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TOURISM COMPETITIVENESS, ENVIRONMENTAL QUALITY AND CIRCULAR ECONOMY: A PANEL APPROACH

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Abstract
Tourism as an important sector of the economy has significant impact on the GDP in certain countries. Tourism expenditure is a generator of employment and wealth in the whole economy, not only in tourism. Tourism has a positive impact on economic growth and development, but it can have a negative impact on the environment. With the increasing competition in the global tourism market, research on sustainability and competitiveness in tourism is attracting increasing attention. Environmental protection is one of the essential prerequisites for improving tourism competitiveness. Tourists are more likely to visit tourism destinations of high environmental quality. Circularity can be essential in increasing environmental protection. The purpose of this paper is to analyse the impact of Sustainable Development Goals (SDGs) and circular economy on tourism competitiveness. The analysis was conducted for 27 European Union countries during the period 2014-2023. The results indicate that the impact of Sustainable Development Goals on tourism competitiveness depends on the level of circular economy indexes. In European Union countries with lowest level of circular economy indexes, the Sustainable Development Goals have significant impact on tourism competitiveness while in European Union countries with highest level of circular economy indexes, the Sustainable Development Goals have not significant impact on tourism competitiveness.
Keywords: *Tourism industry, circular economy, environment, competitiveness, SDGs, EU-27.*
JEL Classification: Z32, Q56

1. INTRODUCTION

Tourism is an important sector of the world economy, as it significantly contributes to the growth of the GDP of certain countries. Despite the positive effects recorded on the economic and social level, there are also negative external effects that tourism generates on the environment through the degradation of air,

soil and water. The tourism industry is a large consumer of resources and a generator of waste.

Tourism is one of the most developed sectors in the world. The World Travel and Tourism Council predicts that by 2026 the tourism industry will reach 10.8% of world GDP (Khizar *et al*., 2023). Although it brings significant economic benefits, tourism is a water- and energy-intensive sector, as well as a sector that generates waste and wastewater, but it is also one of the largest contributors to global greenhouse gas (GHG) emissions (Zorpas *et al*., 2021; Kaszás *et al*., 2022; Caponi, 2022). GHG emissions originating from tourism are estimated to represent approximately 8% of the global value, and alarmingly, are expected to triple by 2050 (Koçak *et al*., 2024; Peeters *et al*., 2024). According to Pablo-Romero *et al*. (2023), the link between tourism and GHG emissions should be attributed to the energy intensity of the sector, which comes from transport, commercial activities and ancillary services. Also, tourism has a significant impact on waste generation, as tourists generate twice as much waste as residents (Rodríguez *et al*., 2020). Regarding wastewater, tourism contributes about 7% to water pollution in the Mediterranean basin (UNEP, 2003). Considering that it is the largest global tourist destination that attracts almost one third of the world's foreign tourists, its popularity is predicted to grow exponentially (Lanquar, 2011). According to the EU Green Deal, the green transition in tourism needs to reduce global emissions by 55% by 2030 (European Commission, 2021).

Bearing in mind that the linear business model prevails in tourism, this has a negative effect on the growth of tourism and the economy, but also on its resilience and sustainability. The circular economy offers a possible solution for mitigating the environmental externalities of the tourism industry to make tourism more sustainable by reducing environmental, social and economic effects. The role of the circular economy in tourism is emphasized by the possibility of achieving all the sustainable development goals (SDGs) directly and indirectly.

Circularity as a strategic approach applied in the tourism sector implies minimizing its impacts on the environment, including waste and pollution, as well as CO2 emissions. Integrating the principle of circularity into business aims to improve the efficiency of resources in the tourism value chain so that the tourism sector accepts a sustainable and resilient path of development.

The introduction of a circular economy can contribute to competitiveness in tourism, not only in terms of opportunities for innovation, differentiation and diversification of revenue streams, but also governments and investors are increasingly committed to environmental, social, and governance (ESG) policies.

For tourism destinations, the circular economy contributes to tourism's positive impact on sustainable development, creating benefits for local populations through the creation of new jobs and more inclusive local value chains. For tourists, the circular economy encourages a change in their behaviour.

That is why the UN supports numerous initiatives aimed at a circular economy in tourism within the Global Tourism Plastics Initiative, the Global Roadmap for Food Waste Reduction in Tourism, as well as the Glasgow Declaration on Climate Action in Tourism, which aims to halve emissions in the next decade and reach net zero emissions by 2050.

The purpose of this paper is to analyse the impact of Sustainable Development Goals (SDGs) and circular economy on tourism competitiveness. The aim of this paper is to analyse whether the level of development of circular economy contributes to the impact of Sustainable Development Goals (SDGs) on tourism competitiveness.

2. THEORETICAL BACKGROUND

There are numerous scientific studies on the mutual influence of the circular economy, environmental quality and competitiveness in tourism. One part of the authors dealt with the relationship between the circular economy and tourism, while the other part dealt with the relationship between the quality of the environment and tourism.

There are numerous long-term socio-economic trends that affect the players of the tourism industry, both on the supply side and on the demand side. These trends highlight the growing need for innovation, sustainability, health and safety performance and cost optimization as important elements of competitiveness in the coming years (Einarsson and Sorin, 2020).

A study by Erdiaw-Kwasie *et al.* (2023) based on the analysis of time series data for 14 EU member states in the period 2000-2020 showed that the promotion of circular innovative practices, including recycling and the use of secondary raw materials in tourist destinations, can improve the quality of the environment and positively affect tourism revenues. They investigated how the transition to a circular economy has effects on tourism revenues. The results showed that increasing competitiveness and innovation in the circular economy drive circularity in the tourism industry across Europe. The authors believe that institutions play a significant role in the implementation of circular economy initiatives in the tourism sector. This study provides policy and practical suggestions for innovation in the circular economy, such as policy makers needing to implement and monitor the implementation of a strict environmental framework, investing more in waste reduction, promoting reusable packaging, recycling tourism waste and using secondary raw materials. Also, policy makers should consider heterogeneous country-specific effects when implementing tourism strategies based on circularity and use circular economy standards as part of the regulatory framework.

Gabor *et al.* (2023) investigated the total, direct and indirect effects of the several independent variables on the dependent variable (municipal waste) in the case of 30 European countries. The main conclusions are that, on the one hand,

the increase in the average stay/arrivals/nights of tourists and the decrease in the rank of tourism competitiveness (from the last to the first) has a negative impact on waste management and environmental pollution. On the other hand, the improvement of circular economy indicators (renewable resource consumption and rate of circular use of materials) has a positive impact on waste management and environmental pollution in European countries. They concluded that the paradigm shifts and transition from a linear to a circular economy requires consumer awareness of the role they play in promoting the principles of circularity, and in the field of tourism, hotels and tourist destinations can even be promoted as living labs of the circular economy. They propose a paradigm shift in terms of business goals, because the focus should not be on waste reduction, but on the renewal and use of certain materials, thus promoting the principles of a circular economy.

The concept of circular tourism economy is reinforced due to the importance of the tourism industry in certain European countries, considering the efforts of public authorities to promote the circular economy and the transition to a low-carbon economy (Rodríguez *et al.*, 2020). Strippoli *et al.* (2024) investigated circular economy (CE) strategies applicable in the tourism industry with reference to the management of plastic waste, food waste and wastewater. They believe that in addition to the 4R strategy (reduce, reuse, recycle, and recover), more strategies should be developed and promoted. Based on the review, the authors found that CE strategies that are effective from a social, environmental and economic point of view in tourism management are those related to mitigating GHG emissions, reducing waste, increasing revenue while reducing costs.

Environmental protection becomes an essential prerequisite for achieving a sustainable competitive advantage and an integral part of proactive management of the tourism industry (Bacoș and Gabor, 2021). In addition to positive economic and social effects, negative externalities are generated by tourism because tourism is a carbon-intensive industry, so there are many scientific studies on the relationship between the development of this sector and the CO2 emissions generated by specific activities (Leitão and Lorente, 2020, Sharif *et al*., 2020a, Campos *et al*., 2021, Pata and Balsalobre-Lorente, 2022). Also, tourism generates water and soil pollution, which is why it is a highly discussed topic in scientific literature on the impact of tourism on the ecological footprint (Sinha *et al*., 2020; Ghosh *et al*., 2022).

Robaina *et al*. (2020) based on data for five European countries shows the correlation between air quality and tourist demand. They also specify the impact that the tourism industry has on air quality in the mentioned countries. Research conducted by Ciarlantini *et al*. (2022) shows indirect links between economic development and air quality. Bacoș and Gabor, (2022) claim that there is a causal relationship between macroeconomic indicators and quality, i.e. air pollution.

3. RESEARCH METHODOLOGY

The study deploys data for the period from 2014 to 2023 of 27 European Union members. Regression analysis has examined the impact of the circular economy and environmental quality on the tourism competitiveness of observed countries. Reliability issues are governed by using Breusch-Pagan test for testing the heteroscedasticity as well as Durbin Watson test and Breusch-Godfrey LM test for testing the autocorrelation. Research information base has included the data about number of tourists, circular material use rate and employees in circular economy sectors from Eurostat Database (The World Bank, 2014-2023) as well as data about sustainable development goals from World Development Indicators (World Bank). In the paper special attention was paid to the Sustainable Development Goals: Goal 1 (G1) – No poverty, Goal 2 (G2) – Zero hunger, Goal 3 (G3) – Good health and well-being, Goal 4 (G4) – Quality education, Goal 5 (G5) – Gender equality, Goal 6 (G6) – Clean water and sanitation, Goal 7 (G7) – Affordable and clean energy, Goal 8 (G8) – Decent work and economic growth, Goal 9 (G9) – Industry, innovation and infrastructure, Goal 10 (G10) – Reduced inequalities, Goal 11 (G11) – Sustainable cities and communities, Goal 12 (G12) – Responsible consumption, Goal 13 (G13) – Climate action, Goal 15 (G15) – Life on land, Goal 16 (G16) – Peace, justice and strong institutions and Goal 17 (G17) – Partnerships for the goals.

4. RESULTS AND DISCUSSION

Based on cluster analysis an investigation is conducted of the heterogeneity of the observed countries. The results of cluster analysis highlighted four clusters for 2014 (Table 1). The following countries belong to the first cluster: France, Germany, Italy, Poland and Spain. The observed cluster recorded the highest average values of circular material use rate and employed in circular economy sectors in 2014. The observed cluster recorded about 481 employees in circular economy sectors and about 13 circularity rates (the ratio of the circular use of materials to the overall material use).

The following countries belong to the second cluster: Bulgaria, Czechia, Hungary, Netherland, Portugal and Romania. The observed cluster recorded about 121 employees in circular economy sectors and about 7,6 circularity rates (the ratio of the circular use of materials to the overall material use).

The following countries belong to the third cluster: Austria, Belgium, Croatia, Denmark, Finland, Greece, Latvia, Lithuania, Slovenia and Sweden. The observed cluster recorded about 58 employees in circular economy sectors and about 6,9 circularity rates (the ratio of the circular use of materials to the overall material use).

The fourth cluster includes Cyprus, Estonia, Ireland, Luxemburg, Malta and Slovenia, i.e. the countries that recorded the lowest average value of circular material use rate and employees in circular economy sectors.

For 2023, the results of cluster analysis highlighted four clusters (Table 2). The same countries belong to the first cluster or cluster with the highest average values of circular material use rate and employees in circular economy sectors. These countries recorded the highest level of achievement of sustainable development goals. In 2023, the average level of achievement of the sustainable development goals of these countries is about 0,9.

Table 1. Members of Cluster and Distances from Cluster Center (2014)

Cluster 1		Cluster 2		Cluster 3		Cluster 4	
Members	Distances	Members	Distances	Members	Distances	Members	Distances
C_10	11.7748	C_3	16.66344	C_1	4.63155	C_5	6.34429
C_11	128.8088	C_6	5.54225	C_2	7.94548	C_8	4.42326
C_15	11.1539	C_13	16.63926	C_4	1.67094	C_14	13.14062
C_21	5.744	C_20	20.60490	C_7	10.47199	C_18	7.24226
C_26	79.5876	C_22	12.18513	C_9	8.69996	C_19	6.72500
		C_23	54.79322	C_12	14.57070	C_25	3.03885
				C_16	13.35494		
				C_17	3.315507		
				C_24	1.86400		
				C_27	13.17657		

Source: (Authors based on data, STATA 19)

Bulgaria, Denmark and Latvia recorded a worsening of their position compared to 2014. In 2023, Bulgaria belongs to the third cluster while Denmark and Latvia belong to the fourth cluster. Estonia recorded an improvement in its position compared to 2014. In 2023, it belongs to the third cluster. The fourth cluster includes Cyprus, Denmark, Finland, Ireland, Latvia, Luxemburg, Malta and Slovenia, i.e. the countries that recorded the lowest average value of circular material use rate and employees in circular economy sectors. In 2023, the average level of achievement of the sustainable development goals of these countries is about 0,8.

Table 2. Members of Cluster and Distances from Cluster Center (2023)

Cluster 1		Cluster 2		Cluster 3		Cluster 4	
Members	Distances	Members	Distances	Members	Distances	Members	Distances
C_10	4.9691	C_6	2.66144	C_1	3.84625	C_5	10.27093
C_11	170.1279	C_13	18.24382	C_2	8.62526	C_7	9.51061
C_15	17.3454	C_20	22.13791	C_3	18.56132	C_9	10.37397
C_21	85.0182	C_22	13.47114	C_4	3.70045	C_14	6.83366
C_26	72.8329	C_23	45.55780	C_8	11.97459	C_16	3.96190
				C_12	6.11443	C_18	5.00132
				C_17	7.30182	C_19	16.47545
				C_24	3.24577	C_25	1.12884
				C_27	6.91871		

Source: (Authors based on data, STATA 19)

Regression results after correction of heteroscedasticity and autocorrelation problems are given in Table 3 and Table 4. The heteroscedasticity is checked through Breusch-Pagan test while Durbin Watson test and Breusch-Godfrey LM test are used for testing the autocorrelation.

The results of regression analysis indicate that sustainable development goals have significant impact on tourism competitiveness in the EU member states with the lowest level of circular economy indexes (Table 3). Results indicate that G1, G4, G5, G8, G10, G11, G15 and G16 have significant impact on tourism competitiveness of EU members. Achieving the goals of sustainable development such as no poverty, quality education, gender equality, sustainable economic growth, sustainable cities and communities, protect, restore and promote sustainable use of terrestrial ecosystems and promote peaceful and inclusive societies for sustainable development has significant impact on tourism competitiveness of EU members with lower level of development of circular economy. The results of regression analysis indicate that sustainable development goals do not have a significant impact on tourism competitiveness of the EU member states with the highest level of circular economy indexes (Table 4).

Table 3. The impact of achieving sustainable development goals on tourism competitiveness of EU member states with the lowest level of circular economy indexes

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Iteration 37:  rho = 0.9775
Iteration 38:  rho = 0.9775
Iteration 39:  rho = 0.9775
Iteration 40:  rho = 0.9775
Iteration 41:  rho = 0.9775

Cochrane-Orcutt AR(1) regression -- iterated estimates
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Source	SS	df	MS	Number of obs	=	72
				F(16, 55)	=	5.45
Model	108.273591	16	6.76709947	Prob > F	=	0.0000
Residual	68.25147	55	1.24093582	R-squared	=	0.6134
				Adj R-squared	=	0.5009
Total	176.525062	71	2.48626847	Root MSE	=	1.114

Tourists	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
G1	7.903901	2.434534	3.25	0.002	3.024986	12.78282
G2	4.033625	2.485037	1.62	0.110	-.9465006	9.013752
G3	-6.09478	6.242738	-0.98	0.333	-18.60551	6.415946
G4	4.204952	1.921454	2.19	0.033	.3542719	8.055632
G5	-4.713887	1.565893	-3.01	0.004	-7.852006	-1.575768
G6	-1.182435	4.992458	-0.24	0.814	-11.18754	8.822674
G7	1.796596	3.226064	0.56	0.580	-4.668581	8.261772
G8	7.564186	2.464104	3.07	0.003	2.626011	12.50236
G9	4.301102	2.417264	1.78	0.081	-.5432044	9.145408
G10	.7537223	2.143288	0.35	0.726	-3.541523	5.048968
G11	-3.744923	1.722499	-2.17	0.034	-7.196887	-.292959
G12	-1.412972	2.45051	-0.58	0.567	-6.323903	3.49796
G13	-1.133637	1.381026	-0.82	0.415	-3.901274	1.634
G15	-6.449829	3.121937	-2.07	0.044	-12.70633	-.1933274
G16	-5.088228	2.474008	-2.06	0.044	-10.04625	-.1302049
G17	-4.044051	2.719448	-1.49	0.143	-9.493948	1.405845
_cons	12.73261	14.13568	0.90	0.372	-15.59592	41.06114
rho	.9774759					

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Durbin-Watson statistic (original)    0.506548
Durbin-Watson statistic (transformed) 2.003520
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Source: (Authors based on data, STATA 19)

Table 4. The impact of achieving sustainable development goals on tourism competitiveness of EU member states with the highest level of circular economy indexes

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Iteration 55:  rho = 0.8484
Iteration 56:  rho = 0.8484
Iteration 57:  rho = 0.8484

Cochrane-Orcutt AR(1) regression -- iterated estimates
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Source	SS	df	MS	Number of obs	=	45
				F(16, 28)	=	2.08
Model	22161.5201	16	1385.09501	Prob > F	=	0.0436
Residual	18656.0028	28	666.285814	R-squared	=	0.5429
				Adj R-squared	=	0.2818
Total	40817.5229	44	927.670976	Root MSE	=	25.813

Tourists	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
G1	55.61265	91.46385	0.61	0.548	-131.7426	242.9679
G2	24.22332	66.09231	0.37	0.717	-111.1606	159.6073
G3	11.21266	142.7971	0.08	0.938	-281.2939	303.7192
G4	-72.5609	55.84033	-1.30	0.204	-186.9446	41.82282
G5	-46.10409	70.74952	-0.65	0.520	-191.0279	98.81972
G6	110.0399	108.3882	1.02	0.319	-111.9833	332.0631
G7	93.03479	79.91344	1.16	0.254	-70.66047	256.73
G8	84.34182	71.88879	1.17	0.251	-62.9157	231.5993
G9	78.507	90.31416	0.87	0.392	-106.4932	263.5072
G10	-38.71311	46.4922	-0.83	0.412	-133.9481	56.52184
G11	48.26808	47.61331	1.01	0.319	-49.26337	145.7995
G12	21.99409	56.75462	0.39	0.701	-94.26247	138.2506
G13	-53.88152	47.39882	-1.14	0.265	-150.9736	43.21055
G15	-206.3843	113.9665	-1.81	0.081	-439.834	27.06547
G16	64.1385	93.00593	0.69	0.496	-126.3755	254.6525
G17	-53.05645	81.85513	-0.65	0.522	-220.7291	114.6162
_cons	-43.8925	130.5035	-0.34	0.739	-311.2168	223.4318
rho	.8483618					

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Durbin-Watson statistic (original)    0.930541
Durbin-Watson statistic (transformed) 1.748191
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Source: (Authors based on data, STATA 19)

5. CONCLUSION

Tourism is one of the most developed activities in the world. It has positive social, economic and cultural effects. But it causes the emission of greenhouse gases, creates difficulties in waste management and represents a higher consumer of resources. The circular economy can be a possible solution to mitigate these externalities (Strippoli *et al*., 2024).

Using a time series dataset from 27 selected European countries from 2014 to 2023, we investigated the effects of a circular economy and Sustainable Development Goals on tourism competitiveness. The results of research indicate

that the impact of Sustainable Development Goals on tourism competitiveness depends on the level of circular economy indexes. The Sustainable Development Goals have significant impact on tourism competitiveness in European Union countries with lowest level of circular economy indexes.

The findings of this study have important policy implications. First, the application of the circular economy in tourism should be increased. Second, by reducing environmental problems in tourism destinations, circular economy initiatives can help improve tourism competitiveness in countries with lowest level of circular economy indexes. Third, achieving the goals of sustainable development can contribute to increasing tourism competitiveness.

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