

# Tourism Development Structure Feature Analysis Based on Ecological Footprint Model

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*Received 1 November 2014, www.cmnt.lv*

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## Abstract

With the expansion of human tourism activity scale, the development of tourism brings considerable economic benefits for local as well as a series negative effect for local environment, society and culture. The key point and difficult point of tourism research is how to reasonably construct structural system in tourism development and lead it to a sustainable way. Based on absorbing theories and methods at home and abroad, this paper uses the newest international method for measuring sustainable development—ecological footprint model for reference, and studied assessment of sustainable development of regional tourism in the perspective of theory, method and practice.

**Keywords:** Tourism sustainable development; Ecological footprint analysis; Ecological footprint calculation.

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## 1 Introduction

In the case of rapid development of tourism, an important and urgent topic of current world environment and development is protecting the ecological environment and cultural heritage of various countries and promoting tourism to transform into sustainable tourism. The history of environmental protection and tourism development in different countries indicates that, only the development way of effective environment protection and reasonable utilization of resources can vivid tourism. In fact, modern tourism activity, a large scale of social phenomenon, emerged for not a long time, therefore, its negative influence brought to tourism destination begin to draw people's extensive attention [1]. After that, the influence of tourism development on economy, society culture and environment is always the important topic of tourism research field. In the article of Assessment and Analysis of Shanghai Tourism footprint [2], He Huan from Shanghai Normal University, proposed relative suggestions for sustainable development of Shanghai tourism based on the analysis result of tourism footprint calculation combined with the development status of Shanghai tourism, which has important influence on the safety of Shanghai tourism ecology. In the article of Review of Sustainable Development of Island Tourism [3], Zhao Yujie analyzed limiting conditions such as the particularity of island geographical location, regional of tourism resources and fragility of ecological system and analyzed a kind of sustainable development system of island tourism based on man-land system theory, in order to promote the comprehensive and healthy development of economy, culture and society of island community with the carrying out of tourism activity. In the article of Sustainable Development Pattern of Ecotourism in Less-development

Areas [4], Qiu Yunmei analyzed the basic features of less-development areas. Combined with the general pattern of ecotourism development in our country, it selected the sustainable development pattern of less-development areas and proposed implementation strategy advice, in order to protect ecological environment quality and sustainable development of ecotourism.

This paper applied ecological footprint model into the research on assessment of tourism sustainable development, explored the relationship between ecological footprint and the behavioral pattern and consumption pattern of tourists and drew certain regular conclusion to make more real, comprehensive and correct assessment on tourism, confirm reasonable development speed and level, and provide scientific decision basis for the local government and department of tourism administration.

## 2 Basic Concept

### A. OVERVIEW OF SUSTAINABLE DEVELOPMENT ASSESSMENT RESEARCH

Sustainable development is an ideal state of human society development. It emphasizes the harmonious relationship between human society civilization and natural environment. The purpose of this harmonious relationship is to keep the sustainable development of coordination of economy, society, environment and resource. Therefore, the research on the theory, concept, and approach and means of realization of sustainable development has become the leading edge of research at home and abroad and the hotspot of governments and public in the world [5, 6]. The core problem of sustainable development from theory to practice is how to formulate reasonable index and assessment method of sustainable development, which is also the key point and difficult point of sustainable

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development research.

### B. ECOLOGICAL FOOTPRINT

Ecological footprint was first proposed by Canadian Ecological economist William Rees et al. In 1992 and perfected by his student Wackernagel et al in 1996. It is a method for measuring the utilization degree of human on natural resources and the life support service function of natural world for human. As for the definition of ecological footprint, Wackernagel held that, any ecological footprint with known population (a country, a region or a city) refers to the total area and water amount of ecologically productive area needed in producing all resources consumed by these population and the waste used for absorbing these population, and it is also termed as “occupied carrying capacity”. It indicates the requirements of human’s survival and development on the natural ecological system, and reflects the influence and pressure of human activities on natural ecological system to some extent. Ecological footprint not only reflects the influence of human on earth environment, but also contains sustainable mechanism. It is a kind of quantitative index of the most representative sustainable development based in land area.

### 3 Concept System of Ecological Footprint Model

Ecological footprint model is to compare the natural resource consumption quantity for maintaining survival and development of human and the biological productive land area needed for absorbing waste in certain area with the biological carrying capacity in certain area, evaluate the influence of human on ecological system and measure sustainable development situation. Ecological footprint analysis not only reflects the influence of human activity on natural resource consumption and environment, but also reflects the degree of sustainable development. The calculation of ecological footprint is based on the following two facts: (1) human can confirm the amount of the most resources they consumed and waste; (2) these resources and wastes can be converted into biological production area or ecological production area for producing and digesting these resources and waste material logistics. In business accounting of ecological footprint account, various material consumption and resource consumption should be converted into land area according to relative conversion ratio. Biological productive area mainly includes the following six types, as shown in TABLE 1:

TABLE 1: Types of biological productive area

| Types              | Overview  |
|--------------------|---|
| Fossil energy land | Fossil energy land refers to land used for absorbing carbon dioxide emitted by burning of fossil.                   |
| Cultivated land    | Cultivated land is the ecological productive land with the largest production ability, and it produce most biomass. |
| Grassland          | Grassland is used for developing animal husbandry.  |
| Forest land        | Forest land contains natural forest and man-made forest.  |
| Building land      | Building land refer to accommodations and road.   |
| Water area         | Water area contains sea and inland lakes.   |

A fundamental assumption of ecological footprint analysis is that, various kinds of lands are mutually exclusive. For example, when a land is used for constructing highway, then it can not become forest, cultivated land and grass land in the meanwhile.

The space mutual exclusive make us sum the various kinds of ecological productive land and understand the total supply ability of natural system and the total demand of human system on natural system at macro level.

### 4 Tourism Ecological Footprint Structure Model

#### A. COMPONENTS OF TOURISM ECOLOGICAL FOOTPRINT

In tourism ecological footprint calculation, the resource consumption and environmental influence of tourism activities can be divided into “eat, accommodation, driving, traveling, shopping and entertainment”, according to the features of tourist consumption, as shown in TABLE 2:

TABLE 2: Tourism ecological footprint calculation account

| Ecological footprint account | Components   |
|------------------------------|--|
| driving                      | Energy consumption of vehicle, built-up area of traffic facilities, etc.   |
| eat                          | Food consumption, energy consumption, built-up area of dining facilities, etc.                                     |
| accommodation                | Energy consumption, hotel facilities, guest room supplies consumption,etc.   |
| traveling                    | Consumption of energy and material, built-up area of sightseeing place, etc in sightseeing activity process        |
| shopping                     | Consumption of material and energy of tourism commodity manufacture, built-up area of tourism shopping place, etc. |
| entertainment                | Consumption of energy and material in entertainment and built-up area of entertainment facilities                  |

### B. TOURISM ECOLOGICAL FOOTPRINT CALCULATION METHOD

Since tourism consumption activities is a continuous process and it runs throughout the whole tourism activity, and involves eat, accommodation, driving, shopping,

traveling, shopping and entertainment, measurement of tourism ecological footprint is based on the following three basic facts: ① tourists consume material products and service in order to meet their own need of physiology, mentality and enjoyment and produces tourism waste in

traveling process; ② we can confirm the amount of most natural resources consumed by tourists and wastes; ③ these natural resources and wastes can converted into relative biological productive area. According to the features of tourism ecological consumption, tourism ecological footprint is composed of driving, accommodation, eat, shopping, entertainment and traveling.

According to the general model of ecological footprint, the calculation model of tourism ecological footprint can be expressed as:

$$TEF = N(tef) = N \sum (aa_i) = N \sum (q_i \bullet c_i / p_i)$$

$N$  is the amount of tourists;  $tef$  is per capita tourism ecological footprint ( $hm^2/\text{per capita}$ );  $aa_i$  is the biological productive area converted by  $i$  kinds of consumer goods per capita ( $hm^2/\text{per capita}$ );  $c_i$  is the per capita consumption quantity of  $i$  kinds of consumer products( $hm^2/\text{per capita}$ );  $p_i$  is the average production ability of  $i$  kinds of consumer products ( $kg/hm^2$ );  $q_i$  is the equivalence factor of  $i$  kinds of land area.

### C. TOURISM ECOLOGICAL FOOTPRINT MODEL ASSESSMENT

#### Innovated Theory and Strong Operability

Tourism ecological footprint model states the various resources consumed by tourists and land area used for absorbing waste in traveling process and makes direct vertical and horizontal comparison, which provides an intuitive, concise and operable method for quantitative evaluation of tourism sustainable development.

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#### Concise Method and Strong Applicability

Tourism ecological footprint can scientifically measure the influence of tourism activity on environment, provide scientific decision foundation for local government and tourism management department, ensure sustainable development of tourism, provide reference for producing, organizing and selling tourism products, improve the environmental awareness of tourists and strengthen consciousness and initiative of protecting environment.

### 5 Conclusion

Sustainable development requires taking social and economic needs into account. In many areas, the development of tourism has huge potential on promoting local economical development and brings negative impact for society, culture and environment. Customers usually consider price, safety and healthy rather than environmental cost when purchasing a tourism product [7, 8]. However, tourism ecological footprint model is a convenient and visual method in measuring ecological influence of tourists. It makes people to assess the ecological influence of tourism activity in the perspective with integrity and comprehensiveness [9]. This paper analyzed the concept system and structural composition with concept of tourism ecological footprint. It can effectively educate tourists on environment and ecology, help to improve the ecological awareness of tourists, help tourists to establish reasonable and healthy consumption concept, culture civilized and ecological tourism behavior, thus to promote the popularization of sustainable development of tourism.