

## ANALYSIS OF THE *TOURISM - ENVIRONMENT* RELATIONSHIP FROM AN ECONOMETRIC PERSPECTIVE; CASE STUDY: EUROPEAN COUNTRIES

Simona Ghita<sup>52</sup>

<https://doi.org/10.31410/itema.2018.118>

---

**Abstract:** *The upward trend of the tourism industry and its impact on the global economy is in contradiction with the degradation of the environment and the intensification of global warming. Therefore, naturally, one question arises: are tourism and environment allies or enemies? The right of mankind and the economic interest, must surpass the right of nature to survival? Statistical data reveal promising developments in the tourism sector and its contribution to the global economy. According to the report “Travel & Tourism, Economic impact 2018, World”, the total contribution of Travel & Tourism industry in 2017 reached 10.4% of GDP, with a 4% estimated increase in 2018. The effect of this industry on global employment is also a positive one, providing directly over 118 million jobs (3.8% of total employment). Taking into account indirect impact as well, the travel & tourism industry provides over 313 million jobs, meaning that one in 10 jobs worldwide is supported by this industry. In a world where increasing opportunities to ensure a large number of quality jobs is more and more important, tourism is seen as a catalyst for human development. On the other hand, mankind faces an increase in the average global temperature of 1 Celsius degree compared to the pre-industrial period, specialists drawing attention that there is a real danger of worsening this situation. In this context, the present paper aims at analyzing the two-way relationship between tourism and environment, base on a panel of statistical and econometric methods. Thus, data covering the last 10 years, provided by EUROSTAT for the 28 countries of the European Union are analyzed. The set of indicators is focused on three main pillars: Tourism pillar, Environmental Pillar and Economy and digital economy background Pillar. The statistical analysis of the data set includes Descriptive statistics tools, Principal Component Analysis, non-parametric statistical tests and statistical correlation and regression.*

**Keywords:** *Tourism demand, Sustainable tourism, Principal Component Analysis, Non-parametric test, Statistical regression and correlation*

---

### 1. INTRODUCTION. TRENDS IN TOURISM DEVELOPMENT IN EUROPEAN COUNTRIES

The enhancement of the globalization process, the development of infrastructure and information technology have given a significant boost to international tourism, which in 2017 recorded the highest increase in the last 7 years in terms of international tourist arrivals (1326 million arrivals, 7% increase compared to the previous year). Of these, Europe has just over 50%, followed by the Asia and Pacific Region (24%) and the Americas (16%). Europe is also witnessing an increase in international tourist arrivals above average (8% increase) [1]. According to the report “Travel & Tourism, Economic impact 2018, World”, the total contribution of Travel & Tourism industry in 2017 reached 10.4% of GDP, with a 4%

---

<sup>52</sup> Department of Statistics and Econometrics, The Bucharest Academy of Economic Studies, 15-17 Calea Dorobantilor, 010552, Bucharest, Romania

estimated increase in 2018. The effect of this industry on global employment is also a positive one, providing directly over 118 million jobs (3.8% of total employment). Taking into account indirect impact as well, the travel & tourism industry provides over 313 million jobs, meaning that one in 10 jobs worldwide is supported by this industry. [2] Europe holds the first two places in a world tourism destinations top, with France ranking the first (almost 87 million arrivals in 2017) and Spain ranking the second (almost 82 million arrivals in the same year). Italy, United Kingdom and Germany rank the 5<sup>th</sup>, the 7<sup>th</sup> and the 9<sup>th</sup> in the same world top [1].

Along with the decline in environmental quality as a result of human activities, concern for the sustainable side of tourism activity has grown [3]. Thus, there has been an increase in ecological tourism, tourist arrivals in ecological-type accommodation establishments having increased by almost 20% compared to 2008, reaching 84 million arrivals in 2017. During this period, there has been a steady, continuous increase in the indicator level, although it was more pronounced at the beginning of the period, before the global economic and financial crisis and more attenuated over the last two years (Figure 1). Analyzing the impact of human activities on the environment, we will consider the amount of waste generated and the greenhouse gas emissions. Thus, unfortunately, the amount of waste generated has not improved favorably over the past 14 years; there was a decline in the total amount of waste generated, but not a significant sustainable decline. With regard to the greenhouse gas emissions, there is a steady and continuous decline, even though still low, from 8436 kg per capita in 2008 to 6913 kg per capita in 2016 (for all economic activities). In accommodation and food service activities the greenhouse gas emissions decreased from 43 kg per capita in 2008 to 36.4 kg per capita in 2016 (Figure 2), with 2% average annual decrease.

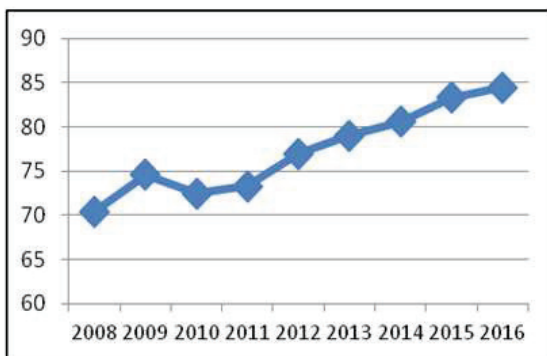


Figure 1: Tourists' arrivals in camping grounds, recreational vehicle parks and trailer parks (millions) 2008-2016 in EU28

Source: authors' contribution, based on EUROSTAT data

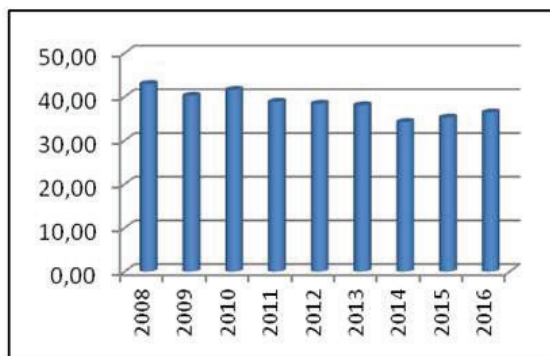


Figure 2: Greenhouse gases emissions in accommodation and food service activities (kg/inhabitant), 2008-2016, in EU28 (millions)

The average expenditures per trip have increased between 2012 and 2016, reaching 432.66 Euro. Luxembourg and Switzerland are the top two countries in Europe (with over 800 Eur on average per trip), followed by Austria and Belgium (over 600 Eur on average per trip). In this top, Romania ranks the second last (with an average of 125 Eur per trip), preceded by Latvia (with an average of 124 Eur per trip). The increase in the number of tourist arrivals was accompanied by the increase of the employed population in this sector. Thus, in the last 10 years, the number of employees in accommodation and food service activities has increased from 9408 thousand persons (2008) to 10973 thousand persons (2017), respectively by 1.72% on average per year. At the same time, the number of low-educated employees decreased, increasing the number of those with upper secondary and post-secondary non-tertiary

education, but also of those with tertiary education. This has led to an increase in the quality of tourism services and has determined, to a certain extent, the expansion of this sector.

## 2. DATA AND METHODOLOGY

The analysis aims at answering the following question: Is there a tendency towards the sustainable tourism component? What are the main determinants? In order to study the relationship between the tourism activity and the natural environment and to identify the main factors that favor sustainable tourism, a set of seven variables has been selected to accurately illustrate three pillars: *Tourism pillar, Environmental Pillar and Economy and digital economy background Pillar*. The values of the selected variables were provided by EUROSTAT, covering 28 European countries (2016). Table 1 describes the variables, as follows:

Table 1: List of variables explained [4]

Variable	Pillar	Significance
Tourists' arrivals in camping grounds, recreational vehicle parks and trailer parks (number, 2016) ( <i>Arrivals_camping</i> )	Tourism Pillar	Arrivals of residents and non-residents at ecological accommodation units, like: camping grounds, recreational vehicle parks and trailer parks
Employed persons with tertiary education in accommodation and food service activities (thousand), 2016 ( <i>Employed_accomodation_tertiary</i> )		Number of people employed in accommodation and food service activities, with tertiary education (ISCED levels 5-8)
Average expenditure per trip (Eur), 2016 ( <i>Average_expenditure_per_trip</i> )		Consumption expenditure made by a visitor or on behalf of a visitor for and during his/her trip and stay at destination (average per trip)
Greenhouse gases (in CO2 equivalent) in accommodation and food service activities, 2016 (kg per capita) ( <i>GHG_accomodation_food</i> )	Environmental Pillar	Greenhouse gases emissions (CO2, N2O in CO2 equivalent, CH4 in CO2 equivalent) in accommodation and food service activities
Generation of waste (kg per capita) 2016 ( <i>Waste</i> )		Quantity of substances or objects discarded, generated by economic activities or by households.
GDP - Percentage of EU28 total (based on million euro), current prices, 2016 ( <i>GDP_percent_EU28</i> )	Economy and digital economy Pillar	The share of Gross Domestic Product at market prices of a country, out of the total EU28 indicator level.
Level of internet access - households (%) 2016 ( <i>Internet_access</i> )		Percentage of households who have internet access at home (all types of internet use, people aged 16-74).

Analyzing the correlation between the selected variables, there are strong correlations between „Arrivals in camping grounds, recreational vehicle parks and trailer parks”, „Tertiary employment in accommodation and food service activities” and GDP (values between 0.78 and 0.86 of the correlation coefficients) (Figure 3 a), b)). Also, Average expenditures per trip are moderately correlated with Internet Access level, on the one hand, and GHG emissions in accommodation and food service activities on the other hand.

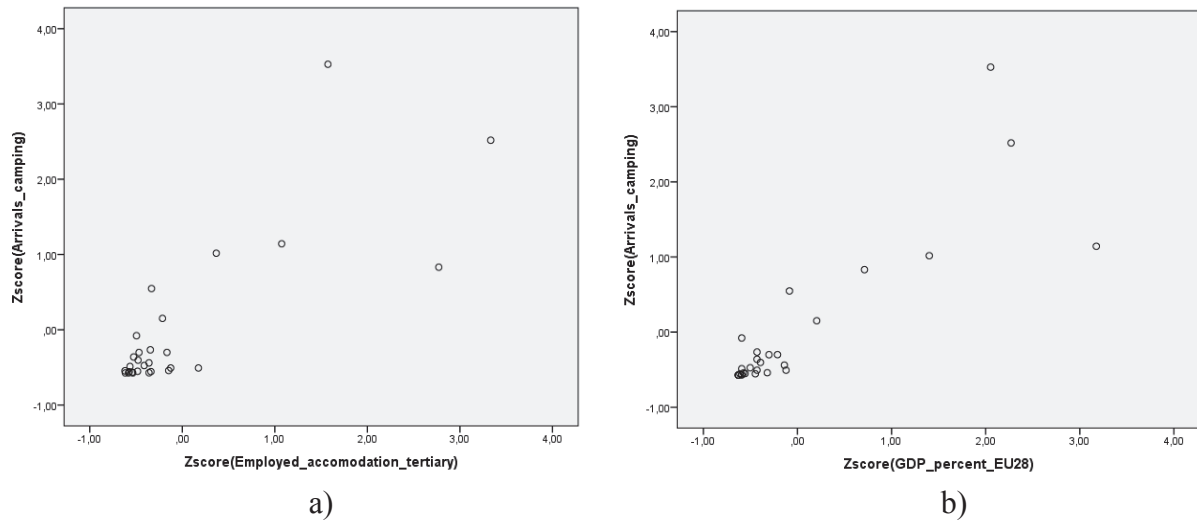


Figure 3: The correlation between Arrivals in camping grounds, recreational vehicle parks and trailer parks and Tertiary employment in accommodation and food service activities (a) and Arrivals in camping grounds, recreational vehicle parks and trailer parks and GDP (b)

Source: Authors' processing, based on EUROSTAT data, SPSS ver. 20

Since the variables analyzed have different measurement units, absolute or relative, they have been standardized. In the first step of the analysis, a reduction of the initial data set was performed, identifying a limited number of key components (factors) that retained an important share of the variability of the data. For this purpose, the Principal Component Analysis method (PCA) was applied. The opportunity, the adequacy of applying the PCA method was analyzed using the Kaiser-Meyer-Olkin Measure (KMO) and the Bartlett's Test of Sphericity. The KMO measure is 0.728, Significance level Sig. <0.05, allowing the method to be continued. Based on Initial Eigenvalues there were extracted three main components (factors), which explained more than 80% of the total variability in the data set (the first component explains 39.55%; the second component explains 22.24% and the third component explains 18.76% of the variability). (Tables 2 and 3).

Table 2: Factor contribution to the total variability

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,984	42,634	42,634	2,984	42,634	42,634	2,769	39,553	39,553
2	1,637	23,387	66,021	1,637	23,387	66,021	1,557	22,238	61,790
3	1,017	14,526	80,547	1,017	14,526	80,547	1,313	18,757	80,547
4	,626	8,936	89,484						
5	,386	5,519	95,002						
6	,217	3,100	98,102						
7	,133	1,898	100,000						

Extraction Method: Principal Component Analysis.

Source: Authors' processing, based on EUROSTAT data, SPSS ver. 20

Analyzing the factor loadings that explain the correlation between each individual variable and each factor, one can observe that the first component is strongly positively correlated to GDP, Arrivals in camping grounds, recreational vehicle parks and trailer parks and Tertiary employment in accommodation and food services. The second component is strongly positively

correlated to Average expenditures per trip and to Greenhouse gases emissions in accommodation and food service activities, while the third component is strongly positively correlated to Waste generated and moderately correlated to Internet access level:

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	,728
Approx. Chi-Square	80,166
Bartlett's Test of Sphericity df	21
Sig.	,000

Table 3: KMO and Bartlett's Test of Sphericity

	Rotated Component Matrix*		
	Component		
	1	2	3
Zscore(Arrivals_camping)	,943		
Zscore(GDP_percent_EU28)	,927	,159	
Zscore(Employed_accomodation_tertiary)	,913		
Zscore(Average_expenditure_per_trip)		,821	,306
Zscore(GHG_accomodation_food)	,181	,815	-,168
Zscore(Waste)	-,174		,865
Zscore(Internet_access)	,347	,424	,660

Table 4: Rotated Component Matrix

Source: Authors' processing, based on EUROSTAT data, SPSS ver. 20

*Communalities* table reveals the highest influence of the three factors on GDP, Arrivals in camping grounds, recreational vehicle parks and trailer parks and Tertiary employment in accommodation and food services, the main components explaining more than 80% of the variability of these variables. After applying the factor rotation procedure, the three main components extracted have the following structure (Table 4):

- the 1<sup>st</sup> component includes the variables: GDP, Arrivals in camping grounds, recreational vehicle parks and trailer parks and Tertiary employment in accommodation and food services; it was named Ecological tourism and its resources (financial, human resources)
- the 2<sup>nd</sup> component includes the variables: Average expenditure per trip and the Greenhouse gases emissions in accommodation and food service activities. It was named Financial and environmental trip costs.
- the 3<sup>rd</sup> component includes the following variables: Internet Access level and Waste generated and it was named Environment Pollution and technology. (Figures 4 and 5)

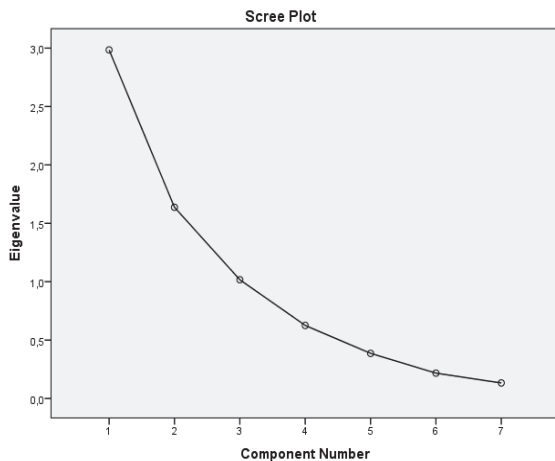


Figure 4: Scree Plot

Source: authors' contribution, using SPSS 20, based on EUROSTAT data.

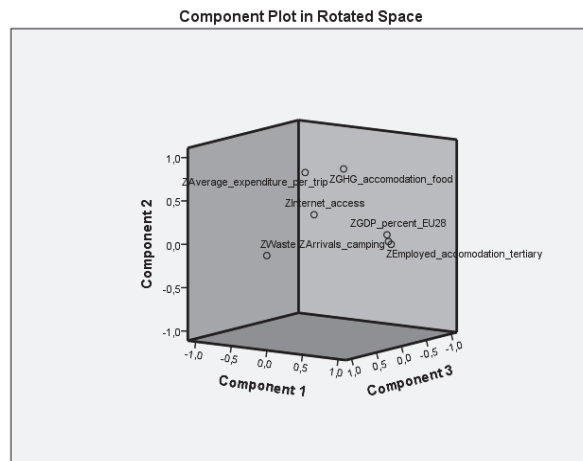


Figure 5: Component Plot in Rotated Space

Based on the estimated factor scores and the component score coefficient matrix provided, the three main factor regression equations are:

$$FS_{(1st\ comp.)} = 0,356 \cdot Zscore(Arrivals\_camping) + 0,348 \cdot Zscore(Employed\_accomodation\_tertiary) - 0,117 \cdot Zscore(Average\_expenditure\_per\_trip) - 0,051 \cdot Zscore(GHG\_acomodation\_food) - 0,029 \cdot Zscore(Waste) + 0,339$$



$$\cdot Zscore_{(GDP\_percent\_EU28)} + 0,097 \cdot Zscore_{(Internet\_access)} \quad (1)$$

$$FS_{(2nd\ comp.)} = - 0,078 \cdot Zscore_{(Arrivals\_camping)} - 0,091 \cdot Zscore_{(Employed\_acomodation\_tertiary)} + 0,548 \cdot Zscore_{(Average\_expenditure\_per\_trip)} + 0,602 \cdot Zscore_{(GHG\_acomodation\_food)} - 0,188 \cdot Zscore_{(Waste)} - 0,020 \cdot Zscore_{(GDP\_percent\_EU28)} + 0,138 \cdot Zscore_{(Internet\_access)} \quad (2)$$

$$FS_{(3rd\ comp.)} = 0,032 \cdot Zscore_{(Arrivals\_camping)} - 0,039 \cdot Zscore_{(Employed\_acomodation\_tertiary)} + 0,093 \cdot Zscore_{(Average\_expenditure\_per\_trip)} - 0,282 \cdot Zscore_{(GHG\_acomodation\_food)} + 0,707 \cdot Zscore_{(Waste)} + 0,022 \cdot Zscore_{(GDP\_percent\_EU28)} + 0,467 \cdot Zscore_{(Internet\_access)} \quad (3)$$

The second part of the analysis has focused on identifying the main factors and their influence on the *Arrivals in camping grounds, recreational vehicle parks and trailer parks* (the *explained variable*). Among these factors, the variable: *Tertiary employment in accommodation and food services* was selected as *explanatory variable* and a rank-based non-parametric test: the Kruskal-Wallis test was applied. The analysis aims at identifying if the educational attainment level of employment in tourism activities determines significant differences in the tourists' arrivals at ecological types of accommodation establishments, for European countries. The following hypotheses were formulated:

*H<sub>0</sub>: the educational attainment level of employment in tourism activities does not have a significant influence on the tourists' arrivals at ecological accommodation establishments.*

*H<sub>1</sub>: the educational attainment level of employment in tourism activities has a significant influence on the tourists' arrivals at ecological accommodation establishments.*

According to the results of the analysis performed, there are sufficient reasons to reject the null hypothesis and to accept the alternative one, at 95% confidence level, therefore it is expected that the tourists' arrivals in ecological types of accommodation establishments (like campings, recreational vehicle parks and trailer parks) significantly differ based on the educational level of employment in touristic activities (Table 5).

Ranks			
	Tertiary empl tourism	N	Mean Rank
Arrivals_camping	low	12	9,92
	moderate	11	14,27
	high	5	26,00
	Total	28	

a)

Test Statistics <sup>a,b</sup>	
	Arrivals_camping
Chi-Square	13,510
df	2
Asymp. Sig.	,001

b)

Table 5: Results of Kruskal-Wallis Test (a) Ranks; (b) Test Statistics

Source: Authors' processing, based on EUROSTAT data, SPSS ver. 20

### 3. CONCLUSIONS

In a world of globalization, characterized by an increase in the information flow, the touristic movement to various destinations is also stimulated. This phenomenon has positive effects on world GDP growth, the combined contribution of direct and indirect effects of tourism reaching 10.4% of GDP. The positive effect of tourism is, however, countered to a certain extent by the negative effect on the environment, which is why, in the last period, there has been an increasing emphasis on the practice of sustainable, environmentally friendly tourism [5][6]. In this context,

there is an increasing interest of tourists for ecological tourist destinations, for ecological tourist services, close to nature.

Our study addresses the sustainable aspect of tourism, studying the inclination for sustainable tourism in European countries through economic variables grouped on 3 pillars: a pillar targeting the tourism activity, a pillar that focuses on the quality of the environment and a pillar that targets the economic framework of the European countries. Following the statistical analysis, the 7 variables studied were reduced to 3 main components, which kept more than 80% of the variation in the initial data set: a component that captures the demand for ecological tourism, but also the need for high quality human resources from an educational point of view; a component that includes the financial resources needed to support travel, but also the effects of greenhouse gas emissions on environmental quality; a component that captures the waste generation and the accessibility of tourism information, by developing information technology.

The quality of human resources in the tourism sector (reflected by the indicator *Employed persons with tertiary education in accommodation and food service activities*) has had a significant impact on tourists' arrivals at ecological types of accommodation establishments, meaning that tourists are guided in choosing their destination by the quality of services in this area. This can be a way of optimizing the demand for ecological tourism services.

The authors intend to continue the research in the future, by identifying other factors that will boost the demand for ecological tourism, as well as by quantifying these influences.

## REFERENCES

- [1] UNWTO (2018) *Tourism Highlights – 2018 Edition*, pp. 2-9.
- [2] World Travel&Tourism Council (2018) *Travel&Tourism Economic Impact 2018 – World Travel&Tourism, Economic Impact 2018, World*. pp. 2-4, 7-10.
- [3] Bricker, K. (2015) *Trends and Issues for Ecotourism & Sustainable Tourism*, The International Ecotourism Society, pp. 8-13.
- [4] EUROSTAT, <https://ec.europa.eu/eurostat>.
- [5] Mancini M.S., Evans M.C., Iha K., Galli, A., Danelutti C. (2018) Assessing the Ecological Footprint of Ecotourism Packages: A Methodological Proposition. *Resources* 2018, 7(2), 38; doi:[10.3390/resources7020038](https://doi.org/10.3390/resources7020038), pp. 7.
- [6] Ghita, SI; Saseanu, AS; Gogonea, RM; Huidumac-Petrescu, CE (2018) Perspectives of Ecological Footprint in European Context under the Impact of Information Society and Sustainable Development; in *Sustainability*, 10( 9), 3224 DOI: 10.3390/su10093224; SEP 2018, pp. 20-21.