cross-sectional units
Time-series length: minimum 10, maximum 11
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−46.4410	5.34967	−8.681	<0.0001	***
GDPPC	−0.000294932	5.58009e-05	−5.285	<0.0001	***
l_EMP	11.3543	0.975735	11.64	<0.0001	***
FDI	0.0336658	0.00980407	3.434	0.0007	***
MONITOR	−0.259503	0.0492531	−5.269	<0.0001	***

Mean dependent var	9.515498	S.D. dependent var	6.970725
Sum squared resid	1788.082	S.E. of regression	2.213335
LSDV R-squared	0.909139	Within R-squared	0.321941
LSDV F(40, 365)	91.30337	P-value(F)	2.7e-165

Log-likelihood	−877.0458	Akaike criterion	1836.092
Schwarz criterion	2000.352	Hannan-Quinn	1901.103
rho	0.554956	Durbin-Watson	0.663662

Joint test on named regressors -
Test statistic: F(4, 365) = 43.3254
with p-value = P(F(4, 365) > 43.3254) = 9.6083e-30

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(36, 365) = 71.8904
with p-value = P(F(36, 365) > 71.8904) = 3.7059e-143

APPENDIX H

REGRESSION OUTPUTS FOR THE EU-27 DATA

EU27-LAND

Model 1: Fixed-effects, using 537 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 20
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.235240	0.0297598	−7.905	<0.0001	***
GDPPC	−5.05869e-06	9.97857e-07	−5.070	<0.0001	***
sq_GDPPC	3.10054e-011	9.97573e-012	3.108	0.0020	***
l_EMP	0.0744990	0.00672481	11.08	<0.0001	***
FDI	0.000115192	4.15750e-05	2.771	0.0058	***
CC	0.0221115	0.00842795	2.624	0.0090	***

Mean dependent var	0.066381	S.D. dependent var	0.070028
Sum squared resid	0.500337	S.E. of regression	0.031476
LSDV R-squared	0.809647	Within R-squared	0.215296
LSDV F(31, 505)	69.28923	P-value(F)	1.8e-160
Log-likelihood	1111.749	Akaike criterion	−2159.499
Schwarz criterion	−2022.347	Hannan-Quinn	−2105.846
rho	0.491347	Durbin-Watson	0.924758

Joint test on named regressors -
Test statistic: F(5, 505) = 27.711
with p-value = P(F(5, 505) > 27.711) = 8.03584e-25

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 505) = 49.0292
with p-value = P(F(26, 505) > 49.0292) = 2.5865e-120

Model 2: Fixed-effects, using 511 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 19
Dependent variable: LAND

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−0.292518	0.0338426	−8.643	<0.0001	***
GDPPC	−5.47397e-06	1.17552e-06	−4.657	<0.0001	***
sq_GDPPC	2.83139e-011	1.06715e-011	2.653	0.0082	***
l_EMP	0.0948036	0.00749972	12.64	<0.0001	***

FDI	9.71930e-05	4.11244e-05	2.363	0.0185	**
PROAREA	−0.000459134	0.000250207	−1.835	0.0671	*

Mean dependent var	0.067022	S.D. dependent var	0.070662
Sum squared resid	0.452664	S.E. of regression	0.030741
LSDV R-squared	0.822242	Within R-squared	0.262600
LSDV F(31, 479)	71.47331	P-value(F)	1.9e-158
Log-likelihood	1070.826	Akaike criterion	−2077.651
Schwarz criterion	−1942.088	Hannan-Quinn	−2024.506
rho	0.532921	Durbin-Watson	0.844821

Joint test on named regressors -
Test statistic: F(5, 479) = 34.1159
with p-value = P(F(5, 479) > 34.1159) = 7.94561e-30

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 479) = 50.1223
with p-value = P(F(26, 479) > 50.1223) = 5.3033e-119

EU27 – RAW

Model 3: Fixed-effects, using 537 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 20
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−1.50608	0.167740	−8.979	<0.0001	***
GDPPC	−1.04102e-05	2.77844e-06	−3.747	0.0002	***
l_EMP	0.430317	0.0362938	11.86	<0.0001	***
FDI	−0.000754341	0.000234653	−3.215	0.0014	***
CC	0.100300	0.0473790	2.117	0.0347	**

Mean dependent var	0.506363	S.D. dependent var	0.410672
Sum squared resid	15.97203	S.E. of regression	0.177666
LSDV R-squared	0.823313	Within R-squared	0.239089
LSDV F(30, 506)	78.59398	P-value(F)	1.8e-169
Log-likelihood	181.8502	Akaike criterion	−301.7003
Schwarz criterion	−168.8344	Hannan-Quinn	−249.7242
rho	0.557719	Durbin-Watson	0.860164

Joint test on named regressors -
Test statistic: F(4, 506) = 39.748
with p-value = P(F(4, 506) > 39.748) = 5.83842e-29

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 506) = 64.708
with p-value = P(F(26, 506) > 64.708) = 1.0528e-142

Model 4: Fixed-effects, using 511 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 19
Dependent variable: RAW

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−2.07205	0.204149	−10.15	<0.0001	***
GDPPC	−1.30853e-05	3.67435e-06	−3.561	0.0004	***
l_EMP	0.590837	0.0454088	13.01	<0.0001	***
PROAREA	−0.00393443	0.00150326	−2.617	0.0091	***
FDI	−0.000815626	0.000253552	−3.217	0.0014	***

Mean dependent var	0.511786	S.D. dependent var	0.421625
Sum squared resid	17.27521	S.E. of regression	0.189710
LSDV R-squared	0.809454	Within R-squared	0.274307

LSDV F(30, 480)	67.96912	P-value(F)	3.1e-152
Log-likelihood	140.3258	Akaike criterion	−218.6516
Schwarz criterion	−87.32410	Hannan-Quinn	−167.1669
rho	0.650033	Durbin-Watson	0.582656

Joint test on named regressors -
Test statistic: F(4, 480) = 45.3592
with p-value = P(F(4, 480) > 45.3592) = 2.54501e-32

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 480) = 55.9641
with p-value = P(F(26, 480) > 55.9641) = 1.71106e-127

EU27-BWC

Model 5: Fixed-effects, using 537 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 20
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−36.6205	4.05767	−9.025	<0.0001	***
GDPPC	−0.000306957	6.72111e-05	−4.567	<0.0001	***
l_EMP	9.67876	0.877957	11.02	<0.0001	***
FDI	0.00925009	0.00567631	1.630	0.1038	
CC	5.16093	1.14611	4.503	<0.0001	***

Mean dependent var	9.758882	S.D. dependent var	9.750671
Sum squared resid	9346.326	S.E. of regression	4.297790
LSDV R-squared	0.816597	Within R-squared	0.222417
LSDV F(30, 506)	75.09824	P-value(F)	2.0e-165
Log-likelihood	−1529.005	Akaike criterion	3120.010
Schwarz criterion	3252.876	Hannan-Quinn	3171.986
rho	0.573161	Durbin-Watson	0.805170

Joint test on named regressors -
Test statistic: F(4, 506) = 36.1837
with p-value = P(F(4, 506) > 36.1837) = 1.3086e-26

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 506) = 62.7021
with p-value = P(F(26, 506) > 62.7021) = 4.30833e-140

Model 6: Fixed-effects, using 511 observations
Included 27 cross-sectional units
Time-series length: minimum 17, maximum 19
Dependent variable: BWC

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−46.6216	4.41511	−10.56	<0.0001	***
GDPPC	−0.000285589	7.94651e-05	−3.594	0.0004	***
l_EMP	13.2401	0.982054	13.48	<0.0001	***
FDI	0.0117515	0.00548357	2.143	0.0326	**
PROAREA	−0.183896	0.0325110	−5.656	<0.0001	***

Mean dependent var	9.829073	S.D. dependent var	9.627450
Sum squared resid	8080.053	S.E. of regression	4.102858
LSDV R-squared	0.829069	Within R-squared	0.293249
LSDV F(30, 480)	77.60487	P-value(F)	2.0e-163

Log-likelihood	−1430.458	Akaike criterion	2922.916
Schwarz criterion	3054.243	Hannan-Quinn	2974.401
rho	0.587408	Durbin-Watson	0.752295

Joint test on named regressors -
Test statistic: F(4, 480) = 49.7912
with p-value = P(F(4, 480) > 49.7912) = 4.75835e-35

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(26, 480) = 63.8358
with p-value = P(F(26, 480) > 63.8358) = 8.22494e-138

APPENDIX I

SUMMARY STATISTICS

GLOBAL					
	Mean	Median	S.D.	Min	Max
LAND	0.05093	0.02534	0.07592	1.55E-06	0.7552
RAW	0.3131	0.1527	0.4357	6.93E-06	4.688
BWC	10.93	5.258	21.87	0.001223	466.8
GDPPC	11251	3910	15655	189.3	86757
EMP	656.6	136.5	1808	0.01	19219
FDI	4.594	2.208	15.19	-40.09	449.1
CC	-0.1314	-0.4251	1.035	-1.849	2.459
MONITOR	3.162	1	3.611	0	11

EU-27					
	Mean	Median	S.D.	Min	Max
LAND	0.06221	0.04794	0.06369	0.000886	0.4215
RAW	0.4731	0.3999	0.4145	0.01523	3.596
BWC	10.73	6.887	14.06	0.2037	153
GDPPC	24070	20354	14180	3537	72339
EMP	434	156.6	647.1	6.3	3164
FDI	9.223	2.872	33.2	-40.09	449.1
CC	0.9468	0.8956	0.7872	-0.6498	2.459
PROAREA	20.42	18	9.489	3.895	40.74

OECD					
	Mean	Median	S.D.	Min	Max
LAND	0.06568	0.05076	0.05779	0.008372	0.4254
RAW	0.5049	0.4584	0.321	0.07031	2.387
BWC	9.136	7.276	6.479	1.036	38.18
GDPPC	32869	33518	19049	5042	86757
EMP	1332	371.4	2662	12.3	17306
FDI	3.938	2.38	9.125	-40.09	81.25
CC	1.122	1.265	0.8278	-0.9519	2.435
MONITOR	6.23	7	3.346	0	11

REFERENCES

Adiego, A., Vela-Ruiz Figueroa, G., Repetto Giavelli, F., Gale-Detrich, T. (2023). Identification of Causal Chains for Sustainable Tourism Development Within Two Chilean Patagonia National Parks: Cerro Castillo and Torres del Paine. In: Gale-Detrich, T., Ednie, A., Bosak, K. (eds) Tourism and Conservation-based Development in the Periphery. Natural and Social Sciences of Patagonia. Springer, Cham.

Adrianto, L., Kurniawan, F., Romadhon, A., Bengen, D. G., Sjafrie, N. D. M., Damar, A., & Kleinertz, S. (2021). Assessing social-ecological system carrying capacity for urban small island tourism: The case of Tidung Islands, Jakarta Capital Province, Indonesia. *Ocean and Coastal Management*, *212*.

Akhtar, S., & Najar, A. H. (2020). Environmental sustainable practices in the hotels: From existence to implementation. *Ecology, Environment and Conservation*, *26*(1), 111–116.

Bennett, N. J., & Satterfield, T. (2018, November 1). Environmental governance: A practical framework to guide design, evaluation, and analysis. *Conservation Letters*. Wiley-Blackwell.

Bhuiyan, M. A., Paiano, A., & Crovella, T. (2024). Exploring the nexus between economic and environmental issues in the tourism sector at the country level. A replicable framework. *Heliyon*, *10*(5).

Bokpin, G. A. (2017). Foreign direct investment and environmental sustainability in Africa: The role of institutions and governance. *Research in International Business and Finance*, *39*, 239–247.

Casals Miralles, C., Barioni, D., Mancini, M. S., Colón Jordà, J., Boy Roura, M., Ponsá Salas, S., … Galli, A. (2023, October 10). The Footprint of tourism: a review of Water, Carbon, and Ecological Footprint applications to the tourism sector. *Journal of Cleaner Production*. Elsevier Ltd.

Castellani, V., Sala, S., & Pitea, D. (2007). A new method for tourism carrying capacity assessment. *WIT Transactions on Ecology and the Environment*, *106*, 365–374.

Cheng, K., Fu, Q., Meng, J., Li, T. X., & Pei, W. (2018). Analysis of the Spatial Variation and Identification of Factors Affecting the Water Resources Carrying Capacity Based on the Cloud Model. *Water Resources Management*, *32*(8), 2767–2781.

Darimani, A., Akabzaa, T. M., & Attuquayefio, D. K. (2013). Effective environmental governance and outcomes for gold mining in Obuasi and Birim North Districts of Ghana. *Mineral Economics*, *26*(1–2), 47–60.

Drukker, D. M. (2003). Testing for Serial Correlation in Linear Panel-data Models. *The Stata Journal: Promoting Communications on Statistics and Stata*, *3*(2), 168–177.

Duda-Seifert, M., Widawski, K., & Wyrzykowski, J. (2017). Geography of tourism of Poland. In *The Geography of Tourism of Central and Eastern European Countries: Second Edition* (pp. 281–327). Springer International Publishing.

Feng, Y., Xu, J., Lan, Y., Guo, J., Zeng, W., & Cheng, X. (2018). From greedy selection to exploratory decision-making: Diverse ranking with policy-value networks. In *41st International ACM SIGIR Conference on Research and Development in Information Retrieval, SIGIR 2018* (pp. 125–134). Association for Computing Machinery, Inc.

Fernández, J. I. P., & Rivero, M. S. (2009). Measuring tourism sustainability: Proposal for a composite index. *Tourism Economics*, *15*(2), 277–296.

Gani, A., & Scrimgeour, F. (2014). Modeling governance and water pollution using the institutional ecological economic framework. *Economic Modelling*, *42*, 363–372.

Gao, C., & Cheng, L. (2020). Tourism-driven rural spatial restructuring in themetropolitan fringe: An empirical observation. *Land Use Policy*, *95*.

Gössling, S. (2002). Global environmental consequences of tourism. *Global Environmental Change*, *12*(4), 283–302.

Gössling, S., & Peeters, P. (2015). Assessing tourism's global environmental impact 1900–2050. *Journal of Sustainable Tourism*, *23*(5), 639–659.

Gössling, S., Peeters, P., Hall, C. M., Ceron, J. P., Dubois, G., Lehmann, L. V., & Scott, D. (2012). Tourism and water use: Supply, demand, and security. An international review. *Tourism Management*. Elsevier Ltd.

Hall, C. M. (2009). Degrowing Tourism: Décroissance, Sustainable Consumption and Steady-State Tourism. *Anatolia*, *20*(1), 46–61.

Hao, Z., Ye, D., Hui, W., Zenglin, H., & Hongye, W. (2022). An empirical analysis of tourism eco-efficiency in ecological protection priority areas based on the DPSIR-SBM model: A case study of the Yellow River Basin, China. *Ecological Informatics*, *70*.

Haseeb, M., Hassan, S., Azam, M., & Suryanto, T. (2018). The dynamics of governance, tourism and environmental degradation: the world evidence. *International Journal of Global Environmental Issues*, 17(4), 340.

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, *46*(6), 1251–1271.

Hussain, I., Ahmad, E., & Majeed, M. T. (2023). Curvature and turning point of the environmental Kuznets curve in a global economy: the role of governance. *Environmental Science and Pollution Research*, *30*(18), 53007–53019.

Jaz, N. A. A., Habibullah, M. S., Ngah, W. A. S. W., & Kaliappan, S. R. (2023). Does Tourism Lead to Environmental Impact? Cross-National Static and Dynamic Evidence from the Ecological Footprint. *Institutions and Economies*, *15*(2), 115–141.

Khatter, A. (2023). Challenges and Solutions for Environmental Sustainability in the Hospitality Sector. *Sustainability (Switzerland)*. Multidisciplinary Digital Publishing Institute (MDPI).

Li, G., Zhang, Y., Wang, Y., Wang, Y., & Tian, J. (2023). Evaluation and analysis of tourism resources and environmental carrying capacity (TRECC) of 278 cities in China: A pressure-support perspective. *Journal of Cleaner Production*, *420*.

Lin, D., Hanscom, L., Murthy, A., Galli, A., Evans, M., Neill, E., … Wackernagel, M. (2018). Ecological footprint accounting for countries: Updates and results of the national footprint accounts, 2012-2018. *Resources*, *7*(3).

Lin, Y., Zhang, F., Cai, G., Jin, Y., Zhang, L., & Ge, Y. (2023). Spatio-temporal pattern and driving factors of tourism ecological security in Fujian Province. *Ecological Indicators*, *157*.

Liu, D., & Yin, Z. (2022). Spatial-temporal pattern evolution and mechanism model of tourism ecological security in China. *Ecological Indicators*, *139*.

Liu, F., Li, L., Liang, G., Huang, L., & Gao, W. (2022). National water footprints and embodied environmental consequences of major economic sectors-a case study of Japan. *Structural Change and Economic Dynamics*, *60*, 30–46.

Mandić, A. (2020). Structuring challenges of sustainable tourism development in protected natural areas with driving force–pressure–state–impact–response (DPSIR) framework. *Environment Systems and Decisions*, *40*(4), 560–576.

Mejjad, N., Rossi, A., & Pavel, A. B. (2022, October 1). The coastal tourism industry in the Mediterranean: A critical review of the socio-economic and environmental pressures & impacts. *Tourism Management Perspectives*. Elsevier B.V.

Molina, R., Di Paola, G., Manno, G., Panicciari, A., Anfuso, G., & Cooper, A. (2023). A DAPSI(W)R(M) framework approach to characterization of environmental issues in touristic coastal systems. An example from Southern Spain. *Ocean and Coastal Management*, *244*.

Moosa, I. A., & Burns, K. (2022). The Energy Kuznets Curve: Evidence from Developed and Developing Economies. *Energy Journal*, *43*(6), 47–70.

Mundlak, Y. (1978). On the Pooling of Time Series and Cross Section Data. *Econometrica*, *46*(1), 69.

Nathaniel, S. P., & Adedoyin, F. F. (2022). Tourism development, natural resource abundance, and environmental sustainability: Another look at the ten most visited destinations. *Journal of Public Affairs*, *22*(3).

Navarro Jurado, E., Tejada Tejada, M., Almeida García, F., Cabello González, J., Cortés Macías, R., Delgado Peña, J., … Solís Becerra, F. (2012). Carrying capacity assessment for tourist destinations. Methodology for the creation of synthetic indicators applied in a coastal area. *Tourism Management*, *33*(6), 1337–1346.

Newsome, D., & Hughes, M. (2016). Understanding the impacts of ecotourism on biodiversity: a multi- scale, cumulative issue influenced by perceptions and politics. *Handbook on Biodiversity and Ecosystem Services in Impact Assessment*, 276-298.

Nuss, P., Sanyé-Mengual, E., & Sala, S. (2023). Monitoring the consumption footprint of countries to support policy-making: An assessment of data availability in Germany. *Journal of Industrial Ecology*, *27*(5), 1354–1369.

OECD. (2023). Protected Areas [Data Set]. https://stats.oecd.org/Index.aspx?DataSetCode=PROTECTED_AREAS

Our World in Data. (2023). GDP per capita [Data Set]. https://ourworldindata.org/grapher/gdp-per-capita-worldbank

Our World in Data. (2023). Monitoring of Sustainable Tourism [Data Set]. https://ourworldindata.org/grapher/implementation-of-tools-to-monitor-economic-and-environmental-tourism

Ozturk, I., Al-Mulali, U. & Saboori, B. (2016). Investigating the environmental Kuznets curve hypothesis: the role of tourism and ecological footprint. Environmental Science and Pollution Research, 23(2), 1916–1928.

Pan, H., Dong, L., & Sun, R. (2023). Study on the environmental effects of two-way foreign direct investment in China's service industry. *Indoor and Built Environment*, *32*(8), 1592–1605.

Pásková, M., Wall, G., Zejda, D., & Zelenka, J. (2021). Tourism carrying capacity reconceptualization: Modelling and management of destinations. *Journal of Destination Marketing and Management*, *21*.

Phumalee, U., Phongkhieo, N. T., Emphandhu, D., & Bejranonda, S. (2018). Touristic ecological footprint in Mu Ko Surin National Park. *Kasetsart Journal of Social Sciences*, *39*(1), 1–8.

Ruan, W., Li, Y., Zhang, S., & Liu, C. H. (2019). Evaluation and drive mechanism of tourism ecological security based on the DPSIR-DEA model. *Tourism Management*, *75*, 609–625.

Schönherr, S., Peters, M., & Kuščer, K. (2023). Sustainable tourism policies: From crisis-related awareness to agendas towards measures. *Journal of Destination Marketing and Management*, *27*.

SCP-HAT. (2022). A brief guide for users. https://scp-hat.org/wp-content/uploads/2021/11/Sustainable-Consumption-and-Production-Hotspots-Analysis-Tool-_SCP-HAT_-A-brief-guide-for-users_final-Nov.21.pdf

SCP-HAT. (2023). Module 2 Hotspot Identification [Data Set]. https://scp-hat.org/module-2-scp-hotspots/

Shimizu, T., & Okamoto, H. (2024). Tourism infrastructure and the environment: how does environmental regulation affect welfare, tourism industry, and domestic wage inequality? *Japanese Economic Review*, *75*(1), 147–179.

Sirilersuang, P., & Pongkijvorasin, S. (2018). Dynamic optimal joint policies for tourism promotion and environmental restoration. *Environmental Economics and Policy Studies*, *20*(2), 261–286.

Soylu, Ö. B., Adeleye, B. N., Okur, F., & Emikönel, M. (2023). Tourism and FDI-Growth Nexus in Upper-Middle Income Countries: Evidence from Static and Dynamic Panel Analyses. *Tourism*, *71*(1), 162–177.

The World Bank, World Development Indicators (2024). *Foreign Direct Investment* [Data Set]. https://databank.worldbank.org/source/world-development-indicators#

The World Bank, World Governance Indicators. (2024). *Control of Corruption* [Data Set]. https://databank.worldbank.org/source/worldwide-governance-indicators#

Tian, K., Li, M., Hu, W., Fan, Y., Huang, B., & Zhao, Y. (2022). Environmental capacity of heavy metals in intensive agricultural soils: Insights from geochemical baselines and source apportionment. *Science of the Total Environment*, *819*.

Voukkali, I., Papamichael, I., Loizia, P., & Zorpas, A. A. (2023). The importance of KPIs to calibrate waste strategy in hospitality sector. *Energy Nexus*, *11*.

Wang, S., Hu, Y., He, H., & Wang, G. (2017). Progress and prospects for tourism footprint research. *Sustainability (Switzerland)*. MDPI.

Wang, Y., Zhang, J., Wang, C., Yu, Y., Hu, Q., & Duan, X. (2021). Assessing tourism environmental psychological carrying capacity under different environmental situations. *Asia Pacific Journal of Tourism Research*, *26*(2), 132–146.

Xiaobin, M., Biao, S., Guolin, H., Xing, Z., & Li, L. (2021). Evaluation and spatial effects of tourism ecological security in the Yangtze River Delta. *Ecological Indicators*, *131*.

Xiong, C., Khan, A., Bibi, S., Hayat, H., & Jiang, S. (2023). Tourism subindustry level environmental impacts in the US. *Current Issues in Tourism*, *26*(6), 903–921.

Xu, A., Wang, C., Tang, D., & Ye, W. (2022). Tourism circular economy: Identification and measurement of tourism industry ecologization. *Ecological Indicators*, *144*.

Zelenka, J., & Kacetl, J. (2014). The concept of carrying capacity in tourism. *Amfiteatru Economic*, *16*(36), 641–654.

Zhang, F., Jiang, C., Ma, D., Yang, X., Xiao, Y., & Tan, H. (2023). Evaluation of tourism ecological security based on DPSIRM-SBM model and its temporal–spatial evolution characteristics. *Environment, Development and Sustainability*.

Zhang, Z., Hu, B., & Qiu, H. (2022, May 1). Comprehensive evaluation of resource and environmental carrying capacity based on SDGs perspective and Three-dimensional Balance Model. *Ecological Indicators*. Elsevier B.V.