Building a Sustainability Performance Index for Tourism Destinations

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Abstract

This work pretends to bring into the tourism management area a new evaluation practice based on expert preferences and the theoretical support of Behavioural Decision Theory. The evaluation model utilizes facts and measures (indicators) about tourism industry as inputs which, with the support of expert preferences, will be graded from the perspective of sustainability. Expert knowledge is "captured" with the realization of a Delphi expert panel and brought into the model in terms of: the weight that each sustainability component (social, economic and environmental) should have in order to measure tourism sustainability; the importance of each indicator on integrating this measure; and the way experts evaluate good and bad performance of tourism industry. The empirical part consists in a complete application of the model, determining the Sustainability Performance Index for a set of country members of the OECD.

Keywords: sustainable tourism evaluation, behavioral decision theory, sustainability indicators, expert preferences, sustainability performance index.

Building a Sustainability Performance Index for Tourism Destinations

1 INTRODUCTION

The results presented by tourism industry during 2006 exceed the forecast for this year. As reported by World Tourism Organization (WTO, 2007), 842 Millions of visitors and a growing rate of 4.8% gives a new record for the industry.

Unfortunately, this economic activity is based on the use and consumption of "free public goods" (cultural and environmental wealth) that should be preserved in order to guarantee the requirements of present and future generations of stakeholders (tourists, firms, residents, governments, etc.) in a tourism destination.

Sustainable development of tourism comprehend a wise management of natural, cultural and economic resources and the application of specific management tools designed from the perspective of making this industry sustainable.

The purpose of this work is to introduce a new evaluation tool, designed from the perspective of sustainability, that can be used by tourism industry managers to measure the effect of strategies on their goal of "making tourism industry sustainable".

In the first section of this work, we make some comments about topics related with sustainability tourism, in order to build an initial background for our study.

In section two, the state of art of literature on sustainability tourism evaluation is reviewed. Behavioural Decision Theory is selected as our theoretical framework, given that is accord with asymmetric treatment of gains and losses, the approach in which our model is based.

In section three the methodological steps in order to build a sustainability performance index of a tourism destination is described: sustainability indicators are selected as inputs in our model; expert preferences are included; data sources are identified; and finally, our model is introduced.

The last part of this job consists in an empirical exercise on building our index, which generates a measure for a set of country members of the OECD.

1.1 Background of the Research Problem

Having in mind that the intention of this job it is to develop a measure of performance for tourism industry (at country level and under the perspective of "making tourism sustainable"), it is necessary to encompass some other topics related with sustainability, particularly with sustainable tourism, in order to establish an initial background of this research. With this aim, a briefly discuss is made about: business ethics, corporate governance, corporate social responsibility and sustainable development of tourism.

The relationship between these topics and the main intention of this job is reasonable. Each one of the stakeholders involved in tourism industry have a different vision of the problem of "making tourism sustainable", therefore, a wide perspective is needed. Firms have to be sensitive about their social responsibility, instead of defining business strategies just with the "positive VAN" or economic perception. Governments need to act with higher level of business ethics and from a social and ecological perspective. Corruption is one of the characteristics that "distinguish" TD regulators and managers of touristic "commons". As mentioned in (Tepelus, 2008), "ethical questions related to globalization, human rights, unfair labor practices and trans-boundary exchanges of capital and workforce create even more complex challenges for the tourism sustainability agenda". To conclude this section, the concept of sustainable development of tourism is in brief commented.

Business Ethics

Communities in tourism destinations are demanding better levels of business ethics in response to illegal or improper commercial activities (Reichert, Webb & Thomas, 2000) in firms and regulators of tourism industry. The WTO, in response to this demand, developed an industry focused code of ethics (WTO, 2003), a voluntary code of conduct that firms can apply as a reference framework to develop their internal and external policies with regard to issues such as human rights, environment, local economic development and cultural diversity. Unfortunately, there is a lack of consensus about, not the convenience, but the feasibility of application of this code (Fennel, Malloy 2007).

Like any other code, ethics is an attitude that can be taught and learned. With this in mind, universities and institutes of superior education in tourism have incorporated "business ethics" into their tourism academic programs. The inclusion of this subject in diverse seminars and conferences in sustainable tourism give us an idea about the importance of this topic for tourism researchers.

Corporate Governance

Following Jean Tirole´s (2000) example, that describes the selling of a "customized machine" from a manufacturer to a buyer, we can understand the importance that corporate governance have in the sustainability of tourism industry:

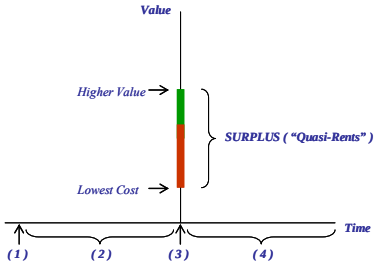

Fig 1: Phases of a selling-buying transaction

1. *The buyer contracts the manufacturer and they agree the specifications of the machine and the final price.*
2. *The production requires some time. Many events can occur that change costs, times and willingness to pay.*

The customized good probably has a higher value to the buyer than to the market. Also, the manufacturer has the lowest cost to produce the good.

3. *Transaction is complete, and "Quasi-Rents" (the difference between what the two parties can generate together and what they can get in the market) are generated*
4. *Quasi-Rents are divide (Ex-Post)*

But, when a transaction like the aforementioned is dealing with Services, in particular, with Touristic Services, we need to consider something else.

- *The Quasi-Rents have another component; it is a value that represents the "amount" of a "common good" that a tourism enterprises take from the community where they are located.*

- *Firms –responding to degradation of natural and cultural wealth as a "free rider"- have instruments (a Governance System) to distribute the surplus between shareholders exclusively, but excluding from this benefit any other stakeholders.*

Actually, the value off the free public good is expropriated from the community and is far away from the real value of the "Quasi-Rent". The value of the "common" is divided between the touristic service provider and the tourist. The government, through taxes, received a part of the surplus (in fact, just and insignificant part non representative of the depredated common good real value). Another fact that characterizes tourism industry is that, being dominated by major foreign investors, the economic benefit produced, leaves the tourism destination (a phenomenal known as "leaking").

Many of this situations, can be (and have been) profitably analyzed from the perspective of investors (traditional shareholders), but this perspective excludes any other stakeholder (employees, customers, suppliers, local government and of course the owners of natural and cultural assets; communities) from being important to the governance of the firm.

Corporate Social Responsibility

The traditional shareholder value approach of corporate governance is too narrow a view; it comprises just an economic analysis. A more wide sustainable perspective is needed. In this work the concept of corporate governance covers the design of institutions that induce or force management to internalize the welfare of stakeholders (Tirole, 2000), having this in mind, the next key issues emerge:

First, a measure of aggregated welfare is needed; this measure must integrate the value of the expropriated "common good" (i.e. the "compensation" for the wealth lost).

Second, the design of right incentives, which induce the management to compensate the natural stakeholders for the expropriation of their wealth, should be adopted; i.e. driving corporate governance into a new philosophy of governance: the Corporate Social Responsibility (CSR).

Sustainable Development of Tourism

This work is realized based on the next essentials definitions about sustainable tourism that the WTO uses as a conceptual framework:

In 1987, the World Commission on Environment and Development defined "Sustainable Development" in terms of "meet the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). In this definition, environmental degradation, equity (unequal distribution of resources) and the perception of "limits" (current state of technology and social organization limits the environment to meet present and future needs) are fundamental principles that focus not only on environmental protection but in a more complex frame, the notion of sustainability, that encompass social, economic and environmental priorities.

Based on the previous conceptual framework, the World Tourism Organization (2004) referred "Sustainable Tourism" as "the environmental, economic and socio-cultural aspects of tourism development and a suitable balance that must be established between these three dimensions to guarantee its long-term sustainability.

Thus, accordingly with this conceptual definition, sustainable tourism should:

1) Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity.

2) Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance.

3) Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.

Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary.

Sustainable tourism should also maintain a high level of tourist satisfaction and ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them" (WTO, 2004).

Sustainability Indicators

A "Measure of sustainability of a TD" could be initially shaped, using a set of selected "good" and "bad" performance indicators resulting from tourism business realization. There have been several exercises on this task, like the six key dimensions classification (economic, social, cultural, environmental, political/institutional, and technological) by HwanSuk (2005). Another reference is the study by Graham Miller (2001), with a subjective measure of sustainability in TD, resulting from the application of a Delphi technique.

In order to specify a selected set of Sustainability Tourism Indicators, the WTO had realized, since 1995, several exercises of classification an organization of opinions and study cases about sustainable indicators. The result of this initiative was presented during 2004, when "Sustainable Indicators" where first referenced as "Information sets which are formally selected for a regular use to measure changes in key assets and issues of tourism destinations and sites" (WTO, 2004). One of the results emerged form this WTO initiative, is the Sustainability Tourism Baseline Indicators list, which is used in this work, in order to determine a measure of sustainability in TD.

1.2 Research Problem

Results presented for world tourism market during 2006 exceed the forecast for this year. As reported by World Tourism Organization (WTO, 2007), 842 Millions of visitors and a growing rate of 4.8% gives a new record for the industry. Unfortunately, tourism industry is based on the use and consumption of "free public goods" that needs to be preserved in order to guarantee the requirements of residents, firms, governments and other stakeholders in a Tourism Destination (TD). The Market and firms within, which responds to degradation of the aforementioned wealth as a "free rider", provides instruments to guide economic development, however is insensitive to many requirements of sustainable tourism (WTO, 2004)

The efficient management of these common goods becomes a success key factor; since all tourism products and services are totally permeated with the "quality" of these natural assets (they play a fundamental role on building TD´s image).

An industry like this is necessarily supported by National Tourism Administrations (NTAs), governmental institutions that play a fundamental role preserving these "commons" (The Economist, 2008), designing institutions, protecting investors,

determining taxes, increasing transparency, enforcing contracts and keeping register of tourism activities.

Governments have a key participation in this economic sector: they regulate how countries' free public wealth is used; they are in charge of the strategic management of their natural and cultural wealth in order to sustain the tourism industry, and mainly; they are responsible of fulfilling the needs of the present tourism industry's stakeholders without compromising the ability of future generations to meet their own needs.

1.3 Objectives

Is the purpose of this work to show how countries can evaluate their performance in tourism industry from the perspective of "making tourism industry sustainable". With this objective in mind, a measure is defined in terms of indicators and expert opinion about sustainable tourism. Indicators and expert's perception are handled as inputs in a model that is concerned about the three components of sustainability: Economic, Ecological and Social distinctiveness of tourism activity.

The intention of this job is resumed in two central objectives:

First:

> *To define a Sustainability Performance Index for Tourism Destinations (SPITD) based on a set of baseline indicators that the World Tourism Organization (WTO) selected as key inputs in the process of measure sustainability (WTO, 2004).*

Second:

> *To determine the perception of experts in tourism industry, about the importance (weight) that each of these indicators should have in order to measure sustainability. Expert's preferences about likely values of these indicators (good and bad results when exceeding or failing a targeted value) will be determined also.*

2 LITERATURE REVIEW

Diverse sources of information were consulted, specialized journals, technical reports and study cases. Informal sources like magazines and periodical publications were considerate also in this literature review.

2.1 Reference Framework

According to our first objective, we proceed to identify the state of art on Tourism Sustainability Assessment, and Sustainable Tourism Indicators, which is concentrated in the next literature sources:

Sustainable Tourism Indicators

The central reference on tourism indicators is the "Sustainable Tourism Baseline Indicators list" defined by the World Tourism Organization (2004), which includes a complete selection of indicators, classifications and case studies on sustainability issues. This work is based on WTO's selected list in order to specify a measure of sustainability for TD.

Another excellent reference is the one offered by the Organization for Economic Cooperation and Development (OECD, 2008), which is the most recent synthesis of sustainability indicators and a broad overview of environmental issues in OECD countries.

An exercise developed by Tae Gyou Ko (2005), realize a procedure for the assessment of tourism sustainability, in this job, a categorization in terms of systems, dimensions and indicators is presented. Gradients of sustainability are defined by means of a 5-point Likert scale (sustainable/excellent, potentially sustainable/good, intermediate/medium, potentially unsustainable/poor, unsustainable/bad) in one of the procedural steps.

A work that pretends to develop indicators to measure community tourism development (CTD) within a sustainable framework (HwanSuk, Choy and Sirakaya, 2006) identifies a list of 125 sustainable tourism indicators classified on six key dimensions (economic, social, cultural, environmental, political/institutional, and technological). Top three indicators of each dimension are also determined. One important aspect of this job is the use of a Delphi technique, a qualitative and structured technique for predicting future events by reaching consensus between experts.

In order to develop a set of indicators for sustainable tourism, Graham Miller (2001) identified 1) a list of 16 sustainable tourism indicators classified on five key dimensions (resident attitude, employment, financial, customer satisfaction, environmental impact assessment). Results come from the application of Delphi survey that captures expert opinions (tourism researchers) about sustainability issues (indicators) and their

relevance to measure the movement of the tourism product at a company/resort level towards a position of greater/lesser sustainability. A significant characteristic of this job is the inclusion of subjective indicators and the participation of other shareholders of tourism industry in the process.

Tourism Sustainability Assessment

An assessment procedure for tourism sustainability was introduced by Ko,T.G. (2005) with a conceptual framework including: identification of the systems, dimensions, and indicators; scaling of sustainability; gradations of sustainability; development of tourism sustainability assessment maps; extension of the maps over time. The model defined, represents the comprehensive level of tourism sustainability in a given destination, combining human and natural indicators into an index of sustainable tourism development. 'Barometer of tourism sustainability' (BTS) and 'AMOEBA of tourism sustainability indicators' (ATSI) models, are introduced as devices for the assessment of tourism sustainability. A difference between this job and ours is the scope; it applies to specific tourism destinations (case studies), while our model is a more general measure with a country scope.

By the other side some authors, like George Hughes (2002), Furley, Hughes and Thomas (1996), establish a critique (feasibility) on building a "ideal set of environmental indicators". They exhibit the way environmental indicators research fails on assessment ecological impact of tourism, due to some methodological impediments.

One of the most recent compilations on sustainability assessments issues is the one conducted by the Organization for Economic Cooperation and Development (OECD, 2008). Proceedings on the OECD workshops on sustainability assessment methodologies are included in this job.

Another paper which tries to provide a unified methodology to assess tourism sustainability based in a number of quantitative indicators is the one by Cernat and Gourdon (2007). This job provides a methodological framework against which the sustainability of tourism activities in countries can be assessed.

An interesting work that utilizes subjective measures to analyze the relationships between resource, community and tourism in sustainable ecotourism is the one by Sheng-Hshiung Tsaura, Yu-Chiang Linb and Jo-Hui Linc (2006). Local residents, tourists and resource administration were interviewed to explore each group's

perception of relationships with the remaining two groups. The Delphi technique was used to identify evaluation indicators for a tourist destination and the authors suggest that the evaluation variables identified can be reapplied to other destinations.

The latest reference to sustainability tourism assessment is the work developed by the World Economic Forum (Blanke & Chiesa, 2009), a detailed assessment of tourism and travel environment in 133 countries, covering 70 indicators used to integrate a composite index on tourism competitiveness. The index contained in this reference will be used as a benchmark to compare the results generated in our research work.

2.2 Theoretical Framework

According with our second objective, we focused the literature review on research works that incorporates perception of experts with the purpose of establish an evaluation (measurement) of performance. Our searching let us to identify various studies where preferences of experts are included in the evaluation process, in this scenario, preferences can be defined as what the evaluators want to achieve/avoid (targets), and therefore what they value as desirable/undesirable (scores). The main theoretical framework of these jobs consists in the Behavioural Decision Theory (BDT), which we choose to support this research.

Basic examples of literature are those having a "*mean-risk approach*", where targets and preferences of experts are considered. The measure proposed by Stone (1973) considers a performance variable x (wealth) and its distribution function $F(x)$ in the next definition:

$$L(x^{ref}, k, A) = \int_{-\infty}^{A} \left| x - x^{ref} \right|^{k} dF(x) \quad , k \geq 0 , \tag{1}$$

where targets:

x^{ref} = The reference level of wealth against performance is measured,

and preferences:

k = The importance of the deviation from the target.

A = The range of deviations to include in the measure,

are considered.

In this model, Stone (1973) selects the mean as the wealth reference level. When dealing with the importance of deviations, a value of $k=0$ is utilized when the size of deviations do not count at all; $k=1$ when all deviations have the same importance; $0<k<1$ when small deviations are more important than larger ones; and $1<k<\infty$ when large deviations are more important than small ones.

As signaled by Grifell-Tatjé and Marques (2008), Stone's model main contributions are: i) it makes explicit that the measure chosen depends on the evaluators´ preferences; ii) it introduces the importance of target levels in evaluating performance; and iii) it proposes the same evaluation for "good" and "bad" results, leaving the decision of what results to include into the measure to the choice of A.

A second perspective adopted by some authors, known as the "*downside approach*", selects $A = x^{ref}$, considering just those deviations below the reference level. Since outcomes over the target are ignored, the model gives a different treatment to "bad" results than to the "good" ones, i.e. giving an asymmetric treatment for gains and losses.

Most of the work under this perspective has been developed on the field of finance (Ang, Bekaert, Lui, 2005; Ballestero, 2005) recently, but just a few relevant studies Miller and Reuer (1996) and Miller and Leiblin (1996), in the field of management.

A third perspective, which considers that gains and losses needs asymmetric treatment, permits define measures of performance that better considers evaluators´ preferences. Unser (2000) found that positive deviations from and individual reference point tend to decrease perceived risk, while in the management field, (Kahneman and Tversky, 1979) signaled that managers make a clear distinction between gains and losses. Again, as signaled by Grifell-Tatjé and Marques (2008), this approach requires firstly, $A=\infty$ to include all type of results (gains and losses), which is incompatible with the downside approach. Secondly, it needs a different evaluation for different types of results. For example, allowing a different k for gains and losses in (1) implies that the unique structure for evaluating results has to be transformed into an evaluation function, with different parts for each type of results.

First mentioned in the work by Bell (1985), a specific class of risk-value models typically referred to as "disappointment models", was defined. Bell defined *disappointment* as a psychological reaction to an outcome that does not meet the

decision maker's a priori expectation. When the decision maker does better than expected, he will experience *elation*, the opposite of disappointment.

Based on Bell's job, Jia, Dyer and Butler (2001) proposed that, disappointment and elation are proportional to the difference between outcome and expectation, and that the preference relationship is additive between gains and losses. In the same job, a piece-wise power utility model is depicted, indicating that the evaluators' preferences make a distinction between different types of outcomes, namely gains and losses, and that there may be a non-linear evaluation of the outcomes. These types of preferences are depicted in Figure 2, presenting asymmetry between gains and losses, loss aversion, and diminishing sensitivity.

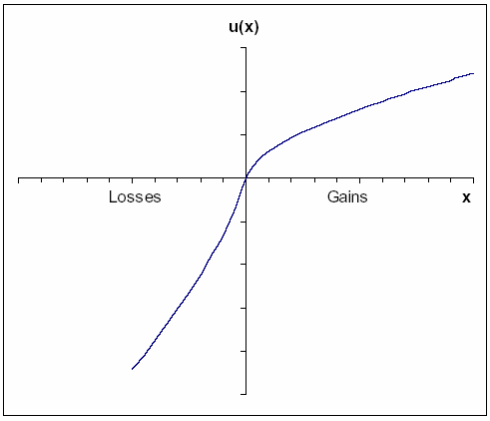

Figure 2: Utility curves based in a piece-wise power model

Consistently, the risk evaluation proposed by Jia, Dyer and Butler (2001) has the following structure, where a performance variable x (wealth) and its distribution function $p(x)$ are considered:

$$R(x) = d \sum_{x<x^{ref}} p\left|x - x^{ref}\right|^{\theta_1} - e \sum_{x \geq x^{ref}} p\left|x - x^{ref}\right|^{\theta_2}, \qquad (2)$$

and also targets:

x^{ref} = The reference level (expected value) of wealth against performance is measured,

and preferences:

d, e = Parameters reflecting the relative importance of good and bad results,

θ_1, θ_2 = Parameters that represent how deviations from the target are considerate.

The proposals of the disappointment models share some ground with Behavioural Decision Theory (Fishburn, 1984; Luce, 1996), where asymmetric treatment of gains and losses is realized and aggregation of the value of gains or losses is additive. We will also assume this approach in the next section, when our model will be specified.

The theoretical proposals of the disappointment models have been used in applications in the marketing field, such as Inman and Zeelenberg (2002), and Homburg, Koschate and Hoyer (2005). However, to the best of our knowledge, it has been applied to the management field, particularly in the performance evaluation field, uniquely in the work by Grifell-Tatjé and Marques (2008).

3 METHODOLOGY

In order to complete our first objective, we will define a Sustainability Performance Index for Tourism Destinations based on the set of baseline indicators determined by WTO (2004) and incorporating tourism experts' preferences. Whit this purpose, we followed the next procedural steps: developing a measure of sustainability; selecting sustainability indicators; capturing experts' preferences; identifying data sources; and finally, calculating SPTID.

3.1 Developing a measure of sustainability

According with our theoretical framework, we defined an evaluation model that explicitly consider targets and the asymmetry between gains and loses.

We evaluate the sustainability performance index of a Tourism Destination **SPITD** indexed by *i*; based on a selected set of Baseline Indicators *SI* indexed by *i,j*; where the importance of each indicator on measuring sustainability is determined by the parameters ω indexed by *j*; and were the preferences of tourism experts about how to evaluate good or bad results is determined by the function α (*SI*) indexed by *j*.

$$SPTDI_i = \sum_j \omega_j \alpha_j (SI_{i,j}) \quad (3)$$

In this model:

- Parameter ω_j will represent the weight that indicator j has in the measure.

$$\sum_j \omega_j = 1$$

- The performance of tourism destination *i* on indicator *j,* is represented by the value of the indicator $SI_{i,j}$
- Function α_j it's used to evaluate the performance $SI_{i,j}$ of tourism destination *i* on indicator *j*.
- Function α_j is defined in pieces, over a domain of intervals (gradients of sustainability), therefore, each of the possible good or bad results (performance) can be evaluated under the same function.

$$\alpha_j : Bad \cup Poor \cup Good \cup Excelent \longrightarrow [0,10]$$

Bad: Range of values of indicator $SI_{i,j}$ that, according with expert preferences, deserve a "*bad result*" evaluation.

Poor: Range of values of indicator $SI_{i,j}$ that, according with expert preferences, deserve a "*poor result*" evaluation.

Good: Range of values of indicator $SI_{i,j}$ that, according with expert preferences, deserve a "*good result*" evaluation.

Excellent: Range of values of indicator $SI_{i,j}$ that, according with expert preferences, deserve a "*excellent result*" evaluation.

- Function α_j it's our alternative to *k* in (1) and, θ_1, θ_2 in (2).

This model definition is accord with our theoretical framework, particularly on Behavioural Decision Theory (Fishburn, 1984; Luce, 1996), where asymmetric treatment of gains and losses is realized, and where aggregation of the value of gains or losses is additive.

3.2 Selecting sustainability Indicators

The first decision to take was the selection of a proper set of sustainable tourism indicators. We review several proposals, between them, those from Graham Miller (2001), (HwanSuk, Choy and Sirakaya, 2006), Gyou Ko (2005), and the one defined by the World Tourism Organization (WTO, 2004), which was our choice.

We support our selection in the following aspects:

i) Since sustainability is an aggregated concept that seeks a balance between economic, social and environmental considerations, we tried to find a proposal with this level of aggregation (i.e. according with the three components of sustainability). The "Sustainable Tourism Baseline Indicators list", defined by the World Tourism Organization (2004), fulfills this requirement.

ii) The selected list is the result of several exercises (classification an organization of opinions and cases studies about sustainable indicators) that WTO realized since 1995 until 2004, when "Sustainable Indicators" where first referenced as "Information sets which are formally selected for a regular use to measure changes in key assets and issues of tourism destinations and sites"

iii) WTO initiative on indicators is an international project, therefore there are several countries were indicators are being applied for keeping register of tourism industry. The availability of data was another aspect in which we based our selection.

Since our purpose is to evaluate sustainability at country level, this "short" list of 29 indicators looks accurate to our plans. The complete list is exhibit in appendix 1.

After reviewing aspects related with availability, accuracy and standardization of data, we finally selected our definitive list of sustainability indicators, which is presented in Table 1.

INDICATOR	DESCRIPTION
Ratio of tourists to locals	It is the relationship between the number of tourists and local people (of a country) in annual average.
Social expenditure attributed to tourism	It is the share of public expenditure attributed to tourism, i.e. It is the percentage of public expenditure corresponding to tourism GDP.
Tourist expenditure	It is the annual expenditure that, in average, is realized by a tourist
Occupancy rate	It is the occupancy rate of tourism infrastructure
Tourism employment rate	It is the share total employment rate corresponding to tourism,

	i.e. it is the percentage of total employment corresponding to Tourism GDP
Tourism GDP	It is the share of GDP corresponding to tourism activity
Contribution of renewables to total energy supply	It is the share total energy consumption, which is covered with renewables
Energy consumption by tourist	It refers to the annual average of energy consumption (all sources) per tourist
Water consumption by tourist	It refers to the annual average of water consumption per tourist
Waste generation by tourist	It refers to the annual average of waste generated per tourist

Table 1: Sustainability Indicators

3.3 Capturing experts' preferences

According with our model, we need to determine preferences of tourism experts about: the importance of each indicator on measuring sustainability (parameters $\omega_j = \omega_C \,.\, \omega_{SI}$); and, How do they evaluate good or bad results (function α_j).

With this objectives in mind, we realized an exercise of application of the Delphi technique; i.e. an expert panel, with specialist on tourism sustainability.

The panel was integrated by two specialists on tourism sustainability from the University School of Tourism and Hotel Management (EUTDH) of Autonomous University of Barcelona (UAB).

The consult instruments used to capture expert preferences are presented in appendix 2 to 6.

This exercise let us determine:

3.3.1. Sustainability components weights (ω_C)

The Expert opinion about the weight that each sustainability component (social, economic and ecologic), should have, in order to evaluate a tourism destination, was the result of a two round Expert panel Delphi exercise.

In this activity, tourism experts determined that the social component weight should be 25%. Complementarily, economic and environmental components were equally weighted (37.5%). See appendix 7.

3.3.2. Sustainability indicator weights (ω_{SI})

Expert opinion about the weight that each sustainability indicator should have, in order to evaluate a tourism destination, was the result of a two round Delphi exercise, where experts assign a high weight (65%) to the "Ratio of tourist to locals" indicator, but

contrarily, they determined that the weight of the "Occupancy rate" in the measure should be null (weights 0%). "Tourism GDP" (60%) and "Tourism employment rate" (40%) have an important contribution to the measure, while the environmental indicators are equally weighted (25%)

Results are presented in appendix 8.

3.3.3. Evaluation functions (α_j)

We needed to capture in our model, how experts evaluate results (performance), in order to incorporate this knowledge into our model.

Since the evaluation functions (α_j) are defined in pieces, firstly, we identified the indicator values (frontiers) that determine the *gradients of sustainability* (segments of the evaluation function domain having a similar value in expert preferences): "bad", "poor", "good", and "excellent".

With this purpose, we designed a consulting instrument in order to determine each evaluation function domain (one for each indicator). During the exercise, experts could analyze and example of the values that a set of countries of the OECD report for each indicator. With this information in hands, they were able to establish an opinion about the gradients frontiers values (See fig. 3 and appendix 4, 5, 6 and 10).

The gradients of sustainability frontiers determined in this step are presented in appendix 9.

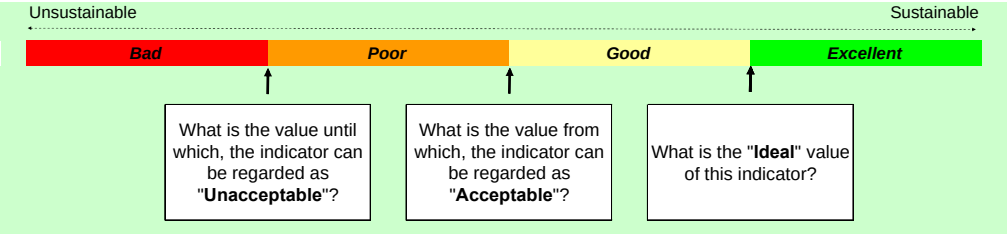

Figure 3: Gradients of sustainability frontiers

Until this point, we have defined the domain of each evaluation functions (one for each indicator); the next step consisted in the specification of the association rule between performance (indicators values) and the corresponding scores (the valuation according with expert preferences). With this purpose we assigned the scores corresponding to the frontier values, which we present next:

$$\alpha(frontier(bad, poor)) = 5$$

$$\alpha(frontier(poor, good)) = 8$$

$$\alpha(frontier(good, excellent)) = 10$$

It is important to note that the evaluation function's codomain (according with our specification in (3) is the interval [0, 10]

Our immediate duty, in order to determine these evaluation functions, was to build them using segments of straight lines that are coincident in each of the gradients frontiers.

We selected this specification criterion (approximation using a linear function), in order to keep the procedure as simple as possible, since we didn't have the opportunity to count with a bigger group of experts in the panel exercise.

The shape of these functions is presented in appendix 11, and the explicit definition of each evaluation function (after the linear approximation) is presented in appendix 12.

3.4 Identifying data sources

This work is based on a database by the Organization for Economic Cooperation and Development (OECD, 2009), where Country statistical profiles of countries members of the OECD, are offered for free. Each profile is conformed by key annual statistics by country, including a complete set of sustainable indicators. We selected this secondary source of data and complement the sustainability indicators with information about tourism industry that we capture directly from compendium of tourism statistics (WTO, 2008).

In Section 3.2 we introduce our selected set of Sustainability Indicators (see appendix 1 also). Some of these indicators were included in our database, as they are published in the original sources. However, other indicators had to be defined making use of alternative "proxy" variables (a figure that can be used to represent the value of the missing indicator).

A detailed table, with the specification of the proxy indicators, original sources and measuring units, is presented in appendix 13

Our database is integrated with key statistics from 30 OECD country members. The detailed list is presented in appendix 14.

Each country includes annual observations for the period 1997-2006. Unfortunately, there are some absences of data in several years. Therefore, with the purpose of

illustrate the index generation procedure, we select the observations corresponding to year 2005 (a complete set).

3.5 Calculating a SPITD

The last step in our methodology consists, in essence, in operating each of the terms generated on previous methodological steps.

- ω_j : Generated in sections 3.3.1 and 3.3.2
- $\alpha_j(SI_{i,j})$: Generated in sections 3.3.3
- $SI_{i,j}$: Generated in sections 3.4

Now, we are ready to calculate our model (see section 3.1).

$$SPTDI_i = \sum_j \omega_j \alpha_j(SI_{i,j})$$

Step1

The selected set of indicators/proxies ($SI_{i,j}$), are determined for 30 countries members of the OECD. The values corresponding to year 2005 are presented in appendix 15.

Step 2

The evaluation function $\alpha_j(SI_{i,j})$ is applied in order to establish individual measures (by indicator) based on expert preferences. The scores generated are presented in appendix 16.

Step 3

The importance of each indicator on measuring sustainability ($\omega_j = \omega_C \,.\, \omega_{SI}$) is introduced in the calculus, affecting the scores (resulting from the application of function α_j). The perception of tourism experts, about the weights of sustainability components and indicators have in order to measure sustainability has being included in the process. The resultant table is presented in appendix 17.

Step 4

Finally, partial results (by sustainability component) are generated, and the final aggregated measure (a composite index) is calculated. The SPITD has being generated, and results are presented in appendix 18.

The main objective of this final section is to give some comments about how the SPITD is defined and generated. The selection of the OECD country members was based on availability of data and with the only objective to show the index in practice, however, we can avoid observing some interesting aspects. There is a good level of coherence between the results obtained (the index value) and how OECD countries are positioned in tourism industry. Expert preferences determined that the social component weight should be 25% and that economic and environmental components were equally weighted, however, we can observe (in practice) that the main component is the economic in all cases, with the exception of the countries with missing data. By the other side, the environmental component is the one with less impact.

4 CONCLUSIONS

This work constitutes and alternative approach for evaluation a tourism destination when subjective aspects (experts preferences) wants to be considerate. It is a subjective measure that incomes in areas never being attended by traditional tourism management

The tool incorporates the judge of experts of evaluation based on the achievement of targets and the asymmetry of gains and loses. By the nature of the index, we can follow the track of a good/ bad result, and identify which sustainability indicators are impacting this measure.

A system of alerts and warnings, on achieving sustainability, could be implemented; therefore, the resulting index can be used as a management tool for tourism destinations.

Although expert preferences can change (as industry change), the method of generation facilitates updating those preferences (changing weights or even including others indicators).

The quality of data is a fundamental aspect in every initiative of evaluation. Tourism destination managers should considerate the convenience on keeping registers of tourism activities.

The expert panel can be extended in order to include perceptions aggregated by geographical area (as tourism industry is). This will permit comparability of different types of tourism destinations. The model can be extended (or adapted) to specific types

of tourism destinations, including indicators according to different types or tourism practices.

Finally, with the intention to let this topic research open, we will signal some aspects to improve:

The refinement of the expert panel and the possibility to improve this exercise with the support of information technologies (in the realization of the Delphi exercise) should be considered.

The inclusion of subjective indicators of sustainability should be considered.

The inclusion of other tourism industry shareholders in the process of determining gradients of sustainability, frontiers of accept/reject areas, and inclusive, other perspectives of evaluation, should be considered.

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APENDIX 1

WTO´s Baseline Sustainability Indicators

As an example of a baseline on the specification of Sustainability Indicators, the list proposed by WTO (2004), which aggregates objective and subjective indicators, is presented:

Social Indicators

- Local satisfaction level with tourism (questionnaire-based)
- Ratio of tourists to locals (average and peak period/days)
- % of locals who believe that tourism has helped bring new services or infrastructure (questionnaire-based)
- Number and capacity of social services available to the community (% which are attributed to tourism)
- Perception of value for money (questionnaire-based)
- Tourist arrivals by month or quarter (distribution throughout the year)
- Occupancy rates for licensed (official) accommodation by month (peak periods relative to low season) and % of all occupancy in peak quarter or month)
- % of business establishments open all year
- Existence of Sustainable Tourism Master Plan
- % of business establishments with a Sustainable Tourism Certification

Economic Indicators

- Number and % of tourism industry jobs which are permanent or full year (compared to temporary jobs)
- Number of local people (and ratio men to women) employed in tourism (also ratio of tourism employment to total employment)
- Revenues generated by tourism as % of total revenues generated in the community
- Percent of income leakage from the community (money leaving)
- Percentage of return visitors

Environmental Indicators

- Per capita consumption of energy from all sources
- % businesses participating in energy conservation/saving programs
- % of energy consumption from renewable resources (at destinations, establishments)
- Water use (total volume consumed per tourist per day)
- % water saving (reduced, recaptured or recycled)
- % of tourism establishments with water treated to international potable standards
- % of visitors reporting water-borne illnesses during their stay
- % of sewage from site receiving treatment
- % of tourism establishments on treatment systems
- Waste volume produced by the destination
- Volume of waste recycled
- Quantity of waste strewn in public areas
- Existence of a land use or development planning process
- % of area subject to control (density, design, etc)
- Number of tourists per square meter of the site
- Level of satisfaction by specialists about environmental quality (questionnaire-based)
- % of rural/natural area affected by tourism activity

APPENDIX 2

Sustainable Tourism Components

EXPERT PANEL

Expert: _____ **Date:** _____

Instructions:

For the following components of sustainability, in which we can classify tourism activities, determine the weight to be given to each component when trying to measure the sustainability of a tourism destination. For this purpose, assign a porcentage in the appropriate column.

	SUSTAINABILITY COMPONENT	*PONDERATION (%)* First Round	Second Round
C1	SOCIAL		
C2	ECONOMIC		
C3	ENVIRONMENTAL		
		100%	*100%*

APPENDIX 3

Sustainable Tourism Indicators

EXPERT PANEL

Instructions:

For the following indicators, determine the weight to be given to each of them when trying to measure the sustainability of a tourism destination. For this purpose, assign a porcentage in the appropriate column.

SUSTAINABILITY INDICATORS World Tourism Organization (WTO)		*Notes*	*PONDERATION (%)* First Round	Second Round
Social				
S1	Ratio of tourists to locals	It is the relationship between the number of tourists and local people (of a country) in annual average.		
S2	Social expenditure attributed to tourism	It is the share of public expenditure attributed to tourism, i.e. It is the percentage of public expenditure corresponding to tourism GDP.		
S3	Tourist expenditure	It is the annual expenditure that, in average, is realized by a tourist		
			100%	100%
Economic				
E1	Occupancy rate	It is the occupancy rate of tourism infrastructure		
E2	Tourism employment rate	It is the share total employment rate corresponding to tourism, i.e. it is the percentage of total employment corresponding to Tourism GDP		
E3	Tourism GDP	It is the share of GDP corresponding to tourism activity		
			100%	100%
Environmental				
A1	Contribution of renewables to total energy supply	It is the share total energy consumption, which is covered with renewables		
A2	Energy consumption by tourist	It refers to the annual average of energy consumption (all sources) per tourist		
A3	Water consumption by tourist	It refers to the annual average of water consumption per tourist		
A4	Waste generation by tourist	It refers to the annual average of waste generated per tourist		
			100%	100%

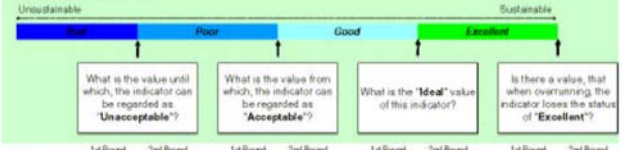
APPENDIX 4

SUSTAINABLE TOURISM GRADIENTS

Expert Panel

Instructions:

For the following indicators, determine the limits (frontiers) among gradients of sustainability, registering the appropriate value in the corresponding cell



SOCIAL Component

	INDICATOR	DESCRIPTION	What is the value until which, the indicator can be regarded as "**Unacceptable**"?		What is the value from which, the indicator can be regarded as "**Acceptable**"?		What is the "**Ideal**" value of this indicator?		Is there a value, that when overrunning, the indicator loses the status of "**Excellent**"?	
			1st Round	2nd Round	1st Round	2nd Round	1st Round	2nd Round	1st Round	2nd Round
S1	Ratio of tourists to locals	It is the relationship between the number of tourists and local people (of a country) in annual average.								
S2	Social expenditure attributed to tourism	It is the share of public expenditure attributed to tourism, i.e. It is the percentage of public expenditure corresponding to tourism GDP.								
S3	Tourist expenditure	It is the annual expenditure that, in average, is realized by a tourist								

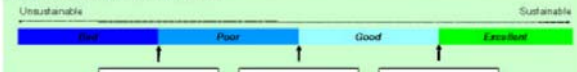
APPENDIX 5

SUSTAINABLE TOURISM GRADIENTS

Expert Panel

Instructions:

For the following indicators, determine the limits (frontiers) among gradients of sustainability, registering the appropriate value in the corresponding cell



ECONOMIC Component

	INDICATOR	DESCRIPTION	What is the value until which, the indicator can be regarded as "Unacceptable"? (1st Round)	What is the value until which, the indicator can be regarded as "Unacceptable"? (2nd Round)	What is the value from which, the indicator can be regarded as "Acceptable"? (1st Round)	What is the value from which, the indicator can be regarded as "Acceptable"? (2nd Round)	What is the "Ideal" value of this indicator? (1st Round)	What is the "Ideal" value of this indicator? (2nd Round)
E1	Occupancy rate	It is the occupancy rate of tourism infrastructure						
E2	Tourism employment rate	It is the share total employment rate corresponding to tourism, i.e. it is the percentage of total employment corresponding to Tourism GDP						
E3	Tourism GDP	It is the share of GDP corresponding to tourism activity						

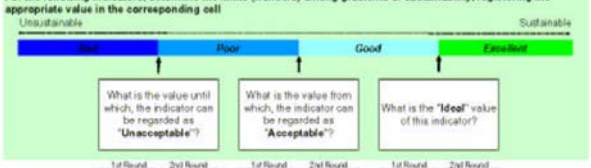
APPENDIX 6

SUSTAINABLE TOURISM GRADIENTS

Expert Panel

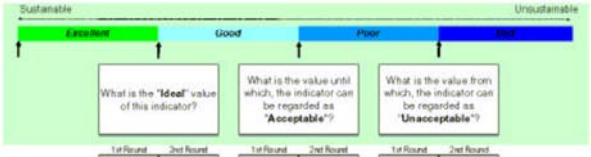
Instructions:

For the following indicators, determine the limits (frontiers) among gradients of sustainability, registering the appropriate value in the corresponding cell



ENVIRONMENTAL Component

	INDICADOR	DESCRIPCION	1st Round	2nd Round	1st Round	2nd Round	1st Round	2nd Round
A1	Contribution of renewables to total energy supply	It is the share total energy consumption, which is covered with renewables						



A2	Energy consumption by tourist	It refers to the annual average of energy consumption (all sources) per tourist						
A3	Water consumption by tourist	It refers to the annual average of water consumption per tourist						
A4	Waste generation by tourist	It refers to the annual average of waste generated per tourist						

APPENDIX 7

		Expert 1		Expert 2		Component Weight	
SUSTAINABILITY COMPONENT		PONDERATION (%)		PONDERATION (%)		MEAN (%)	
		First Round	Second Round	First Round	Second Round	First Round	Second Round
C1	SOCIAL	25	25	25	25	25	25
C2	ECONOMIC	40	40	30	35	35	37.5
C3	ENVIRONMENTAL	35	35	45	40	40	37.5
		100%	100%	100%	100%	100%	100%

APPENDIX 8

		Expert 1		Expert 2		Indicator Weight	
SUSTAINABILITY INDICATORS World Tourism Organization (WTO)		***PONDERATION (%)***		***PONDERATION (%)***		***MEAN (%)***	
		First Round	Second Round	First Round	Second Round	First Round	Second Round
Social							
S1	Ratio of tourists to locals	40	40	33	90	36.5	65
S2	Social expenditure attributed to tourism	20	20	33	0	26.5	10
S3	Tourist expenditure	40	40	33	10	36.5	25
		100%	*100%*	*100%*	*100%*	*100%*	*100%*
Economic							
E1	Occupancy rate	15	0	0	0	7.5	0
E2	Tourism employment rate	40	40	40	40	40	40
E3	Tourism GDP	45	60	60	60	52.5	60
		100%	*100%*	*100%*	*100%*	*100%*	*100%*
Environmental							
A1	Contribution of renewables to total energy supply	20	20	30	30	25	25
A2	Energy consumption by tourist	30	30	20	20	25	25
A3	Water consumption by tourist	30	30	20	20	25	25
A4	Waste generation by tourist	20	20	30	30	25	25
		100%	*100%*	*100%*	*100%*	*100%*	*100%*

APPENDIX 9

Indicator	*Expert 1*								*Expert 2*								*Gradients of Sustainability Frontiers*			
	"Unacceptable"		"Acceptable"		"Ideal"		"Saturated"		"Unacceptable"		"Acceptable"		"Ideal"		"Saturated"		"Unacceptable"	"Acceptable"	"Ideal"	"Saturated"
	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R	1ª R	2ª R				
S1	1.1	1.1	0.6	0.6	0.3	0.3	0.2	0.2	1.5	1.2	1.0	0.8	0.6	0.4	0.5	0.2	1.1	0.7	0.3	0.2
S2	2.5	2.5	4.5	4.5	8.0	8.0			2.5	2.5	5.0	5.0	7.5	7.5			2.5	4.8	7.8	
S3	0.5	0.5	1.0	1.0	2.0	2.0			0.5	0.5	1.0	1.0	1.5	1.5			0.5	1.0	1.8	
E1	30.0	30.0	50.0	50.0	70.0	70.0			40.0	40.0	55.0	55.0	75.0	75.0			35.0	52.5	72.5	
E2	2.0	2.0	8.0	8.0	20.0	20.0			10.0	5.0	15.0	10.0	30.0	20.0			3.5	9.0	20.0	
E3	5.0	5.0	10.0	10.0	15.0	15.0			2.5	2.5	7.0	7.0	12.0	12.0			3.8	8.5	13.5	
A1	10.0	10.0	20.0	20.0	60.0	60.0			10.0	10.0	20.0	20.0	50.0	50.0			10.0	20.0	55.0	
																	"Ideal"	"Acceptable"	"Unacceptable"	
A2	1	1	3	3	6	6			1	1	3	3	5	5			0.8	2.5	5.5	
A3	100	100	200	200	400	400			250	120	300	250	500	400			110.0	225.0	400.0	
A4	100	100	200	200	400	400			150	150	250	250	300	300			125.0	225.0	350.0	

APPENDIX 10

Ratio of tourists to locals

Ratio

JPN	MEX	POL	KOR	USA	SVK	AUS	DEU	DNK	HUN	GBR	SWE	FIN	NLD	FRA	BEL	PRT	CAN	CZE	ITA	NZL	NOR	GRC	ESP	CHE	AUT	IRL	ISL
0.057	0.092	0.098	0.127	0.170	0.240	0.246	0.250	0.250	0.299	0.303	0.316	0.388	0.524	0.531	0.541	0.556	0.560	0.564	0.581	0.582	0.611	0.677	0.788	1.050	1.809	1.927	2.406

Social expenditure attributed to tourism

Percent

DNK	NLD	NZL	KOR	JPN	MEX	USA	SVK	CAN	POL	DEU	GBR	FIN	NOR	CZE	AUS	ITA	HUN	IRL	FRA	BEL	SWE	ESP	CHE	PRT	GRC	ISL	AUT
0.00	0.00	0.00	0.44	0.58	0.68	1.47	2.09	2.14	2.37	3.48	3.63	4.16	4.28	4.68	4.80	5.04	5.94	6.03	7.33	7.49	7.60	8.56	8.73	9.14	9.28	10.22	16.64

Tourist expenditure

Thousands

DNK	NLD	NZL	SVK	ISL	CAN	IRL	CZE	ITA	AUT	KOR	MEX	NOR	JPN	CHE	HUN	FRA	ESP	PRT	FIN	GRC	BEL	DEU	POL	GBR	USA	SWE	AUS
0.00	0.00	0.00	0.00	0.93	0.93	0.96	1.01	1.22	1.26	1.31	1.38	1.50	1.57	1.62	1.64	1.66	1.67	1.71	1.72	1.92	2.04	2.07	2.17	2.35	2.53	3.64	4.69

Occupancy rate

Percent

BEL	AUT	SVK	CZE	DEU	SWE	DNK	NOR	ITA	CHE	POL	HUN	NLD	GBR	ISL	PRT	FIN	KOR	MEX	NZL	ESP	GRC	CAN	FRA	USA	IRL	AUS	JPN
0.00	35.60	35.70	35.80	35.90	36.10	36.20	38.10	40.80	41.70	42.20	42.40	45.30	47.00	47.00	48.30	49.90	52.00	52.78	53.34	56.43	58.60	59.90	60.40	63.30	64.00	66.90	73.10

Tourism employment rate

Percent

DNK	NLD	NZL	SVK	JPN	KOR	MEX	USA	POL	CAN	DEU	NOR	FIN	ITA	HUN	GBR	CZE	FRA	BEL	AUS	SWE	GRC	ESP	IRL	PRT	CHE	AUT	ISL
0.00	0.00	0.00	0.00	1.97	4.63	6.41	7.07	7.92	10.31	10.94	13.23	14.03	14.32	15.50	15.63	16.88	17.15	19.73	23.28	24.56	29.14	29.21	30.16	30.89	34.85	44.83	51.98

Tourism GDP

Percent

DNK	NLD	NZL	SVK	JPN	KOR	USA	MEX	CAN	POL	DEU	NOR	FIN	GBR	ITA	CZE	HUN	FRA	AUS	BEL	SWE	IRL	ESP	CHE	PRT	GRC	ISL	AUT
0.00	0.00	0.00	0.00	2.82	7.25	9.82	10.51	14.14	14.55	16.26	17.52	20.35	21.55	24.52	25.86	27.04	27.54	32.27	32.69	32.96	44.25	44.44	44.71	45.50	47.74	60.94	63.90

Contribution of renewables to total energy supply

Percent

KOR	GBR	IRL	BEL	JPN	NLD	HUN	CZE	SVK	USA	AUS	POL	GRC	FRA	DEU	ESP	ITA	MEX	DNK	CAN	PRT	CHE	AUT	FIN	SWE	NZL	NOR	ISL
1.30	2.10	2.90	3.10	3.40	3.60	4.30	4.50	4.80	5.00	5.20	5.20	5.80	6.30	6.30	6.60	6.80	9.40	15.60	16.10	16.90	17.00	21.30	22.60	29.30	30.00	38.50	77.60

Energy consumption by tourist

Tonnes of oil equivalent (toe) per tourist

MEX	JPN	POL	KOR	HUN	SVK	DNK	DEU	GBR	USA	PRT	AUS	SWE	ITA	GRC	FRA	NZL	CZE	NLD	ESP	FIN	BEL	CHE	NOR	CAN	IRL	AUT	ISL
0.2	0.2	0.3	0.6	0.8	0.8	0.9	1.1	1.2	1.3	1.4	1.5	1.8	1.8	1.9	2.3	2.5	2.5	2.6	2.6	2.8	2.9	4.0	4.0	4.6	7.5	7.5	34.6

Water consumption by tourist

m3 / Tourist

POL	DNK	JPN	SVK	KOR	GBR	MEX	SWE	DEU	CZE	FIN	HUN	AUS	NLD	USA	FRA	BEL	CHE	ITA	NOR	PRT	GRC	IRL	ESP	NZL	CAN	AUT	ISL
29.3	29.9	35.8	44.7	68.8	70.6	75.1	90.9	97.8	111.1	156.8	180.5	229.5	277.3	286.7	322.0	335.5	340.2	384.6	430.9	436.5	533.9	585.8	604.6	813.9	825.2	830.1	1238.8

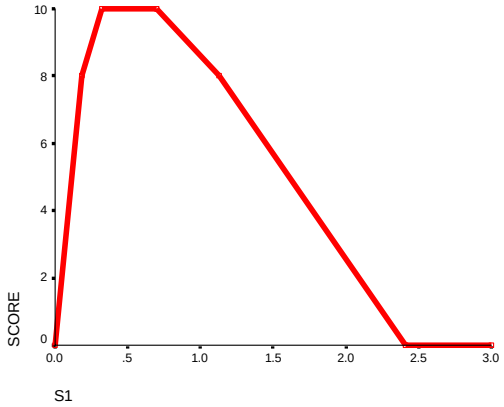
Waste generation by tourist

Kg / Tourist

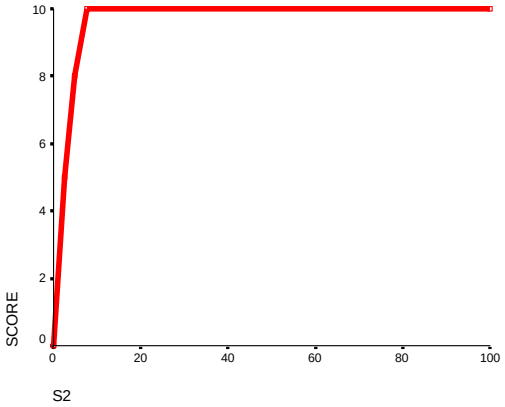
JPN	POL	MEX	KOR	SVK	USA	DEU	HUN	SWE	CZE	FIN	GBR	AUS	DNK	NZL	BEL	PRT	CAN	GRC	ITA	NLD	FRA	NOR	ESP	CHE	AUT	ISL	IRL
21.1	24.4	35.0	47.5	60.3	124.3	136.5	143.2	145.4	161.1	163.8	163.8	170.3	184.5	230.9	237.4	238.6	244.1	283.0	284.5	307.0	310.5	436.6	436.7	631.8	989.1	1130.1	1313.7

APPENDIX 11

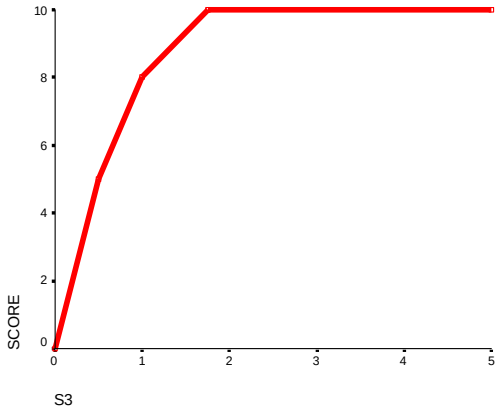
Ratio of tourists to locals



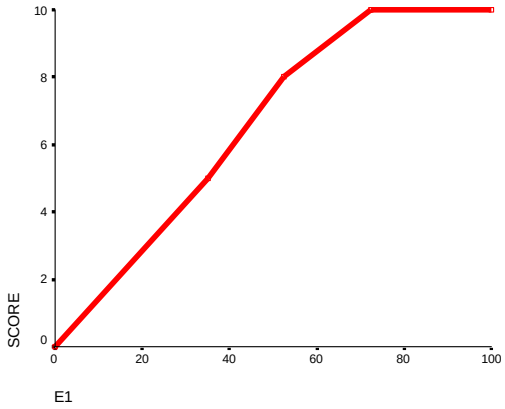
Social expenditure attributed to tourism



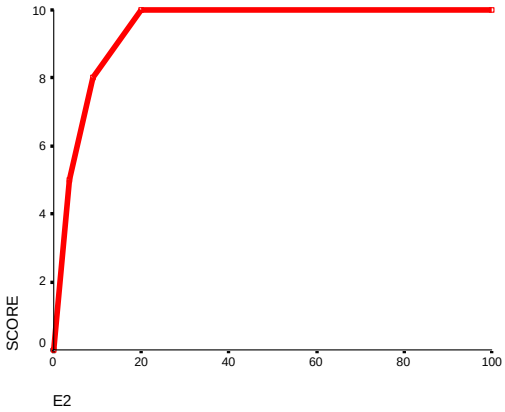
Tourist expenditure



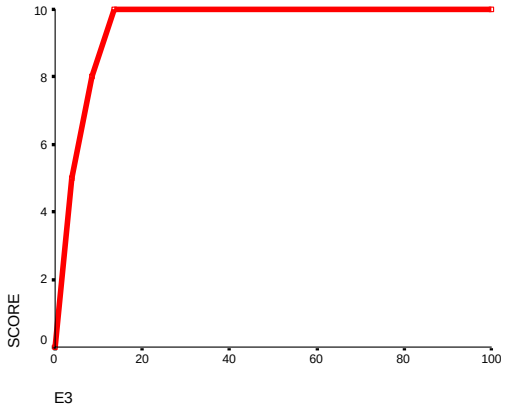
Occupancy rate



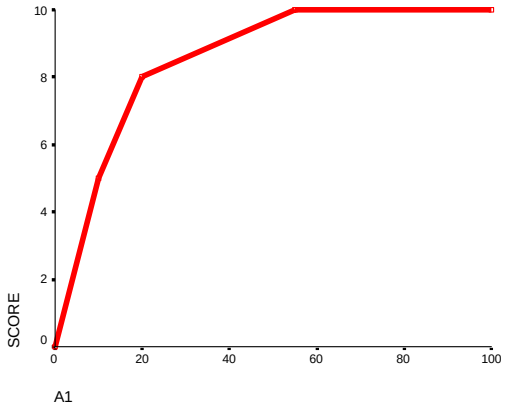
Tourism employment rate



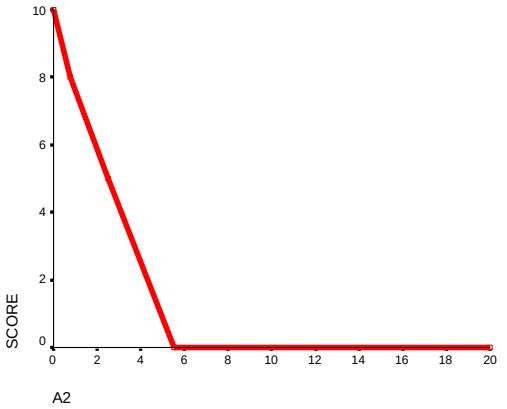
Tourism GDP



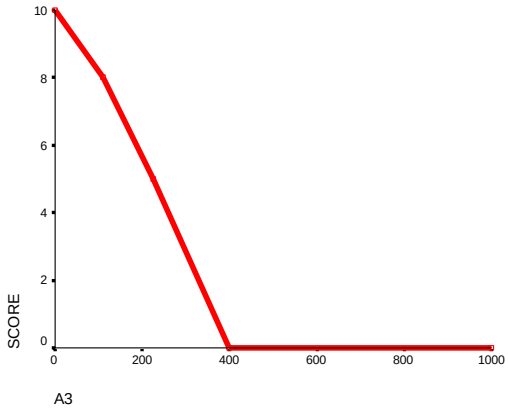
Contribution of renewables to total energy supply



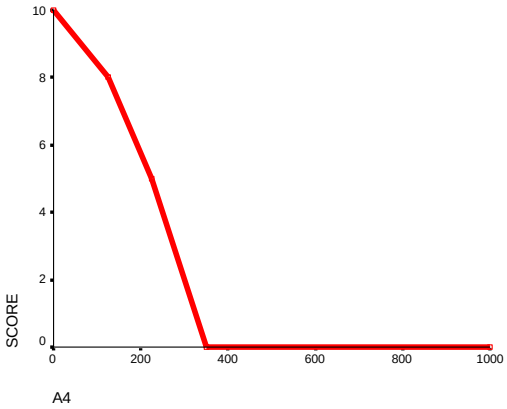
Energy consumption by tourist



Water consumption by tourist



Waste generation by tourist



APPENDIX 13

WTO Baseline Indicator / Issues	Indicator	Proxie /Variable	Notes	Type
Social				
Ratio of tourists to locals (average and peak period/days)	S1	Ratio of tourists to locals	Ratio of tourists to locals (average annual) TOURISM_T1 / EVOPOP_T1	Ratio
Number and capacity of social services available to the community (% which are attributed to tourism)	S2	Social expenditure attributed to tourism	As a proxie, we can use the porcentage of "Public Social Expenditure" corresponding to tourism activity: (SOCEXPEND_T1) * Tourism_GDP	Percent
Tourist arrivals by month or quarter (distribution throughout the year)	S3	Tourist expenditure	As a proxie we can use the annual "spending by tourist" : "TOURISM EXPENDITURE" (WTO) / TOURISM_T1	Thousands
Economic				
Occupancy rates for licensed (official) accommodation by month (peak periods relative to low season) and % of all occupancy in peak quarter or month)	E1	Occupancy rate	OCCUPANCY RATES (WTO)	Percent
Number of local people (and ratio men to women) employed in tourism (also ratio of tourism employment to total employment)	E2	Tourism employment rate	As a proxie, we can use the porcentage of "Employment rate total" corresponding to tourism activity: EMPLGNDR_T1 * Tourism_GDP	Percent
Revenues generated by tourism as % of total revenues generated in the community	E3	Tourism GDP	As a proxie we can use the Porcentage of "Tourism Expenditure" in Gross Domestic Product": "TOURISM EXPENDITURE" (WTO) / SIZEGDP_T1	Percent
Environmental				
% of energy consumption from renewable resources (at destinations, establishments)	A1	Contribution of renewables to total energy supply	As a proxie we can use variable "Contribution of renewables to energy supply": RNEWABLE_T1	Percent
Per capita consumption of energy from all sources (overall, and by tourist sector- per person/day)	A2	Energy consumption by tourist	"Total Primary Energy Supply per Cápita" times "Ratio of Tourist to Locals" TPES2_T1 * S1	Tonnes of oil equivalent (toe) per tourist
Water use (total volume consumed and litres per tourist per day)	A3	Water consumption by tourist	"Per capita water abstractions" times "Ratio of Tourist to Locals" WATER_T1B * S1	m3 / Tourist
Waste volume produced by the destination (tonnes averall and by tourist sector - per person a day)	A4	Waste generation by tourist	"Generation Intensities of Municipal Waste" per capita times "Ratio of Tourist to Locals" WASTE_T1B * S1	Kg / Tourist

Note:
All variables with the extension “WTO” are included from the source (WTO, 2008). The rest of them are included using their original name in (OECD, 2009).

APPENDIX 14

OECD Members		
1	Australia	AUS
2	Austria	AUT
3	Belgium	BEL
4	Canada	CAN
5	Czech Republic	CZE
6	Denmark	DNK
7	Finland	FIN
8	France	FRA
9	Germany	DEU
10	Greece	GRC
11	Hungary	HUN
12	Iceland	ISL
13	Ireland	IRL
14	Italy	ITA
15	Japan	JPN
16	Korea	KOR
17	Luxembourg	LUX
18	Mexico	MEX
19	Netherlands	NLD
20	New Zealand	NZL
21	Norway	NOR
22	Poland	POL
23	Portugal	PRT
24	Slovak Republic	SVK
25	Spain	ESP
26	Sweden	SWE
27	Switzerland	CHE
28	Turkey	TUR
29	United Kingdom	GBR
30	United States	USA

APPENDIX 15

	Sustainability Indicators (SI)									
	S1	S2	S3	E1	E2	E3	A1	A2	A3	A4
AUS	0.25	4.80	4.69	66.90	23.28	32.27	5.20	1.46	229.53	170.30
AUT	1.81	16.64	1.26	35.60	44.83	63.90	21.30	7.53	830.13	989.09
BEL	0.54	7.49	2.04	0.00	19.73	32.69	3.10	2.90	335.53	237.45
CAN	0.56	2.14	0.93	59.90	10.31	14.14	16.10	4.65	825.20	244.07
CHE	1.05	8.73	1.62	41.70	34.85	44.71	17.00	3.97	340.21	631.81
CZE	0.56	4.68	1.01	35.80	16.88	25.86	4.50	2.49	111.12	161.12
DEU	0.25	3.48	2.07	35.90	10.94	16.26	6.30	1.06	97.82	136.49
DNK	0.25	0.00	0.00	36.20	0.00	0.00	15.60	0.93	29.91	184.45
ESP	0.79	8.56	1.67	56.43	29.21	44.44	6.60	2.59	604.64	436.68
FIN	0.39	4.16	1.72	49.90	14.03	20.35	22.60	2.79	156.80	163.77
FRA	0.53	7.33	1.66	60.40	17.15	27.54	6.30	2.32	322.01	310.51
GBR	0.30	3.63	2.35	47.00	15.63	21.55	2.10	1.16	70.62	163.85
GRC	0.68	9.28	1.92	58.60	29.14	47.74	5.80	1.86	533.93	283.05
HUN	0.30	5.94	1.64	42.40	15.50	27.04	4.30	0.82	180.55	143.19
IRL	1.93	6.03	0.96	64.00	30.16	44.25	2.90	7.50	585.83	1313.68
ISL	2.41	10.22	0.93	47.00	51.98	60.94	77.60	34.55	1238.78	1130.11
ITA	0.58	5.04	1.22	40.80	14.32	24.52	6.80	1.82	384.58	284.48
JPN	0.06	0.58	1.57	73.10	1.97	2.82	3.40	0.24	35.81	21.06
KOR	0.13	0.44	1.31	52.00	4.63	7.25	1.30	0.57	68.82	47.55
MEX	0.09	0.68	1.38	52.78	6.41	10.51	9.40	0.15	75.08	34.97
NLD	0.52	0.00	0.00	45.30	0.00	0.00	3.60	2.57	277.28	306.99
NOR	0.61	4.28	1.50	38.10	13.23	17.52	38.50	3.98	430.86	436.61
NZL	0.58	0.00	0.00	53.34	0.00	0.00	30.00	2.47	813.89	230.89
POL	0.10	2.37	2.17	42.20	7.92	14.55	5.20	0.25	29.27	24.39
PRT	0.56	9.14	1.71	48.30	30.89	45.50	16.90	1.35	436.55	238.58
SVK	0.24	2.09	0.00	35.70	0.00	0.00	4.80	0.83	44.66	60.29
SWE	0.32	7.60	3.64	36.10	24.56	32.96	29.30	1.79	90.90	145.44
USA	0.17	1.47	2.53	63.30	7.07	9.82	5.00	1.32	286.68	124.28

APPENDIX 16

	α (SI)									
	S1	S2	S3	E1	E2	E3	A1	A2	A3	A4
AUS	8.87	8.03	10.00	9.44	10.00	10.00	2.60	6.79	4.87	6.64
AUT	3.73	10.00	8.70	5.10	10.00	10.00	8.07	0.00	0.00	0.00
BEL	10.00	9.82	10.00	0.00	9.95	10.00	1.55	4.33	1.84	4.50
CAN	10.00	4.28	7.58	8.74	8.24	10.00	6.83	1.42	0.00	4.24
CHE	8.35	10.00	9.66	6.15	10.00	10.00	7.10	2.55	1.71	0.00
CZE	10.00	7.91	8.03	5.14	9.43	10.00	2.25	5.01	7.97	6.92
DEU	8.92	6.30	10.00	5.15	8.35	10.00	3.15	7.47	8.22	7.66
DNK	8.92	0.00	0.00	5.21	0.00	0.00	6.68	7.69	9.46	6.22
ESP	9.59	10.00	9.79	8.39	10.00	10.00	3.30	4.85	0.00	0.00
FIN	10.00	7.21	9.91	7.55	8.91	10.00	8.15	4.52	6.78	6.84
FRA	10.00	9.72	9.77	8.79	9.48	10.00	3.15	5.32	2.23	1.58
GBR	9.68	6.51	10.00	7.06	9.21	10.00	1.05	7.29	8.72	6.83
GRC	10.00	10.00	10.00	8.61	10.00	10.00	2.90	6.10	0.00	2.68
HUN	9.63	8.79	9.71	6.27	9.18	10.00	2.15	7.88	6.16	7.45
IRL	2.99	8.85	7.75	9.15	10.00	10.00	1.45	0.00	0.00	0.00
ISL	0.00	10.00	7.57	7.06	10.00	10.00	10.00	0.00	0.00	0.00
ITA	10.00	8.19	8.60	5.99	8.97	10.00	3.40	6.16	0.44	2.62
JPN	2.48	1.16	9.51	10.00	2.82	3.76	1.70	9.37	9.35	9.66
KOR	5.51	0.88	8.83	7.91	5.62	7.21	0.65	8.47	8.75	9.24
MEX	4.00	1.36	9.00	8.03	6.59	8.81	4.70	9.59	8.63	9.44
NLD	10.00	0.00	0.00	6.77	0.00	0.00	1.80	4.89	3.51	1.72
NOR	10.00	7.38	9.32	5.53	8.77	10.00	9.06	2.54	0.00	0.00
NZL	10.00	0.00	0.00	8.08	0.00	0.00	8.57	5.06	0.00	4.76
POL	4.25	4.74	10.00	6.23	7.41	10.00	2.60	9.32	9.47	9.61
PRT	10.00	10.00	9.88	7.28	10.00	10.00	7.07	6.97	0.00	4.46
SVK	8.78	4.18	0.00	5.12	0.00	0.00	2.40	7.87	9.19	9.04
SWE	9.87	9.90	10.00	5.19	10.00	10.00	8.53	6.22	8.35	7.39
USA	7.35	2.95	10.00	9.08	6.95	8.53	2.50	7.02	3.24	8.01

APPENDIX 17

	ω	0.16	0.03	0.06	0.00	0.15	0.23	0.09	0.09	0.09	0.09
		ω α (SI)									
		S1	S2	S3	E1	E2	E3	A1	A2	A3	A4
AUS		1.44	0.20	0.63	0.00	1.50	2.25	0.24	0.64	0.46	0.62
AUT		0.61	0.25	0.54	0.00	1.50	2.25	0.76	0.00	0.00	0.00
BEL		1.63	0.25	0.63	0.00	1.49	2.25	0.15	0.41	0.17	0.42
CAN		1.63	0.11	0.47	0.00	1.24	2.25	0.64	0.13	0.00	0.40
CHE		1.36	0.25	0.60	0.00	1.50	2.25	0.67	0.24	0.16	0.00
CZE		1.63	0.20	0.50	0.00	1.41	2.25	0.21	0.47	0.75	0.65
DEU		1.45	0.16	0.63	0.00	1.25	2.25	0.30	0.70	0.77	0.72
DNK		1.45	0.00	0.00	0.00	0.00	0.00	0.63	0.72	0.89	0.58
ESP		1.56	0.25	0.61	0.00	1.50	2.25	0.31	0.45	0.00	0.00
FIN		1.63	0.18	0.62	0.00	1.34	2.25	0.76	0.42	0.64	0.64
FRA		1.63	0.24	0.61	0.00	1.42	2.25	0.30	0.50	0.21	0.15
GBR		1.57	0.16	0.63	0.00	1.38	2.25	0.10	0.68	0.82	0.64
GRC		1.63	0.25	0.63	0.00	1.50	2.25	0.27	0.57	0.00	0.25
HUN		1.56	0.22	0.61	0.00	1.38	2.25	0.20	0.74	0.58	0.70
IRL		0.49	0.22	0.48	0.00	1.50	2.25	0.14	0.00	0.00	0.00
ISL		0.00	0.25	0.47	0.00	1.50	2.25	0.94	0.00	0.00	0.00
ITA		1.63	0.20	0.54	0.00	1.35	2.25	0.32	0.58	0.04	0.25
JPN		0.40	0.03	0.59	0.00	0.42	0.85	0.16	0.88	0.88	0.91
KOR		0.90	0.02	0.55	0.00	0.84	1.62	0.06	0.79	0.82	0.87
MEX		0.65	0.03	0.56	0.00	0.99	1.98	0.44	0.90	0.81	0.89
NLD		1.63	0.00	0.00	0.00	0.00	0.00	0.17	0.46	0.33	0.16
NOR		1.63	0.18	0.58	0.00	1.32	2.25	0.85	0.24	0.00	0.00
NZL		1.63	0.00	0.00	0.00	0.00	0.00	0.80	0.47	0.00	0.45
POL		0.69	0.12	0.63	0.00	1.11	2.25	0.24	0.87	0.89	0.90
PRT		1.63	0.25	0.62	0.00	1.50	2.25	0.66	0.65	0.00	0.42
SVK		1.43	0.10	0.00	0.00	0.00	0.00	0.23	0.74	0.86	0.85
SWE		1.60	0.25	0.63	0.00	1.50	2.25	0.80	0.58	0.78	0.69
USA		1.19	0.07	0.63	0.00	1.04	1.92	0.23	0.66	0.30	0.75

APPENDIX 18

Country	Social	Economic	Environmental	SPTDI
SWE	2.48	3.75	2.86	**9.08**
FIN	2.42	3.59	2.46	**8.48**
HUN	2.39	3.63	2.22	**8.23**
GBR	2.36	3.63	2.24	**8.23**
DEU	2.23	3.50	2.48	**8.22**
CZE	2.32	3.66	2.08	**8.07**
PRT	2.49	3.75	1.73	**7.98**
AUS	2.27	3.75	1.96	**7.98**
POL	1.43	3.36	2.91	**7.70**
BEL	2.50	3.74	1.15	**7.38**
GRC	2.50	3.75	1.10	**7.35**
FRA	2.48	3.67	1.15	**7.30**
MEX	1.25	2.97	3.03	**7.25**
ITA	2.37	3.60	1.18	**7.15**
NOR	2.39	3.57	1.09	**7.04**
CHE	2.21	3.75	1.07	**7.03**
ESP	2.42	3.75	0.76	**6.93**
CAN	2.21	3.49	1.17	**6.86**
USA	1.89	2.96	1.95	**6.80**
KOR	1.47	2.46	2.54	**6.48**
AUT	1.40	3.75	0.76	**5.91**
ISL	0.72	3.75	0.94	**5.41**
JPN	1.03	1.27	2.82	**5.11**
IRL	1.19	3.75	0.14	**5.08**
DNK	1.45	0.00	2.82	**4.27**
SVK	1.53	0.00	2.67	**4.20**
NZL	1.63	0.00	1.72	**3.35**
NLD	1.63	0.00	1.12	**2.74**