**UNIVERSITI PUTRA MALAYSIA**

*DEVELOPMENT OF CRITERIA AND INDICATORS FOR SUSTAINABLE ECOTOURISM RESOURCE MANAGEMENT IN PENANG NATIONAL PARK, MALAYSIA*

**MARZIEH FALLAH**

**FPAS 2014 22**

# DEVELOPMENT OF CRITERIA AND INDICATORS FOR SUSTAINABLE ECOTOURISM RESOURCE MANAGEMENT IN PENANG NATIONAL PARK, MALAYSIA

By

**MARZIEH FALLAH**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy**

**December 2014**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

# DEVELOPMENT OF CRITERIA AND INDICATORS FOR SUSTAINABLE ECOTOURISM RESOURCE MANAGEMENT IN PENANG NATIONAL PARK, MALAYSIA

By

## MARZIEH FALLAH

### December 2014

**Chairman:** **Associate Professor Ahmad Makmom Abdullah, PhD**
**Faculty:** **Environmental Studies**

The Penang National Park (PNP) is one of the few natural heritage sites located in the northwest corner of Penang Island. It was officially declared a national park in April 2003. The site covers an area of about 1,266 hectares of coastline hills with many exclusive features. With the rapid influx of visitors, PNP is facing several threats of various degrees in ecotourism development, such as poor disposal of solid wastes, flora, and fauna loss, lack of public social involvement or participation and low environmental consciousness among the visitors. Thus, criteria and indicators are effective tools for evaluating and assessing its sustainability. However, up to now, there is still no clear image of the criteria and indicators (C&I) of sustainability index for managing ecotourism in the PNP. Prioritizing C&I set makes it easier for managers to monitor and assess the sustainability of ecotourism management in the park. In terms of time and expenses, the fuzzy model developed for assessing the ecotourism management in the park is a flexible and could easily update the model with new knowledge.

The objectives of this study were (1) to identify the important of sustainability C&I for the management of ecotourism in PNP; (2) to develop a hierarchy model of sustainable ecotourism management of PNP through C&I; and (3) to assess the sustainability of ecotourism management in PNP. Methodologically, a panel of 30 academic and non-academic experts in sustainable tourism, ecotourism, and forestry management helped to identify C&I using modified Delphi Technique, and this was followed by conducting the inter-rater reliability (Content Validity Ratio) test. The next step was the application of Fuzzy Analytic Hierarchical Process (FAHP), which is a Multi Criteria Decision Making (MCDM) method through engaging five experts from academic and non-academic fields to prioritize the most important criteria and indicators and to establish the hierarchy model of C&I.

Fuzzy Inference System (FIS) was employed in the final step based on certain indicators as inputs by applying Matlab software. The real value, minimum value, and maximum value of each indicator obtained through reports and interview with experts. The membership function of each indicator was established through Matlab software and 169 rules were established for the whole system. A sensitivity analysis

was conducted to identify the most effective indicator in determining the sustainability level of the park. In phase one, the modified Delphi technique revealed a consensus of 9 criteria and 21 indicators for the ecotourism management of PNP. The C&I are as follows, ecological dimension (three criteria and six indicators), social dimension (three criteria and seven indicators), economical dimension (two criteria and four indicators), and institutional dimension (one criterion and two indicators). In phase 2, four dimensions of ecological, social, economic, and institutional criteria and indicators were prioritized. In ecological dimension, the criterion of conservation of biodiversity and its sole indicator, the number of threatened species, were found to be the most important criterion and indicator. In the social dimension, the criterion of visitor safety, and its sole indicator, the number of trained, skilled, and dedicated staff in the park were found to be the most important criterion and indicator. In economic dimension, criterion community's economic improvement, and its sole indicator, number of tourism businesses and services operated and owned by the locals was found to the most important C&I, and in institutional dimension, its sole indicator, number of stakeholders involved in park's management was the most important indicator. Consistency Ratio (CR) for each pairwise comparison was calculated and it was less than $0.1 (< 0.1)$.

The 9 criteria and 21 indicators encompass all the different dimensions of environmental, social, economic and institutional, which were associated with sustainable development concept. In addition, the ecological dimension has the highest priority and institutional cooperation dimension has the lowest priority. An overall sustainability of ecotourism management in PNP indicated that more than 50% was considered medium level of sustainability of the park. In conclusion, this set of C&I would serve as an instrument for monitoring ecotourism activity and evaluating the sustainability of ecotourism management in PNP by the Department of Wildlife and tourism organization in Malaysia. Prioritizing C&I with MCDM ensures that the most important tool in assessing the ecotourism management in PNP and the FIS was used to identify the level and status of sustainability of ecotourism management in the park.

Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

## PENILAIAN KEMAMPANAN PENGURUSAN EKOPELANCONGAN DI TAMAN NEGARA PULAU PINANG, MALAYSIA

Oleh

## MARZIEH FALLAH

## Disember 2014

**Pengerusi:** **Profesor Madya Ahmad Makmom Abdullah, PhD**
**Fakulti:** **Pengajian Alam Sekitar**

Taman Negara Pulau Pinang (TNPP) merupakan salah satu daripada tapak warisan semula jadi yang terletak di sudut barat laut Pulau Pinang. Ia diisytiharkan secara rasmi sebagai Taman Negara pada bulan April 2003. Taman Negara ini meliputi kawasan seluas1266 hektar yang terdiri daripada kawasan pesisiran pantai yang berbukit serta beberapa ciri-ciri yang khusus. Dengan peningkatan jumlah pengunjung, TNPP menghadapi beberapa ancaman dalam pembangunan ekopelancongan seperti pelupusan sisa pepejal yang lemah, kehilangan flora dan fauna, kekurangan penglibatan sosial daripada orang awam dan kesedaran alam sekitar yang rendah di kalangan pengunjung. Oleh itu, ciri-ciri dan petunjuk merupakan alat yang berkesan untuk menilai dan mengkaji kemampanan TNPP. Walau bagaimanapun, sehingga kini, masih tiada imej yang jelas mengenai ciri-ciri dan petunjuk (C&P) kepada indeks kemampanan dalam pengurusan ekopelancongan di TNPP. Pengutamaan set C&P memudahkan pengurus untuk mengawasi dan menilai kemampanan pengurusan ekopelancongan di taman negara. Dari segi masa dan perbelanjaan, model fuzzy telah dibangunkan untuk menilai pengurusan ekopelancongan di taman negara dan merupakan model yang boleh lentur serta mudah untuk ditambah nilai dengan pengetahuan baharu.

Objektif kajian ini adalah (1) untuk mengenal pasti kepentingan kemapanan C&P dalam pengurusan ekopelancongan di TNPP; (2) untuk membangunkan model hierarki kemapanan dalam pengurusan ekopelancongan di TNPP melalui C&P; dan (3) untuk menilai tahap kemampanan pengurusan ekopelancongan di TNPP. Secara kaedahnya, panel yang terdiri daripada  30 pakar akademik dan bukan akademik dalam bidang pelancongan mampan, ekopelancongan dan pengurusan hutan terlibat dalam pengenalpastian C&P, dengan menggunakan teknik Delphi yang diubahsuai, dan ini diikuti dengan menjalankan ujian kebolehpercayaan inter-rater (Nisbah Pengesahan Kandungan). Langkah seterusnya adalah menjalankan proses analisa hierarki fuzzy (PAHF), dimana ianya tergolong dalam kaedah Penentuan Keputusan Pelbagai Ciri (PKPC). melalui penglibatan 5 orang pakar dari bidang akademik dan bukan akademik untuk melaksanakan pengutamaan ciri-ciri dan petunjuk yang paling penting dalam mewujudkan model hierarki C&P.

Sistem Penyimpulan Fuzzy (SPF) telah digunakan di langkah terakhir berdasarkan petunjuk tertentu sebagai input dengan menggunakan perisian Matlab. Nilai sebenar, nilai minima dan nilai maksima setiap petunjuk yang diperolehi adalah melalui laporan dan temubual dengan pakar-pakar. Fungsi keahlian bagi setiap petunjuk telah diwujudkan dalam perisian Matlab dan sebanyak 169 peraturan telah ditetapkan bagi keseluruhan sistem. Analisa kepekaan telah dijalankan untuk mengenalpasti petunjuk yang paling berkesan dalam penentuan tahap kemampanan taman negara. Dalam fasa pertama, teknik Delphi yang diubahsuai telah menghasilkan sembilan ciri-ciri dan 21 petunjuk bagi pengurusan ekopelancongan Taman Negara Pulau Pinang. C&P adalah seperti berikut, dimensi ekologi (tiga ciri dan enam petunjuk), dimensi sosial (tiga ciri dan tujuh petunjuk), dimensi ekonomi (dua ciri dan empat petunjuk), ~~dan~~ serta dimensi institusi (satu ciri dan dua petunjuk).

Dalam fasa kedua, empat ciri dan petunjuk dimensi iaitu ekologi, sosial, ekonomi dan institusi telah diberikan keutamaan. Dalam dimensi ekologi, ciri pemuliharaan kepelbagaian bio dan petunjuknya, jumlah spesies yang terancam telah dikenalpasti sebagai ciri-ciri dan petunjuk yang paling penting. Dalam dimensi sosial, ciri keselamatan pengunjung dan petunjuknya, bilangan kakitangan yang terlatih, mahir dan berdedikasi di taman negara telah dikenalpasti sebagai ciri-ciri dan petunjuk yang paling penting. Dalam dimensi ekonomi pula, peningkatan ciri ekonomi komuniti dan petunjuknya, bilangan perniagaan dan perkhidmatan berasaskan pelancongan dikendali serta dimiliki oleh penduduk tempatan menjadi ciri dan petunjuk yang paling penting, manakala dalam dimensi institusi pula, pihak berkepentingan yang terlibat dalam pengurusan taman negara telah ditentukan sebagai petunjuk yang paling penting. Nisbah Ketekalan (NK) bagi setiap perbandingan secara berpasangan telah dikira dan nilainya adalah kurang daripada 0.1 (<0.1).

Sembilan ciri dan 21 petunjuk merangkumi semua dimensi yang berbeza seperti alam sekitar, sosial, ekonomi dan institusi, telah dikaitkan dengan konsep pembangunan lestari. Di samping itu, dimensi ekologi mempunyai keutamaan yang tertinggi manakala dimensi kerjasama antara institusi mempunyai keutamaan yang terendah. Kemampanan pengurusan ekopelancongan di TNPP secara keseluruhannya menunjukkan bahawa kemampanan taman negara berada pada tahap sederhana iaitu dengan peratusan melebihi 50%. Kesimpulannya, set ciri dan petunjuk (C&P) boleh digunakan sebagai alat untuk memantau aktiviti ekopelancongan dan penilaian kemampanan pengurusan ekopelancongan di TNPP oleh Jabatan Perlindungan Hidupan Liar serta organisasi pelancongan di Malaysia. Pengutamaan Ciri-ciri dan Petunjuk (C&P) bersama dengan Penentuan Keputusan Pelbagai Ciri (PKPC) memastikan bahawa peralatan yang paling penting dalam penilaian pengurusan ekopelancongan di TNPP serta SPF digunapakai sepenuhnya dalam penentuan tahap dan juga status kemampanan pengurusan ekopelancongan di taman negara.

# ACKNOWLEDGEMENTS

Important Milestones in life can only be achieved through help of family, friends and mentors. During the course of completing this work, I have received enormous support from many individuals and groups, for which I am deeply grateful.
I would like to express my deepest appreciation to my supervisor , Assoc. Prof. Dr. Ahmad Makmom Abdullah, for his professional and scientific guidance and sparing me her precious time effort and giving me encouragement to help me overcome all my obstacles and complete this dissertation.

My gratitude also goes to the member of my supervisory committee, Assoc. Prof. Dr. Abdullah Mohd from the faculty of Forestry for his expertise and important contributions for completing this thesis. I also wish to express my appreciation to my committee member, Assoc. Prof. Dr. Azlizam Aziz, from the faculty of Forestry for his invaluable suggestions, helpful comments and personal mentor. I would also like to thank Dr. khairil form faculty of economy for his kind guidance and for providing much time for checking the whole thesis draft and serving me as my committee member.

Special thanks to Mr. Kanda Kumar head of Malaysian Nature Society (MNS), Ms Nurul deputy dean of department of wildlife in Penang National Park, Dr. Zaaba Abidin Deputy director general in Department of Wildlife and National Parks (DWNP), Dr. Siva Head of ecotourism division in DWNP for their kind cooperation and support in collecting data and valuable information during my study.

Last but not the least, for all they mean to me, I must thank my father and my mother for their unconditional love and continual support at every stage of my education. And specially my deepest and immeasurable thanks go to my dearest friend Mitra who has been a great inspiratory, listener, and supporter throughout the entire process of this work.

I certify that a Thesis Examination Committee has met on 18 December 2014 to conduct the final examination of Marzieh Fallah on her thesis entitled "Development of Criteria and Indicators for Sustainable Ecotourism Resource Management in Penang National Park, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

**Mohamad Pauzi b Zakaria, PhD**
Professor
Faculty of Environmental Studies
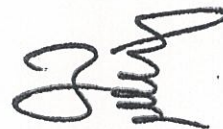Universiti Putra Malaysia
(Chairman)

**Manohar a/l Mariapan, PhD**
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

**Mohd Rusli bin Yacob, PhD**
Associate Professor
Faculty of Environmental Studies
Universiti Putra Malaysia
(Internal Examiner)

**Indah Susilowati, PhD**
Professor
Dipcnegoro University (UNDIP)
Country
(External Examiner)

**ZULKARNAIN ZAINAL, PhD**
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 19 March 2015

The thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the supervisory Committee were as follows:

**Ahmad Makmom Abdullah, PhD**
Associate Professor
Faculty of Environmental Studies
Universiti Putra Malaysia
(Chairman)

**Abdullah Mohd, PhD**
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

**Azlizam Aziz, PhD**
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

**Khairil Wahidin Awang, PhD**
Associate Professor
Faculty of Economy
Universiti Putra Malaysia
(Member)

**BUJANG BIN KIM HUAT, PhD**
Professor and Dean,
School of Graduate Studies
Universiti Putra Malaysia

Date

**Declaration by graduate student**

I hereby confirm that:
- this thesis is my original work
- quotations, illustrations and citations have been duly referenced
- the thesis has not been submitted previously or comcurrently for any other degree at any institutions
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice –Chancellor (Research and innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date: _____

Name and Matric No: Marzieh Fallah GS23752

**Declaration by Members of Supervisory Committee**

This is to confirm that:
- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

Signature:

Name of Chairman of Supervisory Committee:

ASSOC. PROF. DR. AHMAD MAKMOM ABDULLAH
Deputy Dean of (Academic and Student Affairs)
Faculty of Environmental Studies
Universiti Putra Malaysia
43400 UPM Serdang

Signature:

Name of Member of Supervisory Committee:

PROF. MADYA DR. ABDULLAH MOHD
Pensyarah
Jabatan Rekreasi dan Ekopelancongan
Fakulti Perhutanan
Universiti Putra Malaysia
43400 UPM Serdang, Selangor.

Signature:

Name of Member of Supervisory Committee:

ASSOC. PROF. DR. KHAIRIL WAHIDIN HJ. AWANG
Department of Management and Marketing
Faculty of Economics and Management
Universiti Putra Malaysia

Signature:

Name of Member of Supervisory Committee:

PROF. MADYA DR. AZLIZAM AZIZ
Ketua
Jabatan Rekreasi dan Ekopelancongan
Fakulti Perhutanan
Universiti Putra Malaysia
43400 UPM Serdang

**TABLE OF CONTENTS**

# LIST OF TABLES

**LIST OF FIGURES**

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AHP | Analytic Hierarchy Process |
| C | Criteria |
| I | Indicator |
| C&I | Criteria and indicators |
| CES | Compendium of Environmental Statistics |
| CITES | Convention on Internationally Traded and Endangered Species |
| CR | Consistency ratio |
| CSD | Commission on Sustainable Development |
| DWNP | Department of Wildlife and National Park Malaysia |
| DM | decision maker |
| EF | Ecological Foot Printing |
| FIS | Fuzzy Inference System |
| FAHP | Fuzzy Analytic Hierarchy Process |
| FL | Fuzzy Logic |
| IISD | International Institute for Sustainable Development |
| GDP | Gross Domestic Product |
| MCDM | Multi Criteria Decision Making |
| MDCs | More Developed Countries |
| MOTAC | Ministry of Tourism and Culture |
| NES | National Ecotourism Strategy |
| NGO | Non-Governmental Organizations |
| NT | Nearly Threatened |
| PNP | Penang National Park |
| SAFE | Sustainability assessment by fuzzy evaluation |
| SD | Sustainable development |
| TIES | International Ecotourism Society |
| UNCED | United Nation's Conference on Environment and Development |
| UN | United Nations |
| WCED | United Nations World Commission on Environment and Development |
| WTO | World Tourism Organization |

# CHAPTER 1

## INTRODUCTION

### 1.1  Background

Ecotourism as a term referring to a particular concept of tourism was first used in the late 1980s in the context of environmental preservation and sustainable development (Ceballos-Lascurain, 1996; Coria & Calfucura, 2012; Diamantis, 1999). Ecotourism is broadly defined as tourism experiences that care for the integrity of the biophysical environment, providing for economic viability and social responsibility in the long term (Hall, 2011; Pegas & Castley, 2014; Singh, 2012). It supports environmental conservation of threatened natural areas as well as generating economic opportunities (Agardy, 1993; E. Boo, 1990; Burton, 1998; Ceballos-Lascurain, 1996; Dixon et al., 2003; Gössling, 1999; Honey, 1999; López, 2002; Miller & Kaae, 1993; Wall, 1997; Western et al., 1993; Zhang & Lei, 2012). Ecotourism therefore becomes a noteworthy subject in the tourism industry (Vincent & Thompson, 2002; Weaver & Lawton, 2007) and is recognized as a sustainable way to develop regions with abundant tourism resources (Weaver, 2001; Zhang & Lei, 2012).

Ecotourism has grown steadily over the last few years (Goodwin, 1996; Torquebiau & Taylor, 2009) registering a growth rate of 10 -125% annually. i.e., 300% faster than the average growth rate for the whole tourism industry (IES, 2008) and the major players are mostly developing countries with flora and fauna that are both rare and under threat and endangered that see ecotourism as a great opportunity for economic development through sustainable development (Brooks et al., 2006; Coria & Calfucura, 2012).

However, in recent years, ecotourism has faced some challenges, especially since the notion of ecotourism is still to be adequately defined while guidelines about which opportunities are involved as ecotourism, and which are not have still to be formulated (Sander, 2012). Ecotourism would destroy the natural resources upon which it depends, especially when management is poor (Mieczkowski, 1995; Stabler, 1997). Therefore, ecotourism is not only an opportunity but also a challenge for sustainability of reserves (Li, 2004).

There is concern that ecotourism will perform in much the same way as mass tourism only degrading the resources at a slower rate (Bauer, 2001). Ecotourism sites can be situated in highly sensitive and vulnerable environments, some of which cannot endure even moderate levels of usage, and which often have minute or no infrastructure at all (Butler, 1999). Previous studies also indicate significant shortcomings in the field, including equity disparities in local income and employment; dilution of local culture; limited revenue accruing to the destination country, protected area and local communities; and loss of economic diversity (Honey, 2008; Weaver, 2001). Ecotourism initiatives aim to minimize the negative impacts generated by the tourism industry (e.g. commodification of local cultures) (Bramwell & Lane, 1994). However, require critical examination to assess their overall sustainability (Doan, 2011; Pegas & Castley, 2014).

1

In addition, existing ecotourism activities may provide benefits for conservation, but are not comparable to the costs involved in the conservation of the protected areas concerned. Hence, current ecotourism activities have not met the expectations of the protected area managers. The role that ecotourism can play as a conservation strategy depends on the strategies designed by protected area managers to consider the cost and benefits and manage the ecotourism sites sustainably from the environmental, social and economic contexts (López, 2002).

## 1.2 **Problem statement**

The Penang National Park (PNP) situated in Northern Peninsular Malaysia offers many unique features such as the Meromictic Lake, turtle sanctuary, and so forth. These features are potential opportunities for ecotourism activities (Hong & Chan, 2010a). According to the reports from the Wildlife and National Park Department of Penang National Park, visitor numbers increased from 21,768 in 2004 to 115,915 in 2013 with 4% growth, rate annually (figure 1.1).
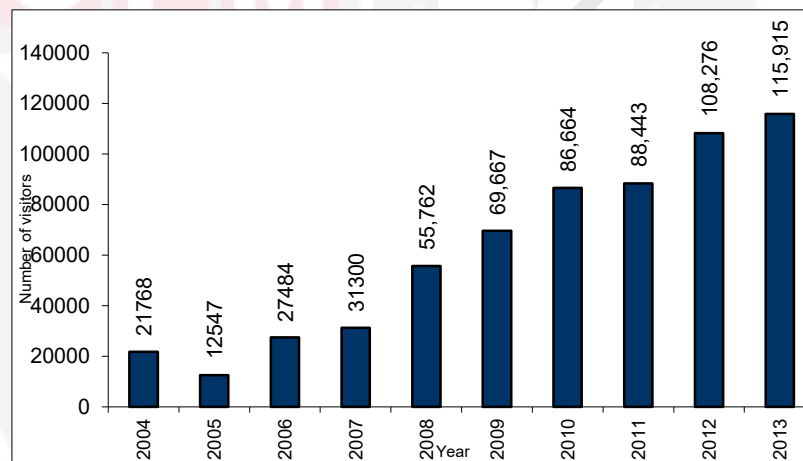


**Figure 1.1 Total Number of visitors to PNP (2004 -2013)**
**Source: Department of Wildlife and National Park in PNP**

Along with the rapid influx of visitors, PNP is facing several threats of various degrees in ecotourism development. According to Hong and Chan (2010a) the most serious threat is solid waste management, which is affecting the PNP's image. This is because of the absence of a waste management policy, inadequate disposal system, and low environmental consciousness among the visitors.

In addition, the park has been facing some serious environmental threats pertaining to flora and fauna loss (Hong & Chan, 2010b). According to some reports due to illegal poachers, there have been some cases of species loss such as the clouded leopard. Moreover, there have been reports of turtle eggs being stolen from the beaches, which will endanger of the long-term survival of these amphibians (Lee & Leong, 2003). Ignorant or irresponsible visitors have also damage flowers, flowering plants, and stolen ornamental plants from the National Park. The reason for such acts could be the low level of environmental awareness among the park visitors. Chan, Chan, et al. (2004) stated that some places have also been illegally planted with fruit trees, spices and flowers as well as vegetables. This may disrupt or affect the forest ecosystem, due to clearing activities because of these illegal activities, which also include illegal farming. Additionally, Ang (2006) stated that some foreign workers have used mist

2

nets to trap birds and bats for food. Even worse is the fact that the mist nets were laid at the border of the forest in the Meromictic Lake, which could in turn threaten the existence of the wildlife in the area. In addition, due to shortage of land, private property-owners on the margins of the park may engage in activities like agriculture, housing development, and tourism development and infringe parkland. These encroachments can be observed at the Paya Terubong hills which have been cleared for the building of apartments but which have subsequently led to environmentally negative consequences such as flash floods and hillside erosion and landslides (Chan, 1997; Hong & Chan, 2010a). Soil erosion, pollution, and flagging of the adjacent slopes are the other threats of encroachment into the PNP, which weakens the structure of the adjacent Teluk Bahang Dam. As long as encroachment causes deforestation, this might also have adverse impacts on the ecosystem of the forest. According to (Chan, Wan, et al., 2004) farming activities are closely related to the development of the hill land. Be it legal or illegal, farming activities involve deforestation and replacing virgin forest with planted crops. This might cause a major increase in soil erosion rate (Chan, Chan, et al., 2004).

In terms of social cooperation, the concern is associated with the lack of public social involvement or participation (Hong & Chan, 2010a). Unfortunately, the local community has not been given any involvement, directly or indirectly in the management of PNP While Lepper and Schroenn (2010) and Coria and Calfucura (2012) have specified that ecotourism management must involve the local community by way of employment opportunities in development projects, and building community capacity by involving communities in the tourism industry, management of natural resources, and the enrichment of locals to enhance the attraction of the destination.

All these negative evidences mention indicate that there are serious challenges in the ecotourism management of the Penang National Park. Considering the facts that PNP is a sensitive protected area, there are major challenges for ecotourism management besides the increasing number of visitors while no consideration appears to have been given to investigate the carry capacity of the Park. Another issue of concern is the general lack of environmental education and awareness, which may have serious impacts on the sustainability of ecotourism in this park.

According to the World Commission on Environment and Development (WCED, 1987), a sustainable development is defined as a development that will contribute to the enhancement of the economy, preserve and must improve the efficiency of the economy, protect and re-establish damaged ecologies and generally bring improvement to the well-bring of all (IISD, 1993; WCED, 1987). Assessment of sustainability implies management, including careful estimation of the level of sustainability, and clearly developed plans and strategies for stakeholders and administrators to ensure the sustainability level of a project (Kommadath et al., 2012). Therefore, there is a need to assess the sustainability of ecotourism management in PNP to help managers prevent damage to the Park, which will diminish the impact of the recreational usage image of the Park.

## 1.3 Research Objective

The general Objective: "To assess the sustainability of ecotourism management of the Penang National Park".
Specifically this study is designed to:

1. Identify important sustainability criteria and indicators for management of ecotourism in PNP
2. Develop a hierarchy model of sustainable ecotourism management of PNP through criteria and indicators;
3. Assess the sustainability of ecotourism management in the Penang National Park.

## 1.4 Research questions

To meet the specified objective, the following research questions are proposed:
What are the appropriate sustainability criteria and indicators for ecotourism management in PNP?

1. Have all experts arrived at a consensus (inter-rater reliability) in the last round of the Delphi survey?
2. What is the hierarchy for identified sustainable criteria and indicators?
3. Which are the most effective criteria and indicators?
4. Are all experts' opinions consistent with the FAHP model?
5. What is the sustainability fuzzy model for criteria and indicators?
6. What are the rules for fuzzy modelling of sustainability in PNP?
7. How much of the park is environmentally, socially, economically, and institutionally sustainable?

## 1.5 Significance of the Study

In the tourism industry, Ecotourism has gained more attention in Malaysia compared to the other types of tourism such as urban tourism, rural tourism and others. Following the development of ecotourism in Malaysia, the Ministry of Tourism and Culture (Previously, the ministry of Culture, Art, and Tourism), Developed the national ecotourism plan in 1996 to assist the government in developing the potential ecotourism. Apart from that, the development of indicator is very important in dealing with environmental issues such as Compendium of Environmental Statistics (CES) that is used as a tool to monitor pollution, depletion, and degradation of environmental quality. It is very important because Malaysia has many natural resources as tourist attractions. In addition, Malaysia is one of the 12 Mega diversity in the world that accepts the importance of preserving its social, environmental, and cultural wealth heritage. According to the Bellagio Principles, 'indicators' and 'standardized measurements' (principle 5) are needed for evaluating the sustainable development. Similarly, Agenda 21 provides an action-oriented strategy for the implementation of sustainable development at a local level, also highlights the urgent need to monitor progress explicitly referring (in chapter 40) to the employment of indicators for sustainable development (UN, 1993).
Therefore, it becomes necessary to suggest a complete methodology to develop and identify criteria and indicators for evaluation of Ecotourism management.

Comprehensive criteria and indicators identified in the economic, ecological, social, and institutional aspects and the most important criteria and indicators were selected to be used practically in the process of ecotourism management. This study uses appropriate tools like Modified Delphi technique, Fuzzy Analytic hierarchical process, and fuzzy inference system with experts' knowledge in the fields of environment, social and economy to propose a suitable planning framework for ecotourism management in Penang National Park. This framework is useful for monitoring, assessment, and efficient planning of future ecotourism management. In addition, it is also useful to analyse change patterns of the sustainability of the park in time durations. The outputs of this study can assist decision making for future development of the study area.

This research formulates an integrated approach for finding the best criteria and indicators as a tool for evaluation and assessment of ecotourism management and for future sustainable development of ecotourism in the national parks. The methodology is expected to be brief with a set of guidelines and recommendations for organizing and expressing the complexities found sustainable approach of ecotourism management. To-date there is no published for criteria and indicators for ecotourism management in PNP and application of Fuzzy Inference system in evaluation of ecotourism management.

Identified criteria and indicators can be used for future monitoring and evaluating the Penang National Park. The fuzzy inference system can be practiced as a tool designed for policy-makers to predict the future actions on sustainability and set up better decisions and policies for sustainable management of ecotourism. Therefore, with this model policy-makers can evaluate existing sustainability and project future sustainability of either other national parks or recreation areas, regarding how to identify criteria and indicators and to evaluate the level of sustainability. Fuzzy rules are important outcomes of fuzzy systems, which could be used as a framework for managers and decision makers for defining a framework for managing and monitoring the park.

Assessing of sustainability is difficult to undertake with conventional recognized methods due to the inherent uncertainties and ambiguities. This study proposed the use of a 'sustainability assessment framework, through fuzzy logic based methodology, which is recommended for the assessment of the sustainability of ecotourism management of the Penang National Park. By explaining sustainability as a function of a number of variables and in combination with expert opinions, numerical values of sustainability for each dimension and the overall sustainability as a result are calculated. This is an applicable and functional method of current existing sustainability assessment practices. The model is not rigid and users can select the set of indicators and modify the rules of any knowledge base according to their needs and the nature of the socio–environmental system to be evaluated Thus, this method might be modified to evaluate other parameters like poverty, inequality, human development index etc., besides sustainability of areas other than ecotourism management.

1.6 **Scope of the study**

This research has focused on addressing the following research statement:
"Efficient and applicable sustainability model for monitoring and assessment of ecotourism management for Institutional, Social, Ecological and Economical sustainability in the National Park". The main approaches in this study are using Modified Delphi Technique (MDT) and Fuzzy Inference System (FIS) to develop a sustainability framework for monitoring the ecotourism management. As the case study, the Penang National Park, Malaysia has been considered. In this research the sustainability index for ecotourism in PNP is established. This sustainability index is compatible with United Nation World Tourism Organization indicators for sustainable tourism. The details are presented in chapter 4. The most important criteria and indicators have been chosen from different fields of environment, social and economic through experts in Malaysia. This study area was chosen based on several reasons. This is the first national park gazette under the National park Act (1980). It has some unique features like Meromictic lake and turtle sanctuary, with several ecological types of beaches. The Park is undergoing rapid influx of visitors, influenced by some challenges like waste management and flora and fauna extinction, land encroachment. However, it needs urgent sustainable plan for evaluating and assessment. Some other researches were done in this study area. Arifin (2008) did research about Perception of stakeholders and Hong and Chan (2010) conducted a SWOT study on PNP.

1.7 **Framework for sustainability Indicator**

The first step for organizing the selection and development of indicators to measure true sustainability is to establish a framework. Sustainability frameworks give form and direction to the environmental, social, and economic activities. Nevertheless, it must be recognised that framework by itself is an imperfect tool for organizing and expressing the complexities and interrelationships encompassed by sustainable development. Ultimately, the choice of a framework and a core set of indicators must meet the needs and priorities of users.

The framework employed in this study is based on four pillars of sustainable development used in UNCSD work program focusing on themes and sub-themes for the selection of sustainable ecotourism indicators (figure1.2). The early indicator work under CSD organized the chapters of Agenda 21 under the four primary dimensions of sustainable development—social, economic, environmental, and institutional. Indicators first became a subject for attention from the tourism sector, as a response to the global focus on sustainability stimulated by the Brundtland Commission (1986) and the Rio Earth Summit (1992). Selected indicators will be developed within the context of the goals and objectives of the destinations, and important as potential performance measures for progress towards planned goals. The goal of sustainable development for tourism and the destinations has become increasingly accepted, thus provide the framework for the identification and evaluation of indicators. Identified indicators are not an end in themselves; they are specific tools for a broader process of planning for tourism. This indicator system for ecotourism helps managers to monitor the changes in sustainability over time. It promotes sound environmental and social practices, encourages transparency and accountability, and contributes to positive development impacts. More specifically, to

develop a framework for the sustainability index, the following factors are used as a guide- (a) country recommendations; (b) the inclusion of common priority issues relevant to assessing sustainable development progress; "(c)the desire for comprehensiveness and balance across the sustainable development spectrum, as reflected in Agenda 21; and (d) limiting the number of indicators to achieve a core set.

A successful framework should reflect the connections between dimensions, themes, and subthemes. It should implicitly reflect the goals of sustainable development to advance social and institutional development, to maintain ecological integrity, and to ensure economic prosperity. Following this resolution, the resulting structure presents the indicators under four major dimensions, further broken down into themes and sub-themes. Therefore, the four primary sustainability dimensions (social, economic, environmental, institutional) are retained for this study based on: 1) relevant to assessing sustainable development progress; 2) understandable, clear, and unambiguous, to the extent possible; 3) within the capabilities of national government to develop;4) conceptually sound; 5) limited in number, but remaining open-ended and adaptable to future needs; 6) broad in coverage of Agenda 21 and all aspects of sustainable development; and 7) dependent on cost effective data of known quality.

In the criteria selection, the expert panel relied particularly on factors such as feasibility to measure; relevance to national sustainable development priorities; and sub-theme to represent specific needs related to sustainable development priority setting, policymaking, monitoring, and evaluation.
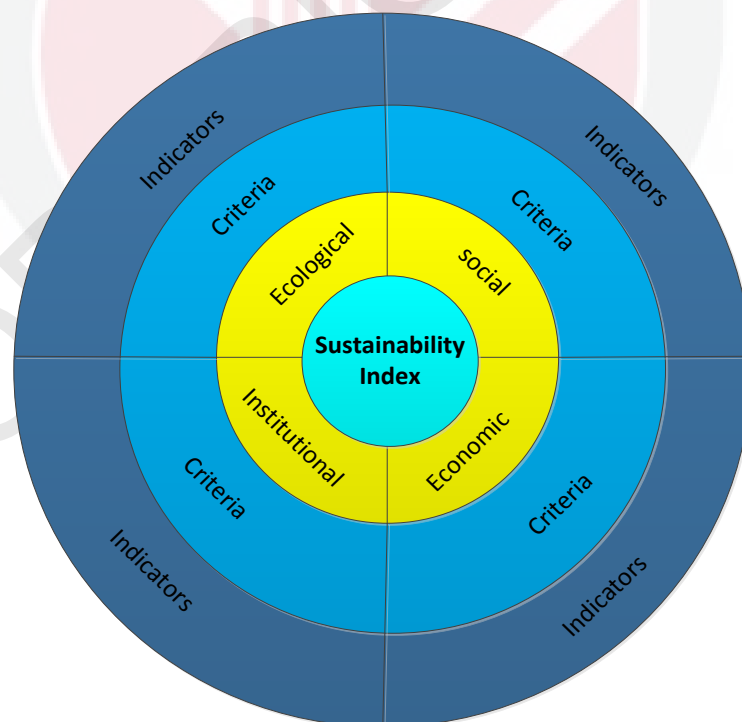


**Figure 1.2 Sustainability index based on UNCSD framework**

## 1.8  **Thesis Organization**

This section presents the organization of this thesis. It reviews the related literature available on the sustainability, sustainability criteria and indicators and ecotourism. The present study aims at identifying sustainability criteria and indicators for ecotourism management in the Penang National Park in Malaysia. Subsequently the sustainability of ecotourism management will be measured by fuzzy inference system. The organization of the contents of Chapters 2 to 6 are as follows:

Chapter 2 is a perspective and introductory discussion on the study area, PNP, and its geographical position, natural resources, geophysical, biological, and recreational characteristics, and also its ecological and social potentials and threats. Chapter 3 reviews the background information related to this study. The common terminology that is employed in sustainability and ecotourism is introduced. Several previous studies that used the models are also discussed. In Chapter 4, the material and methods used in this study will be described. The procedures of Delphi techniques, providing the instrument, data collection, qualification of expert panels will be described. Furthermore, the procedures of Fuzzy Analytic Hierarchy Process (FAHP), preparing the questionnaire, data collection, and finally procedures of Fuzzy Inference System (FIS), and interviews with experts are introduced. Developing the fuzzy inference engine is described. This chapter also provides a description of the study area.

Chapter 5 reports the results and discussions of the four rounds of Delphi technique, consensus analysis, as well as the results of the FAHP matrices and developing the hierarchy for the identified criteria and indicators and calculating the consistency ratio (CR). Finally, the results of FIS and final model for sustainability of ecotourism management and subsequent sustainability rules are discussed. Chapter 6 provides the conclusions drawn from the research and recommendations for future study.

# REFERENCES

Abbitt, R. J., Scott, J. M., and Wilcove, D. S. (2000). The geography of vulnerability: incorporating species geography and human development patterns into conservation planning. *Biological Conservation, 96*(2), 169-175.

Abidin, Z. Z. (1999). *The identification of criteria and indicators for the sustainable management of ecotourism in Taman Negara National Park, Malaysia: A Delphi consensus.* West Virginia University Libraries.

Aczel, J., and Roberts, F. S. (1989). On the possible merging functions. *Mathematical Social Sciences, 17*(3), 205-243.

Aczél, J., and Saaty, T. L. (1983). Procedures for synthesizing ratio judgements. *Journal of mathematical Psychology, 27*(1), 93-102.

Adamowicz, W. (2003). Economic indicators of sustainable forest management: theory versus practice. *Journal of Forest Economics, 9*(1), 27-40.

Adinyira, E., Oteng-Seifah, S., and Adjei-Kumi, T. (2007). *A review of urban sustainability assessment methodologies.* Paper presented at the International conference on whole life urban sustainability and its assessment. Glasgow.

Adriaanse, A. (1993). *Environmental policy performance indicators: A study on the development of indicators for environmental policy in the Netherlands*: Sdu Uitgeverij Koninginnegracht.

Adriaenssens, V., Baets, B. D., Goethals, P. L., and Pauw, N. D. (2004a). Fuzzy rule-based models for decision support in ecosystem management. *Science of The Total Environment, 319*(1), 1-12.

Adriaenssens, V., Baets, B. D., Goethals, P. L. M., and Pauw, N. D. (2004b). Fuzzy rule-based models for decision support in ecosystem management. *Science of The Total Environment, 319*(1–3), 1-12. doi: http://dx.doi.org/10.1016/S0048-9697(03)00433-9

Agardy, M. T. (1993). Accommodating ecotourism in multiple use planning of coastal and marine protected areas. *Ocean & Coastal Management, 20*(3), 219-239.

Agrawal, A., and Redford, K. (2006). Poverty, development, and biodiversity conservation: Shooting in the dark? *Ann Arbor MI, 48109*(734), 647-5948.

Ahn, B., Lee, B., and Shafer, C. S. (2002). Operationalizing sustainability in regional tourism planning: an application of the limits of acceptable change framework. *Tourism Management, 23*(1), 1-15. doi: 10.1016/s0261-5177(01)00059-0

Akis, S., Peristianis, N., and Warner, J. (1996). Residents' attitudes to tourism development: the case of Cyprus. *Tourism Management, 17*(7), 481-494.

Al-Busaidi, K. A. (2014). SWOT of social networking sites for group work in government organizations: an exploratory Delphi study from IT managers' perspective. *VINE, 44*(1), 6-6.

Allahyari, T., Rangi, N. H., Khosravi, Y., and Zayeri, F. (2011). Development and Evaluation of a New Questionnaire for Rating of Cognitive Failures at Work. *International Journal of Occupational Hygiene, 3*(1).

Anderson, L. E., Manning, R. E., Monz, C. A., and Goonan, K. A. (2012). Indicators and standards of quality for paddling on Lake Champlain. *Journal of Great Lakes Research, 38, Supplement 1*(0), 150-156. doi: 10.1016/j.jglr.2011.05.003

Andriantiatsaholiniaina, L. A., Kouikoglou, V. S., and Phillis, Y. A. (2004). Evaluating strategies for sustainable development: fuzzy logic reasoning and sensitivity analysis. *Ecological Economics, 48*(2), 149-172.

Ang, S. C. (2006). Conservation and Ecotourism in Penang National Park *Master Thesis in Conservation and Natural Resources Atlantic International University.*

Armstrong, J. S. (2001). *Principles of forecasting: a handbook for researchers and practitioners* (Vol. 30): Springer.

Arunraj, N., and Maiti, J. (2009). Development of environmental consequence index (ECI) using fuzzy composite programming. *Journal of hazardous materials, 162*(1), 29-43.

Asselin, M., and Harper, M. (2014). Revisiting the Delphi Technique: Implications for Nursing Professional Development. *Journal for nurses in professional development, 30*(1), 11-15.

Atkinson, G. (2000). Measuring corporate sustainability. *Journal of Environmental Planning and management, 43*(2), 235-252.

Aull-Hyde, R., Erdogan, S., and Duke, J. M. (2006). An experiment on the consistency of aggregated comparison matrices in AHP. *European Journal of Operational Research, 171*(1), 290-295.

Avouac, J., Huscher, D., Furst, D. E., Opitz, C. F., Distler, O., Allanore, Y., Ahmadi-Simab, K., Albera, C., Behrens, F., and Bolster, M. B. (2014). Expert consensus for performing right heart catheterisation for suspected pulmonary arterial hypertension in systemic sclerosis: a Delphi consensus study with cluster analysis. *Annals of the rheumatic diseases, 73*(1), 191-197.

Awasthi, A., and Chauhan, S. S. (2011). Using AHP and Dempster–Shafer theory for evaluating sustainable transport solutions. *Environmental Modelling & Software, 26*(6), 787-796.

Ayağ, Z., and Özdemir, R. (2006). A fuzzy AHP approach to evaluating machine tool alternatives. *Journal of Intelligent Manufacturing, 17*(2), 179-190.

Ayotte, A. L. (2009). *Ecotourism as a form of sustainable development in South Africa.* MR65139 M.E.S., Queen's University (Canada), Ann Arbor. Retrieved from http://search.proquest.com/docview/760946555?accountid=27932 ProQuest Dissertations & Theses Full Text database.

Ayres, R. U. (1995). Life cycle analysis: a critique. *Resources, Conservation and Recycling, 14*(3), 199-223.

Azadi, H., van den Berg, J., Shahvali, M., and Hosseininia, G. (2009). Sustainable rangeland management using fuzzy logic: A case study in Southwest Iran. *Agriculture, Ecosystems & Environment, 131*(3–4), 193-200. doi: http://dx.doi.org/10.1016/j.agee.2009.01.017

Baez, and Fernandez. (1992). Ecotourism as an economic activity: the case of tortuguero in
Costa Rica. Paper presented at the First World Congress of Tourism and the Environment,
Belize.

Baker, J., Lovell, K., Harris, N., and Campbell, M. (2007). Multidisciplinary consensus of best practice for pro re nata (PRN) psychotropic medications within acute mental health settings: a Delphi study. *Journal of psychiatric and mental health nursing, 14*(5), 478-484.

Bakkes, J. A. (1994). *An overview of environmental indicators: state of the art and perspectives* (Vol. 94): UNEP/Earthprint.

Balana, B. B., Mathijs, E., and Muys, B. (2010). Assessing the sustainability of forest management: An application of multi-criteria decision analysis to community forests in northern Ethiopia. *Journal of Environmental Management, 91*(6), 1294-1304. doi: 10.1016/j.jenvman.2010.02.005

Balas, C. E., Ergın, A., Williams, A. T., and Koc, L. (2004). Marine litter prediction by artificial intelligence. *Marine Pollution Bulletin, 48*(5), 449-457.

Bali, Ö., Gümüş, S., and Dağdeviren, M. (2013). A group MADM method for personnel selection problem using Delphi technique based on intuitionistic fuzzy sets. *Journal of Military and Information Science, 1*(1), 1-13.

Bank, W. (1995). Social impact of adjustment operations:

An overview. . *World Bank Operations Evaluation Department, Washington DC.*

Barnard, P., Brown, C. J., Jarvis, A. M., Robertson, A., and Van Rooyen, L. (1998). Extending the Namibian protected area network to safeguard hotspots of endemism and diversity. *Biodiversity & Conservation, 7*(4), 531-547.

Barrett, C. B., Brandon, K., Gibson, C., and Gjertsen, H. (2001). Conserving tropical biodiversity amid weak institutions. *BioScience, 51*(6), 497-502.

Barzekar, G., Aziz, A., Mariapan, M., Ismail, M. H., and Hosseni, S. M. (2011a). Delphi technique to generating criteria and indicators for monitoring ecotourism sustainability in Northern forest of Iran: case study on Dohezar and Sehezar Watersheds. *Folia Forestalia Polonica. Series A, Forestry, 53*(2), 130-141.

Barzekar, G., Aziz, A., Mariapan, M., Ismail, M. H., and Hosseni, S. M. (2011b). Using analytical hierarchy process (AHP) for prioritizing and ranking of ecological indicators for monitoring sustainability of ecotourism in northern forest, Iran. *Ecologia Balkanica, 3*(1), 59-67.

Bauer, R., Körmer, C., and Sector, M. (2005). Scope and patterns of tourist injuries in the European Union. *International journal of injury control and safety promotion, 12*(1), 57-61.

Bauer, T. G. (2001). *Tourism in the Antarctic: opportunities, constraints, and future prospects*: Haworth Hospitality Press.

Beinat, E., and Nijkamp, P. (1997). Environmental rehabilitation: efficiency and effectiveness in soil remediation. *Research Memorandum, 1997*, 62.

Bell, S., and Morse, S. (2001). Breaking through the Glass Ceiling: who really cares about sustainability indicators? *Local Environment, 6*(3), 291-309.

Bell, S., and Morse, S. (2003). *Measuring sustainability: learning from doing*: Routledge.

Bell, S., and Morse, S. (2008). *Sustainability indicators: measuring the immeasurable?* : Earthscan.

Belton, V., and Stewart, T. (2002). *Multiple criteria decision analysis: an integrated approach*: Springer.

Besculides, A., Lee, M. E., and McCormick, P. J. (2002). Residents' perceptions of the cultural benefits of tourism. *Annals of Tourism Research, 29*(2), 303-319.

Bisset, R. (1980). METHODS FOR ENVIRONMENTAL-IMPACT ANALYSIS-RECENT TRENDS AND FUTURE-PROSPECTS. *Journal of Environmental Management, 11*(1), 27-43.

Blamey, R., and Hatch, D. (1998). *Profiles and motivations of nature-based tourists visiting Australia*: Bureau of Tourism Research.

Blamey, R. K. (1997). Ecotourism: The search for an operational definition. *Journal of Sustainable Tourism, 5*(2), 109-130.

Blancas, F. J., Caballero, R., González, M., Lozano-Oyola, M., and Pérez, F. (2010). Goal programming synthetic indicators: An application for sustainable tourism in Andalusian coastal counties. *Ecological Economics, 69*(11), 2158-2172.

Blancas, F. J., González, M., Lozano-Oyola, M., and Pérez, F. (2010). The assessment of sustainable tourism: Application to Spanish coastal destinations. *Ecological Indicators, 10*(2), 484-492.

Blancas, F. J., Lozano-Oyola, M., González, M., Guerrero, F. M., and Caballero, R. (2011). How to use sustainability indicators for tourism planning: The case of rural tourism in Andalusia (Spain). *Science of The Total Environment, 412–413*(0), 28-45. doi: 10.1016/j.scitotenv.2011.09.066

Blangy, S., and Mehta, H. (2006). Ecotourism and ecological restoration. *Journal for Nature Conservation, 14*(3), 233-236.

Bond, A. J., and Morrison-Saunders, A. (2009). Sustainability appraisal: jack of all trades, master of none? *Impact assessment and project appraisal, 27*(4), 321-329.

Bonn, A., Rodrigues, A. S., and Gaston, K. J. (2002a). Threatened and endemic species: are they good indicators of patterns of biodiversity on a national scale? *Ecology Letters, 5*(6), 733-741.

Bonn, A., Rodrigues, A. S. L., and Gaston, K. J. (2002b). Threatened and endemic species: are they good indicators of patterns of biodiversity on a national scale? *Ecology Letters, 5*(6), 733-741. doi: 10.1046/j.1461-0248.2002.00376.x

Boo. (1990). Ecotourism: The Potentials and Pitfalls  *Washington, DC: WorldWide Fund for Nature., Vols 1&2.*

Boo, E. (1990). *Ecotourism: the potentials and pitfalls: country case studies*: WWF.

Bookbinder, M. P., Dinerstein, E., Rijal, A., Cauley, H., and Rajouria, A. (1998). Ecotourism's support of biodiversity conservation. *Conservation biology, 12*(6), 1399-1404.

Booysen, F. (2002). An overview and evaluation of composite indices of development. *Social indicators research, 59*(2), 115-151.

Borri, D., Concilio, G., and Conte, E. (1998). A fuzzy approach for modelling knowledge in environmental systems evaluation. *Computers, environment and urban systems, 22*(3), 299-313.

Bosch, P. (2002). The European Environment Agency focuses on EU-policy in its approach to sustainable development indicators. *Statistical Journal of the United Nations Economic Commission for Europe, 19*(1), 5-18.

Bosserman, R. W., and Ragade, R. K. (1982). Ecosystem analysis using fuzzy set theory. *Ecological Modelling, 16*(2), 191-208.

Boucher, D. H., Aviles, J., Chepote, R., Gil, O. E. D., and Vilchez, B. (1991). Recovery of trailside vegetation from trampling in a Tropical Rain Forest. *Environmental Management, 15*(2), 257-262.

Bouyssou, D., and Marchant, T. (2006). An Axiomatic Approach to Noncompensatory Sorting Methods In MCDM, I.

Boyd, S. W., and Butler, R. W. (1996). Managing ecotourism: an opportunity spectrum approach. *Tourism Management, 17*(8), 557-566. doi: 10.1016/s0261-5177(96)00076-3

Bozdağ, C. E., Kahraman, C., and Ruan, D. (2003). Fuzzy group decision making for selection among computer integrated manufacturing systems. *Computers in Industry, 51*(1), 13-29.

Bramwell, B., and Lane, B. (1993). Sustainable tourism: An evolving global approach. *Journal of Sustainable Tourism, 1*(1), 1-5.

Bramwell, B., and Lane, B. (1994). *Rural tourism and sustainable rural development. Proceedings of the Second International School on Rural Development, 28 June-9 July 1993, University College Galway, Ireland*: Channel View Publications.

Bramwell, B., and Lane, B. (2014). The "critical turn" and its implications for sustainable tourism research. *Journal of Sustainable Tourism, 22*(1), 1-8.

Bramwell, B., and Sharman, A. (1999). Collaboration in local tourism policymaking. *Annals of Tourism Research, 26*(2), 392-415. doi: http://dx.doi.org/10.1016/S0160-7383(98)00105-4

Brandon, K. (1996). Ecotourism and conservation: a review of key issues.

Brandon, K. E., and Wells, M. (1992). Planning for people and parks: Design dilemmas. *World Development, 20*(4), 557-570. doi: http://dx.doi.org/10.1016/0305-750X(92)90044-V

Brang, P., Courbaud, B. t., Fischer, A., Kissling-Näf, I., Pettenella, D., Schönenberger, W., Spörk, J., and Grimm, V. (2002). Developing indicators for the sustainable management of mountain forests using a modelling approach. *Forest Policy and Economics, 4*(2), 113-123. doi: 10.1016/s1389-9341(02)00011-4

Bratton, S. P., Stromberg, L. L., and Harmon, M. E. (1982). Firewood-gathering impacts in backcountry campsites in Great Smoky Mountains National Park. *Environmental Management, 6*(1), 63-71.

Bright, J. A. (1986). Hiker impact on herbaceous vegetation along trails in an evergreen woodland of Central Texas. *Biological Conservation, 36*(1), 53-69.

Brooks, J. S., Franzen, M. A., Holmes, C. M., Grote, M. N., and Mulder, M. B. (2006). Testing hypotheses for the success of different conservation strategies. *Conservation biology, 20*(5), 1528-1538.

Brown, T. C., and Daniel, T. C. ( 1984). Modeling forest scenic beauty: concepts and application
to ponderosa pine. *USDA Forest Service Research Pape*
*Rocky*
*Mountain Forest and Range Experiment Station*.

Buckley, J. J. (1985). Fuzzy hierarchical analysis. *Fuzzy Sets and Systems, 17*(3), 233-247.

Buckley, R. (1999). Tools and indicators for managing tourism in parks. *Annals of Tourism Research, 26*(1), 207-210.

Buckley, R. (2002). Tourism ecolabels. *Annals of Tourism Research, 29*(1), 183-208.

Buckley, R. (2012). Sustainable tourism: Research and reality. *Annals of Tourism Research, 39*(2), 528-546. doi: 10.1016/j.annals.2012.02.003

Bunruamkaew, K., and Murayama, Y. (2012). Land use and natural resources planning for sustainable ecotourism using GIS in Surat Thani, Thailand. *Sustainability, 4*(3), 412-429.

Burton, F. (1998). Can ecotourism objectives be achieved? *Annals of Tourism Research, 25*, 755-757.

Butler, R., and Ilbery, B. (1998). Rural recreation and tourism. *The geography of rural change.*, 211-232.

Butler, R. W. (1999). Sustainable tourism: A state-of-the-art review. *Tourism Geographies, 1*(1), 7-25.

Butler, R. W. (2002). The development of tourism in frontier regions: Issues and approaches. *Tourism in frontier areas*, 3-20.

Butler, R. W., and Boyd, S. W. (2000). *Tourism and national parks: issues and implications*: John Wiley & Sons Ltd.

Calabrese, A., Costa, R., and Menichini, T. (2013). Using Fuzzy AHP to manage Intellectual Capital assets: An application to the ICT service industry. *Expert Systems with Applications, 40*(9), 3747-3755. doi: http://dx.doi.org/10.1016/j.eswa.2012.12.081

Caldwell, L. K. (1991). Analysis-assessment-decision: the anatomy of rational policymaking. *Impact Assessment, 9*(4), 81-92.

Camagni, R. (2002). On the concept of territorial competitiveness: sound or misleading? *Urban studies, 39*(13), 2395-2411.

Caniani, D., Lioi, D. S., Mancini, I. M., and Masi, S. (2011). Application of fuzzy logic and sensitivity analysis for soil contamination hazard classification. *Waste management, 31*(3), 583-594.

Carlucci, D., and Schiuma, G. (2007). Knowledge assets value creation map: assessing knowledge assets value drivers using AHP. *Expert Systems with Applications, 32*(3), 814-821.

Carmines, E. G., and Zeller, R. A. (1979). *Reliability and validity assessment* (Vol. 17): Sage.

Carrasco, E. F., Rodrıguez, J., Punal, A., Roca, E., and Lema, J. (2002). Rule-based diagnosis and supervision of a pilot-scale wastewater treatment plant using fuzzy logic techniques. *Expert Systems with Applications, 22*(1), 11-20.

Carter*, R., and Beeton, R. (2004). A model of cultural change and tourism. *Asia Pacific Journal of Tourism Research, 9*(4), 423-442.

Carvalho, G. O. (2001). Sustainable development: is it achievable within the existing international political economy context? *Sustainable Development, 9*(2), 61-73. doi: 10.1002/sd.159

Castellani, V., and Sala, S. (2008). 3.5 Ecological Footprint: a way to assess impact of tourists' choices at local scale. *Development of methodologies and indicators to assess sustainability in tourism and agriculture*, 68.

Castellani, V., and Sala, S. (2010). Sustainable performance index for tourism policy development. *Tourism Management, 31*(6), 871-880. doi: 10.1016/j.tourman.2009.10.001

Castellani, V., Sala, S., Pitea, D., Tiezzi, E., Marques, J., Brebbia, C., and Jørgensen, S. (2007). *A new method for tourism carrying capacity assessment.* Paper presented at the Sixth International Conference on Ecosystems and Sustainable Development, Coimbra, Portugal, September 2007.

Cater, E. (1993). Ecotourism in the third world: problems for sustainable tourism development. *Tourism Management, 14*(2), 85-90. doi: 10.1016/0261-5177(93)90040-r

Ceballos-Lascurain, H. (1987). The future of ecotourism. *Mexico Journal, January*, 13–14.

Ceballos-Lascurain, H. (1996). *Tourism, ecotourism, and protected areas: The state of nature-based tourism around the world and guidelines for its development*: Iucn.

Cernat, L., and Gourdon, J. (2012). Paths to success: Benchmarking cross-country sustainable tourism. *Tourism Management, 33*(5), 1044-1056. doi: 10.1016/j.tourman.2011.12.007

Chadwick, B. A., Bahr, H. M., and Albrecht, S. L. (1984). *Social science research methods*: Prentice-Hall Englewood Cliffs, NJ.

Chambers, R., and Conway, G. (1992). *Sustainable rural livelihoods: practical concepts for the 21st century*: Institute of Development Studies (UK).

Chan, F. T., and Kumar, N. (2007). Global supplier development considering risk factors using fuzzy extended AHP-based approach. *Omega, 35*(4), 417-431.

Chan, N. W., Chan, L. K., and K. Kumar. (2004). Chapter 7: Ecotourism in the Penang National Park:Issues and Challenges. *Penang. School of Humanities, Universiti Sains Malaysia Publisher*.

Chan, N. W., Wan, and Ibrahim, A. L. (2004). Environmental Charachteristics of Pantai Acheh Forest Reserve: Physical geography, climate change and hyrology. . *Journal bioscience, 15*(1), 101-222.

Chan, N. W. a. W. R. I. (1997). Impak Manusia Terhadap Unsur-unsur Kitaran (TRC) Social Transformation Platform, Badaruddin
Hidrologi di Malaysia. Ilmu Alam. 23: 41-58.

Chang, D.-Y. (1996). Applications of the extent analysis method on fuzzy AHP. *European Journal of Operational Research, 95*(3), 649-655.

Chang, D. (1992). Extent analysis and synthetic decision, optimization techniques and applications, Vol. 1: World Scientific, Singapore.

Charters, and Saxon, E. ( 2007). Tourism and mountains; A Practical Guide to Managing the Environmental and Social Impacts of Mountain Tours (2007) A. Sweeting, United Nations Environment Programme, Conservation International, Tour Operators' Initiative.

Chen, M.-K., and Wang, S.-C. (2010). The use of a hybrid fuzzy-Delphi-AHP approach to develop global business intelligence for information service firms. *Expert Systems with Applications, 37*(11), 7394-7407. doi: http://dx.doi.org/10.1016/j.eswa.2010.04.033

Chen, Q., and Mynett, A. E. (2003). Integration of data mining techniques and heuristic knowledge in fuzzy logic modelling of eutrophication in Taihu Lake. *Ecological Modelling, 162*(1), 55-67.

Chevalier, R. F., Hoogenboom, G., McClendon, R. W., and Paz, J. O. (2012). A web-based fuzzy expert system for frost warnings in horticultural crops. *Environmental Modelling & Software, 35*(0), 84-91. doi: http://dx.doi.org/10.1016/j.envsoft.2012.02.010

Chevalier, S., Choiniere, R., Bernier, L., Sauvageau, Y., Masson, I., and Cadieux, E. (1992). User guide to 40 community health indicators. *Community Health Division, Health and Welfare Canada, Ottawa*.

Childress, R. D., and Crompton, J. L. (1997). A comparison of alternative direct and discrepancy approaches to measuring quality of performance at a festival. *Journal of Travel Research, 36*(2), 43-57.

Cho, J., and Lee, J. (2013). Development of a new technology product evaluation model for assessing commercialization opportunities using Delphi method and fuzzy AHP approach. *Expert Systems with Applications, 40*(13), 5314-5330. doi: http://dx.doi.org/10.1016/j.eswa.2013.03.038

Chou, T.-Y., and Liang, G.-S. (2001). Application of a fuzzy multi-criteria decision-making model for shipping company performance evaluation. *Maritime Policy & Management, 28*(4), 375-392.

Chow, T. E., and Sadler, R. (2010). The consensus of local stakeholders and outside experts in suitability modeling for future camp development. *Landscape and Urban Planning, 94*(1), 9-19. doi: 10.1016/j.landurbplan.2009.07.013

Chuang, H.-M., Lin, C.-K., Chen, D.-R., and Chen, Y.-S. (2013). Evolving MCDM Applications Using Hybrid Expert-Based ISM and DEMATEL Models: An Example of Sustainable Ecotourism. *The Scientific World Journal, 2013*.

Çipi, A., Llaci, S., and Ferreira, F. A. (2014). Current Situation of Corporate Governance Practices in Albanian Joint Stock Companies: A Delphi-based Approach. *Procedia-Social and Behavioral Sciences, 110*, 841-851.

Clark, B. D., Bisset, R., and Wathern, P. (1980). Environmental impact assessment: a bibliography with abstracts.

Clark, B. D., Chapman, K., Bisset, R., and Wathern, P. (1978). Methods of environmental impact analysis. *Built Environment (1978-)*, 111-121.

Coccossis, H. (2008). Cultural heritage, local resources and sustainable tourism. *International Journal of Services Technology and Management, 10*(1), 8-14.

Cofre, H., and Marquet, P. A. (1999). Conservation status, rarity, and geographic priorities for conservation of Chilean mammals: an assessment. *Biological Conservation, 88*(1), 53-68.

Cohen, S., and Burgiel, S. (1997). Exploring biodiversity indicators and targets under the convention on biological diversity. *BIONET and IUCN, Washington, DC and Gland*.

Constantin, D.-L., and Mitrut, C. (2008). Tourism, cultural resources and regional competitiveness: a case study in Romania. *International Journal of Services Technology and Management, 10*(1), 48-60.

Coria, J., and Calfucura, E. (2012). Ecotourism and the development of indigenous communities: The good, the bad, and the ugly. *Ecological Economics, 73*(0), 47-55. doi: 10.1016/j.ecolecon.2011.10.024

Cornelissen, A., Van den Berg, J., Koops, W., Grossman, M., and Udo, H. (2001). Assessment of the contribution of sustainability indicators to sustainable development: a novel approach using fuzzy set theory. *Agriculture, Ecosystems & Environment, 86*(2), 173-185.

Cornelissen, A. M. G., van den Berg, J., Koops, W. J., Grossman, M., and Udo, H. M. J. (2001). Assessment of the contribution of sustainability indicators to sustainable development: a novel approach using fuzzy set theory. *Agriculture, Ecosystems &amp; Environment, 86*(2), 173-185. doi: 10.1016/s0167-8809(00)00272-3

Craik, J. (1995). Are there cultural limits to tourism? *Journal of Sustainable Tourism, 3*(2), 87-98.

Croes, R. R. (2006). A paradigm shift to a new strategy for small island economies: Embracing demand side economics for value enhancement and long term economic stability. *Tourism Management, 27*(3), 453-465.

Dalal-Clayton, Barry and Sadler, and Barry. (2009 ). Sustainability Appraisal. A Sourcebook and Reference Guide to International Experience. *London: Earthscan ISBN 978-1-84407-357-3.*

Dale, V. H., and Beyeler, S. C. (2001). Challenges in the development and use of ecological indicators. *Ecological Indicators, 1*(1), 3-10.

Daniels, R. R., Hegde, M., Joshi, N., and Gadgil, M. (1991). Assigning conservation value: a case study from India. *Conservation biology, 5*(4), 464-475.

Davey, S. (1989). Thoughts towards a forest wildlife management strategy. *Australian Forestry, 52*(2), 56-67.

Davey, S. M., Hoare, J., and Rumba, K. (2003). Sustainable forest management and the ecosystem approach-an Australian perspective. *Unasylva, 54*(3), 3-12.

Dawson, S., and Barker, J. (1995). Hospice and palliative care: A Delphi survey of occupational therapists' roles and training needs. *Australian Occupational Therapy Journal, 42*(3), 119-127.

De Kok, J.-L., Titus, M., and Wind, H. G. (2000). Application of fuzzy sets and cognitive maps to incorporate social science scenarios in integrated assessment modelsA case study of urbanization in Ujung Pandang, Indonesia. *Integrated assessment, 1*(3), 177-188.

de los Angeles Somarriba-Chang, M., and Gunnarsdotter, Y. (2012). Local community participation in ecotourism and conservation issues in two nature reserves in Nicaragua. *Journal of Sustainable Tourism, 20*(8), 1025-1043.

de Siqueira Campos Boclin, A., and de Mello, R. (2006). A decision support method for environmental impact assessment using a fuzzy logic approach. *Ecological Economics, 58*(1), 170-181.

De Vet, J. Brug, J. De Nooijer, A. Dijkstra, and Vries, N. K. D. (2005). Determinants of forward stage transitions: a Delphi study. *Health Educ. Res., 20*, 195–205.

Dedina, S., and Young, E. (1995). *Conservation and development in the gray whale lagoons of Baja California Sur, Mexico*: Prepared for.

141

Delbecq, A. L., Van de Ven, A. H., and Gustafson, D. H. (1975). *Group techniques for program planning: A guide to nominal group and Delphi processes*: Scott, Foresman Glenview, IL.

Dempsey, N., Bramley, G., Power, S., and Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development, 19*(5), 289-300.

Deng, H. (1999). Multicriteria analysis with fuzzy pairwise comparison. *International Journal of Approximate Reasoning, 21*(3), 215-231.

Deng, J., Bender, M., and Selin, S. (2011). Development of a point evaluation system for ecotourism destinations: a Delphi method. *Journal of Ecotourism, 10*(1), 77-85.

Dev, S. (2013). Holistic Approach To Sustainable Tourism.

DeVantier, L., Turak, E., Al-Shaikh, K., and De ath, G. (2000). Coral communities of the central-northern Saudi Arabian Red Sea. *Fauna of Arabia, 18*, 23-66.

Devuyst, D. (1999). Sustainability assessment: the application of a methodological framework. *Journal of Environmental Assessment Policy and Management, 1*(04), 459-487.

Dhakal, S., and Imura, H. (2003). Policy-based indicator systems: emerging debates and lessons.

Dhar, A., Ruprecht, H., and Vacik, H. (2008). Population viability risk management (PVRM) for in situ management of endangered tree species—A case study on a< i> Taxus baccata</i> L. population. *Forest Ecology and Management, 255*(7), 2835-2845.

Diamantis, D. (1999). The concept of ecotourism: Evolution and trends. *Current issues in Tourism, 2*(2-3), 93-122.

Diedrich, A., Balaguer Huguet, P., and Tintoré Subirana, J. (2011). Methodology for applying the Limits of Acceptable Change process to the management of recreational boating in the Balearic Islands, Spain (Western Mediterranean). *Ocean &amp; Coastal Management, 54*(4), 341-351. doi: 10.1016/j.ocecoaman.2010.12.009

Dieke, P. U. (1991). Policies for tourism development in Kenya. *Annals of Tourism Research, 18*(2), 269-294.

Dixon, R. K., Smith, J., and Guill, S. (2003). Life on the edge: vulnerability and adaptation of African ecosystems to global climate change. *Mitigation and Adaptation Strategies for Global Change, 8*(2), 93-113.

Doan, T. M. (2011). Sustainable ecotourism in Amazonia: Evaluation of six sites in southeastern Peru. *International Journal of Tourism Research*.

Dobson, A. P., Rodriguez, J. P., Roberts, W. M., and Wilcove, D. S. (1997). Geographic distribution of endangered species in the United States. *Science, 275*(5299), 550-553.

DOE, U. (1996). Indicators of Sustainable Development for the United Kingdom. *Department of the Environment, HMSO, London.*
.

Dokas, I. M., Karras, D. A., and Panagiotakopoulos, D. C. (2009). Fault tree analysis and fuzzy expert systems: Early warning and emergency response of landfill operations. *Environmental Modelling & Software, 24*(1), 8-25. doi: http://dx.doi.org/10.1016/j.envsoft.2008.04.011

Donohoe, H. M. (2011). Defining culturally sensitive ecotourism: a Delphi consensus. *Current issues in Tourism, 14*(1), 27-45.

Drinkrow, D., and Cherry, M. (1995). Anuran distribution, diversity and conservation in South Africa, Lesotho and Swaziland. *South African Journal of Zoology, 30*(3), 82-90.

Dubois, D., and Prade, H. (1998). An introduction to fuzzy systems. *Clinica Chimica Acta, 270*(1), 3-29.

Duelli, P., and Obrist, M. K. (2003). Biodiversity indicators: the choice of values and measures. *Agriculture, Ecosystems & Environment, 98*(1-3), 87-98.

Duffy, R. (2000). Shadow players: ecotourism development, corruption and state politics in Belize. *Third World Quarterly, 21*(3), 549-565.

Duffy, R. (2006). Global environmental governance and the politics of ecotourism in Madagascar. *Journal of Ecotourism, 5*(1-2), 128-144.

Dunham, R. B. (1998). The Delphi Technique. *Organizational Behavior*.

Dunn, E., Keller, J., Marks, L., Ikerd, J., Gader, P., and Godsey, L. (1995). *Extending the application of fuzzy sets to the problem of agricultural sustainability.* Paper presented at the Uncertainty Modeling and Analysis, 1995, and Annual Conference of the North American Fuzzy Information Processing Society. Proceedings of ISUMA-NAFIPS'95., Third International Symposium on.

Eccles, G. (1995). Marketing, sustainable development and international tourism. *International Journal of Contemporary Hospitality Management, 7*(7), 20-26.

Edwards, D., Jensen, F. S., Marzano, M., Mason, B., Pizzirani, S., and Schelhaas, M.-J. (2011). A theoretical framework to assess the impacts of forest management on the recreational value of European forests. *Ecological Indicators, 11*(1), 81-89. doi: 10.1016/j.ecolind.2009.06.006

Elkington, J. (1997). Cannibals with Forks: The triple bottom line of 21st Century Business. *UK: Capstone*.

Ellis, D. H., and Lish, J. W. (1999). Trash-caused mortality in Mongolian raptors. *Ambio*, 536-537.

Enea, M., and Piazza, T. (2004). Project selection by constrained fuzzy AHP. *Fuzzy Optimization and Decision Making, 3*(1), 39-62.

Enea, M., and Salemi, G. (2001). Fuzzy approach to the environmental impact evaluation. *Ecological Modelling, 136*(2), 131-147.

Ertuğrul, İ., and Karakaşoğlu, N. (2009). Performance evaluation of Turkish cement firms with fuzzy analytic hierarchy process and TOPSIS methods. *Expert Systems with Applications, 36*(1), 702-715.

Everett, A. (1993). Piercing the veil of the future. A review of the Delphi method of research. *Professional nurse (London, England), 9*(3), 181-185.

Failing, L., and Gregory, R. (2003). Ten common mistakes in designing biodiversity indicators for forest policy. *Journal of Environmental Management, 68*(2), 121-132.

Fan, Z.-P., Ma, J., and Zhang, Q. (2002). An approach to multiple attribute decision making based on fuzzy preference information on alternatives. *Fuzzy Sets and Systems, 131*(1), 101-106.

Farrell, T. A., and Marion, J. L. (2001). Trail impacts and trail impact management related to visitation at Torres del Paine National Park, Chile. *Leisure/Loisir, 26*(1-2), 31-59.

Farsari, Y., and Prastacos, P. (2001). Sustainable tourism indicators: pilot estimation for the municipality of Hersonissos, Crete. *Athens: Regional Analysis Division, Institute of Applied and Computational Mathematics, Foundation for the Research and the Technology Hellas.*

144

Fava, J. A. (1998). Life cycle perspectives to achieve business benefits: from concept to technique. *Human and Ecological Risk Assessment: an International Journal, 4*(4), 1003-1017.

Feng, S., and Xu, L. D. (1999). Decision support for fuzzy comprehensive evaluation of urban development. *Fuzzy Sets and Systems, 105*(1), 1-12.

Fennell, D. (2007). *Ecotourism Third Edition*: Routledge.

Ferraro, D. O., Ghersa, C. M., and Sznaider, G. A. (2003). Evaluation of environmental impact indicators using fuzzy logic to assess the mixed cropping systems of the Inland Pampa, Argentina. *Agriculture, Ecosystems &amp; Environment, 96*(1–3), 1-18. doi: 10.1016/s0167-8809(03)00017-3

Ferri, M. Prince, C. B., H. Brodaty, L. Fratiglioni, M. Ganguli, K. H., K. Hasegawa, H. Hendrie, Y. H., A. Jorm, C. M., P.R. Menezes, E. Rimmer, and M. Scazufca. (2005). Global prevalence of dementia: a Delphi consensus study. *Lancet 366*, 2112–2117.

Ferri, C. P., Prince, M., Brayne, C., Brodaty, H., Fratiglioni, L., Ganguli, M., Hall, K., Hasegawa, K., Hendrie, H., and Huang, Y. (2006). Global prevalence of dementia: a Delphi consensus study. *The Lancet, 366*(9503), 2112-2117.

Filev, D. P., and Yager, R. R. (1991). A generalized defuzzification method via BAD distributions. *International Journal of Intelligent Systems, 6*(7), 687-697.

Fink, A., Kosecoff, J., Chassin, M., and Brook, R. H. (1984). Consensus methods: characteristics and guidelines for use. *American journal of public health, 74*(9), 979-983.

Fischer, R. G. (1978). The Delphi method: a description, review and criticism. *Journal of academic librarianship, 4*(2), 64-70.

Fisher, B. E. (2006). Fuzzy approaches to environmental decisions: application to air quality. *Environmental Science & Policy, 9*(1), 22-31.

Forman, E., and Peniwati, K. (1998). Aggregating individual judgments and priorities with the analytic hierarchy process. *European Journal of Operational Research, 108*(1), 165-169.

Franco, L. A., and Montibeller, G. (2010). Facilitated modelling in operational research. *European Journal of Operational Research, 205*(3), 489-500.

Gagliardi, F., Roscia, M., and Lazaroiu, G. (2007). Evaluation of sustainability of a city through fuzzy logic. *Energy, 32*(5), 795-802.

145

Gakahu, C. G. (1992). Visitor Dispersal Strategies in Ecotourism Management. *Paper presented at Fourth World Congress of National Parks and Protected Areas*, p. 11.

Galley, G., and Clifton, J. (2004). The motivational and demographic characteristics of research ecotourists: Operation Wallacea volunteers in Southeast Sulawesi, Indonesia. *Journal of Ecotourism, 3*(1), 69-82.

Gallopín, G. (1996). Environmental and sustainability indicators and the concept of situational indicators. A systems approach. *Environmental Modeling & Assessment, 1*(3), 101-117. doi: 10.1007/bf01874899

Gamble, D. (1989). Two Techniques for Gathering Data and Building Rich Pictures in Rural and Community Development Action Research Projects. *University of Western Sydney, Hawkesbury*.

Gamper, C., and Turcanu, C. (2007). On the governmental use of multi-criteria analysis. *Ecological Economics, 62*(2), 298-307.

Gao, L., and Hailu, A. (2012). Ranking management strategies with complex outcomes: An AHP-fuzzy evaluation of recreational fishing using an integrated agent-based model of a coral reef ecosystem. *Environmental Modelling & Software, 31*(0), 3-18. doi: http://dx.doi.org/10.1016/j.envsoft.2011.12.002

García-Melón, M., Gómez-Navarro, T., and Acuña-Dutra, S. (2012). A combined ANP-delphi approach to evaluate sustainable tourism. *Environmental Impact Assessment Review, 34*, 41-50.

Garcia, C. A., and Lescuyer, G. (2008). Monitoring, indicators and community based forest management in the tropics: pretexts or red herrings? *Biodiversity and Conservation, 17*(6), 1303-1317.

Garrod, B. (2012). Applying the Delphi method in an ecotourism context: a response to Deng et al.'s 'Development of a point evaluation system for ecotourism destinations: a Delphi method'. *Journal of Ecotourism, 11*(3), 219-223.

Geldermann, J. (2000). Development of a multicriteria decision support system for integrated technique assessment. *The International Journal of Life Cycle Assessment, 5*(3), 144-144.

Geller, E. S., Winett, R. A., Everett, P. B., and Winkler, R. C. (1982). *Preserving the environment: New strategies for behavior change*: Pergamon Press New York.

Genske, D. D., and Heinrich, K. (2009). A knowledge-based fuzzy expert system to analyse degraded terrain. *Expert Systems with Applications, 36*(2), 2459-2472.

146

George, R. (2010). Visitor perceptions of crime-safety and attitudes towards risk: The case of Table Mountain National Park, Cape Town. *Tourism Management, 31*(6), 806-815. doi: http://dx.doi.org/10.1016/j.tourman.2009.08.011

Ghasemi, M., Hamzah, A., and Mohamed, B. (2010). *The use of delphi technique to determine variables for the assessment of community-based ecotourism.* Paper presented at the Proceedings of Regional Conference on Tourism Research, Universiti Sains Malaysia, Penang, Malaysia, 13-14 December 2010. The state of the art and its sustainability.

Gibbons, R. D., Bhaumik, D., and Aryal, S. (2009). *Statistical methods for groundwater monitoring* (Vol. 59): John Wiley & Sons.

Giddings, B., Hopwood, B., and O'brien, G. (2002). Environment, economy and society: fitting them together into sustainable development. *Sustainable Development, 10*(4), 187-196.

Glasson, J., Therivel, R., and Chadwick, A. (2013). *Introduction to environmental impact assessment*: Routledge.

Godde, P. M., Price, M. F., and Zimmerman, F. M. (2000). *Tourism and development in mountain regions*: CABI.

Goluchowicz, K., and Blind, K. (2011). Identification of future fields of standardisation: an explorative application of the Delphi methodology. *Technological Forecasting and Social Change, 78*(9), 1526-1541.

González, B., Adenso-Diaz, B., and González-Torre, P. (2002). A fuzzy logic approach for the impact assessment in LCA. *Resources, Conservation and Recycling, 37*(1), 61-79.

Goodman, D. (1987). The demography of chance extinction. *Viable populations for conservation*, 11-34.

Goodwin, H. (1996). In pursuit of ecotourism. *Biodiversity & Conservation, 5*(3), 277-291.

Gössling, S. (1999). Ecotourism: a means to safeguard biodiversity and ecosystem functions? *Ecological Economics, 29*(2), 303-320.

Graham, B., Regehr, G., and Wright, J. G. (2003). Delphi as a method to establish consensus for diagnostic criteria. *Journal of Clinical Epidemiology, 56*(12), 1150-1156. doi: http://dx.doi.org/10.1016/S0895-4356(03)00211-7

Grainger, A. (2012). Forest sustainability indicator systems as procedural policy tools in global environmental governance. *Global Environmental Change, 22*(1), 147-160. doi: 10.1016/j.gloenvcha.2011.09.001

Green, H., Hunter, C., and Moore, B. (1990). Application of the Delphi technique in tourism. *Annals of Tourism Research, 17*(2), 270-279. doi: http://dx.doi.org/10.1016/0160-7383(90)90087-8

Grimaldi, M., and Rippa, P. (2011). An AHP-based framework for selecting knowledge management tools to sustain innovation process. *Knowledge and Process Management, 18*(1), 45-55.

Groombridge, B., Mace, G. M., and Raab, G. (1993). *1994 IUCN red list of threatened animals*: IUCN Gland, Switzerland.

Gudmundsson, H. (2003). Making concepts matter: sustainable mobility and indicator systems in transport policy*. *International Social Science Journal, 55*(176), 199-217.

Guldin, R. (2008). Telling the Story of Sustainable Forests: Is It More than Publishing Another C&I Report?

Gupta, U. G., and Clarke, R. E. (1996). Theory and applications of the Delphi technique: A bibliography (1975–1994). *Technological Forecasting and Social Change, 53*(2), 185-211.

Haas, P. M. (2002). UN Confreences and Constructivist Governance of the Environment. *Global governance, 8*, 73.

Hahn, and Rayens, M. K. (2000). Building consensus using the policy Delphi method, Policy Polit. *Nurs. Pract*(1), 308–315.

Hajkowicz, S., and Higgins, A. (2008). A comparison of multiple criteria analysis techniques for water resource management. *European Journal of Operational Research, 184*(1), 255-265.

Hák, T., Moldan, B., and Dahl, A. L. (2007). *Sustainability indicators: a scientific assessment*: Island Press.

Hall, C. M. (2011). Policy learning and policy failure in sustainable tourism governance: from first-and second-order to third-order change? *Journal of Sustainable Tourism, 19*(4-5), 649-671.

Hall, C. M., and Lew, A. A. (1998). *Sustainable tourism. A geographical perspective*: Addison Wesley Longman Ltd.

Hall, C. M., and Mitchell, R. (2000). Wine tourism in the Mediterranean: A tool for restructuring and development. *Thunderbird International Business Review, 42*(4), 445-465.

Hall, J. (1971). Decisions, decisions, decisions.

Hall, J. P. (2001). Criteria and indicators of sustainable forest management. *Environmental Monitoring and Assessment, 67*(1-2), 109-119.

Hammond, A. L., Adriaanse, A., Rodenburg, E., Bryant, D., and Woodward, R. (1995). *Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development*: World Resources Institute Washington, DC.

Haq, A. N., and Kannan, G. (2006). Fuzzy analytical hierarchy process for evaluating and selecting a vendor in a supply chain model. *The International Journal of Advanced Manufacturing Technology, 29*(7-8), 826-835.

Haralambopoulos, N., and Pizam, A. (1996). Perceived impacts of tourism: The case of Samos. *Annals of Tourism Research, 23*(3), 503-526.

Hardi, P., and Zdan, T. J. (1997). *Assessing sustainable development: principles in practice*: International Institute for Sustainable Development Winnipeg.

Harris, R., Griffin, T., and Williams, P. (2002). *Sustainable tourism: a global perspective*: Routledge.

Hasson, F., Keeney, S., and McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of advanced nursing, 32*(4), 1008-1015. doi: 10.1046/j.1365-2648.2000.t01-1-01567.x

Haughton, G., and Hunter, C. (1994). Sustainable cities, regional policy and development series 7. *Regional Studies Association. London and Bristol, Pennsylvania.*

He, G., Chen, X., Liu, W., Bearer, S., Zhou, S., Cheng, L. Y., Zhang, H., Ouyang, Z., and Liu, J. (2008). Distribution of economic benefits from ecotourism: A case study of Wolong Nature Reserve for Giant Pandas in China. *Environmental Management, 42*(6), 1017-1025.

Healey, P. (1998). Collaborative planning in a stakeholder society. *Town planning review, 69*(1), 1.

Healy, R. G. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research, 21*(3), 596-611.

Helgath, S. F. (1975). *Trail deterioration in the Selway-Bitterroot wilderness* (Vol. 193): Intermountain Forest and Range Experiment Station.

Hemdi, A., Mat Saman, M. Z., and Sharif, S. (2012). Fuzzy Application in Sustainability Assessment: A Case Study of Automotive Headlamp. In G. Seliger (Ed.), *Sustainable Manufacturing* (pp. 49-56): Springer Berlin Heidelberg.

Hersh, M. A. (1999). Sustainable decision making: the role of decision support systems. *Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on, 29*(3), 395-408.

Herva, M., Franco-Uría, A., Carrasco, E. F., and Roca, E. (2012). Application of fuzzy logic for the integration of environmental criteria in ecodesign. *Expert Systems with Applications, 39*(4), 4427-4431. doi: http://dx.doi.org/10.1016/j.eswa.2011.09.148

Hezri, A. (2004). Sustainability indicator system and policy processes in Malaysia: a framework for utilisation and learning. *Journal of Environmental Management, 73*(4), 357-371.

Hezri, A. A., and Dovers, S. R. (2006). Sustainability indicators, policy and governance: issues for ecological economics. *Ecological Economics, 60*(1), 86-99.

Hickey, G. M., and Innes, J. L. (2008). Indicators for demonstrating sustainable forest management in British Columbia, Canada: An international review. *Ecological Indicators, 8*(2), 131-140.

Hidinger, L. A. (1996). Measuring the impacts of ecotourism on animal populations: A case study of Tikal National Park, Guatemala. *Yale Forestry & Environment Bulletin, 99*, 49-59.

Hildreth, B. E. (2011). *Obstacles to instructional design practices in community colleges: A modified Delphi study.* 3460056 Ph.D., Capella University, Ann Arbor. Retrieved from http://search.proquest.com/docview/876017846?accountid=27932 ProQuest Dissertations & Theses Full Text database.

Hogan, D. B. G., Lee A. Schmidt, Nancy. (2001). Development and validation of the Hogan grief reaction checklist. *Death studies, 25*(1), 1-32.

Holden, E., and Linnerud, K. (2007). The sustainable development area: satisfying basic needs and safeguarding ecological sustainability. *Sustainable Development, 15*(3), 174-187.

Holmberg, J., and Sandbrook, R. (1992). Sustainable development: what is to be done?

Holsti, O. R. (1969). Content analysis for the social sciences and humanities.

Holvoet, B., and Muys, B. (2004). Sustainable forest management worldwide: a comparative assessment of standards. *International Forestry Review, 6*(2), 99-122.

Honey, M. (1999). *Ecotourism and sustainable development: Who owns paradise?* : Island Press.

Honey, M. (2008). 1 5 Setting Standards: Certification Programmes for Ecotourism and Sustainable Tourism. *Ecotourism and Conservation in the Americas*, 234.

Hong, C. W., and Chan, N. W. (2010a). The potentials, threats and challenges in sustainable development of Penang National Park. *Malaysian Journal of Environmental Management, 11*(2), 95-109.

Hong, C. W., and Chan, N. W. (2010b). Strength-weakness-opportunities-threats Analysis of Penang National Park for Strategic Ecotourism Management. *World Applied Sciences Journal, 10*, 136-145.

Hopwood, B., Mellor, M., and O'Brien, G. (2005). Sustainable development: mapping different approaches. *Sustainable Development, 13*(1), 38-52.

Hossein, G. O., Alipour, H., and Dalir, S. (2014). An Entrepreneurial Tourism Project through Agro-Tourism Farm in Iran. *Journal of Sustainable Development Studies, 6*(1).

Hsieh, T.-Y., Lu, S.-T., and Tzeng, G.-H. (2004). Fuzzy MCDM approach for planning and design tenders selection in public office buildings. *International journal of project management, 22*(7), 573-584.

Hsu, C. C., and Sandford, B. A. (2007). The Delphi technique: Making sense of consensus. *Practical Assessment, Research & Evaluation, 12*(10), 1-8.

Hunter, C. (2002). Sustainable tourism and the touristic ecological footprint. *Environment, Development and Sustainability, 4*(1), 7-20.

Hunter, C., and Green, H. (1995). *Tourism and the Environment: A Sustainable relationship?* : Routledge.

Hunter, C., and Shaw, J. (2005). Applying the ecological footprint to ecotourism scenarios. *Environmental Conservation, 32*(04), 294-304.

151

IES. (2008). Fact Sheet: Global Ecotourism. *The International Ecotourism Society, Size of Global Ecotourism.* .

IISD. (1993). (International Institute for Sustainable Development).Coming clean. Corporate environmental reporting. Deloitte Touche-Tohmatsu International, London, 64 pp. .

Innes, J., and Booher, D. E. (2000). Indicators for sustainable communities: A strategy building on complexity theory and distributed intelligence. *Planning theory & practice, 1*(2), 173-186.

Jaafar, M., and Maideen, S. A. (2012). Ecotourism-related products and activities, and the economic sustainability of small and medium island chalets. *Tourism Management, 33*(3), 683-691. doi: 10.1016/j.tourman.2011.07.011

Jaana, M., Tamim, H., Paré, G., and Teitelbaum, M. (2011). Key IT management issues in hospitals: Results of a Delphi study in Canada. *International Journal of Medical Informatics, 80*(12), 828-840.

Jairath, N., and Weinstein, J. (1993). The Delphi methodology (Part one): A useful administrative approach. *Canadian journal of nursing administration, 7*(3), 29-42.

Jalani, J. O. (2012). Local People's Perception on the Impacts and Importance of Ecotourism in Sabang, Palawan, Philippines. *Procedia - Social and Behavioral Sciences, 57*(0), 247-254. doi: http://dx.doi.org/10.1016/j.sbspro.2012.09.1182

Jalilova, G., Khadka, C., and Vacik, H. (2012). Developing criteria and indicators for evaluating sustainable forest management: A case study in Kyrgyzstan. *Forest Policy and Economics, 21*(0), 32-43. doi: 10.1016/j.forpol.2012.01.010

Jang, J. R. (1997). *MATLAB: Fuzzy Logic Toolbox User's Guide: Version 1*: Math Works.

Jones, A., Kaufmann, A., and Zimmermann, H.-J. (1986). *Fuzzy sets theory and applications*: Springer.

Jones, J., and Hunter, D. (1995). Consensus methods for medical and health services research. *BMJ: British Medical Journal, 311*(7001), 376.

Jones, J., Sanderson, C., and Black, N. (1992). What will happen to the quality of care with fewer junior doctors? A Delphi study of consultant physicians' views. *Journal of the Royal College of Physicians of London, 26*(1), 36-40.

Joseph-Williams, N., Newcombe, R., Politi, M., Durand, M.-A., Sivell, S., Stacey, D., O'Connor, A., Volk, R. J., Edwards, A., and Bennett, C. (2013). Toward Minimum Standards for Certifying Patient Decision Aids A Modified Delphi Consensus Process. *Medical Decision Making*, 0272989X13501721.

Joshi, R., Banwet, D. K., and Shankar, R. (2011). A Delphi-AHP-TOPSIS based benchmarking framework for performance improvement of a cold chain. *Expert Systems with Applications, 38*(8), 10170-10182. doi: 10.1016/j.eswa.2011.02.072

Juang, Y.-S., Lin, S.-S., and Kao, H.-P. (2007). Design and implementation of a fuzzy inference system for supporting customer requirements. *Expert Systems with Applications, 32*(3), 868-878.

Jurincic, I. (2005). Carrying capacity assessment of Slovene Istria for tourism. *Sustainable development and planning*, 725-733.

Kahraman, C., Cebeci, U., and Ruan, D. (2004). Multi-attribute comparison of catering service companies using fuzzy AHP: The case of Turkey. *International Journal of Production Economics, 87*(2), 171-184.

Kahraman, C., Cebeci, U., and Ulukan, Z. (2003). Multi-criteria supplier selection using fuzzy AHP. *Logistics Information Management, 16*(6), 382-394.

Kalaian, S., and Shah, H. (2006). *Overview of parametric and non-parametric statistical methods for analyzing Delphi data.* Paper presented at the Annual Meeting of the Mid-Western Educational Research Association. Columbus, Ohio.

Kalaian, S. A., and Kasim, R. M. (2012). Terminating Sequential Delphi Survey Data Collection. *Practical Assessment, Research & Evaluation, 17*(5), 2.

Kandel, A. (1991). *Fuzzy expert systems*: CRC press.

Kangas, J., and Kangas, A. (2005). Multiple criteria decision support in forest management—the approach, methods applied, and experiences gained. *Forest Ecology and Management, 207*(1), 133-143.

Karanth, K. K., and Nepal, S. K. (2012). Local residents perception of benefits and losses from protected areas in India and Nepal. *Environmental Management, 49*(2), 372-386.

Katambara, Z., and Ndiritu, J. (2009). A fuzzy inference system for modelling streamflow: Case of Letaba River, South Africa. *Physics and Chemistry of the Earth, Parts A/B/C, 34*(10), 688-700.

Kates, R. W., Clark, W. C., Corell, R., Hall, J. M., Jaeger, C. C., Lowe, I., McCarthy, J. J., Schellnhuber, H. J., Bolin, B., and Dickson, N. M. (2001). *Sustainability science* (Vol. 292): International Institute for Applied Systems Analysis.

Kaufmann, A., Gupta, M. M., and Kaufmann, A. (1985). *Introduction to fuzzy arithmetic: theory and applications*: Van Nostrand Reinhold Company New York.

Kaufmann, M., Tobias, S., and Schulin, R. (2009). Quality evaluation of restored soils with a fuzzy logic expert system. *Geoderma, 151*(3), 290-302.

Kelly, K. L. (1998). A systems approach to identifying decisive information for sustainable development. *European Journal of Operational Research, 109*(2), 452-464.

Kelly, R. A., Jakeman, A. J., Barreteau, O., Borsuk, M. E., ElSawah, S., Hamilton, S. H., Henriksen, H. J., Kuikka, S., Maier, H. R., Rizzoli, A. E., van Delden, H., and Voinov, A. A. (2013). Selecting among five common modelling approaches for integrated environmental assessment and management. *Environmental Modelling & Software, 47*(0), 159-181. doi: http://dx.doi.org/10.1016/j.envsoft.2013.05.005

Kim, K. K., O'Bryan, C. A., Crandall, P. G., Ricke, S. C., and Neal Jr, J. A. (2013). Identifying baseline food safety training practices for retail delis using the Delphi expert consensus method. *Food Control, 32*(1), 55-62. doi: http://dx.doi.org/10.1016/j.foodcont.2012.10.009

Kimmel, J. R. (1999). Ecotourism as environmental learning. *The Journal of Environmental Education, 30*(2), 40-44.

Kirkby, J., O'Keefe, P., and Timberlake, L. (1995). *The earthscan reader in sustainable development*: Earthscan Publications London.

Kiss, A. (2004). Is community-based ecotourism a good use of biodiversity conservation funds? *Trends in Ecology & Evolution, 19*(5), 232-237.

Kleijn, D., Baquero, R., Clough, Y., Diaz, M., Esteban, J. d., Fernández, F., Gabriel, D., Herzog, F., Holzschuh, A., and Jöhl, R. (2006). Mixed biodiversity benefits of agri-environment schemes in five European countries. *Ecology Letters, 9*(3), 243-254.

Klenk, N. L., and Hickey, G. M. (2011). A virtual and anonymous, deliberative and analytic participation process for planning and evaluation: The Concept Mapping Policy Delphi. *International Journal of Forecasting, 27*(1), 152-165.

Klir, G. J., and Yuan, B. (1995). *Fuzzy sets and fuzzy logic* (Vol. 4): Prentice Hall New Jersey.

154

Knight, R. L., and Gutzwiller, K. J. (1995). Wildlife and recreationists: coexistence through management and research.

Kommadath, B., Sarkar, R., and Rath, B. (2012). A Fuzzy Logic Based Approach to Assess Sustainable Development of the Mining and Minerals Sector. *Sustainable Development, 20*(6), 386-399.

Kosko. (1992a). *Neural networks and fuzzy systems*: Prentice hall.

Kosko. (1992b). *Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence/Book and Disk*: Prentice-Hall International.

Kratz, T. K., Magnuson, J. J., Bayley, P., Benson, B. J., Berish, C. W., Bledsoe, C. S., Blood, E. R., Bowser, C. J., Carpenter, S. R., and Cunningham, G. L. (1995). Temporal and spatial variability as neglected ecosystem properties: Lessons learned from 12 North American ecosystems *Evaluating and monitoring the health of large-scale ecosystems* (pp. 359-383): Springer.

Kwong, C., and Bai, H. (2003). Determining the importance weights for the customer requirements in QFD using a fuzzy AHP with an extent analysis approach. *IIE transactions, 35*(7), 619-626.

Landeta, J., Barrutia, J., and Lertxundi, A. (2011). Hybrid Delphi: A methodology to facilitate contribution from experts in professional contexts. *Technological Forecasting and Social Change, 78*(9), 1629-1641. doi: 10.1016/j.techfore.2011.03.009

Landorf, C. (2009). Managing for sustainable tourism: a review of six cultural World Heritage Sites. *Journal of Sustainable Tourism, 17*(1), 53-70.

Larimian, T., Zarabadi, Z. S. S., and Sadeghi, A. (2013). Developing a fuzzy AHP model to evaluate environmental sustainability from the perspective of Secured by Design scheme—A case study. *Sustainable Cities and Society, 7*(0), 25-36. doi: http://dx.doi.org/10.1016/j.scs.2012.10.001

Lawshe, C. H. (1975). A QUANTITATIVE APPROACH TO CONTENT VALIDITY1. *Personnel psychology, 28*(4), 563-575.

Layke, C., Mapendembe, A., Brown, C., Walpole, M., and Winn, J. (2012). Indicators from the global and sub-global Millennium Ecosystem Assessments: An analysis and next steps. *Ecological Indicators, 17*, 77-87.

Lee, C.-C. (1990). Fuzzy logic in control systems: fuzzy logic controller. II. *Systems, Man and Cybernetics, IEEE Transactions on, 20*(2), 419-435.

Lee, G. K., and Chan, E. H. (2008). The analytic hierarchy process (AHP) approach for assessment of urban renewal proposals. *Social indicators research, 89*(1), 155-168.

Lee, S.-H. (2010). Using fuzzy AHP to develop intellectual capital evaluation model for assessing their performance contribution in a university. *Expert Systems with Applications, 37*(7), 4941-4947.

Lee, S., and Leong, Y. (2003). Should Pantai Acheh Reserve be a State Park or a State National Park for Penang. *Pantai Acheh Forest Reserve: The case for a State Park*, 21-28.

Leekwijck, W. V., and Kerre, E. E. (1999). Defuzzification: criteria and classification. *Fuzzy Sets and Systems, 108*(2), 159-178.

Leigh Jr, G. (1981). The average lifetime of a population in a varying environment. *Journal of Theoretical Biology, 90*(2), 213-239.

Leong, S., and du Cros, H. (2013). Intangible Heritage and Sustainable Tourism Planning: A Critique of a Tourism Resort Development Proposal for Lugu Lake, China. *CULTURAL HERITAGE TOURISM ASIA PACI*, 221.

Lepper, and Schroenn. (2010). Community-based natural resource management, poverty alleviation and livelihood diversification: A case study from northern Botswana. *Development Southern Africa, 27*(5), 725-739.

Lermontov, A., Yokoyama, L., Lermontov, M., and Machado, M. A. S. (2009). River quality analysis using fuzzy water quality index: Ribeira do Iguape river watershed, Brazil. *Ecological Indicators, 9*(6), 1188-1197.

Leskinen, P., Kangas, A. S., and Kangas, J. (2004). Rank-based modelling of preferences in multi-criteria decision making. *European Journal of Operational Research, 158*(3), 721-733.

Leung, L., and Cao, D. (2000). On consistency and ranking of alternatives in fuzzy AHP. *European Journal of Operational Research, 124*(1), 102-113.

Levy, D. L. (1997). Environmental management as political sustainability. *Organization & Environment, 10*(2), 126-147.

Li, and Yen. (1995). Fuzzy Sets and Fuzzy Decision-making. *USA: CRC Press Inc*.

Li, H. X., and Yen, V. C. (1995). Fuzzy Sets and Fuzzy Decision-making. *USA: CRC Press Inc.*

156

Li, W. (2004). Environmental management indicators for ecotourism in China's nature reserves: A case study in Tianmushan Nature Reserve. *Tourism Management, 25*(5), 559-564. doi: http://dx.doi.org/10.1016/j.tourman.2003.06.001

Li, W., and Han, N. (2001). Ecotourism management in China's nature reserves. *AMBIO: A Journal of the Human Environment, 30*(1), 62-63.

Liddle, M. (1997). *Recreation ecology: the ecological impact of outdoor recreation and ecotourism*: Chapman & Hall Ltd.

Lin, T., Lin, J.-y., Cui, S.-h., and Cameron, S. (2009). Using a network framework to quantitatively select ecological indicators. *Ecological Indicators, 9*(6), 1114-1120. doi: 10.1016/j.ecolind.2008.12.009

Lindberg, K., Enriquez, J., and Sproule, K. (1996). Ecotourism Questioned: Case studies from Belize. *Annals of Tourism Research, 23*(3), 543-562. doi: 10.1016/0160-7383(95)00074-7

Lindberg, K., McCool, S., and Stankey, G. (1997). Rethinking carrying capacity. *Annals of Tourism Research, 24*(2), 461-465.

Lindeman, C. A. (1975). Delphi survey of priorities in clinical nursing research. *Nursing research, 24*(6), 434-441.

Lindsey, P. A., Alexander, R. R., Du Toit, J. T., and Mills, M. (2005). The potential contribution of ecotourism to African wild dog< i> Lycaon pictus</i> conservation in South Africa. *Biological Conservation, 123*(3), 339-348.

Linstone, H. A., and Turoff, M. (1975). The Delphi method: Techniques and applications.

Liou, Y.-T., and Lo, S.-L. (2005). A fuzzy index model for trophic status evaluation of reservoir waters. *Water Research, 39*(7), 1415-1423.

Liu, J., Qu, H., Huang, D., Chen, G., Yue, X., Zhao, X., and Liang, Z. (2014). The role of social capital in encouraging residents' pro-environmental behaviors in community-based ecotourism. *Tourism Management, 41*, 190-201.

Lohuis, A., Vuuren, M., and Bohlmeijer, E. (2014). Context-specific definitions of organizational concepts: Defining 'team effectiveness' with use of the Delphi Technique. *Journal of management and organization*.

Loo, R. (2002). The Delphi method: a powerful tool for strategic management. *Policing: An International Journal of Police Strategies & Management, 25*(4), 762-769.

157

López. (2002). Evaluating ecotourism in natural protected areas of La Paz Bay, Baja California Sur, México: ecotourism or nature-based tourism? *Biodiversity and Conservation, 11*(9), 1539-1550. doi: 10.1023/a:1016887417263

López, García, M., Schuhmacher, M., and Domingo, J. L. (2008). A fuzzy expert system for soil characterization. *Environment international, 34*(7), 950-958.

Lozano-Oyola, M., Blancas, F. J., González, M., and Caballero, R. (2012). Sustainable tourism indicators as planning tools in cultural destinations. *Ecological Indicators, 18*(0), 659-675. doi: 10.1016/j.ecolind.2012.01.014

Ludlow. (1975). Delphi inquiries and knowledge utilization in: H.A. Linstone, M. Turoff (Eds.), The Delphi Method - Techniques and Applications, pp. 102–123.

Lukasheh, A. F., Droste, R. L., and Warith, M. A. (2001). Review of expert system (ES), geographic information system (GIS), decision support system (DSS), and their applications in landfill design and management. *Waste management & research, 19*(2), 177-185.

Lumsdon, L. M., and Swift, J. S. (1998). Ecotourism at a crossroads: The case of Costa Rica. *Journal of Sustainable Tourism, 6*(2), 155-172.

MacKay, A. F. (1980). *Arrow's theorem, the paradox of social choice: a case study in the philosophy of economics*: Yale University Press New Haven.

Macoun, P., and Prabhu, R. (1999). *Guidelines for applying multi-criteria analysis to the assessment of criteria and indicators* (Vol. 9): CIFOR.

Maes, W. H., Fontaine, M., Rongé, K., Hermy, M., and Muys, B. (2011). A quantitative indicator framework for stand level evaluation and monitoring of environmentally sustainable forest management. *Ecological Indicators, 11*(2), 468-479. doi: 10.1016/j.ecolind.2010.07.001

Mäkelä, A., Río, M. d., Hynynen, J., Hawkins, M. J., Reyer, C., Soares, P., van Oijen, M., and Tomé, M. (2012). Using stand-scale forest models for estimating indicators of sustainable forest management. *Forest Ecology and Management, 285*(0), 164-178. doi: 10.1016/j.foreco.2012.07.041

Mamdani, E. H., and Assilian, S. (1975). An experiment in linguistic synthesis with a fuzzy logic controller. *International journal of man-machine studies, 7*(1), 1-13.

Mancini, M. (2000). *Conducting tours: A practical guide*: Cengage Learning.

Marchais-Roubelat, A., and Roubelat, F. (2011). The Delphi method as a ritual: Inquiring the Delphic Oracle. *Technological Forecasting and Social Change, 78*(9), 1491-1499.

Marchini, A., Facchinetti, T., and Mistri, M. (2009). F-IND: a framework to design fuzzy indices of environmental conditions. *Ecological Indicators, 9*(3), 485-496.

Marion, J. L. (1994). *An assessment of trail conditions in Great Smoky Mountains National Park*: US Department of Interior, National Park Service, Great Smoky Mountains National Park, Division of resource Management and Science.

Marion, J. L., and Leung, Y.-F. (2001). Trail resource impacts and an examination of alternative assessment techniques. *Journal of Park & Recreation Administration, 19*(3).

Marker, M. A., Blanco, A., Lokanathan, S., and Verma, A. (2008). Ecotourism in Malaysia. *Project for pp5279: clusters and national competitiveness, Lee Kuan Yew school of public policy*.

Marks, L., Dunn, E., Keller, J., and Godsey, L. (1995). *Multiple criteria decision making (MCDM) using fuzzy logic: an innovative approach to sustainable agriculture.* Paper presented at the Uncertainty Modeling and Analysis, 1995, and Annual Conference of the North American Fuzzy Information Processing Society. Proceedings of ISUMA-NAFIPS'95., Third International Symposium on.

Marsh, J. (1993). An index of tourism sustainability. *Tourism and Sustainable Development: Monitoring, Planning and Managing, Usha CV Haley and George T. Haley When the tourists flew in: strategic implications of foreign direct investment in Vietnam's tourism industry Management Decision, 35*(8), 1997.

Martha, H. (2008). Ecotourism and sustainable development: who owns paradise? : Washington DC: Island Press. ISBN1-59726-125-4 ISBN978-1597261258.

Mbaiwa, J. E., and Stronza, A. L. (2010). The effects of tourism development on rural livelihoods in the Okavango Delta, Botswana. *Journal of Sustainable Tourism, 18*(5), 635-656.

Mccool, S. F., and Stankey, G. H. (2004). Indicators of sustainability: challenges and opportunities at the interface of science and policy. *Environmental Management, 33*(3), 294-305.

McDonald, M., Blair, R., Bolgrien, D., Brown, B., Dlugosz, J., Hale, S., Hedtke, S., Heggem, D., Jackson, L., and Jones, K. (2004). The US Environmental Protection Agency's Environmental Monitoring and Assessment Program. *Environmental monitoring*, 649-668.

McKenna, H. P. (1994). The Delphi technique: a worthwhile research approach for nursing? *Journal of advanced nursing, 19*(6), 1221-1225. doi: 10.1111/j.1365-2648.1994.tb01207.x

McQueen, D., and Noack, H. (1988). Health promotion indicators: current status, issues and problems. *Health Promotion International, 3*(1), 117-125.

Mendoza, and Prabhu. (2000a). Development of a methodology for selecting criteria and indicators of sustainable forest management: a case study on participatory assessment. *Environmental Management, 26*(6), 659-673.

Mendoza, and Prabhu. (2000b). Multiple criteria decision making approaches to assessing forest sustainability using criteria and indicators: a case study. *Forest Ecology and Management, 131*(1–3), 107-126. doi: 10.1016/s0378-1127(99)00204-2

Mendoza, G., and Prabhu, R. (2004). Fuzzy methods for assessing criteria and indicators of sustainable forest management. *Ecological Indicators, 3*(4), 227-236.

Mendoza, G. A., Macoun, P., Prabhu, R., Sukadri, D., Purnomo, H., and Hartanto, H. (1999). *Guidelines for applying multi-criteria analysis to the assessment of criteria and indicators*. Bogor, Indonesia: CIFOR.

Mendoza, G. A., and Prabhu, R. (2003). Qualitative multi-criteria approaches to assessing indicators of sustainable forest resource management. *Forest Ecology and Management, 174*(1), 329-343.

Mendoza, G. A., and Prabhu, R. (2003). Qualitative multi-criteria approaches to assessing indicators of sustainable forest resource management. *Forest Ecology and Management, 174*(1–3), 329-343. doi: 10.1016/s0378-1127(02)00044-0

Mendoza, G. A., and Prabhu, R. (2006). Participatory modeling and analysis for sustainable forest management: Overview of soft system dynamics models and applications. *Forest Policy and Economics, 9*(2), 179-196.

Meshkat, B., Cowman, S., Gethin, G., Ryan, K., Wiley, M., Brick, A., Clarke, E., and Mulligan, E. (2014). Using an e-Delphi technique in achieving consensus across disciplines for developing best practice in day surgery in Ireland. *Journal of Hospital Administration, 3*(4), p1.

160

Metternicht, G. (2001). Assessing temporal and spatial changes of salinity using fuzzy logic, remote sensing and GIS. Foundations of an expert system. *Ecological Modelling, 144*(2), 163-179.

Mieczkowski, Z. (1995). *Environmental issues of tourism and recreation*: University Press of America.

Mikhailov, L., and Tsvetinov, P. (2004). Evaluation of services using a fuzzy analytic hierarchy process. *Applied Soft Computing, 5*(1), 23-33.

Miller, G. (2001). The development of indicators for sustainable tourism: results of a Delphi survey of tourism researchers. *Tourism Management, 22*(4), 351-362. doi: 10.1016/s0261-5177(00)00067-4

Miller, G., and Twining-Ward, L. (2005). *Monitoring for a sustainable tourism transition: The challenge of developing and using indicators*: CABI.

Miller, M. L., and Kaae, B. C. (1993). Coastal and marine ecotourism: a formula for sustainable development. *Trends, 30*(2), 35-41.

Milne, S., and Ateljevic, I. (2001). Tourism, economic development and the global-local nexus: theory embracing complexity. *Tourism Geographies, 3*(4), 369-393.

Mitchell, G. (2006). Problems and fundamentals of sustainable development indicators.

Mitchell, G., May, A., and McDonald, A. (1995). PICABUE: a methodological framework for the development of indicators of sustainable development. *The International Journal of Sustainable Development & World Ecology, 2*(2), 104-123.

Mitchell, V. (1991). The Delphi technique: an exposition and application. *Technology Analysis & Strategic Management, 3*(4), 333-358.

Moldan, B., Billharz, S., and Matravers, R. (1997). *Sustainability indicators: A report on the project on indicators of sustainable development* (Vol. 58): John Wiley & Sons.

Montazar, A., Gheidari, O. N., and Snyder, R. L. (2013). A fuzzy analytical hierarchy methodology for the performance assessment of irrigation projects. *Agricultural Water Management, 121*(0), 113-123. doi: http://dx.doi.org/10.1016/j.agwat.2013.01.011

Mortensen, C. O. (1989). Visitor use impacts within the Knobstone Trail Corridor. *Journal of soil and water conservation, 44*(2), 156-159.

Moscardo, G., Schurmann, A., Konovalov, E., and McGehee, N. G. (2013). Using tourism to build social capital in communities: new pathways to sustainable tourism futures.

Mowforth, M. Munt, 1., 1998, Tourism and sustainability: new tourism in the Third World: London: Routledge.

Mowforth, M., and Munt, I. (2003). Tourism and Sustainability: Developments and New
Tourism in the Third World  *Routledge, London., Second Edition*.

Mowforth, M., and Munt, I. (2008). *Tourism and sustainability: Development, globalisation and new tourism in the third world*: Taylor & Francis US.

Mudge. (1993). Environmental Assessment – Present Problems and Future Prospects – Capacity Building. *International Academy of the Environment*
*Natural Resources Geneva. Canada.*

Munda, G., Nijkamp, P., and Rietveld, P. (1994). Qualitative multicriteria evaluation for environmental management. *Ecological Economics, 10*(2), 97-112.

Murphy, M., Black, N., Lamping, D., McKee, C., Sanderson, C., Askham, J., and Marteau, T. (1997). Consensus development methods, and their use in clinical guideline development. *Health technology assessment (Winchester, England), 2*(3), i-iv, 1-88.

Murphy, P. E., and Price, G. G. (2005). 9 Tourism and sustainable development. *Digitally signed by TeAM YYePG DN: cn= TeAM YYePG, c= US, o= TeAM YYePG, ou= TeAM YYePG*, 167.

Murphy, T. H., and Terry, H. R. (1998). Opportunities and obstacles for distance education in agricultural education. *Journal of agricultural education, 39*, 28-36.

Murry Jr, J. W., and Hammons, J. O. (1995). Delphi: A Versatile Methodology for Conducting Qualitative Research. *Review of Higher Education, 18*(4), 423-436.

Nan, C., Khan, F., and Iqbal, M. T. (2008). Real-time fault diagnosis using knowledge-based expert system. *Process Safety and Environmental Protection, 86*(1), 55-71.

Nasiri, F., Huang, G., and Fuller, N. (2007). Prioritizing groundwater remediation policies: a fuzzy compatibility analysis decision aid. *Journal of Environmental Management, 82*(1), 13-23.

Nepal, S. K., and Nepal, S. A. (2004). Visitor impacts on trails in the Sagarmatha (Mt. Everest) National Park, Nepal. *AMBIO: A Journal of the Human Environment, 33*(6), 334-340.

Netemeyer, R. G., Bearden, W. O., and Sharma, S. (2003). *Scaling procedures: Issues and applications*: Sage.

Neto, F. (2003). *A new approach to sustainable tourism development: Moving beyond environmental protection.* Paper presented at the Natural Resources Forum.

Nevo, D., Benbasat, I., and Wand, Y. (2012). Understanding technology support for organizational transactive memory: Requirements, application, and customization. *Journal of Management Information Systems, 28*(4), 69-98.

Niemeijer, D., and de Groot, R. S. (2008). A conceptual framework for selecting environmental indicator sets. *Ecological Indicators, 8*(1), 14-25.

Niemi, G. J., and McDonald, M. E. (2004). Application of ecological indicators. *Annual Review of Ecology, Evolution, and Systematics*, 89-111.

Nowack, M., Endrikat, J., and Guenther, E. (2011). Review of Delphi-based scenario studies: Quality and design considerations. *Technological Forecasting and Social Change, 78*(9), 1603-1615. doi: http://dx.doi.org/10.1016/j.techfore.2011.03.006

Ocampo-Duque, W., Ferre-Huguet, N., Domingo, J. L., and Schuhmacher, M. (2006). Assessing water quality in rivers with fuzzy inference systems: A case study. *Environment international, 32*(6), 733-742.

OECD. (1993). OECD Employment outlook 1993 OECD*Paris (1993)*.

OECD. (2001). Environmental Indicators for Agriculture—Methods and Results Paris, France. *vol. 3*.

Okoli, C., and Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management, 42*(1), 15-29. doi: http://dx.doi.org/10.1016/j.im.2003.11.002

Olaizola, A., Bernués, A., Blasco, I., and Sanz, A. (2012). Prospects for a meat quality designation: exploratory analysis for" Serrana de Teruel" beef. *ITEA, 108*(4), 546-562.

Olsen, A. R., Sedransk, J., Edwards, D., Gotway, C. A., Liggett, W., Rathbun, S., Reckhow, K. H., and Yyoung, L. J. (1999). Statistical issues for monitoring ecological and natural resources in the United States. *Environmental Monitoring and Assessment, 54*(1), 1-45.

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V., Underwood, E. C., D'amico, J. A., Itoua, I., Strand, H. E., and Morrison, J. C. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity. *BioScience, 51*(11), 933-938.

Olson, E. A. (2014). *Rethinking Sustainable Development in South Africa Through An Integrated Biodiversity Conservation and Climate Change Adaptation Approach.* UNIVERSITY OF CALIFORNIA, SANTA BARBARA.

Ovenden, G. N., Swash, A. R., and Smallshire, D. (1998). Agri-environment Schemes and their Contribution to the Conservation of Biodiversity in England. *Journal of Applied Ecology, 35*(6), 955-960.

Packer, J., and Ballantyne, R. (2013). 16. Developing ecotourists' environmentally sustainable behaviour. *International Handbook on Ecotourism*, 192.

Panos. (1997). Ecotourism. *http://www.oneworld.org/panos/panos_eco2.html*.

Paré, G., Cameron, A.-F., Poba-Nzaou, P., and Templier, M. (2013). A systematic assessment of rigor in information systems ranking-type Delphi studies. *Information & Management, 50*(5), 207-217.

Parsons, R. (1995). Conflict between ecological sustainability and environmental aesthetics: Conundrum, canärd or curiosity. *Landscape and Urban Planning, 32*(3), 227-244.

Patton, M. Q. (1980). Qualitative evaluation methods.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., Watson, R., and Zeller, D. (2002). Towards sustainability in world fisheries. *Nature, 418*(6898), 689-695.

Pearce, D., Barbier, E., and Markandya, A. (2013). *Sustainable development: economics and environment in the Third World*: Routledge.

Pearce, D. W., Barbier, E. B., and Markandya, A. ( 1990). Sustainable development; Economics and environment in the third world. *Edward Elgar, London*.

Pearce, F. (1995). Selling wildlife short. *New Scientist*(147), 28-31.

Peche, R., and Rodríguez, E. (2009). Environmental impact assessment procedure: A new approach based on fuzzy logic. *Environmental Impact Assessment Review, 29*(5), 275-283.

Peche, R., and Rodríguez, E. (2012). Development of environmental quality indexes based on fuzzy logic. A case study. *Ecological Indicators, 23*(0), 555-565. doi: 10.1016/j.ecolind.2012.04.029

Pedrycz, W., and Gomide, F. (1994). A generalized fuzzy Petri net model. *Fuzzy Systems, IEEE Transactions on, 2*(4), 295-301.

Peeters, P. M. (2013). Developing a long-term global tourism transport model using a behavioural approach: implications for sustainable tourism policy making. *Journal of Sustainable Tourism, 21*(7), 1049-1069.

Pegas, F. d. V., and Castley, J. G. (2014). Ecotourism as a conservation tool and its adoption by private protected areas in Brazil. *Journal of Sustainable Tourism*(ahead-of-print), 1-22.

Phillips, R. (2000). New applications for the Delphi technique. *ANNUAL-SAN DIEGO-PFEIFFER AND COMPANY-, 2*, 191-196.

Phillis, and Andriantiatsaholiniaina. (2001). Sustainability: an ill-defined concept and its assessment using fuzzy logic. *Ecological Economics, 37*(3), 435-456.

Phillis, and Davis. (2009). Assessment of Corporate Sustainability via Fuzzy Logic. *Journal of Intelligent & Robotic Systems, 55*(1), 3-20. doi: 10.1007/s10846-008-9289-3

Phillis, Y., and Davis, B. (2009). Assessment of Corporate Sustainability via Fuzzy Logic. *Journal of Intelligent and Robotic Systems, 55*(1), 3-20. doi: 10.1007/s10846-008-9289-3

Phillis, Y. A., and Andriantiatsaholiniaina, L. A. (2001). Sustainability: an ill-defined concept and its assessment using fuzzy logic *Ecological Economics* (Vol. 37, pp. 435-456).

Pill, J. (1971). The Delphi method: substance, context, a critique and an annotated bibliography. *Socio-Economic Planning Sciences, 5*(1), 57-71.

Plummer, R., and Fennell, D. A. (2009). Managing protected areas for sustainable tourism: prospects for adaptive co-management. *Journal of Sustainable Tourism, 17*(2), 149-168.

Pokorny, B., and Adams, M. (2003). What do criteria and indicators assess? An analysis of five C&I sets relevant for forest management in the Brazilian Amazon. *International Forestry Review, 5*(1), 20-28.

Pokorny, B., Sabogal, C., Silva, J., Bernardo, P., Souza, J., and Zweede, J. (2005). Compliance with reduced-impact harvesting guidelines by timber enterprises in terra firme forests of the Brazilian Amazon. *International Forestry Review, 7*(1), 9-20.

Poore, D. (2003). Changing Landscapes. *Earthscan Publications, London.*

Pope, J., Annandale, D., and Morrison-Saunders, A. (2004). Conceptualising sustainability assessment. *Environmental Impact Assessment Review, 24*(6), 595-616.

Powell, C. (2003). The Delphi technique: myths and realities. *Journal of advanced nursing, 41*(4), 376-382.

Prabhu, Ruitenbeek, H. J., Boyle, T. J. B., and Colfer, C. J. B. (2001). Between voodoo science and adaptive management: the role and research needs for indicators of sustainable forest management.

Prabhu, R. (1996). *Testing Criteria and Indicators for the Sustainable Management of Forests: Final Report. phase 1*: CIFOR.

Prabhu, R., Colfer, C. J. P., and Dudley, R. G. (1999). *Guidelines for developing, testing and selecting criteria and indicators for sustainable forest management: a C&I developer's reference* (Vol. 1): CIFOR.

Prato, T. (2005). A fuzzy logic approach for evaluating ecosystem sustainability. *Ecological Modelling, 187*(2–3), 361-368. doi: http://dx.doi.org/10.1016/j.ecolmodel.2005.01.035

Prato, T. (2009). Fuzzy adaptive management of social and ecological carrying capacities for protected areas. *Journal of Environmental Management, 90*(8), 2551-2557.

Prendergast, J., Quinn, R., Lawton, J., Eversham, B., and Gibbons, D. (1993). Rare species, the coincidence of diversity hotspots and conservation strategies.

Proctor, W. (2000). *Towards sustainable forest management an application of multi-criteria analysis to Australian forest policy.* Paper presented at the Third International Conference of the European Society for Ecological Economics, Vienna Austria.

Putney, A. D., and Wagar, J. A. (1973). Objectives and evaluation in interpretive planning. *The Journal of Environmental Education, 5*(1), 43-44.

Raison, R. J., Brown, A. G., and Flinn, D. W. (2001). *Criteria and indicators for sustainable forest management*: CABI.

166

Rametsteiner, E., and Simula, M. (2003). Forest certification—an instrument to promote sustainable forest management? *Journal of Environmental Management, 67*(1), 87-98.

Reid, D. (1995). *Sustainable development: an introductory guide*: Earthscan Publications Ltd.

Reid, N. (1988). The Delphi technique: its contribution to the evaluation of professional practice. *Professional competence and quality assurance in the caring professions*, 230-262.

Reid, W. V., Laird, S. A., Meyer, C. A., Gámez, R., Sittenfeld, A., Janzen, D. H., Gollin, M. A., and Juma, C. (1993). *Biodiversity prospecting: using genetic resources for sustainable development*: World Resources Institute.

Requardt, A. (2007). Pan-European Criteria and Indicators for Sustainable Forest Management: Networking Structures and Data Potentials of International Data Sources.

Reynolds, K. M., Johnson, K. N., and Gordon, S. N. (2003). The science/policy interface in logic-based evaluation of forest ecosystem sustainability. *Forest Policy and Economics, 5*(4), 433-446.

Ribeiro, R. A. (1996). Fuzzy multiple attribute decision making: A review and new preference elicitation techniques. *Fuzzy Sets and Systems, 78*(2), 155-181. doi: http://dx.doi.org/10.1016/0165-0114(95)00166-2

Rio, D., and Nunes, L. M. (2012). Monitoring and evaluation tool for tourism destinations. *Tourism Management Perspectives, 4*(0), 64-66. doi: 10.1016/j.tmp.2012.04.002

Roberts, D. W. (1996). Landscape vegetation modelling with vital attributes and fuzzy systems theory. *Ecological Modelling, 90*(2), 175-184.

Robson, A. M. (2011). *Sustainability Measurement: A New Evaluation Framework and a Case Study of Houston, Texas.* 1498869 M.S., Rice University, Ann Arbor. Retrieved from http://search.proquest.com/docview/880569023?accountid=27932 ProQuest Dissertations & Theses Full Text database.

Rodger, K., and Moore, S. A. (2004). Bringing science to wildlife tourism: The influence of managers' and scientists' perceptions. *Journal of Ecotourism, 3*(1), 1-19.

Rodrigues, A. L., Rodrigues, A., and Peroff, D. M. (2014). The Sky and Sustainable Tourism Development: A Case Study of a Dark Sky Reserve Implementation in Alqueva. *International Journal of Tourism Research*.

Roman, G., Dearden, P., and Rollins, R. (2007). Application of Zoning and "Limits of Acceptable Change" to Manage Snorkelling Tourism. *Environmental Management, 39*(6), 819-830. doi: 10.1007/s00267-006-0145-6

Rome, A. (1999). Ecotourism Impacts Monitoring: A Review of Methodologies and Recommendations for Developing Monitoring Programs in Latin America. *The Nature Conservancy, Arlington, VA, USA http://www. conserveonline. org/2001/06/s/Ecotourism_Impacts_Monitoring*.

Ross, S., and Wall, G. (1999a). Ecotourism: towards congruence between theory and practice. *Tourism Management, 20*(1), 123-132.

Ross, S., and Wall, G. (1999b). Evaluating ecotourism: The case of North Sulawesi, Indonesia. *Tourism Management, 20*(6), 673-682. doi: 10.1016/s0261-5177(99)00040-0

Ross, T. J. (2009). *Fuzzy logic with engineering applications*: John Wiley & Sons.

Rowe. (1994). Enhancing Judgement and Decision Making: a critical and empirical investigation of the Delphi technique.Unpublished PhD Thesis, University of Western England, Bristol.

Ruspini, E. H., Bonissone, P. P., and Pedrycz, W. (1998). Handbook of fuzzy computation.

Ryan, C., and Cessford, G. (2003). Developing a visitor satisfaction monitoring methodology: Quality gaps, crowding and some results. *Current issues in Tourism, 6*(6), 457-507.

Ryan, C., and Dewar, K. (1995). Evaluating the communication process between interpreter and visitor. *Tourism Management, 16*(4), 295-303. doi: http://dx.doi.org/10.1016/0261-5177(95)00019-K

Ryan, R. (2012). Effects of Ecotourism and Adventure Tourism in the Santa Cruz Province, Argentina.

Saaty, T. L. (1980). The analytic Hierarchy process. . *McGrow-Hill, New York*.

Saaty, T. L. (1994). How to make a decision: the analytic hierarchy process. *interfaces, 24*(6), 19-43.

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International journal of services sciences, 1*(1), 83-98.

Saaty, T. L., and Alexander, J. M. (1989). *Conflict Resolution: The Analytic Hierachy Approach*: RWS Publications.

168

Saaty, T. L., and Vargas, L. G. (2001). The seven pillars of the analytic hierarchy process *Models, methods, concepts & applications of the analytic hierarchy process* (pp. 27-46): Springer.

Saaty, T. L., Vargas, L. G., and Dellmann, K. (2003). The allocation of intangible resources: the analytic hierarchy process and linear programming. *Socio-Economic Planning Sciences, 37*(3), 169-184.

Sackman, H. (1974). Delphi assessment: Expert opinion, forecasting, and group process: DTIC Document.

Sadiq, R., and Husain, T. (2005). A fuzzy-based methodology for an aggregative environmental risk assessment: a case study of drilling waste. *Environmental Modelling & Software, 20*(1), 33-46.

Sam-Amoah, L., and Gowing, J. (2001). Assessing the performance of irrigation schemes with minimum data on water deliveries1. *Irrigation and Drainage, 50*(1), 31-39.

Sander, B. (2012). The importance of education in ecotourism ventures: lessons from Rara Avis ecolodge, Costa Rica. *International Journal of Sustainable Society, 4*(4), 389-404.

Sankaran, R. (1997). Developing a protected area network in the Nicobar islands: the perspective of endemic avifauna. *Biodiversity & Conservation, 6*(6), 797-815.

Schaltegger, S., and Braunschweig, A. (1996). *Life Cycle Assessment (LCA): Quo Vadis?* : Springer.

Scheyvens, R. (1999). Ecotourism and the empowerment of local communities. *Tourism Management, 20*(2), 245-249.

Scheyvens, R., and Momsen, J. H. (2008). Tourism and poverty reduction: issues for small island states. *Tourism Geographies, 10*(1), 22-41.

Schmoldt, D., and Peterson, D. (2001). Efficient Group Decision Making in Workshop Settings. In D. Schmoldt, J. Kangas, G. Mendoza and M. Pesonen (Eds.), *The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making* (Vol. 3, pp. 97-114): Springer Netherlands.

Schultz, K. S., and Whitney, D. J. (2005). Measurement theory in action: Thousand Oaks, CA: Sage.

Shackley, M. L. (1996). *Wildlife tourism*: Cengage Learning EMEA.

Sherry, E., Halseth, R., Fondahl, G., Karjala, M., and Leon, B. (2005). Local-level criteria and indicators: an Aboriginal perspective on sustainable forest management. *Forestry, 78*(5), 513-539.

Shopley, J., and Fuggle, R. (1984). Comprehensive review of current environmental impact assessment methods and techniques. *J. Environ. Manage.;(United States), 18*(1).

Shultis, J., and More, T. (2011). American and Canadian national park agency responses to declining visitation. *Journal of Leisure Research, 43*(1), 110-132.

Sicat, R. S., Carranza, E. J. M., and Nidumolu, U. B. (2005). Fuzzy modeling of farmers' knowledge for land suitability classification. *Agricultural Systems, 83*(1), 49-75.

Silvert, W. (1997). Ecological impact classification with fuzzy sets. *Ecological Modelling, 96*(1), 1-10.

Silvert, W. (2000). Fuzzy indices of environmental conditions. *Ecological Modelling, 130*(1), 111-119.

Singh, R.-N., and Bailey, W. H. (1997). Fuzzy logic applications to multisensor-multitarget correlation. *Aerospace and Electronic Systems, IEEE Transactions on, 33*(3), 752-769.

Singh, T. V. (2012). *Critical debates in tourism* (Vol. 57): Channel View Publications.

Sirakaya, E., Jamal, T., and Choi, H.-S. (2001). Developing indicators for destination sustainability. *The encyclopedia of ecotourism*, 411-432.

Sivanandam, S., Sumathi, S., and Deepa, S. (2007). *Introduction to fuzzy logic using MATLAB* (Vol. 1): Springer.

Smith, P. G., and Theberge, J. B. (1986). A review of criteria for evaluating natural areas. *Environmental Management, 10*(6), 715-734.

Smith, R. L., Bush, R. J., and Schmoldt, D. L. (1995). A hierarchical analysis of bridge decision makers. . *wood and Fiber science 27*, 225-238.

Sprenkle, D. H., and Piercy, F. P. (2010). *Research methods in family therapy*: Guilford Press.

Stabler, M. J. (1997). *Tourism and sustainability: principles to practice*: Cab International.

Steinert, M. (2009). A dissensus based online Delphi approach: An explorative research tool. *Technological Forecasting and Social Change, 76*(3), 291-300. doi: http://dx.doi.org/10.1016/j.techfore.2008.10.006

Stewart, J. (2001). Is the Delphi technique a qualitative method? *Medical Education, 35*(10), 922.

Stitt-Gohdes, W. L., and Crews, T. B. (2005). The Delphi technique: A research strategy for career and technical education.

Stoeckl, N., Smith, A., Newsome, D., and Lee, D. (2005). Regional economic dependence on iconic wildlife tourism: Case studies of Monkey Mia and Hervey Bay. *Journal of Tourism Studies, 16*, 69-81.

Stokes, F. (1997). Using the Delphi technique in planning a research project on the occupational therapist's role in enabling people to make vocational choices following illness or injury. *British Journal of Occupational Therapy, 60*(6), 263-266.

Stork, N., Boyle, T., Dale, V., Eeley, H., Finegan, B., Lawes, M., Manokaran, N., Prabhu, R., and Soberon, J. (1997). *Criteria and indicators for assessing the sustainability of forest management: conservation of biodiversity*: Center for International Forestry Research Jakarta.

Stronza, A. L. (2010). Commons management and ecotourism: ethnographic evidence from the Amazon. *International Journal of the Commons, 4*(2).

Stroppiana, D., Boschetti, M., Brivio, P. A., Carrara, P., and Bordogna, G. (2009). A fuzzy anomaly indicator for environmental monitoring at continental scale. *Ecological Indicators, 9*(1), 92-106.

Sugeno, M. (1985). An introductory survey of fuzzy control. *Information Sciences, 36*(1), 59-83.

Svoray, T., Gancharski, S. B.-Y., Henkin, Z., and Gutman, M. (2004). Assessment of herbaceous plant habitats in water-constrained environments: predicting indirect effects with fuzzy logic. *Ecological Modelling, 180*(4), 537-556.

Takagi, T., and Sugeno, M. (1985). Fuzzy identification of systems and its applications to modeling and control. *Systems, Man and Cybernetics, IEEE Transactions on*(1), 116-132.

Tang, Y.-C., and Beynon, M. J. (2005). Application and development of a fuzzy analytic hierarchy process within a capital investment study. *Journal of Economics and Management, 1*(2), 207-230.

171

Teh, L., and Cabanban, A. S. (2007). Planning for sustainable tourism in southern Pulau Banggi: An assessment of biophysical conditions and their implications for future tourism development. *Journal of Environmental Management, 85*(4), 999-1008. doi: 10.1016/j.jenvman.2006.11.005

Theobald, W. F. (2005). *Global tourism*: Routledge.

Thompson, R. C., Olsen, Y., Mitchell, R. P., Davis, A., Rowland, S. J., John, A. W., McGonigle, D., and Russell, A. E. (2004). Lost at sea: where is all the plastic? *Science, 304*(5672), 838-838.

Tickell, C. F. I. E. C. a. G. L. e. (1994). Ecotourism: A Sustainable Option? *Brisbane: John Wiley and Sons.*

Tilman, D., Wedin, D., and Knops, J. (1996). Productivity and sustainability influenced by biodiversity in grassland ecosystems. *Nature, 379*(6567), 718-720.

Tisdell, C., and Wilson, C. (2005). Perceived Impacts of Ecotourism on Environmental Learning and Conservation: Turtle Watching as a Case Study. *Environment, Development and Sustainability, 7*(3), 291-302. doi: 10.1007/s10668-004-7619-6

Todd, C. R., and Burgman, M. A. (1998). Assessment of threat and conservation priorities under realistic levels of uncertainty and reliability. *Conservation biology*, 966-974.

Tolga, E., Demircan, M. L., and Kahraman, C. (2005). Operating system selection using fuzzy replacement analysis and analytic hierarchy process. *International Journal of Production Economics, 97*(1), 89-117.

Tolsgaard, M. G., Todsen, T., Sorensen, J. L., Ringsted, C., Lorentzen, T., Ottesen, B., and Tabor, A. (2013). International multispecialty consensus on how to evaluate ultrasound competence: a delphi consensus survey. *PloS one, 8*(2), e57687.

Toman, M. A. (2006). The difficulty in defining sustainability. *The RFF Reader in Environmental and Resource Policy*, 247.

Torquebiau, E., and Taylor, R. D. (2009). Natural resource management by rural citizens in developing countries: innovations still required. *Biodiversity and Conservation, 18*(10), 2537-2550.

Troumbis, A. Y., and Dimitrakopoulos, P. G. (1998). Geographic coincidence of diversity threatspots for three taxa and conservation planning in Greece. *Biological Conservation, 84*(1), 1-6.

Tsaur, S.-H., Lin, Y.-C., and Lin, J.-H. (2006). Evaluating ecotourism sustainability from the integrated perspective of resource, community and tourism. *Tourism Management, 27*(4), 640-653. doi: 10.1016/j.tourman.2005.02.006

Turksen, I., and Yao, D. D. (1984). Representations of connectives in fuzzy reasoning: The view through normal forms. *Systems, Man and Cybernetics, IEEE Transactions on*(1), 146-151.

Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., Eckley, N., Kasperson, J. X., Luers, A., and Martello, M. L. (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the national academy of sciences, 100*(14), 8074-8079.

Turoff, M., and Hiltz, S. R. (1996). Computer based Delphi processes. *Gazing into the oracle: The Delphi method and its application to social policy and public health*, 56-85.

Uricchio, V. F., Giordano, R., and Lopez, N. (2004). A fuzzy knowledge-based decision support system for groundwater pollution risk evaluation. *Journal of Environmental Management, 73*(3), 189-197.

Urquhart, N. S., Paulsen, S. G., and Larsen, D. P. (1998). Monitoring for policy-relevant regionaltrends over time. *Ecological Applications, 8*(2), 246-257.

Uzzell, D. L. (1985). Management issues in the provision of countryside interpretation. *Leisure Studies, 4*(2), 159-174.

Vacik, H., and Lexer, M. J. (2001). Application of a spatial decision support system in managing the protection forests of Vienna for sustained yield of water resources. *Forest Ecology and Management, 143*(1), 65-76.

Vacik, H., Wolfslehner, B., Seidl, R., and Lexer, M. J. (2007). Integrating the DPSIR approach and the analytic network process for the assessment of forest management strategies. *Sustainable Forestry: From Monitoring and Modelling to Knowledge Management and Policy Science*, 393-411.

Vaidya, O. S., and Kumar, S. (2006). Analytic hierarchy process: An overview of applications. *European Journal of Operational Research, 169*(1), 1-29.

van Bueren, E. M. L., and Blom, E. M. (1997). *Hierarchical framework for the formulation of sustainable forest management standards*: Tropenbos Foundation.

Van Cauwenbergh, N., Biala, K., Bielders, C., Brouckaert, V., Franchois, L., Garcia Cidad, V., Hermy, M., Mathijs, E., Muys, B., and Reijnders, J. (2007). SAFE—A hierarchical framework for assessing the sustainability of agricultural systems. *Agriculture, Ecosystems & Environment, 120*(2), 229-242.

van der Werf, H. M., and Zimmer, C. (1998). An indicator of pesticide environmental impact based on a fuzzy expert system. *Chemosphere, 36*(10), 2225-2249.

Van Laarhoven, P., and Pedrycz, W. (1983). A fuzzy extension of Saaty's priority theory. *Fuzzy Sets and Systems, 11*(1), 199-227.

van Oudenhoven, A. P. E., Petz, K., Alkemade, R., Hein, L., and de Groot, R. S. (2012). Framework for systematic indicator selection to assess effects of land management on ecosystem services. *Ecological Indicators, 21*(0), 110-122. doi: 10.1016/j.ecolind.2012.01.012

Vilanova, E., Ramírez-Angulo, H., Ramírez, G., and Torres-Lezama, A. (2012). Compliance with sustainable forest management guidelines in three timber concessions in the Venezuelan Guayana: Analysis and implications. *Forest Policy and Economics, 17*(0), 3-12. doi: 10.1016/j.forpol.2011.11.001

Vincent, V. C., and Thompson, W. (2002). Assessing community support and sustainability for ecotourism development. *Journal of Travel Research, 41*(2), 153-160.

von der Gracht, H. A. (2012). Consensus measurement in Delphi studies: Review and implications for future quality assurance. *Technological Forecasting and Social Change, 79*(8), 1525-1536. doi: http://dx.doi.org/10.1016/j.techfore.2012.04.013

Walker, A., and Selfe, J. (1996). The Delphi method: a useful tool for the allied health researcher. *International Journal of Therapy and Rehabilitation, 3*(12), 677-681.

Wall, G. (1994). Ecotourism: old wine in new bottles. *Trends, 31*(2), 4-9.

Wall, G. (1996). Ecotourism: Change, impacts and opportunities. *¹he ecotourism equation: Measuring the impact.(pp. 206Ð216). Bulletin Series, 99*.

Wall, G. (1997). FORUM: Is Ecotourism Sustainable? *Environmental Management, 21*(4), 483-491.

Wallace, G. N., and Pierce, S. M. (1996). An evaluation of ecotourism in Amazonas, Brazil. *Annals of Tourism Research, 23*(4), 843-873.

Wallace, J. C., and Chen, G. (2005). Development and validation of a work-specific measure of cognitive failure: Implications for occupational safety. *Journal of Occupational and Organizational Psychology, 78*(4), 615-632.

Walpole, M. J., and Goodwin, H. J. (2000). Local economic impacts of dragon tourism in Indonesia. *Annals of Tourism Research, 27*(3), 559-576.

Walton, J., El-Haram, M., Castillo, N., Horner, R., Price, A., and Hardcastle, C. (2005). Integrated assessment of urban sustainability. *Proceedings of the ICE-Engineering Sustainability, 158*(2), 57-65.

Wang, H., Bai, H., Liu, J., and Xu, H. (2012). Measurement indicators and an evaluation approach for assessing Strategic Environmental Assessment effectiveness. *Ecological Indicators, 23*(0), 413-420. doi: http://dx.doi.org/10.1016/j.ecolind.2012.04.021

Wang, Y.-M., Luo, Y., and Hua, Z. (2008). On the extent analysis method for fuzzy AHP and its applications. *European Journal of Operational Research, 186*(2), 735-747.

Wang, Y. M., and Chin, K. S. (2011). Fuzzy analytic hierarchy process: A logarithmic fuzzy preference programming methodology. *International Journal of Approximate Reasoning, 52*(4), 541-553.

Wascher, D. M. (2000). *Agri-environmental indicators for sustainable agriculture in Europe*: European Centre for Nature Conservation.

WCED. (1987). World Commission on Environment and Development. *Oxford*.

Weaver, D. B. (2001). *The encyclopedia of ecotourism*: Cabi.

Weaver, D. B. (2005). Comprehensive and minimalist dimensions of ecotourism. *Annals of Tourism Research, 32*(2), 439-455. doi: 10.1016/j.annals.2004.08.003

Weaver, D. B. (2014). Asymmetrical Dialectics of Sustainable Tourism Toward Enlightened Mass Tourism. *Journal of Travel Research, 53*(2), 131-140.

Weaver, D. B., and Lawton, L. J. (2007). Twenty years on: The state of contemporary ecotourism research. *Tourism Management, 28*(5), 1168-1179. doi: 10.1016/j.tourman.2007.03.004

Weckenmann, A., and Schwan, A. (2001). Environmental life cycle assessment with support of fuzzy-sets. *The International Journal of Life Cycle Assessment, 6*(1), 13-18.

Weiler, B., and Richins, H. (1995). Extreme, extravagant and elite: a profile of ecotourists on Earthwatch expeditions. *Tourism Recreation Research, 20*(1), 29-36.

Weir, B.L. Hicken, H.S. Rappaport, and Nebeker, J. R. (2006). Crossing the quality chasm: the role of information technology departments,
. *Am. J. Med. Qual., 21*, 382–393.

Wern, H. C., and Weng, C. N. (2010). Strength-weakness-opportunities-threats Analysis of Penang National Park for Strategic Ecotourism Management. *World Applied Sciences Journal, 10*, 136-145.

West, A. (2011). Using the Delphi Technique: Experience from the world of counselling and psychotherapy. *Counselling and Psychotherapy Research, 11*(3), 237-242.

West, P., Igoe, J., and Brockington, D. (2006). Parks and peoples: the social impact of protected areas. *Annu. Rev. Anthropol., 35*, 251-277.

Western, D., Lindberg, K., and Hawkins, D. (1993). Defining ecotourism. *Ecotourism: a guide for planners and managers.*, 7-11.

White, C. J., and Lakany, H. (2008). A fuzzy inference system for fault detection and isolation: Application to a fluid system. *Expert Systems with Applications, 35*(3), 1021-1033.

White, V., McCrum, G., Blackstock, K., and Scott, A. (2006). Indicators and sustainable tourism: literature review. *Aberdeen: The Macaulay Institute*.

Wijewardana, D. (2008). Criteria and indicators for sustainable forest management: The road travelled and the way ahead. *Ecological Indicators, 8*(2), 115-122. doi: 10.1016/j.ecolind.2006.11.003

Williams, P. H., Burgess, N. D., and Rahbek, C. (2000). Flagship species, ecological complementarity and conserving the diversity of mammals and birds in sub-Saharan Africa. *Animal Conservation, 3*(3), 249-260.

Wolfslehner, B., and Vacik, H. (2008). Evaluating sustainable forest management strategies with the Analytic Network Process in a Pressure-State-Response framework. *Journal of Environmental Management, 88*(1), 1-10. doi: 10.1016/j.jenvman.2007.01.027

Wolfslehner, B., and Vacik, H. (2011). Mapping indicator models: From intuitive problem structuring to quantified decision-making in sustainable forest management. *Ecological Indicators, 11*(2), 274-283. doi: 10.1016/j.ecolind.2010.05.004

Wolfslehner, B., Vacik, H., and Lexer, M. J. (2005). Application of the analytic network process in multi-criteria analysis of sustainable forest management. *Forest Ecology and Management, 207*(1–2), 157-170. doi: 10.1016/j.foreco.2004.10.025

Woodley, S. J., Alward, G., Gutierrez, L. I., Hoekstra, T., Holt, B., Livingston, L., Loo, J., Skibicki, A., Williams, C., and Wright, P. (2000). North American test of criteria and indicators of sustainable forestry.

Woudenberg, F. (1991). An evaluation of Delphi. *Technological Forecasting and Social Change, 40*(2), 131-150. doi: http://dx.doi.org/10.1016/0040-1625(91)90002-W

Xu, F.-L., Zhao, S.-S., Dawson, R. W., Hao, J.-Y., Zhang, Y., and Tao, S. (2006). A triangle model for evaluating the sustainability status and trends of economic development. *Ecological Modelling, 195*(3–4), 327-337. doi: http://dx.doi.org/10.1016/j.ecolmodel.2005.11.023

Yager, R. R., and Filev, D. (1993). On the issue of defuzzification and selection based on a fuzzy set. *Fuzzy Sets and Systems, 55*(3), 255-271.

Yang, M., Khan, F. I., and Sadiq, R. (2011). Prioritization of environmental issues in offshore oil and gas operations: A hybrid approach using fuzzy inference system and fuzzy analytic hierarchy process. *Process Safety and Environmental Protection, 89*(1), 22-34.

Yang, Y. N. (2003). Testing the Stability of Experts' Opinions between Successive Rounds of Delphi Studies.

Yu, C.-P. S., Chancellor, H. C., and Cole, S. T. (2011). Measuring residents' attitudes toward sustainable tourism: A reexamination of the sustainable tourism attitude scale. *Journal of Travel Research, 50*(1), 57-63.

Zadeh, L. A. (1965). Fuzzy sets. *Information and control, 8*(3), 338-353.

Zadeh, L. A. (1975). The concept of a linguistic variable and its application to approximate reasoning—I. *Information Sciences, 8*(3), 199-249.

Zadeh, L. A. (2008). Is there a need for fuzzy logic? *Inf. Sci., 178*(13), 2751-2779. doi: 10.1016/j.ins.2008.02.012

Zhang, H., Gu, C.-l., Gu, L.-w., and Zhang, Y. (2011). The evaluation of tourism destination competitiveness by TOPSIS & information entropy–A case in the Yangtze River Delta of China. *Tourism Management, 32*(2), 443-451.

Zhang, H., and Lei, S. L. (2012). A structural model of residents' intention to participate in ecotourism: The case of a wetland community. *Tourism Management, 33*(4), 916-925. doi: 10.1016/j.tourman.2011.09.012

Zhenjia, Z. (2008). SIGNIFICANCE OF PROTECTING NATURAL SITES FOR ECOTOURISM DEVELOPMENT. *Management Science & Engineering, 2*(1).

Zhu, K.-J., Jing, Y., and Chang, D.-Y. (1999). A discussion on extent analysis method and applications of fuzzy AHP. *European Journal of Operational Research, 116*(2), 450-456.

Zimmermann, H.-J. (1987). *Fuzzy sets, decision making, and expert systems*: Springer.

Zimmermann, H. J. (2001). *Fuzzy set theory-and its applications*: Springer.