

**Renewable Energy in Tourism Initiative**  
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**Literature Review**

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**Ali, Y., Mustafa, M., Al-Mashaqbah, S., Mashal, K., & Mohsen, M. (2008). Potential of energy savings in the hotel sector in Jordan. *Energy Conversion and Management*, 49, 3391-3397.**

This paper displayed a number of insights into the situation and current trends in energy consumption in the Jordanian tourist accommodation sector, while identifying energy consumption, attitudes, willingness and practices of certain classified hotels. The data came from a survey on environmental performance in the tourist sector in Jordan, as part of an European Commission-funded project. With the survey data results, variables of energy consumption were broken down in order to understand the hotels' overall performance. Of these variables several general characteristics shared among hotels were discovered including similarity of building area, number of rooms and classification; with the highest consumption of energy being for heating, ventilation, air conditioning, water heating, lack of insulation techniques and lack of motion sensors. The final results showed that certain classified hotels had installed energy saving tools, and only (2 -5) higher starred hotels' managers were highly willing to make energy saving changes. This paper did suggest better insulation for the establishments, along with new water reticulation systems.

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**Amelung, B & Viner, D. (2006). Mediterranean Tourism: Exploring the Future with Tourism Climatic Index. *Journal of Sustainable Tourism*, 14, 4, 349 – 366.**

This paper looked at the suitability for tourism in current and future climatic conditions in the Mediterranean with the use of a Tourism Climatic Index (TCI), to predict and rate climatic conditions such as thermal comfort, sunshine, precipitation and wind. TCI was not able to be tested on such a large scale area, so a regional case study in the Balearic Islands was used. For this study area, TCI scores were plotted against levels of visitation, while the implications of climate change for sustainable tourism development were examined in a qualitative way. In order to capture uncertainties related to climate change, the authors used scenario analysis based on the work of the Intergovernmental Panel on Climate Change and analyzed a variety of future scenarios that were created to estimate greenhouse gas emissions from fossil fuels and the atmospheric concentrations of the gases. With these scenarios characterized by a rapid and moderate speed of climate change, the results showed that the global mean temperature would increase from 4.3°C to 5.8°C during the 21<sup>st</sup> century even when considering all of the uncertainties. This increase could have negative economic and social effects on the tourism industry, but would be somewhat appreciated by resource management and biodiversity stakeholders.

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**Arbel, A., & Ravid, S.A. (1983). An industry energy price impact model: the case of the hotel industry. *Allied Economics*, 15, 705-714.**

This article examines the impact of energy costs on the hotel industry by looking at the high energy consumption related to tourism and the elasticity of demand that comes with high prices. Arbel and Ravid create a supply-demand energy impact model that places no restrictions on the elasticity involved with substitution, and from there creates separate equations for different variables involved. The demand elasticity remained positive which meant higher fuel prices would drive demand for hotel services up, showing that tourists still went to their destination, drove somewhere that was a shorter distance or took public transportation, and would stay at the hotel longer. Results from this model also correlated to surveys conducted previously by enforcing the idea that people travel more at the end of the summer because of their main concern; the availability of gas. Gas prices are not as big of a concern as gas shortages for the consumer. For hotels, an increase of 1% in the price of energy created a decline of .35% in quantity of nights sold at equilibrium. Overall, the article found a small negative energy price impact on supply compensated with a positive impact on the demand side.

**Assaf, A. (2009). Are U.S. airlines really in crisis? *Tourism Management*, 1 -6.**

This study focused on providing a current picture of the present performance levels of the U.S. airlines which have been affected by high oil prices and the relationship between air travel demand and tourism. The author used the Bayesian Random Stochastic Frontier methodology to create a statistically developed model to measure the efficiency of the airlines using a panel data sample from 2004 – 2007 of U.S. airlines. A second model, the Bayesian Fixed Stochastic Frontier model, was applied and the results using the Deviance Information Criterion (DIC) test as the criteria for the comparison. The results of the two models showed growing inefficiency over time in the U.S. airline industry with a needed improvement of output by an average of 30.98% to match the best-practice airline. The industry's response to high oil prices was high ticket prices, canceled flights and sometimes, low demand. The study's results create a clear image for private and public policy makers so the airlines may hopefully reach their optimum level of efficiency.

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**Ballantyne, R., Parker, J., & Hughes, K. (2008). Tourists' support for conservation messages and sustainable management practices in wildlife tourism experiences. *Tourism Management*, 1 – 7.**

The aim of this research was to investigate tourists' awareness of, interest and engagement in conservation issues, their willingness to accept conservation messages and the importance of the conservation-related aspects of the experience; all in relation to visitor management techniques. The authors used the Mon Repos Conservation Park, a turtle-based wildlife tourism venture, to collect data from three separate projects. The projects looked at conservation learning, environmental awareness and the evaluation of visitor management and interpretation strategies using descriptive statistics to summarize the results. Kruskal-Wallis, Mann-Whitney, and the Wilcoxon tests were used to determine the differences in projects, and the results showed that visitors to the park overwhelmingly supported all conservation strategies and do expect restrictions for these reason.

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**Beccali, M., La Gennusa, M., Lo Coco, L., & Rizzo, G. (2009). An empirical approach for ranking environmental and energy saving measures in the hotel sector. *Renewable Energy*, 34, 82 – 90.**

This paper offered an empirical approach based on the analysis and elaboration of data from Sicily, Italy to obtain helpful tips for sustainable policies to be implemented in similar Mediterranean areas. The process was completed through a survey of hotels in the area in order to identify clusters of similar characteristics relating to energy efficiency and environmental pressure, an energy audit for each sample case study to assess the consumptions and CO<sub>2</sub> emissions of the clusters, and the selection and ranking of a list of actions to improve the hotel's sustainability. The bulk of the data came from the national census taken by the Italian Institute of Statistics and studies sponsored by the local tourist offices with this study focusing on the number of guests, services and building typologies, the kind of organization, and the hardware technology of the hotel. One important finding was that substantial value would be achieved through "sustainable tourism", and such an initiative should be the marketable goal of every hotel wanting to be successful.

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**Becken, S. (2002). Analysing International Tourist Flows to Estimate Energy Use Associated with Air. *Journal of Sustainable Tourism*, 10, 2, 114 – 131.**

This study quantified total energy use and CO<sub>2</sub> emissions from international air travel of tourists to and from New Zealand. This was completed by estimating the international visitor flows, based on arrival cards, from New Zealand's Customs and Immigration to determine the total 'energy bill'. Two data sets

were used; one containing the visitor's nationality and each international airport used, and the second set containing the visitor's port of last embarkation. Total energy used was calculated by multiplying the energy intensity by energy use per passenger; results determined that the total energy use for the international passenger was 27.8 Pj, or 1.9 million CO<sub>2</sub> tonnes. The European tourists used the most energy because of the long distance and four countries account for more than half of all energy consumption, which were the UK, USA, Australia and Japan. Although New Zealand is aware of environmental impacts caused by air travel, its efforts need to be concentrated on minimizing the impacts of international air transport.

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**Becken, S. (2008). Developing indicators for managing tourism in the face of peak oil. *Tourism Management, 29, 695 – 705.***

This article suggests a major problem with peak oil prices as the dependence of tourism on the availability of fuel; and the need for a plan in case oil is not available or is too costly or painful due to climate change. More recently, the possible arrival of an oil peak has become an increasing concern especially due to several models that have shown near certainty of an oil peak within the next forty years. The author explores ten indicators to assess, monitor, and measure in megajoules, destination-based and transit-related (OD) oil consumption of various markets at different scales and with different end-users. The indicators were applied to data stemming from the 2005 International Visitor Survey and the results were compared to the "Top 10" tourist markets in New Zealand. The indicators include 1) domestic oil use by market, 2) air transport, 3) road travel, 4) ratio of total versus air transport, 5) per tourist-trip, 6) per tourist-day, 7) eco-efficiency, 8) OD travel use by market, 9) oil use by markets, and 10) ration of OD travel to overall oil use. This analysis offers a unique look into the potential degrees of oil conserving actions for each market. The results showed that the lowest risk markets in terms of demand for oil requirements in New Zealand are Australia, China, Singapore, Taiwan and South Korea, although the analysis is not as detailed as needed to determine sub-sectors. Overall, transit-related travel is found to be more demanding of oil requirements and a transition to less oil-intensive tourism will be needed in the future.

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**Becken, S. (2003). Making tourism in New Zealand energy-efficient – more than turning off the lights. *Greenhouse Gas Control Technologies – 6<sup>th</sup> International Conference, 1705-1708.***

This paper studies travel and energy patterns of domestic and international tourists and the tourism sectors in New Zealand which has rarely been studied before. Becken explains that transport is by far the largest use of energy by domestic tourists while international tourists use is broader across the industry but they still use a large amount of energy in transport. Accommodations that are "service-oriented" like hotels and bed and breakfasts tend to use more energy than "purpose-oriented" properties, such as motels and campgrounds. When the individual tourists stop to visit attractions and activities, they demand less energy and the actual behavior of tourists are lumped into two groups those being "Couch tourists", who fly commercial and stay at hotels, have different energy consumption and behavior patterns than "touring tourists", who are mostly international and tend to move to different locations more than domestic tourists. This data overall explains the patterns of behavior that drive tourist energy consumption but it will be difficult for the New Zealand government to alter such behaviors in order to become more environmental friendly in the tourism sector.

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**Becken, S. (2007). Tourists' Perception of International Air Travel's Impact on the Global Climate and Potential Climate Change Policies. *Journal of Sustainable Tourism, 15, 4, 351 – 368.***

The purpose of this study was to look into tourists' knowledge and awareness of aviation's impact on the climate, their sense of personal responsibility and their relationship to specific climate change policies in New Zealand, where international tourism is totally dependent on international air services. Data came from interviews with international tourists who were questioned on topics covering their knowledge of and attitude towards air travel impacts, and was used to inform the development of a focus group approach to extract more detailed data. In the focus groups, three policy scenarios were discussed: voluntary initiatives, a global air travel charge and a per capita carbon budget. The results showed that tourists' knowledge of climate change was very generic, and links between behavior and climate consequences were rarely made. Only a small number of tourists believed that they were not accountable for the GHG emissions caused by air travel. The global air travel tax was chosen as the most realistic characteristic, although responsibility for climate change was believed by many to be in the hands of government or international organizations. Overall, travelers' freedom was favored by most, and limited air travel was not satisfactory, thus only large societal changes in behavior would lead to reduced contributions to climate change.

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**Becken, S. (2008). "Report: The UN Climate Change Conference, Bali: What It Means for Tourism". *Journal of Sustainable Tourism, 16, 2, 246-248.***

The author in this report focused on the UN Climate Change Conference held in Bali in 2007; and as an effect there were a number of positive outcomes for the future of tourism including a common platform for all negotiations related to the climate over the next two years. Main focuses of the conference included equity and development, deforestation, adaptation, integration across agencies and targets for emission reduction in both north and south countries. The resulting Bali Action plan has however been under attack because of its simple nature and lack of emissions guidelines. Overall, the Bali conference identified that better integration and coordination was needed of UN agencies when it came to the global challenge of climate change in the tourism industry.

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**Becken, S., Frampton, C., & Simmons, D. (2001). Energy consumption patterns in the accommodation sector-the New Zealand case. *Ecological Economics, 39, 371-386.***

This paper details a research project studying the consumption of energy by the accommodation sector in New Zealand while presenting the different categories and facts contributing to the sector's energy use. The authors use a "bottom – up" analysis by taking data from three separate sources in the West Coast, the National Survey, and the Hotel Survey and converting all data into energy content (MJ). Additional data came from information about the following: hotels, bed and breakfasts, motels, backpackers and campground accommodations. Log-equations and ANOVA statistics showed various levels of energy consumption from a mixture of capacity, visitor-nights and floor space, found to be the best variables to use. Hotels showed the highest amount of consumption; 75% was electricity use. This results in large amounts of carbon dioxide emissions but also offers the most potential in energy savings due to the number of roles the hotels perform. These results gave information on the fairly low amount of interest and awareness there was about resource management and provided benchmarks for the accommodation sector to make New Zealand known as "clean and green".

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**Becken, S. & Patterson, M. (2006). Measuring National Carbon Dioxide Emissions from Tourism as a Key Step Towards Achieving Sustainable Tourism. *Journal of Sustainable Tourism, 14, 4, 323 – 338.***

In this article, two methodologies called bottom-up and top-down, are used to derive a profile of tourism in New Zealand for energy consumption and carbon dioxide emissions, using statistics from New Zealand government authorities. The bottom-up methodology conducted two analyses of energy consumption and carbon dioxide emissions which were broken up into tourism industries including transport, accommodation, attractions and activities and tourist behavior. The analyses are then placed in a final model of energy use for the tourism sector which showed a total energy use of 25.35 PJ and 1549 kilotonnes of carbon dioxide emitted for the year 2000, with 70% of all energy use consumed by domestic tourists. A top-down analysis, or step-wise methodology, included 12 analytical steps which were based on an input-output model. This methodology showed direct energy use by the tourism sector in 1997/98 to be 27.53 PJ and 1438 kilotonnes of carbon dioxide emitted, with domestic tourist responsible for 74% of all use and emissions. Variations in the result were determined to be caused by dissimilar use of reference year and the scope of the two analyses, including use of different data. The authors hoped that by applying these accounting methodologies to the tourism sector that economic and environmental issues would be integrated in the social dimension in order to fully engage the tourists in the knowledge of their impacts.

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**Becken, S. & Simmons, D. (2008). Using the concept of yield to assess the sustainability of different tourist types. *Ecological Economics, 67, 420 – 429.***

This paper was based upon the belief that tourism does not fit well with already existing sustainability assessments thus the authors' methodology used the concept of "yield" and created indicators for assessing the overall advantage and "sustainability" of five different tourist types in New Zealand. "Yield" is a measurement of the net benefit of tourism activity or the net gain for society, and is looked at from the financial, public sector and sustainable aspects in this analysis. The authors collected data through an exit survey with a sample size of 5,342 visitors with the five tourist types being coach tourists, free independent travelers, backpackers, camping tourists and home visitors. The results indicate that "trade-offs" would be needed to characterize the "ideal visitor type" due to the differences among the visitors in relation to how much they spend, where they spend, CO<sub>2</sub> emissions create from travel and the direct costs to the government councils. The paper determines that policy makers should concentrate on targeted initiatives instead of one type of policy approach.

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**Becken, S., & Simmons, D. G. (2002). Understanding energy consumption patterns in tourist attractions and activities in New Zealand. *Tourism Management, 23, 343 – 354.***

This paper acknowledges that the reduction of resources and continuous emission of greenhouse gases due to increases in energy use are threats to the environment around the globe. A sub-sector of tourism, attractions and activities, has not been well studied despite the contribution to the national 'energy bill' of these sub-sectors. The authors conducted the research by collecting relevant energy information on attractions and activities, comparing their energy bills and then giving suggestions for planning to the tourism industry. They provided a framework and benchmarks to help with the study of these sub-sectors. Two energy concepts were analyzed, which were the total energy use of businesses that are on the supply-side of energy services and the energy use of tourist while visiting these businesses including the type of fuel or fuel mix used. Once the data was collected, key variables showed visitor numbers and energy use as positively skewed and were turned logarithmic to stabilize the ANOVA and sample distribution used. The results found that the more interactive the institution, the higher the use of energy,

but in terms of the individual tourist, vehicle occupancy was the determining factor. All in all, the tourism sector in New Zealand may be very diverse, but energy consumption was found to be lowered by creating energy-efficient products or promoting alternatives to the energy-intensive tourism activities.

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**Becken, S., Simmons, D., & Frampton, C. (2003). Energy use associated with different travel choices. *Tourism Management, 24*, 267-277.**

This article looks at individual travel behavior and the different amounts of energy demanded, currently not well understood due to the lack of previous research and studies. The data used to shed light on the demand for each travel decision came from surveys of West Coast tourists with diverse itineraries and were compared with the rates of energy use (measured in megajoules) reported in outside analysis. This created a “two energy use spectra” to be used on international and domestic tourists, and broke down the activities by three significant sub-sectors: transport, accommodation, and attractions and activities. Other sub-sectors are included that have much less impact on energy consumption and together add up to an “energy bill”. The biggest specific type of energy use was from transport with the distance an individual tourist drove having the most impact. The total “energy bill” was much more diverse than just travel for both domestic and international travelers. The policy implications include the need to analyze and further research the tourist’s bundled travel patterns, as well as to develop strategies to decrease individuals’ energy use.

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**Becken, S., Simmons, D., & Frampton, C. (2003). Segmenting Tourists by their Travel Patterns for Insights into Achieving Energy Efficiency. *Journal of Travel Research, 42*, 28, 48 – 55.**

This paper addressed the measurement of the different energy uses by the travel choices of tourists using a factor-cluster analyzed set of travel choices of international tourists separated into the types of similar travel patterns of transport, accommodation and attraction/activities and energy consumption. The authors first categorized international tourists based on their travel choices and then compared total energy use and energy use per day against the types of patterns. The information used to determine the travel patterns was taken from a survey on the West Coast of New Zealand’s South Island; however, this location may have caused the types of travel patterns to be less diverse than national travel patterns. The seven patterns, or clusters, included the Camper, Backpacker, Visit Friends and Relatives (VFR), Auto tourist, Coach tourists, Trumper (hiker) and Soft-comfort Traveler--all varied in total energy use and energy use per day. The coach traveler consumed the most energy per day, while the VFR, backpacker and trampers use the least per day. The cluster analysis performed is useful to understanding the demand of energy and the implications of addressing different tourist types, and will hopefully help to effectively reduce energy use.

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**Bergmann, A., Colombo, S., & Hanley, N. (2007). Rural versus urban preferences for renewable energy developments. *Ecological Economics, 1016* – 1026.**

This paper looks at the policy implications of economic values from the impact of the development of renewable energy investments (no specific technology) in rural areas. The authors use the Choice Experiment (CE) economic valuation method based on the Random Utility Theory. This theory is used in an attempt to determine the trade-offs between goods as well as obtain results that can be supported by demand theory and used in cost-benefit analyses. In this particular study, two populations are examined that are directly affected, Scotland’s rural citizens, and indirectly, Scotland’s urban population as well as the differences in preferences among the two groups. Overall, the results show that the general feeling among both populations is one that supports renewable energy expansion but age and education play a role in the level of support. Urban residents’ concerns include preservation of landscape, wildlife and air quality; they are willing to pay to get to distant locations. Rural concerns were the creation of jobs; they

would pay for any proposed development. These findings show that any new rural development in Scotland will likely result in conflict and future policy will have to consider this.

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**Berrittella, M., Bigano, A., Roson, R., & Tol, R. (2006). A general equilibrium analysis of climate change impacts in tourism. *Tourism Management*, 27, 913 – 924.**

This paper looked at the economic implications of climate-change-induced changes in the demand for and the supply of tourism services. It used a partial equilibrium analysis with general equilibrium effects to estimate the redistribution of income that resulted from a redistribution of tourists due to climate change. The estimated data for changes in tourist flows came from a simulation model developed by the authors' peers, and the authors themselves created a multi-country world computable general equilibrium (CGE) model used to run through a set of simulation scenarios for years 2010, 2030 and 2050. The simulations showed that economic impacts got worse over time because of rising temperature levels, but CO<sub>2</sub> emissions varied little throughout time, although this study did not include the transportation industries. Also, since the emissions moved in the opposite direction of GDP, this meant that when more tourists arrive to their destination, they gravitated more towards cleaner industries. The paper concluded that climate change will make tourists more vulnerable to the climate conditions and that the tourism industry would indeed be affected and various economic consequences would result.

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**Bode, S., Hapke, J., & Zisler, S. (2003). Need and options for a regenerative energy supply in holiday facilities. *Tourism Management* 24, 257-266.**

In this article, an option is discussed that could be used by holiday resorts to reduce CO<sub>2</sub> emissions at the “destination area”, or the holiday facility, of the demanded energy supply. The authors point out that despite UN policy attempts, the effort to reduce global greenhouse gas (GHG) emissions had not been sufficient and the area of tourism that has the greatest potential of reduction are the holiday facilities. They created a hypothetical facility based on data from similar facilities and imagined it as not being connected to any type of electronic grid that would emit GHG emissions. Their model takes two basic forms of energy, wind and sun, and transforms them into power, water, heat (cold), and transportation using fuel cells and electrolyzers while producing an even energy demand curve. After analysis, the results are positive because of the competitiveness of wind and solar power but are not without problem. Fuel cells and electrolyzers are only offered through a few devices, although these converters' futures look bright with costs anticipated to go down. Apart from the GHG emissions, there are other external effects that can be recognized which would make the tourism industry more sustainable.

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**Borkovic, Z.H., Kulisic, B., & Zidar, M. (2008). Energy audit – method for energy conservation in hotels. *Tourism and Hospitality Management*, 14, 2, 349 – 358.**

In this paper, energy audit methodology was combined with properties of energy consumption in the hotel industry, with the intention to provide guidelines for modern hotel energy management using data from the island of Croatia. An energy audit is an analysis of thermal performance and energy systems of buildings in order to determine if it is energy efficient. Two separate types of audits were used: preliminary and detailed energy audit with the feasibility study. The results showed that large scale hotels were not energy efficient and believed that energy savings would hurt the level of service promised to be provided to guests. Fortunately with the proper green plan, energy savings could be economically feasible because more people would be willing to pay the increased costs.

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**Boukis, I., Vassilakos, N., Karellas, S., & Kakaras, E. (2009). Techno-economic analysis of the energy exploitation of biomass residues in Heraklion Prefecture – Crete. *Renewable and Sustainable Energy Reviews, 13*, 362 – 377.**

This paper assessed the available amount of biomass resources in the study region, Heraklion Prefecture, Crete; in addition to the extent of biomass accessible for electricity production. Currently, the area is not connected to a central power grid, but rather runs on locally generated diesel fuel oils from old power plants. Since tourism has become so popular in the area over the past years, biomass was looked at in the area as a promising new energy source. The results displayed the viability of an 8 MW biomass combustion plant for the region, determined to be a reliable and efficient power plant although with higher total operating costs, but biomass was to be considered due to its short payback period and project life.

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**Bynes, T. A., & Warnken, J. (2006). Greenhouse gas emissions from marine tours: A case study of Australian tour boat operators. *Journal of Sustainable Tourism, 14*, 3, 255 – 270.**

The paper discusses the main objectives of research conducted to characterize types of small to medium-sized tour operations in Australia's coastal area, approximate the overall and per capita GHG emissions for these operations, and to establish ideals of tour boat operators (TBOs) on their impacts on GHG emissions and their rankings of other impacts. Data for this research was collected from face-to-face interviews, mailed questionnaires and *in-situ* audits, and required three phases and tasks due to lack of comprehensive data with a return of 10% of all TBOs in Australia. Despite the inconsistent data reported, the results showed that the TBOs were ignorant when it came to their operations causing environmental damage; which could stem from the already dramatic, arid, and hot climate that the TBOs have gotten used to. Fortunately, the need for frequent replacement of boat engines means constant updates to more modern, cleaner engines. All in all, the research showed a lack of data available to TBOs, but a need for them to take GHG emissions seriously.

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**Chan, W. W. & Mak, B. (2004). An estimation of the environmental impact of diesel oil usage in Hong Kong Hotels. *Journal of Sustainable Tourism, 12*, 4, 346 – 355.**

This study was designed to estimate the amount of pollutants sulphur dioxide, nitrogen oxide, carbon dioxide and particulate matter that was produced by diesel oil's excavation and combustion in hotel boilers. Due to lack of formal publications and data, the authors created a survey that covered energy data from 1994 to 1996 in the hotel industry. Using the linear regression method, the connection between diesel oil consumption and three variables consisting of hotel size, business activity and macroclimate were analyzed, with the use of size, activity and climate variables. These variables were gross floor area (GFA), number of occupied rooms (OCC), and annual heating degree-days (HDD). The relationship between annual diesel oil usage and size of the hotel building were determined by plotting annual consumption against GFA for the ten surveyed hotels. To calculate the approximate emissions of diesel oil, previously created fuel-cycle emission factors were used. The results from the study show the best variable to determine diesel oil consumption in hotels was GFA, and although the study was completed in Hong Kong, the authors' approach can be used in cities with similar climates and commercial development.

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**Chan, W.W., Mak, L.M., Chen, Y.M., Wang, Y. H., Xie, H. R., Hou, G. Q., & Li, D. (2008). Energy Saving and Tourism Sustainability: Solar Control Window Film in Hotel Room. *Journal of Sustainable Tourism*, 16, 5, 563 – 574.**

The purpose of this paper was to calculate the amount of energy saved and the reduction in emissions, as well as to review the investment of the application of solar control film applications, for hotels in China. Two guest rooms with direct sunlight situated in a three-star, city-based hotel, were used as a case study, with one room having film on windows, and the second room without the film. The average daily cooling load difference between the two rooms was .4226 kW (room with film was 1077 W, and the room without was 1499 W), and it was estimated that 155 kWh could be saved for the 100 days that air conditioners were used. For the 100 days, each room that had the film could reduce SO<sub>2</sub> emissions by 920 g and CO<sub>2</sub> emissions by 131 kg, and over a five year period, the total financial savings would range from EMB 879 to 984. These findings are evidence to the tourism industry in China that switching to energy-efficient development could save both energy and financial resources.

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**Choi, H., & Sirakaya, E. (2006). Sustainability indicators for managing community tourism. *Tourism Management*, 27, 1274 – 1289.**

This paper focuses on a study conducted to develop indicators that would gauge community tourism development (CTD) within a sustainable framework using a modified Delphi technique, a qualitative and structured technique used to foresee future events. The expert panel members who participated in the study completed a survey based on a review of the relevant literature and on conversations with the Delphi board. 125 indicators were found for six dimensions, those being political (32), social (28), ecological (25), economic (25), technological (3), and cultural dimensions (13) of CTD. The indicators were found by the authors to be useful when used as a planning tool in the sustainable tourism development process for rural communities, and recommended further study be conducted in order to operationalize the indicators.

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**Claver-Cortés, E., Molina-Azorín, J. F., Pereira-Moliner, J., & López-Gamero, M. D. (2007). Environmental Strategies and Their Impact on Hotel Performance. *Journal of Sustainable Tourism*, 15, 6, 663-679.**

This article analyzed the environmental behavior of individual hotel establishments, in order to identify strategic groups based on environmental practices, and to determine the existence of an affiliation between hotels' environmental "pro-active" attitudes and their economic performance. The authors attempted to fill the research gap and see if commitment to sustainability and performance are related while looking at 153 individual hotel establishments rated from three to five stars in the province of Alicante in south-east Spain, and presented the hotel managers a questionnaire which provided the data for the study. Only 14% of the hotels had a certificate related to environmental management which was surprising high due to the lack of knowledge of this management tool, and the hotels in the area were then grouped into environmentally proactive, environmentally intermediate, and environmentally reactive. Finally, it was discovered that there was no clear relationship between the "pro-active" attitudes and performance of the hotels because tourists to the area did not base their decision on where to stay based on a "pro-active" attitude, while some environmental management variables would not be able to be felt for quite some time.

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**Connell, J., Page, S. J., & Bentley, T. (2009). Towards sustainable tourism planning in New Zealand: Monitoring local government planning under the Resource Management Act. *Tourism Management*. (in press DOI:10.1016/j.tourman.2008.12.001).**

This paper looked at the impacts of innovative sustainability tourism building legislation, which is part of the Resource Management Act (RMA). The Act encourages a planning approach that takes into consideration the impacts of new developments. Tourism in New Zealand is one of the top export earners, and impacts on the environment are a great concern, which lead to the introduction of the RMA that hoped to incorporate sustainable principles in planning. The data came from a self-completed survey by local authorities in New Zealand, including members of Regional Councils and the three types of Territorial Local Authorities; but due to an unsatisfactory return, the accuracy of the authorities opinions could not be guaranteed. The results showed that both councils held equal but dueling powers, and while both realize that there are limited resources to work with due to a small population, it is now a priority among most on the councils that proper energy use and savings in tourism occur.

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**Dallen, J. (2007). “Sustainable Transport, Market Segmentation and Tourism: The Looe Valley Branch Line Railway, Cornwall, UK”. *Journal of Sustainable Tourism*, 15, 2, 180-199.**

This paper attempted to supply further understanding of the passengers of British railways by applying a cluster analysis, which is a customer market segmentation tool, to survey tourist and day trip leisure visitors along with resident train users on the Looe Valley Line Railway in Cornwall, South West England. From the survey, the author was able to identify five groups that used the railway: “train devotees”, “infrequent enthusiasts”, “train tolerators”, “contented car users”, and “last resort riders. Finding out more information about train riders will allow the railway to improve the services and cater to the rider, while securing future use of this sustainable mode of transport.

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**Dalton, G. J., Lockington, D. A., Baldock, T. E. (2008). A survey of tourist attitudes to renewable energy supply in Australian hotel accommodation. *Renewable Energy*, 33, 2174 – 2185.**

This paper presented the results of a survey that examined tourists’ perceptions of renewable energy sources (RES) with specific attention to a candidate pool from four tourism accommodation resorts in Australia. These ranged from mainstream operations in high-density tourism areas to eco-resorts in remote areas. The analysis of the results determined general trends in the responses as well as explanations in response variations due to the nature of the accommodation, country of origin, and age. These results were then compared and contrasted with a recent survey of Australian tourist operators. The overall positive response rate was 50%, which showed a welcome response to RES, but only 49% were willing to pay for the technology. There was no variation in response found due to gender, but age was an influencing factor. Visually, a “not-in-my-backyard” attitude was not widely shown regarding wind farms. . Overall, the results showed high levels of tourist interest and acceptance of RES despite the perceptions of tourist operators.

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**Dalton, G. J., Lockington, D. A., & Baldock, T. E. (2007). A survey of tourist operator attitudes to renewable energy supply in Queensland, Australia. *Renewable Energy*, 32, 567 – 586.**

This paper focuses on a created survey that is used to analyze the current state of renewable energy use (RES) and the attitudes towards implementation in the Australian tourism industry, which have not been thoroughly examined up to the date of this study. The survey examined tourist operators in three sections of Queensland ranging in climate conditions, geographic location, accommodation types and their perception of RES; and, if the operators location and accommodation type influence their views. Once administered, the survey achieved a 65% response rate; with 9.2% of those surveyed having some form of RES installation, 71% expressing positive interest in considering RES installation, 45% agreeing with the statement that RES could be of benefit to them, and 46% believing that RES marketing would have negligible impact (0% said the marketing would be a drawback). When it came to produced energy supply, almost all responders consider RES incapable of supplying all of the power demanded, they lacked confidence in RES reliability, and those without RES installation do not believe that it is economically viable. The results from this survey were not uniform in all results; overall the respondents indicate interest in RES but there is a mixed view when it comes to RES for marketing potential.

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**Dalton, G. J., Lockington, D. A., & Baldock, T. E. (2009). Case study feasibility analysis of renewable energy supply options for small to medium-sized tourist accommodations. *Renewable Energy*, 34, 1134 – 1144.**

This paper looked at three Renewable Energy Supply-equipped Australian tourist accommodation sites to 1) assess the technical and economic feasibility of RES in small to medium-scale tourist accommodations, 2) examine the potential of hydrogen fuel cell and storage technologies as an alternative to conventional fuel and storage methods, and 3) determine the impacts of future fuel price increases and carbon taxes on RES; all by using the HOMER software. Load data for the analysis came from previous data sets, solar data came from the NASA website, and wind speed data came from three study sites of the Bureau of Meteorology. The results showed that RES could adequately and consistently meet the demand of power for stand-alone small to medium-scale tourist accommodations. Hydrogen fuel cells and storage systems were not as economically feasible, while increased fuel costs and carbon taxes would increase net present costs of RES.

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**Dalton, G. J., Lockington, D. A., & Baldock, T. E. (2009). Feasibility analysis of renewable energy supply options for a grid-connected large hotel. *Renewable Energy*, 34, 955 – 964.**

This paper used a case study analysis of load data collected from a large-scale grid-connected resort located in the subtropical Gold Coast area of Queensland, Australia in order to present the technical and financial viability of grid-only, RES-only and grid/RES hybrid power supply configurations. The authors used the RES software HOMER to look at and model net present cost, renewable fraction, and payback time. The results showed that RES did have the potential to supply a large amount of power to a large-scale tourist accommodation, but due to electricity costs, powering the accommodation 100% with RES was not economical at the present time. Overall, RES was found to be technically feasible and economically viable as an addition to a grid-connected supply.

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**Dalton, G. J., Lockington, D. A., & Baldock, T. E. (2008). Feasibility analysis of stand – alone renewable energy supply options for a large hotel. *Renewable Energy*, 33, 1475 – 1490.**

This paper addresses the production of power by renewable energy supply initiatives (RES) that could be applied to a large-scale resort or hotel, by conducting a feasibility analysis using load pattern data from a resort in the Gold Coast area of Queensland, Australia. Two modeling softwares, HOMER and HYBRID, were used to assess the technical potential of RES, while realizing the potential renewable fraction (RF) and evaluating economic viability based on NPC. HOMER is a time-step simulator using hourly data inputs and HYBRID is a simple, spreadsheet-based RES assessment application; both are used to compare RES-only, diesel generator-only, and RES/diesel generator hybrid technologies. The models conclude that stand-alone RES-only configuration could meet the demand of a large-scale hotel with wind energy conversion systems being the most economically viable to produce energy.

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**Dascalaski, E., & Balaras, C. A. (2004). XENIOS – a methodology for assessing refurbishment scenarios and the potential of application of RES and RUE in hotels. *Energy and Buildings*, 36, 1091 – 1105.**

The tourism industry in Southern European countries is the highest oil consumer in the non-residential building sector due to its operations, the use of the facilities, and high seasonal energy demands when prices are high with low supply. This paper looks at two energy conservation practices, ‘rational use of energy’ (RUE) and exploitation of ‘renewable energy sources’ (RES) which have the opportunity to expose energy-savings benefits to the millions who frequent hotels in the Mediterranean basin. The authors use XENIOS methodology, its software and eleven calculations tools, which are focused on the hotel sector, and evaluate the current conditions and potential of the hotel building, to look at specific topics that are concerns to the hotel management. A preliminary pilot study was done to evaluate the completeness and appropriateness of the methodology, and a number of chances for energy savings were found, but the right decision needs to be made on the hotels behalf to make sure quality of services are not compromised. The use of RES and RUE were found to be best suited for hotels because they were found to lower operating costs, increase satisfaction for staff and visitors, lower environmental impact and create a marketing tool to attract business. XENIOS software was found to build interest in environmental and energy matters.

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**De Freitas, C. R., Scott, D., & McBoyle, G. (2008). A second generation climate index for tourism (CIT): specification and verification. *International Journal of Biometeorology*, 52(5), 399 – 407.**

This study was conducted to address the deficiencies of past climate indices for tourism through the development of a theoretically solid and practically useful climate index. The Climate Index for Tourism (CIT) is an index for tourism and recreation which rates climate and weather along a favorable-to-unfavorable spectrum. Using previous work of DeFreitas, important characteristics of an index as determined by the authors were: theoretically sound, integrates the efforts of all facets of climate, simple to calculate, easy to use and understand, recognizes overriding effect of certain weather conditions, and empirically tested. The first stage of the analysis focused on precise facets of 3S tourism weather, and the second stage identified optimal conditions for 3S tourism and the thresholds of the parameters that made up the physical facet. The results show that CIT can be reliable when it comes to an index for beach-based tourism and recreation where the thermal, aesthetic and physical facets of weather determine CIT. Unfortunately, the index failed to meet all requirements of a universal index because there had been no validation by cross section of tourist activities.

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**Desideri, U., Proietti, S., & Sdringola, P. (2009). Solar-powered cooling systems: Technical and economic analysis on industrial refrigeration and air-conditioning applications. *Applied Energy*, 86, 1376-1386.**

This paper described alternative technical installations for solar cooling; a technology that used renewable solar sources to provide cooling in a more energy saving way than air conditioners. It also examined operations for the solar cooling and its advantages and limits. The authors analyzed the technical and economic feasibility of solar absorption cooling systems that were designed for two different application fields: industrial refrigeration and air conditioning. The hybrid trigeneration plant was the option that allowed the greatest operational flexibility for both heating and cooling, as opposed to the absorption chiller used with the solar flat plate collectors. Overall, both situations were more energy efficient than the status quo operations.

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**Dickenson, J., & Dickenson, J. (2006). Local transportation and social representations: challenging the assumptions for sustainable tourism. *Journal of Sustainable Tourism*, 14, 2, 192 – 208.**

This paper created an argument to the assumptions of existing research and offered an approach that had its foundation in Moscovici's social representation theory. This theory states that we create shared perceptions and theories that make up the social realities that we occupy. The authors used no empirical data, but worked with an analysis of the United Kingdom leisure/tourism industry and other secondary data from various studies while local travel to rural destinations was their focus in this piece. There were many alternatives to local travel problems created from qualitative and quantitative studies that look at influencing factors for pro-environmental behavior; but without concentrated knowledge of what works well, where and why, central government can be little help. Social representation theory as a cognitive approach, was related to this travel problem by assuming that what someone answers on a survey is the underlying reality shared among society, or shared perceptions of the nature of phenomena and the cause of events. The theory shows there were four representations of society which included the economic viability and large number of users of alternatives, cars can be restricted, improvement in public transportation would increase usage and alternatives are for other people. After analysis, these representations tells us that planners and policymakers need to consider the local residents travel needs, not just those of the tourist, but also the contradictions in these ideals could pose a challenge to future research.

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**Dolnicar, S. & Leisch, F. Selective marketing for environmental sustainable tourism. *Tourism Management*, 29, 672 – 680.**

This paper is about a study designed to contribute to the knowledge of sustainable tourism in two ways: identifying characteristics of tourists that are related to pro-environmental behavior, and determining if the segment of environmental friendly tourists represents managerially useful targets for selective marketing. The authors used the general adult population of Australia, and 2,500 citizens were sent questionnaires that contained two questions on environmentally friendly behavior. They were also asked to complete the New Ecological Paradigm scale to study environmental attitudes. The data taken were analyzed in two ways, by segmenting tourists into three cells (Small, Large, and Medium Environmental Footprint Tourists) and using linear regression models to determine significant independent variables. These segments were found to differ greatly in a number of characteristics, including travel-related behavior of various groups, socio-demographics and media behavior. The paper concludes by noting that market segments defined by different levels of pro-environmental behavior at a tourist destination are distinct segments of the population and dissimilar in a range of other characteristics.

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**Dubois, G. (2006). “Tourism/Leisure Greenhouse Gas Emissions Forecasts for 2050: Factors for Change in France”. *Journal of Sustainable Tourism*, 14, 2, 172-191.**

This paper attempted to forecast French tourism/leisure mobility demand and associated GHG emissions through the use of modeling based on four modes of transport for the year 2050. The model referred to and was based on the leisure-motivated travel by French households, and used a sensitivity analysis to determine changes in greenhouse gas levels related to demographics, economic situations, international security context, transport technology and policy, the tourism market, lifestyles and cultural change. Different economic situations were found to effect emissions the most, but “business as usual” behavior in the country will lead to a 90% in emission by 2050 due to predicted increases in very long distance trips and air transport by a small group of frequent travelers.

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**Fortuny, M., Soler, R., Cánovas, C., & Sánchez, A. (2008). Technical approach for a sustainable tourism development. Case study in the Balearic Islands. *Journal of Cleaner Production*, 16, 840 – 869.**

This article looks at the ‘concept’ of sustainable tourism development due to a lack of true definition and the current conventional and massive tourism that is stressing the Balearic Islands environment. This area is already groundwater and energy starved and with an increasing demand in rural tourism, development in the rural areas must change its path or the industry may fall apart. The case study conducted provided a methodology for the change from standard to sustainable tourism in small entities or those to be developed. Utilizing an existing country home as an example, the authors looked at three main categories: water, energy and waste while using a Life Cycle Assessment for information too large to work with simple methodology. The house itself, “Sa Cova”, is a family’s second home, and is not connected to water but gets its supply from a rainwater collection and accumulation system; nor is it to electricity, which is obtained from a solar panel systems supported by a diesel generator. The project was to transform the home into a sustainable tourism enterprise and the researchers found that there does not need to be a real reduction in comfort resulting in negative occupancy rates. Often the problems are various “resource leaks” which could save the entity in economic and environmental ways.

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**Gamboa, G., & Munda, G. (2007). The problem of windfarm location: A social multi-criteria evaluation framework. *Energy Policy*, 35, 1564 – 1583.**

In this paper, the potentialities of a social multi-criteria evaluation for working with wind park location problems are shown while using a real world situation in Catalonia, a region in the North-East region of Spain. Four windfarm sites were proposed. Some of the public voiced their opinions against them because of territorial inequalities and their desire to participate in the design. Others, several municipalities and other citizens, thought the farms would be a good change to increase incomes, improve social services, and change declining paths in territory. From the framework, 12 different alternatives were created that relied on the criteria of technical and economic feasibility and the desire for reduction of visibility of the farms. The alternatives were then graded by an evaluation using multi-criteria, or technical translation of social actors’ needs, preferences and desires. Then scores were aggregated by mathematical algorithm. Conclusions indicated that the application of social multi-criteria frameworks involved many steps but policy evaluation is not a one-shot activity but rather a learning process.

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**Gautam, R., Baral, S., & Heart, S. (2009). Biogas as a sustainable energy source in Nepal: Present status and future challenges. *Renewable and Sustainable Energy Reviews, 13, 248 – 252.***

This paper analyzed information concerning the development of biogas in Nepal, which is home to an abundant amount of agriculture. The country is very rural and poor, but due to its intensive cattle population, it was estimated that 1.3 million biogas plants could be installed in the area. Only 110,000 have been installed, or only 9% of biogas is utilized. There are challenges that pertain to the hilly areas spotted throughout, the private sector's lack of participation, remote locations of the plants and increased mosquito population. Despite these hurdles, the potential of biogas in the country is promising and could allow for greater private sector growth.

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**Gitrakos, G., Tsoutsos, T. D., & Zografakis, N. (2009). Sustainable power planning for the Island of Crete. *Energy Policy, 37, 1222 – 1238.***

The main purpose of this study was to identify the complexities regarding renewable energy sources (RES) implementation and other scenarios, so that the RES contribution could be maximized to reduce greenhouse gas (GHG) emissions and make the island of Crete as energy independent as possible. Using the selected accounting framework software "LEAP" to cater to Crete's power system in conjunction with the raw data collected, various energy model software solutions were examined to form possible scenarios of RES use. The results showed that applying the most modest and realistic RES implementation scenario, combined with a partially successful demand restrictions, could result in the mitigation of the island's environmental burden.

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**Gössling, S. (2002). Global environmental consequences of tourism. *Global Environmental Change, 12, 283 – 302.***

The purpose of this article was to identify the elements of tourism that directly and indirectly add to global environmental change, gather available data and scientific information in these areas, to establish first-order estimates of the scale of the changes and analyze the consequences of these changes on sustainability. The author identified and created calculations of change in land use, land cover, energy use, biotic exchange and extinction of wild species, exchange and dispersion of diseases, attributable to tourism. After use of the calculations and analysis of the impacts, global leisure-related tourism was found to consume 14.080 PJ of energy in 2001 and emitted 1400 Mt of CO<sub>2</sub>-e emissions, with transport making up 94% of the energy use and emissions, and having the greatest impact on global warming. The study indicated that tourism has substantial effects on the environment, with strong evidence that the minority of the globe's population creates strong negative influences on the majority of the population.

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**Gössling, S., Borgström Hansson, C., Hörstmeier O., & Saggel, S. (2002). Ecological footprint analysis as a tool to assess the tourism sustainability. *Ecological Economics, 43, 199 – 211.***

In this paper, a methodological framework is used for the calculation of an ecological footprint analysis (EFA) used to assess sustainable tourism, and tests the hypothesis of ecotourism as sustainable tourism with a focus on leisure tourism in the Seychelles. EFA is used to show space equivalents in terms of the misuse of biologically productive areas as determined by lifestyle choices such as consumption and production of waste. The authors break down leisure tourist actions by "transport", "accommodation", "activities" and "food and fibre consumption" and include in the ecological footprint calculations the total

effect to land, fossil fuel energy, arable land, pasture, forest, and sea space. The calculations in Seychelles showed that EFA is not an appropriate means of understanding environmental consequences on tourism and offers no account on the value of land to the industry, due to the EFA's need for difficult to obtain databases and overly complicated calculations. The ecological footprint analysis did show that there was a trade-off between use of and preservation of ecological land which is needed to maintain the tourism industry. Air travel for leisure tourists will be a significant contribution to the footprint for quite some time.

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**Gössling, S. & Peeters, P. (2007). 'It Does Not Harm the Environment!' An analysis of industry discourses on tourism air travel and the environment. *Journal of Sustainable Tourism*, 15, 4, 402 – 417.**

With the emergence of low-fare airlines and hypermobility of tourists, there have been concerns of this type of transport on the environment. It has also raised questions on the awareness of environmental issues on the part of air travelers. This paper looks at a study that used a comparative analysis of statements made by patrons of thirteen different airlines and stakeholder organizations through interpretations of written and spoken language. This included in-flight magazines, website homepages, and brochures, with an emphasis on environmental issues. The four discourses that were identified by this analysis were 1) air travel is energy-efficient, 2) air travel is economically and socially too important to be restricted, 3) impacts exist but technology will solve the problem, and 4) air travel is treated 'unfairly' compared to other modes of transport. After examining the four arguments, it was determined that there were a number of misconceptions in the data, which was due to the airline industry marketing itself as a "green" industry and contributing to tourists' misconceptions on the environmental impact. The authors contend that should this continue, lack of action on the individual's part and further growth of this industry will cause this type of transport to be engrained in our culture as normal travel and change will be harder to come by.

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**Gracan, D., Alkier Radnic, R., Bogdan, S. (2008). "Restorable energy sources as a factor of the competitive improvement ability of a tourist destination". *Tourism and Hospitality Management*, 14, 2, 263-270.**

With the raising costs of fossil fuels and the continuing exploitation of resources, the necessity of replacing restorable energy sources (RES) for the conventional energy sources has been identified for the area of Croatia. Croatia lacks in use of RES due to its high consumption prices and a lack of environmental measurements that could encourage its further use. There have been places where tourist attractions and hotels used wind-energy technology and the future of Croatia's energy may demand solar and wind energy, captured along the tourist coastline. Once this has occurred, Croatia will have the opportunity to improve the island's economic and tourist future.

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**Hartono, D. & Resosudarmo, B. P. (2008). The economy-wide impact of controlling energy consumption in Indonesia: An analysis using a Social Accounting Matrix Framework. *Energy Policy*, 36, 1404 – 1419.**

This paper aimed to contribute to the growing debate surrounding the need to improve energy efficiency and limit the use of energy. The authors approached this by completing the development of a simple economy-wide model that analyzed the impact of improvement in efficiency of energy use, the cutting of the fuel oil subsidy and the restrictions of energy use for households and industries on the Indonesian economy. The Social Accounting Matrix framework was used to predict the impact of energy efficiency for two groups, and was a traditional double accounting economic matrix. The results found that the

framework was too simple to encompass a number of different factors including price, but showed that policy improving efficiency of energy use was better than restricting energy use and a combination of energy policies produced the best outcome for energy efficiency.

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**Honey, M. (2003). Protecting Eden: Setting Green Standards for the Tourism Industry. *Environment*, 45, 6, 8 – 21.**

This paper addresses certification given to buildings, products, or services that have met certain standards determined by assessment and auditing, and which then provides a written guarantee. These certification programs can be described as a three-legged stool; one leg analyzes health and safety, another leg quality, service and price, and the last leg sustainability; some of which tourists take for granted. Ecotourism, or responsible travel to natural areas while improving the environment and its people, would seem to more naturally fit with certification programs, and is one of the fastest growing sectors of tourism. It is these nature-based tourists who are looking for common features such as voluntary involvement, standards and criteria, assessment and auditing, logo and membership and fees. There are two different processes that are used to determine if the expected features exist; process-based or all variations of environmental management systems, or performance-based certification which includes measurement of the business by a group of benchmarks. Of all models, processes and systems, there are three fundamental categories that they fall into--conventional or mass tourism, sustainable tourism which measures socio-cultural and economic equity matters, or ecotourism markets, which portray the company as such, through a number of different public relations outlets. A main concern in the article was the level of consistency among all the different certifications. An agreement was formed at the first tourism workshop in New York City, called the "Mohonk Agreement", which identified a three step process towards building a global accreditation body. Even though green certification programs are helping to measure tourism for sustainable efforts, the author believed it will take more than a certification to promote social equity and emphasis towards sustainable in the tourism industry.

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**Hughly, K.F.D., Ward, J.C., Crawford, K.A., McConnell, L., Phillips, J.G., & Washbourne, R. (2004). A Classification Framework and Management Approach for the Sustainable Use of Natural Assets used for Tourism. *International Journal of Tourism Research*, 6, 349 – 363.**

This paper reviewed relevant literature in order to develop two integrated frameworks for the integration of energy tool development and management and to identify some ongoing research needs. The frameworks, "site specific" and "general classification", provided a set of pressure-state-response model-based indicators, an accessible asset classification system made up by energy asset type, class, importance and fragility, and relationship-based guidelines for management. The results showed that this approach is useful for the sustainable use and management of natural energy resources because any classifications and overall management systems for tourism operators and tourism managers need to be simple and easy to use in order to be successful.

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**Hunter, C. and Shaw, J. (2007). The ecological footprint as a key indicator of sustainable tourism. *Tourism Management*, 28, 46 – 57**

This paper's goal was to provide an overview of the ecological footprint (EF) concept and its use in tourism research, while presenting a simple methodology for the rapid estimation of indicative net tourism EF values using secondary data sources. The argument that the net EF, which is the estimation of demands upon biophysical productivity and waste assimilation capacity of nature imposed by human lifestyle, when applied in the tourism context can be a significant tool to measure the ecological footprint made by tourists when they leave home. After using EF analysis as an indicator of environmental

sustainability in this study, the authors conclude that it would be critical in any tourism environmental impact analysis to fully measure such impact using the EF.

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**Karagiorgas, M., Tsoutsos, T., Drosou, V., Pouffary, S., Pagano, T., Lopez Lara, G., & Melim Mendes, J. M. (2006). HOTRES: renewable energies in the hotels. An extensive technical tool for the hotel industry. *Renewable and Sustainable Energy Reviews, 10, 198 – 224.***

Looking at hotel sectors in the five EU regions of East Attica, Alpes Maritimes, Sicily, Maderia and Andalusia, a study was conducted that analyzed the promotion techniques for RET including solar thermal, solar passive, solar PV, biomass, and geothermal energy. The authors used the HOTRES action plan, which its methodology was based on the implementation of future expansion of these technologies. The plan consisted of two evaluations of positive impact assessment and obstacle assessments that the authors used as proof that solar thermal and geothermal energy were the strongest candidates for use in the hotel sector. In the end, several quantitative results based on technical and economic topics related to the market and the size and type of RET equipment applied. Many qualitative results that took into consideration market audits, event and monitoring of existing RET equipment were attained.

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**Kelly, J., Haider, W., & Williams, P.W. (2007). A Behavioral Assessment of Tourism Transportation Options for Reducing Energy Consumption and Greenhouse Gases. *Journal of Travel Research, 45, 297 – 309.***

This paper described an approach for examining tourist travel-mode choices and forecasted the resulting environmental impact of these selections, using a three-phased method that looked at the relationships between the choices and impacts on energy consumption and GHG emissions. The first stage created a bottom-up model that approximated the effects of various transportation-planning options on energy use and GHG emissions in tourism destinations. The second stage ran a discrete-choice experiment (DCE) to estimate choices under different transportation scenarios, and in the final stage, the findings of the DCE were linked with the bottom-up modeling procedure to derive behaviorally realistic estimates of energy consumption and GHG emissions associated with different scenarios. These stages were applied to a case study in Whistler, British Columbia, and summer-visitor responses to a variety of transportation options associated with travel to Whistler were noted and modeled to show the direct energy consumption and associated GHG emissions that were caused by the choices. The findings concluded that innovative transportation management can effectively encourage tourists to take public transportation on their trip. This study displayed a behaviorally driven approach for looking at energy consumption and GHG emissions resulting from different choice, and provided a look into market responses to proposed strategies for addressing transportation management.

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**Kelly, J., Haider, W., Williams, P. W., & England, K. (2007). Stated preferences of tourists for eco-efficient destination planning options. *Tourism Management, 28, 377 – 390.***

This article developed a systematic framework and an associated method for evaluating tourist preferences for eco-efficiency, or the concept that recommends the reduction in energy and resources and the waste and pollutants emitted for use in destination planning strategies. Using a discrete choice experiment (DCE) method, visitor preferences on land-use, transportation, recreation and other ideas used to promote eco-efficiency were analyzed with the use of a survey based on existing literature, planners and managers in the area. Once the information was compiled, the authors used the Multinomial Logit model to analyze the data which showed that visitors would prefer the eco-efficient planning scenario vs. the business-as-usual scenario overall and they would tolerate new fees for eco-efficient planning. These DCE results reflect the systematic examination of stakeholder perspectives on multi-dimensional planning

scenarios. The methodology used in this study offers planners and managers working in the tourism industry in that region an important tool for analyzing visitor preferences for complex and multi-faceted planning issues.

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**Klein-Vielhauer, S. (2009). Framework model to assess leisure and tourism sustainability. *Journal of Cleaner Production*, 17, 447 – 454.**

This article offered an innovative framework model, tailored for monitoring a particular leisure and tourism-related sustainability situation in various large areas. These areas represented different stages of economic development and importance of leisure activities for locals, as well as domestic and international tourists to the region. The framework was comprehensive and integrated the use of two extensive systemic constituents, which were “object of analysis” and “valuating system”. With the use of this model, it was determined that different areas were characterized by varying topics and analytical results that were all dependent on a specific topic related to leisure activities.

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**Kulisic, B., Zider, M., Jelavic, B., Domac, J., & Segon, V. (2008). “Tourism as a pathway for RES utilization”. *Tourism and Hospitality Management*, 14, 2, 281-290.**

This paper looked into the possibility of the hotel industry helping the community in energy planning by producing bioenergy from organic waste, and attempted to assess the technical potential of this organic waste utilization coming from the tourism and hotel industries. The authors used cross-section analysis in order to determine the direction for implementation of renewable energy sources (RES). The Croatian government set targets of 5.8% as the minimal share of electricity generated from RES, and the paper determined that biogas electricity produced had the potential to save three to four tons of CO<sub>2</sub> emissions per year, and biogas utilization could save 5,000 to 6,000 tons of CO<sub>2</sub> per year. Although tourism in Croatia has not yet looked into RES or bioenergy, and more research on the topic is needed, the energy possibilities in the area are limitless.

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**Kuvlesky Jr., W., Brennan, L., Morrison, M., Boydston, K., Ballard, B., & Bryant, F. (2007). Wind energy development and wildlife conservation: Challenges and opportunities. *The Journal of Wildlife Management*, 71, 8, 2487 – 2498.**

This paper summarizes what is presently understood about how wind energy development affects wildlife populations, particularly resident birds, bats and other wildlife, and to identify specific research opportunities and management challenges that could possibly assist in mitigating the negative consequences of this development. When it comes to birds, most research has been centered on collision mortality although it has been found to have insignificant impacts, unless in an offshore location, but there is data that shows that habitat loss will be more severe in these locations. Bats had not received as much attention as birds, but wind development impacts and collision mortality negatively affect bats much more while other wildlife will be hurt by indirect wind energy development such as electrical transmission lines, road networks and road construction. The central area where Class 4 wind sites would be located that the authors analyzed was the Lower Gulf Coast (LGC) of Texas. They applied the research to determine the impact the wind farms would have. It was determined that no one yet knows how the wind sites would impact LGC but there is the possibility of some damage.

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**Lin, T. (2009). Carbon dioxide emissions from transport in Taiwan's national parks. *Tourism Management*. (in press DOI:10.1016/j.tourman.2009.03.009).**

This paper compared the transport characteristics and CO<sub>2</sub> emissions of single tourist destinations within a country by analyzing five national parks in Taiwan. It also addressed the issues of estimating the total amounts, trends and characteristics of CO<sub>2</sub> emissions from the parks, and how individual parks could reduce their CO<sub>2</sub> emissions, assuming all variables stay the same. Two approaches used to estimate the CO<sub>2</sub> emissions were the top-down and bottom-up methods for the years 1999 – 2006. Emissions were determined to be different in every park and were caused by travel distance and transport modes of the tourists. The author concluded that emissions could be lowered by encouraging tourists to switch to public transport, travel less lengths, and increase load factors of transport through activity management, regulation control and price adjustments.

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**Logar, I. (2009). Sustainable tourism management in Crikvenica, Croatia: An assessment of policy instruments. *Tourism Management*. (in press DOI:10.1016/j.tourman.2009.02.005).**

This study, set in Crikvenica, Croatia, created a number of indicators based on economic, environmental, and social-cultural impacts to the tourism industry. The author then set up eight possible economic, regulatory and institutional policy tools to obtain more sustainable tourism for the area. The eight tools included eco-taxes, user fees, financial incentives, eco-labels, quotas, zoning, tradable building permits and changes in property rights and were graded on a criteria consisting of effectiveness, acceptability and feasibility. The results explained that there was a large opportunity for policy tools for sustainable tourism, but not every instrument met all the criteria.

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**Lumsdon, L., Downward, P., & Rhoden, S. (2006). Transport for Tourism: Can Public Transport Encourage a Modal Shift in the Day Visitor Market? *Journal of Sustainable Tourism*, 14, 2, 139 – 156.**

This study looked at the possibility of a multi-modal ticket that could encourage integrated travel for recreation and tourism into the countryside, while focusing on and creating a profile of the users of the “Way Farer” ticket. From Greater Manchester, UK, this program allows the user to travel by bus, train and Metrolink for one day or the weekend and for 20 years has been marketed as sustainable travel. The data for the study was collected from a survey, with a 2000 sample size, to gather descriptive data to be used in a formal statistical model of the transport of choice by the visitor. The results profiled the user of the ticket program as mostly retired with access to a private car, but who made the choice to take leisure trips using public transport. Therefore, the “Way Farer”, a multi-modal passenger transport ticket, has the potential to become a sustainable modal choice for a large group of people.

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**McEvoy, D., Cavan, G., Handley, J., McMorrow, J., & Lindley S. (2008). “Changes to Climate and Visitor Behaviour: Implications for Vulnerable Landscapes in the North West Region of England”. *Journal of Sustainable Tourism*, 16, 1, 101-121.**

This paper presented “downscaled” climate change scenarios and made available an assessment of how a combination of climate and non-climate factors could likely effect vulnerable landscapes in the North West region of England; and its aim was to take a “place-based” approach to evaluating capacity issues at a detailed landscape scale. The data for this case study analysis was supplied by a number of “risk” workshops that were held with important regional stakeholders present. These stakeholders found the

threat to vulnerable landscapes as significant and felt the threat will increase over time and without the natural resources, tourism in the area will likely decline.

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**Michalena, E. & Angeon, V. (2009). Local challenges in the promotion of renewable energy sources: The case of Crete. *Energy Policy*, 37, 2018 – 2026.**

The authors analyzed in this paper the promotion of renewable energy technologies (RETs) among Cretan municipalities paying particular attention to the consistency of local dynamics in the development of RETs by following an economic academic approach. They also put an emphasis on social and institutional factors, which were driving forces leading to sustainable management resources practices. The data for the study came from a survey of scientific and empirical literature on RETs, and the authors argued that the sustainable diffusion of RETs was mainly related to the local societal context and were determined in three ways. They were 1) the fast assessment of the political context of RETs, 2) the question of local social and institutional determinants and 3) its impact on the efficiency of the management of RETs. They concluded that further action through governmental support would be needed to stimulate the social organization concerning RETs in Crete.

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**Moen, J & Fredman, P. (2007). “Effects of Climate Change in Alpine Skiing in Sweden”. *Journal of Sustainable Tourism*, 15, 4, 418-437.**

The objective of this article was to analyze climate change impact on skiing in a Scandinavian setting and bring to focus some of the related economic consequences; which served as a way to quantify and compare estimated climate change parameters, based on the current ski industry volume. The data for this article was made up from climate data for the last 30 years for the Sälen resort, climate change projections for the period 2070-2100 which were used for scenarios of change for Sälen, and economic expenditures for skiing trips from the national travel and tourism database. The results illustrated that in both scenarios used, the annual number of snowfall days decreased especially mid-season, but the annual snowfall accumulations increased; thus shorter season length, but during the season more snow would fall. Due to these changes, the predicted losses are much larger than current ski ticket sales, and it would be in the ski industries best interest to begin planning for year-round tourist activities.

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**Morgan, J. (1986). The Impact of Travel Costs on Visits to U.S. National Parks: Intermodal Shifting Among Grand Canyon Visitors. *Journal of Travel Research*, 24, 23 – 28.**

In this article, statistical estimates of the magnitude of the impacts from high gasoline prices on the demand for outdoor recreation and the distribution of travel modes used to reach outdoor facilities were made by creating a model using data from visits to all U.S. National Parks with a concentrated look at the Grand Canyon National Park. The model was able to examine the impact of the gasoline crisis and rising costs on the parks. Results showed that there was a modest yet significant energy crisis effect and that high energy prices were one of the biggest reasons tourists took public transportation to the parks.

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**Mycoo, M. (2006). Sustainable Tourism Using Regulations, Market Mechanisms and Green Certification: A Case Study of Barbados. *Journal of Sustainable Tourism*, 14, 5, 489-511.**

This paper sought to discuss past unsustainable tourism practices, review sustainable tourism public policy and planning, and the use of regulatory mechanisms, market instruments, and industry compliance with certification requirements in tourism-intensive small islands, the Barbados. The author received the data for this paper through in-depth, two hour long interviews with two key policy makers in 2001, with updated interviews conducted in 2004, as well as policy documents. The policy makers were questioned

on the policy process and environmental impacts taken into account when processing applications for a number of coastal entertainment and recreations entities. A clear sign of cooperation between government and industry was apparent, through mechanisms such as sustainable land use policies and green certification. Unfortunately, important infrastructure was missing and environmental impact assessments for tourism projects were not required by law, thus Barbados industry and policy makers have many improvements to make.

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**Nepal, S. K. (2008). Tourism-related rural energy consumption in the Annapurna region of Nepal. *Tourism Management*, 29, 89 – 100.**

This article was based on a study conducted to analyze energy consumption and energy-efficiency at tourist lodges and local factors that influenced energy consumption patterns in the Annapurna region of Nepal. The data on the lodges' use of fuelwood, kerosene, LPG, came from 489 interviews with lodge owners representing 95% of all lodges in the region. The results found that energy consumption patterns were based on attitude, accommodation capacity, energy costs, diversity of energy sources, access to energy-saving technologies and institutional rules and regulations. Although the main energy of the lodges came from wood and kerosene, renewable energy use was found to be increasing in the region.

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**Nicolau, J. & Mas, F. (2006). The influence of distance and prices on the choice of tourism destinations: The moderating role of motivations. *Tourism Management*, 27, 982 – 996.**

This paper looked at whether motivations act as moderating dimensions of the influence on distance and price on the choice of tourist destinations, defined as intra-country administration units. Tourist motivations may become the largest generators of utilities when visiting distant or expensive locations; thus the effects of distance and price on destination could alter the motivation of the tourist. The authors came up with 10 hypotheses based on physical, cultural, and interpersonal motivations to explain tourists' decisions. They were tested with random coefficient logit models that controlled possible correlations between different destinations and considered tourist heterogeneity. This study showed that motivations did have a direct moderating effect on the influences of distance and prices.

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**Önüt, S., & Soner, S. Energy efficiency assessment for the Antalya Region hotels in Turkey. *Energy and Buildings*, 38, 964 – 971.**

This paper focuses on the comparison of all different sizes, standards and occupancy levels of hotel facilities and their different energy use in the Antalya Region of Turkey. The main objective was to study and identify the best and worst performing hotels with a data envelopment analysis methodology. The methodology evaluated the performances of different entities that were fused with performance measures to enforce good behavior, elevating problems that these hotels face. There are two models in the methodology, Charnes, Cooper, and Rhodes (CCR) model created with the assumption of continuous returns scale of activities, and the Banker, Charnes, and Cooper (BCC) model that assumes variable returns to scale of activities. There are two versions of both CCR and BCC; the input-oriented model and the output-oriented model, and since this paper looks at minimizing energy "inputs", the input-oriented CCR model was used to look at 32 five-star hotels which were scored by CCR based on efficiency and energy values. The results from the model show that there were too many measures to increase efficiency in inefficient hotels and that energy consumption is very diverse in the area. The model offers a technique that can be used to benchmark energy efficiency and to identify the hotels that are efficient and those that are not.

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**Paoli, C., Vassallo, P., & Fabiano, M. (2008). An energy approach for the assessment of sustainability of small marinas. *Ecological Engineering*, 33, 167 – 178.**

This paper presented a preliminary effort of a bottom-up design with an integrated approach to analyze activities in a coastal zone to guide all stakeholders towards a more environmentally sound way of performing their activities. The authors used an energy methodology that considered both environmental and economic aspects in terms of energy that has been consumed on two separate small Mediterranean marinas. Both marinas proved that energy could be a useful tool to assess and evaluate marina management and sustainability because of the special attention paid to key components of the management systems in the marinas.

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**Patterson, T., Bastianoni, S. & Simpson, M. (2006). Tourism and Climate Change: Two-Way Street, or Vicious/Virtuous Circle? *Journal of Sustainable Tourism*, 14, 4, 339 – 348.**

This paper looked at two central conceptual diagrams related to climate change and tourism based on six international meetings on the two subjects. The first model, “tourism and climate change viewed as a two-way street”, reflected the various tourism influences (top half of model) and conclusions about the climate’s influence on tourism (bottom half); although this model was deemed not complex enough to encompass tourism and climate change interactions. The second model, “states and changes in tourism-climate system”, aimed to join the two perspectives of the first model, but data was reflected in a multi-layer concentric circle diagram. It was determined that such models should support long-term non-territorial collaboration, incorporate adaptation and mitigation in ways which are not mutually exclusive, and that conceptual space for systematic feedback was a necessary step in order to further understand sustainability challenges linked to tourism and climate change.

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**Peeters, P. & Schouten, F. (2006). Reducing the Ecological Footprint of Inbound Tourism and Transport to Amsterdam. *Journal of Sustainable Tourism*, 14, 2, 157 – 171.**

The purpose of this paper was to use the concept of eco-efficiency to assess variations in impact per market sector in Amsterdam for inbound tourism. This was done by analyzing the tourism product chain with the help of the ecological footprint (EF) theory as the general measure. The EF was measured in hectares so the total “footprint area” was obtainable, and the authors took the EF and divided it by all humanity to calculate “fair-earth-share”. This calculation was used for the comparison of the EFs of different sectors of tourism: leisure activity, accommodation and transport (broken up into local and origin-based transport). Leisure activity data came from a survey, and its data was harder to calculate because of the tourists’ infrequency of visits to attractions, restaurants, concerts, etc., but the total EF was determined to be 83,150 hectares for all 39 million visitor days in Amsterdam. Accommodations data was collected from seven hotels ranging in quality and size, and for the 29.9 million overnights, the EF was 299,000 hectares, or an EF 2.15 times the daily fair-earth-share. Local transport data came from visitor survey data, which broke down into 57% of tourism travel by public transport and 30% walking, and had an EF of 7989 hectares for 425 million passenger-kilometres annual tourists plus visitor days. Origin-based transport data came from calculations of great circle distances and multiplied with ‘detour factors’ to account for real distances; the EF was 78,770 hectares for day visitors and 908,000 hectares for tourists, or was 5.4 times the daily ‘fair-earth-share’. The total EF for visits to Amsterdam broke down as follows: origin-based transport 70.1%, accommodation 21.3%, leisure activities 8.1% and .5% for local transport. This paper showed that although policy measure and makers have concentrated on making accommodation and local transports more sustainable, they should be shifting their efforts towards longer, more energy-intensive, origin-based transport.

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**Perry, A. (2006). Will Predicted Climate Change Compromise the Sustainability of Mediterranean Tourism? *Journal of Sustainable Tourism*, 14, 4, 367 – 375.**

This paper was about tourists visiting the Mediterranean, and how they may change their behavior when the impacts of climate change are felt; including excessive summer heat, protracted drought, increased sea levels, and other hydrological stresses. Tourists change their behavior so easily because tourism is a voluntary and discretionary activity, and is dependent on pleasant weather. The Intergovernmental Panel on Climate Change 3<sup>rd</sup> Assessment gave the authors the basis of their study, which was that there would be a rise in maximum temperatures and increases in the frequency of heat waves and hot days; thus the Mediterranean would be unfavorable, health wise. The author concluded by saying that predicting how people would react to the already-complex climate change is very difficult and would need more analysis; but tourist facilities should try to live in harmony with the natural climate.

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**Renderiro Martín-Cejas, R., & Pablo Ramírez Sánchez, P. (2009). Ecological footprint analysis of road transport related to tourism activity: The case for Lanzarote Island. *Tourism Management*, 1-6.**

This paper attempts to approximate the contribution of tourism road travel to the total energy consumption per tourist in the island of Lanzarote. The authors did this by translating carbon dioxide emissions on the island's road networks into equal land/sea area measured in hectares and calculated into an ecological footprint (EF). The results showed that the road transports' EF on the island would soon be the main contributor to the island's total EF. Thus, there would be a need for trade-offs between mobility of the individual tourist and tourism development in Lanzarote.

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**Richins, H. (2008). Environmental, cultural, economic and socio-community sustainability: a framework for sustainable tourism in resort destinations. *Environment, Development and Sustainability* (Book).**

This paper talked about an inclusive community-based sustainability framework consisting of four key components of sustainability (economic, social, environmental and cultural), with a focus on a resort destination. Noosa, Australia is the focal point of framework and provided a model that was applied to address the various challenges of development through more inclusive and comprehensive long-range destination planning, implementation and management. Key community asset resources and stated purposes to protect/enhance/manage these asset resources were identified and were recognized by the Noosa Community Tourism Board to ensure that the community could successfully market itself, although the sustainable tourism process was determined to not yet be complete.

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**Rigall-I-Torrent, R. (2008). Sustainable development in tourism municipalities: The role of public goods. *Tourism Management*, 29, 883 – 897.**

This paper argues that there is a way out of the tradeoffs that lead to unsustainability for municipalities that base their tourism supply on the provision of public goods, because public goods are not depleted and nonrival. The authors used the *Brundtland Report's* definition of sustainable development and assessed endogenous growth development models to show how a public good may add to the achievement of a sustainable development level over a period of time. There is one implication of the use of public goods. If there is no financing for local public goods required to maintain the economic motions of the municipality, than a vicious cycle will emerge; but overall public goods were found to have added to sustainability.

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**Sadhvani, J. J., & Veza, J. M. (2008). Desalination and energy consumption in Canary Islands. *Desalination*, 221, 143 – 150.**

In this paper, the authors looked with a retrospective vision at the evolution of energy consumption from the desalination plants in the Canary Islands. The past thirty years have brought much demand for energy consumption by these large seawater desalination plants. The authors looked at options for the plants to become more sustainable from further advancements such as replacing the traditional method of “reversed pump” to a more efficient “Pelton” turbine; and the alternatives would be determined by the plant size in and effort to lower consumption. The desalination plants are the main industry on the islands as opposed to the mainland, but also consume the most energy. It was determined that more innovative designs will be needed for this area.

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**Scott, D., Jones, B., & Konopek, J. (2007). Implications of climate and environmental change for nature-based tourism in the Canadian Rocky Mountains: A case study of Waterton Lakes National Park. *Tourism Management*, 28, 570 – 579.**

This paper presented an empirical assessment of climate and visitation in the Canadian Rocky Mountains which was used to determine how visitors may have responded to future direct and indirect climate change and related environmental change. A statistical model of monthly visitation and climate was developed by the authors to analyze the direct impact of climate change on visitation. A survey of visitors to the Waterton Lakes National Park was used to explore how indirect effects of climate changes alter visitation. Respectively, monthly visitation was predicted to increase 6 to 10% in the 2020s and between 10 to 36% in the 2050s. For the indirect model, the years through 2020 to the 2050s was found to have little influence on visitation, but the 2080s had the warmest climate predicted and was found to have negative effects. These results show that the long-term impact of climate change was the most important finding.

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**Scott, D., McBoyle, G., Minogue, A., & Mills, B. (2006). “Climate Change and the Sustainability of Ski-based Tourism in Eastern North America: A Reassessment”. *Journal of Sustainable Tourism*, 14, 4, 376-398.**

The purpose of this paper was to analyze how snowmaking would reduce the vulnerability of ski areas to climate change in six separate study areas located in Ontario and Québec, Canada and Michigan and Vermont, USA. The analysis occurred through the development of a model that assessed the impact of climate change on season length, probability of operations during critical tourism periods, snowmaking costs and water requirements. The results of the paper demonstrated that only a minor risk from warm climate change was posed to four of the areas for the year 2020, and by 2050 the warmest climate change effects would endanger the sustainability of three of the ski areas. Overall, climate change in ski industry will create winners and losers causing contraction and consolidation in the industry.

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**Shackleford, P. (1979). Planning for tourism: Research needs in a growth industry. *Futures*, 32 – 43.**

In this article, the attempt is made to identify factors that a Herman Kahn-type thesis might depend on by isolating vital assumptions that the growth in the tourism industry depends on, while spotting priority areas for research to concentrate on. Areas include population and income growth, paid holidays and working hours, policy regulation over transport and energy policy, redistribution of international tourists to developing countries, environmental protection, and finally, the institutional framework. While

analyzing these factors, the author's opinion was that government involvement could soon become very important to the tourism industry. The government's role, according to the author's stated opinion, will become increasingly vital especially in the social role in developing tourism.

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**Somerville, H. (2004). Travel, tourism and he environmental challenges. *Tourism and Hospitality Research*, 5, 1, 65 – 72.**

This paper looks at the more recent concern with the relationship between transport by air travel, road and rail, and energy consumption, and the contribution of humans to global climate change. This issue is related to the commitment of the government of the United Kingdom to reduce emissions by 12.5 percent relative to 1990 by the year 2010. There is considerable agreement that an emissions trading system available to all sectors presents a medium and long-term option for reduction in CO<sub>2</sub> emissions. The UK government has promoted interest in trading in the aviation industry and has supported a study researching an international market of emissions trading. Somerville concludes by stating other actions like an emissions charge will more likely be used throughout Europe.

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**Steinnes, D.N. (1988). A Statistical Analysis of the Impact of Oil Price Shocks on Tourism. *Journal of Travel Research*, 27, 39 – 42.**

In this paper, the difference between time-series and regression methods were discussed and then used to analyze tourism volume for the Duluth, MN area since the last OPEC oil shock; with particular emphasis on the regression analysis. This analysis used oil prices and other variables to make clear the variations in the volume of tourism over time. The data came from studying tourist expenditures from the city of Duluth in order to measure its monthly tourism volume; the actual estimation results for the models were then examined and compared to previous studies done by the author's peers. The results of the analyses showed that tourism expenditures were statistically significantly related to altering levels of tourism over a long period of time.

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**Tabatchnaia-Tamirisa, N., Loke, M. K., Leung, P., & Tucker, K.A. (1997). Energy and tourism in Hawaii. *Annals of Tourism Research*, 24, 2, 390 – 401.**

This paper looks at the tourist industry, which makes up forty percent of the energy demand in Hawaii, and analyzes a situation where fast tourism growth has outpaced the escalation in the host population. The authors provide a methodological framework for estimating energy demands of the industries that provide services to tourists and which have been created due to the quick growth of tourists and their spending. Energy demand is estimated by using an I-O analysis, a 1987 Hawaii input-output table (HI-O) and a previously developed "energy matrix". The study results showed an increase in total demand for energy and fuel, and in some categories this was caused by an increase in either intermediate or final demand, possibly due to rising prices for electricity and gas. The results also show a strong dependence by the Hawaiian economy on the tourism industry and the resulting demand equals to sixty percent of all demand for electricity, gasoline, aviation, and other fuels, on average. The authors concluded that as the international tourist population continues to grow, they will be the main determinate in the future energy demand of Hawaii.

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**Tao, T. C. H. & Wall, G. (2009). Tourism as a sustainable livelihood strategy. *Tourism Management*, 30, 90 -98.**

This paper utilized Scoones's sustainable livelihood conceptual framework in a case study looking at a Cou indigenous community in Shanmei Taiwan; to examine if, and how, tourism fit into livelihood strategies. The data was collected in two phrases, with field research and one hundred and thirty personal

interviews collected over eight months, while two forms of data analysis were used to breakdown the information. After looking at the Danayigu Ecological Park, as the focal tourist attraction in the area, and the contemporary livelihoods of the people, the authors found that the park had an increasing number of livelihood options. The results showed that tourism could be a development option in a tourist setting but it must fit with the already existing system.

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**Tosun, C. (2001). Challenges of sustainable tourism development in the developing world: the case of Turkey. *Tourism Management*, 22, 289 – 303.**

The objective of this paper was to examine challenges in sustainable tourism development in the developing world, specifically Turkey, where there has been a ministerial level of tourism for 30 years, with no current contemporary approach to tourism development. Due to these inadequacies, alternatives are needed and several variables are used to determine the challenges to sustainable development for Turkey, including priorities of national economy, lack of contemporary tourism development approach, structure of public administration system, emergence of environmental matters, over commercialization, and the structure of the international tourism system. The paper concludes with finding Turkey needing a re-structuring of their systems before they will move forward with sustainable development, pending more research.

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**Tsaur, S., Lin, Y., and Lin, J. (2006). Evaluating ecotourism sustainability from the integrated perspective of resource, community, and tourism. *Tourism Management*, 27, 640 – 653.**

This article focuses on a study, which adopted the Barometer of Sustainability proposed by Prescott-Allen, and tried to develop a reasonable method to estimate the sustainability of an ecotourism site, by using subjective measures to investigate stakeholders' perceptions. The authors looked at a Taiwanese indigenous ecotourism site and interviewed local residents, tourists and resource administration to assess their perceptions of the relationships with other groups. From these relationships, variables influencing sustainability were collected and the Delphi technique was then used. The influences included: of the resource on community, of the community on resource, resources on tourism, tourism on resource, local community on tourism, and tourism on local community. The results illustrated that the influence of tourism and community were the most significant on the natural and cultural resources, and these variable could be used when looking at other destinations.

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**Uemura, Y., Kai, T., Natori, R., Takashashi, T., Hatate, Y., & Yoshida, M. (2003). Potential of renewable energy sources and its applications to Yakushima Island. *Renewable Energy*, 29, 581 – 591.**

This paper analyzed a study to determine if renewable energy resources besides hydroelectric (which is the current main energy source), such as wind, photovoltaic, solar thermal, biomass, and waste energy sources could cover the energy demand in Yaskushima, an island located in the southern part of Japan. These energy sources were categorized by electricity, fluid form and solid form capacities and their application to Yaskushima's tourist industry, which was the most country's most promising business. The sum of potential wind and solar energy was determined to be 5.4 times the current electricity consumption on the island. Solar thermal and biogas energy were comparable to the current consumed amounts of LP gas and kerosene and could be replaced completely by the new energy. In addition, the study determined that the transportation capacity for the island was four times as much as the current load which meant Yaskushima could accept up to four times more tourists as the current number when considering the three types of renewable energy capacities. This study found that since the island already used energy-saving hydroelectricity, there would be no need to change wind and solar energy but fossil

fuels could be replaced by solar thermal and biogas energy. Plant biomass and municipal waste were found not to be sufficient.

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**Wagner, C. G. (2005). The Conscientious tourists: Ethical choices influence travelers' vacation planning. *The Futurist*, 14 – 15.**

This piece looks at the new trends in tourism travel such as ecotourism, geotourism, and pro-poor tourism, which are considered non-typical tourism experiences, or “ethical” adventures. One aspect that is creating this demand is the desire of visitors to see the impact that they have on the cultures and environments of the areas they visit. One risk affiliated with these new trends is “greenwashing”, which is the practice of unethical marketing to attract ethical dollars. There are now certification programs that are measuring tourism companies by using environmental, social, and cultural criteria to determine degree of ethical practices. Countless tourists will want to donate their money to leave behind an ethical footprint and will use the certification given to those experiences that do not “greenwash” to determine where their money will go.

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**Warnken, J., Bradley, M., & Guilding, C. (2005). Eco-resorts vs. mainstream accommodation providers: an investigation of the viability of benchmarking environmental performance. *Tourism Management*, 26, 367 – 379.**

This paper reported a study that compared quantifiable performance results of high profile members of an eco-accreditation plan with the performance of mainstream tourist accommodation providers, based on per capita resource consumption and waste production data, which few other studies have done. Unlike in Europe, Australia, where the study was based, had no local or national accreditation schemes, although there were federal and state level environmental performance initiatives. The study concentrated on 3 coastal areas of Queensland, and the facilities in the sector were broken up into four categories, hotels, condominium complexes, eco-resorts and caravan parks, although only 5 high profile NEAP accredited resorts were used as the sample. Findings concluded a lack of data among all resorts for waste and wastewater production and inconsistency of other data which showed that only energy per capita and water consumption data can be benchmarked. Per capita water consumption was not as great as energy consumption, and in eco-resorts, per capita water consumption was affected by location. Hotels used the most energy, followed by condominium complexes, eco-resorts and caravan parks, but no trends could be established in this study because of the small sample size.

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**Warnken, J., Bradley, M., & Guilding, C. (2004). Exploring methods and practicalities of conducting sector-wide energy consumption accounting in the tourist accommodation industry. *Ecological Economics*, 48, 125 – 141.**

The goal of this paper was to explore the possibility of applying sector-wide energy consumption accounting in the fragmented, service-oriented tourism industry tourism sector comprised of small to medium-sized enterprises (SMEs) of Australia. This was carried out by reviewing three approaches that could be taken sector-wide including the Floor Area Method, the Multiple Regression Method and the Mandatory Reporting Method. The field study that was conducted consisted of reviewing the incidence, nature, and the potential of energy consumption accounting and compiling data to contribute to the development of business level regression models for energy consumption predictions. The data from the field study came from eleven hotels, thirteen condominiums, five eco-resorts and one management company which operated six caravan parks. The authors reported great variation in the quality and quantity of the data. The findings show that the Mandatory Reporting Method had the greatest potential when it came to the review of the enterprises floor area by facilitating data accuracy, and encouraged individual business owners to watch their own impacts on the environment. In summary, the study

produced three recommendations for any industry sector 1) environmental resource consumption and waste production is information that should be made public, 2) resource consumption and waste production should be collected for accurate modeling and 3) standardized spreadsheets should be created to encourage reporting of achievements in relation to environmental performance.

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**White, D. (2007). An Interpretive study of Yosemite National Park visitors' perspective toward alternative transportation in Yosemite Valley. *Environmental Management*, 39, 50 – 62.**

This paper's purpose was to present visitor perspectives regarding transportation management in the Yosemite Valley area of Yosemite National Park in California for the National Park Service (NPS). Using an interpretive research approach to compare underlying visitor perspectives with existing information collected by survey methodology and quantitative analysis, the author used a non-probability sampling strategy to show the diversity in perspectives (based on one hundred sixty interviews with visitors to the park). The study's findings show that visitors' behaviors and points of view were affected by several psychological factors and situational influences. Psychological factors consisted of perceived personnel freedom, views on the environment, previous incidents with Yosemite and other national parks, alternative transportation with these parks and feeling towards perceived crowding. Situational influences consisted of convenience, access and flexibility of transportation alternatives, type of visit, group and park use level. In conclusion, these factors and influences should be reflected in communication on travel choices and management perspectives, and the NPS should better understand that alternative transportation has the potential to mitigate environmental damage.

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**Xydis, G., Koroneos, C., & Polyzakis, A. (2009). Energy and exergy analysis of the Greek hotel sector: An application. *Energy and Buildings*, 41, 402 – 406.**

This paper presented energy and exergy utilization assessment for four hotels in Greece while taking into account the sectoral energy and exergy flows. The overall average efficiency of electric energy used was obtained by calculating the medium efficiency of the selected process, and the efficiency of space heating was calculated by the diesel oil energy efficiency for the hotel. The results showed one set of hotels, the Kassandra hotels appeared to be more efficient than the Rethimno hotels. This was due to the greater utilization of electricity in Kassandra hotels. It was suggested that the promotion and implementation of alternative and renewable energy sources should be taken into consideration in the tourism sector in order to increase efficiency.

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**Yeoman, I., Lennon, J. J., Blake, A., Galt, M., Greenwood, C., & McMahon-Beattie, U. (2007). Oil depletion: What does this mean for Scottish tourism. *Tourism Management*, 28, 1354 – 1365.**

This paper examined the long-term effects of changes to oil and energy prices on Scottish tourism. It also reflected global economic and geographical background, the economic impact of oil, energy prices, policy interventions, the short term effects on Scottish tourism and long term implications on policy. Although implementing alternatives that addressed high oil and energy prices have been proven to be a challenge in the past, there is the possibility that prices rise so high that they would secure commitment to research for new technology. Scottish tourism was on track to grow by 50% over the next ten years, which had lead the authors to the creation of two models or scenarios to understand the impact of high prices, *Energy Inflation* and *Paying for Climate Change*. The models were created using secondary data, interviews from experts of the company VisitScotland and a literature review using IDONS software. To measure the economic impacts, computable general equilibrium modeling was used which provided detailed estimates of the effects of actual or possible tourism-related events on the economy. The *Energy Inflation*

scenario assumed that the public belief was there was unlimited energy, but then the supply suddenly dropped and policy was slow to react. *Pay for Climate Change* assumed rising energy prices, but conservation policy was enacted along the way. Both scenarios showed the problem of high dependence on fossil fuels and suggested a number of short-term and long-term policy changes for Scottish tourism.