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## Tourism and Biodiversity Loss: Implications for Business Sustainability

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### Abstract

The purpose of this study is to investigate the impact of tourism on biodiversity loss in a sample of 141 countries. In the analysis, we measure tourism using the numbers of international tourist arrivals, while biodiversity loss is proxy using the numbers of threatened species – birds, fishes, mammals and plants. We also include GDP per capita, population growth, protected areas, and crop production, which act as the control variables. We find that using robust standard error estimator the number of international tourist arrivals, population growth rate, protected areas and crop production increases the numbers of threatened species, while GDP per capita reduces the numbers of threatened species. One policy implication of this study is that since businesses in the tourism industry depend on the very existence of biodiversity, then biodiversity conservation should become the essential factor for business sustainability.

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## 1. Introduction

According to the World Tourism Organization (WTO, 2002), tourism is activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes. Tourism has been described as one of the world's largest industry and creator of jobs across the world (UN, 1999). It has been recognized that the tourism sector can be an important driver of economic growth by contributing foreign exchange earnings, increasing wealth and provides employment and business opportunities for the communities. In 2014, travel and tourism contribute 9.8 per cent to world's gross domestic product (GDP) and create 276.8 million jobs in the world-wide economy or contribute 9.4 per cent of the world's total employment (WTTC, 2015). Tourism is considered an export industry in which foreign tourists who travel abroad purchase goods and services with money from their home countries and we observed that visitors' exports contributed 5.7 per cent of worldwide exports of goods and services. Other than this, the travel and tourism industry had contributed 4.3 per cent of global capital investment.

In 2014, the tourism sector, in terms of international tourist arrivals has reached a record 1133 million arrivals worldwide; with USD1245 billion in international tourism receipts (UNWTO, 2015). International tourism receipts are the earnings generated in destination countries from expenditure on accommodation, food and drink, local transport, entertainment, shopping and other services and goods. Europe share the largest number of international tourist arrival (581.8 million) followed by Asia and the Pacific (263.3 million), the Americas (181.0 million), Africa (55.7 million) and the Middle East (51.0 million). In terms of the average long-term growth (2005-2014), the Asia and the Pacific recorded a 6.1 per cent growth in international tourist arrivals, followed by Africa (5.4 per cent), Middle East (4.7 per cent), the Americas (3.5 per cent), and Europe (2.8 per cent). On the other hand, the Middle East region (+5 per cent) recorded the largest increase in international tourism receipts between 2013 and 2014, followed by the Asia and the Pacific region (+4 per cent), Europe and the Americas (+3 per cent), and Africa (+2 per cent). However, Europe take up the biggest portion of the international tourism receipts with 41 per cent of the market share; followed by the Asia and the Pacific (30 per cent), the Americas (22 per cent), Middle East (4 per cent) and Africa (3 per cent) for the year 2014 (UNWTO, 2015).

Although we recognized the great benefits of the tourism sector to the national economy, the tourism activities has also been connected to the negative impact on the economy in particular to the environment. One crucial aspect of the negative impact as a result of increased tourism activities is on the loss of biodiversity. Thus, the tourism sector and tourism-related activities has been recognize to assert the negative impact on the environment and threatened species. In a study led by the Conservation International (CI) and United Nations Environment Programme (UNEP) on the threats of tourism on biodiversity conservation, Christ et al. (2003) point out that the tourism-related activities that lead to loss of biodiversity can be due to: (i) habitat disruption due to the total landscape transformation for tourism development (infrastructure and facilities) in a rapid and unplanned manner that led to deforestation and drainage of wetlands; (ii) depletion of scarce resources for the indigenous and local people (e.g. water and electricity consumption); (iii) problems associated with littering and water pollution; (iv) sewage pollution from hotels, recreation and other tourism-related facilities; and (v) damage to coral reefs by the activities of careless tourists (see also UNEP, 2013). Nevertheless, UNWTO (2011) reports that the number of international tourist arrivals worldwide is forecast to increase by 3.3% a year, on average, in the period 2010-2030. In terms of numbers, the international tourist arrivals will increase by 43 million a year on average between 2010 and 2030. Thus, it is inevitable that with this rise in the tourism numbers there follows an inevitable increase in negative environmental impacts (Pickering and Hill, 2007; Buckley, 2004).

The main purpose of the present study is to provide empirical evidence of the impact of tourism on biodiversity loss and to seek their implications on business sustainability. In this study, we used the number of threatened species (birds, fishes, mammals and plants) as the measure of biodiversity loss for a sample of 141 countries in 2013. Apart from tourism, we also include income per capita, protected areas, crop yield and population growth as control variables. The model is estimated using OLS with robust standard errors. Our results suggest that tourism has positive impact on the number of threatened species for the 141 countries investigated.

The paper is organized as follows. In the next section we review some related literature on factors affecting the number of threatened species. In section 3, we discuss the model and method used in the study. In section 4, we discuss the empirical results. The last section contains our conclusion.

## **2. Review of related literature**

Tourism is always associated with sand, sea and sun and therefore dependent on coastal areas. To the tourists, tourism provides enjoyment and satisfaction by participating in tourism related activities such as sea-diving, snorkelling, and game fishing. Tourism also increases the demand for seafood and this will have an impact on marine fish resources. Despite biodiversity is vital for tourism, the direct effect of the development of the tourism sector has contributed to biodiversity loss, particularly in the coastal and mountain areas (WTO, 2010). Unsustainable site development in the coastal areas resulted in coastal areas more prone to storm damage. In the mountain areas, damage is done to the vegetation and soils and as a consequence leads to erosion and increasing flooding risks. On the other hand, the presence of visitors (mass tourism) can damage coral reefs at heavily used scuba diving sites; trampling by visitors can destroy vegetation in mountain areas. According to WTO (2010) the loss of biodiversity as a result of human use of the environment can be measured by the loss of forest, wetlands or coral reefs, and in the growing number of species that are threatened with extinction or which have already become extinct. Tourism is increasingly being seen as a threat to wildlife and ecosystem (Croall, 1995). According to UNEP (2002), mass tourism is one of the root causes of coastal degradation today.

Holden (2000) points out that the building of more hotels in the coastal areas to accommodate increasing number of tourists, will result in the increase the sewage runoff and sedimentation. The main impact of sewage pollution is nutrient enrichment that stimulates the growth of algae at the expense of corals. On the other hand, increased sediment loading of coastal waters increases turbidity thus, reduces light levels and leads to bleaching of corals, and ultimately will cause corals to suffocate and die (UNEP, 2014).

In a study on the Mediterranean, Cuttelod et al. (2008) point out that tourism is one of the human activities (causing loss, fragmentation and degradation of habitats) that are leading to an ever-increasing number of Mediterranean marine fish species to be facing a high risk of extinction. Smith and Darwall (2006) suggest that the building of dam in the Mediterranean basin threatened 32 per cent of the freshwater fishes. According to McAllister et al. (2001) dam drastically alters hydrological processes that reduces the amount of water available downstream, thus blocking the migratory routed and impair reproduction. Nevertheless, a study by Munch (2009) on the impact of tourism on biodiversity in Germany could not found any significant effect on the number of birds, butterflies, grasshoppers, plants and orchids.

There are numerous studies conducted on the negative impact of tourism on wildlife. For example, disturbances caused by tourists viewing wildlife can affect threatened mammals species. Green and Higginbottom (2001) posit that the negative effects of wildlife tourism and related human activities on wildlife can be grouped into three main categories. First, disruption of activity such as spotlighting, noisy activities and the approach of tourists towards animals feeding, and if many animals are affected on a regular basis, the population may ultimately decline. Second, direct killing or injury can occur as the result of unintentional events such as road accidents, or from intentional hunting, fishing, collecting, trampling of wildlife; deliberate killing for safety reasons can cause wildlife mortality. And finally, the occurrence of habitat alteration happens when land is cleared or modified to make room for the infrastructure (such as construction of accommodation, camping grounds, roads, parking spaces or picnic areas etc.) needed for tourism activities can significant decreases in population numbers, reduction of protection from predators and the weather, or reduction of prey species.

On the other hand, Pickering and Hill (2007) have reviewed studies on the impact of recreation and tourism on plant biodiversity and vegetation in protected areas in Australia, and found out that vegetation being crushed, sheared off and uprooted as a result of the nature-based tourism activities. Pickering and Hill further contend that those impacts result in changes to the vegetation including loss of height, biomass, reproductive structures (flowers, fruit, etc.), reduction in cover, increased litter, damage to seedlings and change in species composition. These activities will also lead to changes to the hydrology of the site, soil conditions including nutrients and erosion, as well as the introduction

of weeds and pathogen. Tourism can also contribute to the severity of the pathogen's impact by increasing the stress on plants within areas already infected (Buckley et al., 2004).

### 3. Methodology

The term biodiversity or biological diversity refers to the totality (numbers) and variability (types) of living organisms in the ecosystem, region and environment (Butler, 2006). Human will eventually perish without biodiversity. According to the Convention on Biological Diversity (CBD) the definition of biodiversity includes diversity at the gene, species and ecosystem levels; the types of species; and the habitats and ecosystems within which they live. This includes the terrestrial rainforests, the freshwater lakes, the river systems, the coral reefs and the marine ecosystems. The healthy ecosystems provide food, clean air and water for human to consume and survive. The rainforest, although cover less than 2 per cent of Earth's surface, support the greatest diversity of living organisms on Earth – housed more than 50 per cent of the plants and animals on the planet (Butler, 2014). Therefore, the loss of biodiversity among other things; threatens our food supplies, interferes with essential ecological functions, reduces the productivity of ecosystems, and destabilizes and expose the vulnerability of the ecosystems to natural disasters such as floods, droughts, hurricanes etc (UNEP, 2014).

In this study, following the work of Naidoo and Adamowicz (2000), Halkos (2011), Munch (2009), we modeled biodiversity loss, (*bioloss*) as a function of gross domestic product (gdp) per capita (*income*), the numbers of international tourist arrivals (*tourists*), protected areas (*protect*), population growth (*popgrow*), and crop production (*crop*) as follows:

$$bioloss = f(income, tourists, protect, popgrow, crop) \quad (1)$$

Specify in a stochastic form as,

$$lbioloss_{ij} = \alpha + \beta lincome_i + \theta ltourists_i + \phi lprotect_i + \delta lcrop_i + \gamma lpopgrow_i + \varepsilon_{ij} \quad (2)$$

where  $\alpha, \beta, \theta, \phi, \delta$  and  $\gamma$  are parameters to be estimated,  $\varepsilon$  is the error term, and  $i = 1, 2, \dots, 141$  numbers of countries. It is expected *a priori* that  $\theta, \phi, \delta, \gamma > 0$ , and  $\beta < 0$ .  $lbioloss_{ij}$  is biodiversity loss measured by the number of threatened species ( $j =$  birds, fishes, mammals and plants). Variable  $lincome_i$  represents the level of economic development and/or national income and is measured by gross domestic product per capita;  $lpopgrow_i$  is the rate of growth of population of each country.  $lcrop_i$  is agriculture output of crop produced, and  $lprotect_i$  is the total protected areas. Our variable of interest,  $ltourists_i$  proxy for tourism is measured by the numbers of international tourist arrivals. In this study all variables are transform into natural logarithm and denoted by  $l$ . Equation (2) is estimated using Ordinary Least Squares (OLS) with White's heteroskedasticity-consistent standard errors (White, 1980).

In this study the data for the numbers of threatened species – birds, fishes, mammals and plants; the numbers of international tourists' arrivals, gross domestic product per capita, protected areas, and population growth are collected from the World Development Indicators available in the World Bank database. The crop production index (*crop*) was compiled from the FAO database. The reference year is 2013, and our sample consists of 141 countries.

### 4. Results and discussions

The results of our analyses are presented in Table 1. The  $R^2$  show the fit of the model is fairly well for a cross-sectional data analysis. The VIF clearly suggest that multicollinearity is not a problem for all the estimated models. The results for plants, mammals, birds and fishes are reported in column 2, 3, 4 and 5 respectively. Interestingly, our variable of interest that is tourism which is proxy by the numbers of international tourist arrivals, *tourists*, clearly

suggest that it is significant and show expected sign in all four threatened species – plants, mammals, birds and fishes. The positive relationship between tourism and biodiversity loss, therefore implies that increase in tourism is associated with the increase in the numbers of threatened species (biodiversity loss). Thus, a 10 per cent increase in the numbers of international tourist arrivals will lead to an increase in biodiversity loss between 2–4 per cent.

On one hand, *income* that proxy for the level of development is only significant for plants, mammals and birds species and show an inverse relationship. The negative relationship between income and the numbers of threatened species suggests that as a nation grows and wealth increases, the affluent society placed higher value for biodiversity and species diversity, and therefore willing to invest in biodiversity conservation and mitigate biodiversity loss. A 10 per cent increase in income will be able to mitigate biodiversity loss by 3-4 per cent.

On the other hand, our result suggests that population growth (*popgrow*) gives the greatest impact on biodiversity loss. For all four threatened species, population growth is significant and show positive sign. The estimated coefficient ranges from 10.8 for birds to 41.9 for plants species. This implies that a 1 per cent increase in population growth, biodiversity loss will increase by 11-42 per cent. Last but not least, protected area is significant and show positive relationship with biodiversity loss in the case for plants species, while crop production is significant and show positive sign for plants and fishes species. Thus, increase in crop production will ultimately lead to increase in biodiversity loss.

Table 1: Regression results for determinants of the numbers of threatened species

Variables	Plants	Mammals	Birds	Fishes
<i>constant</i>	-0.854 (0.588)	0.904 (1.447)	1.292** (2.343)	-0.442 (0.660)
<i>lincome</i>	-0.399** (2.570)	-0.341*** (4.776)	-0.281*** (4.987)	-0.054 (0.729)
<i>ltourists</i>	0.412*** (5.436)	0.281*** (6.392)	0.242*** (6.710)	0.260*** (6.781)
<i>lprotect</i>	0.324** (2.006)	0.064 (0.873)	0.070 (1.197)	0.014 (0.201)
<i>lcrop</i>	0.242*** (3.276)	0.050 (1.321)	-0.007 (0.210)	0.214*** (5.262)
<i>lpopgrow</i>	41.95** (2.111)	23.85*** (3.311)	10.82* (1.871)	17.47** (2.274)
$R^2$	0.303	0.372	0.283	0.287
<i>Adjusted R<sup>2</sup></i>	0.277	0.349	0.257	0.261
<i>SER</i>	1.538	0.804	0.758	0.884
<i>F – statistic</i>	0.000	0.000	0.000	0.000
<i>N</i>	141	141	141	141
Mean VIF	1.896	1.496	1.414	1.492

Notes: Figures in parentheses are *t*-statistics. Asterisks (\*\*\*),(\*\*),(\*) denote statistically significant at 1%, 5% and 10% level, respectively. SER denotes standard error of regression. Numbers for *F*-statistics is *p*-values.

## 5. Conclusions and implications for business sustainability

In this paper we investigate the impact of tourism on biodiversity loss for a sample of 141 countries. In the study we measure tourism by the numbers of international tourist arrivals, while biodiversity loss is measured by the numbers of threatened species – plants, mammals, birds, and fishes. Our results clearly indicate the negative impact

of tourism on biodiversity. Since tourism depends on biodiversity, it will destroy itself if the tourism industry and tourism-related activities is left unchecked and uncontrolled by the relevant authorities. If biodiversity is lost further, not only the tourism industry that suffers, but the one that suffer most are the communities whose livelihood depends on the tourism industry as well as on other tourism-related industries such as the transportation, hotels and accommodations, food and restaurants, banking, and various leisure and entertainments services. Thus, it should be recognized that business activities in the tourism industry largely depends on biodiversity and no companies are sustainable without rich biodiversity.

Since businesses in the tourism sector depend on the very existence of biodiversity, then biodiversity conservation should become the essential factor for business sustainability by investing their resources for the conservation of biodiversity in order to develop the sustainability of their business. Thus, businesses – whatever they do and whenever they operate – have a responsibility to conserve biodiversity, and sustainable use must be a key feature of the business model. Sustainable use means that the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity.

Furthermore, it is imperative that businesses to address biodiversity issues adequately as it imposes risks on business operations. This is because a company's position in the marketplace and as well as its profitability can be threatened by such risks as: challenges to its legal license to operate, disruption of its supply chain, damage to the brand image, consumer boycotts, fines, lower ratings in the financial markets, and poor staff morale and reduced productivity (IUCN, 2002).

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