305: Certification in The Hotel Sector; Does It Actually Reduce Global CO_2 Emissions?

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Abstract

The scientific community is unequivocal in its acceptance of the connection between climate change and green house gas emissions yet there are no international benchmarks for CO_2 emissions in hotels. Although transport is commonly identified as a major emitter, accommodation receives much less attention, in spite of the fact that it typically accounts for 1/4 of the total emissions from global tourism. The research poses a simple question, 'Does Certification in the hotel sector actually lead to lower CO_2 emissions per guest night?' The research questions whether the certification schemes are robust and rigorous and whether the results are credible.

The paper is divided into three main sections. The first section presents the facts surrounding Climate Change and Global tourism, the issue of carbon offsetting, 'green' electricity and 'additionality'. The second section provides a critique of current methods of certification used in the hotel sector. Finally, the third section examines the environmental impact and the accounting method used in certification.

Keywords: Global warming, tourism, certification, hotels, CO_2 emissions, fuel source, 'green' electricity, carbon offsetting

1. Introduction

We estimate hotels are five times more CO_2 intensive than people living at home yet CO_2 emissions are not accounted for in audits and are not included as a mandatory category in certification. There is a widespread problem of false accounting in certification. Hotels are claiming reduced or zero CO_2 emissions through 'green' electricity deals and carbon offsetting schemes.

2. Climate Change and CO_2 Emissions

2.1 Climate Change and Global Tourism CO_2 Emissions

International arrivals are expected to reach nearly 1.6 billion by the year 2020 from 25 million in 1950. (WTO) Tourism growing at such a rate affects both transport and accommodation equally. If carbon intensive transport reduces then this proportion could become much higher as the focus will tend to shift onto accommodation.

2.2 Carbon Offsetting

Carbon offsetting is the act of mitigating greenhouse gas emissions. It involves calculating emissions and then purchasing 'credits' from emission reduction projects which would prevent or remove an equivalent amount of carbon dioxide elsewhere. Due to its indirect nature, carbon offsetting is difficult to verify. Hotels were found to be making false CO_2 claims.

Table 1: Emissions from Global Tourism 2005 [1](*including same day visitors*)

	CO_2 (Mt)
Air transport	517
Other transport	468
Accommodation	274
Activities	45
TOTAL	**1,304**
Total world	**26,400**
Share (%)	4.94

2.3 'Green' electricity – how green is it?

In response to growing climate and environmental concerns, certification and self-certification of "green" electricity (with different and often conflicting definitions) have proliferated in the marketplace. Many products do not contribute to *additionality* (i.e. the development of new low or zero-carbon generation) but instead favour double selling of electricity already paid off by consumers. The lack of minimum common standards cause significant confusion in the public and undermines the future uptake of green electricity. (CLEAN-E, 2006)

[1] Advanced Summary, Davos Report, 2007.

2.4 The Eugene Standard and 'Additionality'

Green power consumption can only lead to additional low or zero carbon power generation if *additionality* is proven. The Eugene Green Energy Standard is an international standard to which national or international green electricity labeling schemes can be accredited. It confirms that energy supplied under the accredited schemes: 1) Is produced from genuinely sustainable energy sources; 2) Will result in a real increase in renewable generation beyond the requirements imposed by government ('additionality'); 3) That the demand from consumers is matched by renewable generation. Two variations of the standard, 'gold' and 'silver', differentiate between schemes depending on the additionality of new renewable energy supplied. Currently only two national labels (German *ok-power* and Swiss *Naturemade)* are accredited by the Eugene Standard. out of one hundred and ten European labels listed on Eugene website (Eugene, 2005) Despite this fact, it has been found many certified hotels rely on claims of zero carbon or neutrality based on purchasing 'green' electricity, which is not accredited.

3. Certification and Benchmarking

3.1 Comparison of selected schemes

Certification schemes are created by privately operated companies and NGO's and are based on voluntary initiatives by the hotels themselves. Certification delivers a certificate which claims the participant is "green", sometimes that is done by looking at processes. A benchmark measures something quantitatively with a view to comparing it to a given value regarded as a datum. Most certification schemes can be categorized and analyzed by their methodology – as performance-based (using benchmarks) or process based (using environmental management systems) and by sector of the tourism industry they cover (conventional tourism, sustainable tourism or ecotourism). A hybrid of process-based environmental management systems and performance benchmarks are more effective. (Honey, 2002)

3.2 Critique of selected schemes

A comparison of selected certification schemes is presented in Table 2 on the next page. There is a confusing proliferation of a wide range of certification schemes with varying criteria, which is compounded by overuse of 'eco-terminology' for marketing purposes. In most cases methods of calculation, data about baseline indicators and algorithms for use in the performance assessment are not disclosed to the hotel operator or available in the public domain. There is concern that the complexity and cost of certification systems preclude smaller businesses.

There is a lack of transparency as to whether the certification has been awarded on the basis of design intent or for operational performance. There is no correlation between the two and there should be no confusion between certification that goes to design i.e. LEE.D-NC, BREEAM and one that goes to real building i.e. LEED-EB, Green Globe, Nordic Swan, EU Flower.

3.2.1 Accountability of CO_2 emissions in schemes and tools

Only one certification scheme calculates CO_2 emissions but this is included in a non-mandatory category for certification and does not effect overall benchmarking evaluation. As a result, a hotel could in fact have low energy consumption and high CO_2 emissions yet still become certified. Differences were found between our CO_2 emissions calculations and those reported in the benchmarking assessment report. It was found that the actual calculations of CO_2 emissions are dependant on the assumptions about electricity production emissions as shown in section 4.1& 2.

3.2.2 Adding delivered units of electricity to delivered fuels

The most serious error in all schemes analysed is the adding together of delivered electricity to heating without first converting the figures to primary energy (or CO_2 emissions) before adding together. As a result, the energy performance indicators used by the majority of hotels and certification schemes are unreliable.

3.2.3 Weighting of categories in awarding credits for certification

Most schemes involve five or more assessment categories yet success in only one or two categories (energy is not always mandatory) enables a hotel to become certified despite having poor environmental performance. In 2007, Nordic Swan made energy performance a compulsory category. Green Globe includes an indicator for CO_2 emissions and Renewable energy (percentage) used but do not affect the overall benchmarking evaluation. In LEED, it was found that five of the ten LEAST popular (and most difficult to achieve) credits were made up entirely from the Energy & Atmosphere category, which deals directly with CO_2 emissions. (Kramer, 2006)

4. Method

The study involves collecting raw energy data from seventy selected certified hotels worldwide. The data was analyzed in various ways and some were compared with benchmarking assessment reports where applicable.

Four analyses were made. Firstly, a time series analysis is presented to demonstrate the dependency of choice of fuel mix on calculated CO_2 emissions for a selected chain hotel in Stockholm. The impact on emissions was examined before and after certification. The same method was then applied to the CO_2 emissions and energy consumption data for a selected certified chain hotel in London. Thirdly, an example of CO_2 emissions for six certified hotels for a particular year is presented to illustrate the range of CO_2 emissions in different schemes. Finally, an example of CO_2 emissions for 29 certified hotels again for a particular year was presented to demonstrate the range of reported CO_2 emissions within the same scheme.

Table 2: Extract From Table Of Comparison Of Selected Certification Schemes.

	Green Fáilte Award	EC3 Green Globe	Nordic Swan	EU Flower
Region	Ireland	Worldwide	Scandinavia	Europe15 + *Norway, Iceland, Liechtenstein*
Hotels Specific	√	√	√	√
Certification Purchased Operational Data Only	√	√	√	√
Mandatory Energy Management System	√	√	√	√
Back Up Documentation Required	√	√	√	√
On Site Audit	√	√	√	√
Independant Third Party Audit	x	√	X √ Independent energy analysis	
Certification Process	Energy Benchmark + Mandatory & Optional Points	Energy Benchmark	Energy Benchmark + Mandatory & Optional Points	Mandatory & Optional Points
Different Benchmarks for each country	N/A	√	√	N/A
Different Benchmarks for each region in country	N/A	√	√	N/A
Publication of benchmark in public domain	√	x	√	N/A
Award Level	Bronze = 4 Mandatory Categories Higher level (M + *Optional Points any category*) Silver = M + 20 *OP* Gold = M + 30 *OP* Platinum = M + 40 *OP*	Stages Of Certification: 1) Earthchecked: *benchmarked* 2) Bronze = 2 yrs+ 3) Silver = 2 – 5 yrs 4) Gold = 5 yrs + (*continuous certification*)	One Level	One Level
Categories	1) Environ. Management System 2) Water Management 3) Waste Management 4) Energy Management *(mandatory)*	1) Sustainability Policy 2) Energy Consumption 3) Water Consumption/Saving 4) Waste sent landfill/Recycling 5) Community 6) Paper Products 7) Cleaning Products 8) Pesticide Products	1)Energy Consumption (*mandatory*) 2)Water Consumption 3)Waste Consumption 4) Waste Management & Environmental Requirements *(mandatory & points & extra points)*	1) Energy *(mandatory)* 2) Water 3) Chemicals 4) Management 5) Waste 6) Other
Minimum required for certification	Bronze: All 4 mandatory categories	6 out of any 8 categories (*12 months to improve*)	1 limit value over and above energy *(water consumption, chemical products and waste management)*	6 Mandatory Categories & Optional Criteria (*16.5 points / 77 points*)
Weighting of energy criteria	1 of 4 mandatory categories Energy Higher level (M + *Optional Points*) Silver = M + 8 *OP* Gold = M + 10 *OP* Platinum = M + 13 *OP*	1 of 8 core areas (*baseline or best practice standard*)	1 of 4 categories 1) Energy Consumption (*mandatory – new 2007*) 2) At least 60% of max. point score for Operation & Maintenance achieved	1 of 6 mandatory categories 1) 10 energy points out of 37 Mandatory points 2) 17 energy points out of 47 Optional points
Energy mandatory	√	x	√	√
Primary energy	**x**	**x**	**x**	**x**
CO_2 emissions	**x**	√ *	**x**	**x**
% Heat from renewable resources	√	√ *	√	√
% Electricity from renewable resources	√ Platinum (22%)	√ *	√	√
Boiler Efficiency >90%	√ *(Mandatory: Silver, Gold, Platinum)*	x	x	√ *(Mandatory)*
Sub-metering	√ Gold & Platinum	x	x	x

** Non-mandatory*

The consumption data for delivered fuels, electricity and heat was extracted from invoices, meter readings, monitoring data in excel files, intranet access of hotel databases and benchmarking assessment reports. The delivered fuels consumption data differed in units and was converted to CO_2 emissions using the conversion factors from The Carbon Trust and IPCC. The national average electricity fuel mix breakdown and conversion factor was collected from BERR for UK, government and academic sources for each respective country. In order to know which conversion factor to apply for, the district heating information was collected from the supplier about how the heating was generated.

Information was also collected on the physical and operational parameters of the building including: date of certification, total number of guest nights, size, structure, age, orientation and design of the building, number of bedrooms, floors, total area, number of facilities and level of services offered, geographical and climatic location, the type of energy system installed and how they are operated and maintained.

4.1 Dependency of CO_2 emissions calculations to chosen fuel mix: Sweden

Sweden is connected to the other Nordic countries through the Nordic electricity market, NordPool, which also has connections to the European continent. The energy production mix in these three areas is very different as seen below. The collected heating and delivered electricity consumption data for a selected certified chain hotel located in Stockholm, Sweden was using three methods of accounting. The first scenario is where we accept the argument that the electricity is 'green', i.e. 100% renewable. The second scenario assumes an average Nordic electricity mix and the third scenario assumes an average European mix which is more diversified with mainly nuclear,

coal, hydro and natural gas fired power production (as shown in Figure 1). The district heating is supplied by CHP so the CO_2 emissions have already accounted for in electricity production and shall therefore be considered zero.

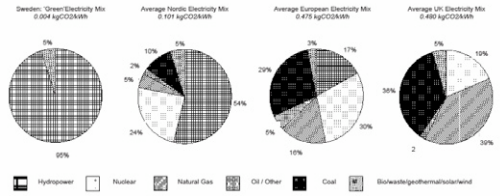

Figure 1 Fuels used in "Green", European and National (Nordic / UK) electricity power production

4.2 Time series analysis of CO_2 emissions per guest night for chosen fuel mix for a selected certified hotel before and after certification

The graph shown in figure 2 shows a more significant reduction in emissions attributable to switching to 'green' electricity rather than to certification alone. However it is acknowledged there is a 10-15% reduction in emissions after the hotel became certified which may be explained by the skilled expertise of the newly appointed environmental manager around the time of certification. The graph clearly shows the significant impact on emissions of the choice of fuel mix chosen.The CO_2 emissions have been calculated in kg CO_2 per guest night.

The graph shows the results of the third scenario which uses the average European electricity mix (0.475 kg CO_2 /kwh) before the hotel switched to 'Bra Miljövil' green electricity in 2006. Heating is supplied by district heating (CHP) and is considered to have zero emissions. By selecting the average European electricity mix, we are presenting the worst-case scenario, which we consider to be reasonably justified due to Sweden's connection to the European continent via Nordpool compared to the totally unjustified switch to 'green' electricity as demonstrated by the graph below.

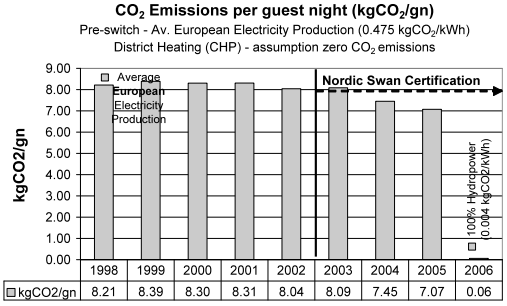

Fig 2. Time series analysis of claimed CO_2 emissions for chosen fuel mix for a selected chain hotel in Stockholm, Sweden before and after certification (kg CO_2 per guest night) Note reduction after switch to "green" electricity.

The marketing of the hotel implies that its reduction in CO_2 emissions are a result of being certified yet the graph shows that until the switch to a different electricity supplier in 2006, certification has had very little effect on reducing CO_2 emissions.The graph also shows despite all the hype surrounding certification it has been shown to have no real effect on reducing CO_2 emissions, irrespective of whether or not the carbon emissions can be decimated overnight by simply switching to a different power company.

3.3 Time series analysis of CO_2 emissions and energy consumption per guest night for a selected certified hotel, before and after certification.

The purpose of the two graph's below shown below is to establish if certification has directly resulted in reduced energy consumption and/or CO_2 emissions per guest night. Heating is supplied by gas and delivered electricity is supplied from the grid (EDF). The hotel does not purchase 'green' electricity. The graph shows that certification has had no effect on either energy consumption or CO_2 emissions, which has in fact increased. It should be acknowledged that a consistent reduction in emissions is recorded from 2002 to 2005 after which the emissions increase. The reduction may be explained by the drive to achieve certification as well as to the individual expertise of a skilled environmental a manager who then left in 2006. He was then replaced by a new less skilled manager who has now since left. The marketing for the selected hotel implies the hotel is 'carbon free' and 'to offset all its emissions' yet only the conference facilities have been 'offset'. Furthermore, due to the lack of transparency in accounting methods, it is impossible to validate the claims made for that improvement and to explain how the energy consumption and CO_2 emissions of that area has been distinguished from the overall area (if there is no sub-metering.)

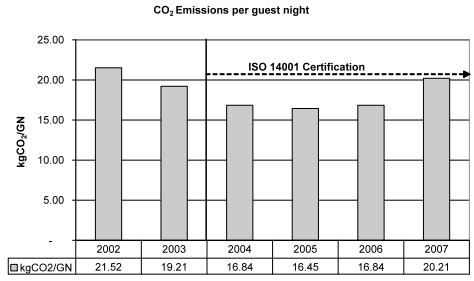

Fig 3. Time series analysis of CO_2 emissions per guest night for a selected chain hotel in London, UK, before and after certification.

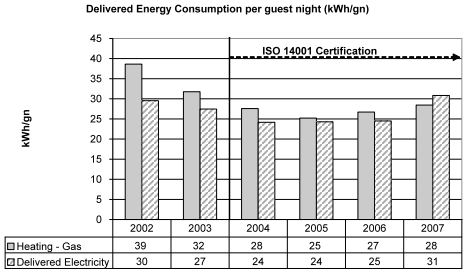

Fig 4. Time series analysis of energy consumption per guest night for a selected chain hotel in London, UK, before and after certification.

4.4 An example of CO_2 emissions for 2006 for eight certified hotels in different schemes

The graph below compares the CO_2 emissions per guest night for a series of certified hotels for a particular year. Despite the wide range in CO_2 emissions, all have been awarded certification. In one case, there is almost no difference in emissions between a certified and non-certified city hotel located in the same country. In another case, a city hotel having achieved gold certification actually emits almost double the CO_2 emissions than a non-certified city hotel in the same country. Based on the figures given and the assumption made in the calculations, is it justified to certify a hotel sustainable that emits 69 kg CO_2 per guest night as another certified hotel that claims to have zero CO_2 emissions? Is it justified that some certified hotels are decimating their CO_2 emissions overnight by simply buying non-accredited, "green" electricity certificates yet still awarded certification?

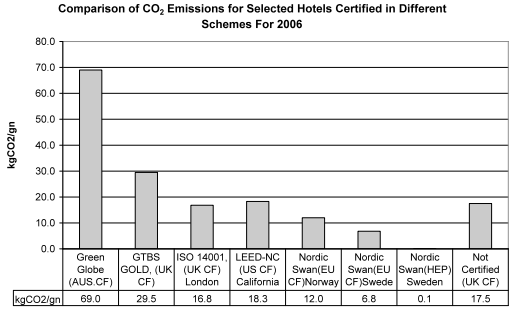

Fig 5. A series of CO_2 emissions, calculated by authors approved method using regional conversion factors, for selected hotels certified in different schemes for 2006.

4.5 An example of reported CO_2 emissions for 2006 for 29 hotels certified within the same scheme

Figure 6 shows the range of CO_2 emissions within the same scheme and have received the same level of certification. It is acknowledged that the scheme in question has been upgraded and now awards three levels of awards, bronze, silver and gold awarded on the basis of length of certification and not on performance level. However, since gold certification is awarded to hotels being certified for over five years it can mislead the guest that its energy performance is better than a bronze hotel.

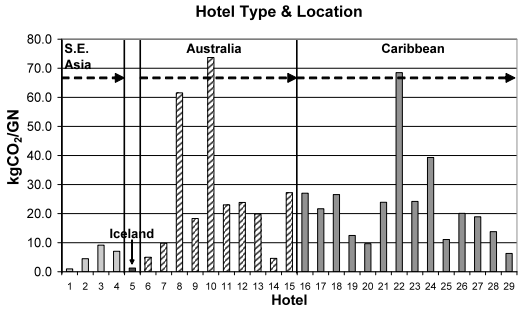

Fig 6 A Range of reported CO_2 emissions within the same certification scheme with the same level

The calculated CO_2 emissions are based on the figures given in the certification benchmarking assessment report sent to the respective hotels. However, it should be noted that numerical errors in reporting have been found between the CO_2 emissions calculations provided by the benchmarking assessment report and our calculations. These numerical errors in reporting undermine confidence in the scheme.

5. Conclusion

The environmental performance of certified hotels, with respect to CO_2 emissions, was investigated to study the effectiveness of certification in reducing global CO_2 emissions in the hotel sector. Preliminary results from the analysis of the primary raw data collected from the selected hotels have shown no direct reduction in CO_2 emissions attributable to certification alone.

Several fundamental weaknesses were identified:

- No benchmarking of CO_2 emissions in schemes (*except one*)
- Incorrect accounting for CO_2
- Adding different types of energy together *i.e delivered electricity and fuels.*
- Weighting of categories in the awarding of credits for certification.
- Numerical errors in calculations
- Confusing proliferation of certification schemes with varying criteria and benchmarks.
- Lack of transparency
    - in the publication of benchmarks in the public domain which allows a wide range of emissions to occur within the same scheme.
    - in the declaration of the criteria used by the certifying bodies to judge the data from the hotels. For example, they may be using out of date benchmarks and there may be some occasions where they are using average rather than good / best practice for comparison.
    - in the way the data is collected and sent to the certifying body and the accounting of numbers of people *i.e. night, day, resident staff* and areas included.
    - in the accounting of the reported CO_2 emissions. For example, in some hotels the reported CO_2 emissions have included guest and employee nights, others night and day/conference guests whilst others have only included guest nights. This has a direct impact on the CO_2 emissions calculations i.e a hotel including guest and employee nights would result in CO_2 emissions of 20kgCO_2/gn but without the employee nights would be 85kgCO_2/gn. Clearly, in the case of a remote island location where employees live on-site this is a completely justified calculation however this should be weighted into the calculations if the same level of certification is to be awarded to different types of hotels.

- in identifying different parts of the hotel that may have different performance and identifying the difference between where an improvement is made and claims are made for that improvement (if there is no sub-metering.)
- in the identification of final energy use *i.e whole building, conference hall, bedroom*
- as to what kind of building is being used to establish the benchmarks against which the subject hotel is being judged *i.e. LEED*
- in what benchmarks have been used in the award of certification.
- Lack of disclosure to the public that the certification has been awarded for design intent or for operational performance

Certification is commendable for addressing a wide range of impacts but it does not account for CO_2 emissions in audits. Certification must make the calculation of emissions a mandatory category which has got to be properly computed. The weighting of this and other categories must be rigorous and reflect the level of impact on global CO_2 emissions.

A simple, accurate method of CO_2 emissions calculation needs to be developed which can be adopted universally. CO_2 emissions per guest night would enable comparisons between different size hotels. CO_2 emissions benchmarks could be set for individual zones within hotels. If a key performance indicator (kg CO_2 per guest night) is to be developed then the calculation method needs to be transparent and standardized. This should be made a compulsory requirement of any performance analysis.

Compulsory sub-metering would identify exceptional or unusual patterns of energy consumption, help diagnose the cause enabling recommendations to be made to rectify the problem thus reducing the environmental impact of the hotel. An independent assessor or dedicated in-house team would decide the monitoring points and specify or install the sub-meters on site to ensure accurate data collection and feedback.

Three levels of assessment could be made; 1) Calculation of global CO_2 emissions based on fuel bills; 2) Separation of *architectural e.g.* space heating/cooling and lighting, and *domestic* energy use e.g . hot water, laundry etc. and identification of associated fuel use for each separated function. 3) *Sub-division* within architectural and domestic energy categories.

This method is the first step of the diagnostic process leading to a solution to rectify the problem thus reducing the environmental impact of the hotel. However, tourism-induced CO_2 emissions are unlikely to be reduced only through voluntary, "soft" instruments such as our proposed method of CO_2 emissions calculation but need to be coupled with indispensable "hard" instruments such as the removal of tax exemptions on aviation fuel or the introduction of a mandatory carbon tax. This would start hotels focusing attention on their CO_2 emissions.

7. References

1. Bohdanowicz, P., (2006), Responsible resource management in hotels - attitudes, indicators, tools and strategies. Royal Institute of Technology Stockholm, Sweden.

2. CLEAN-E (2006) Overview of existing green power labelling schemes eIntelligent Energy Europe, European Commission, [Online], Available:http://www.eugenestandard.org/mdb/publi/20_CLEAN-E Final Report.pdf [16 June 2007-06-16]

3. Benchmarking Assessment Report Accommodation Benchmarking (For Selected Hotels), EC3 Green Globe.

4. Eugene Standard (2005). Eugene Standard Technical Document. Eugene Standard: Brussels.

5. Gössling, S., (2002) Global environmental consequences of tourism. *Global Environ. Change.* 12(4):283-302.

6. HER, Hilton Environmental Reporting [Online – Intranet courtesy of Bohdanowicz & Bergkvist], Available:http://www.hiltonher.com [2007-05-10]

7. Honey, M., (2002) Ecotourism and Certification, Setting Standards in Practice, *Island Press*, Washington, Covelo, London.

8. Intergovernmental Panel on Climate Change (2007a,b.c). Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: *Cambridge University Press.*

9. Hart, P., Becken, S., Turney, I., (2004) Approaches to offsetting greenhouse gas emissions from tourism. In Matzarakis, A., de Freitas, C.R., Scott (eds.) Advances in Tourism Climatology. Ber. Meteor. Inst. Univ. Freiburg Nr. 12, p-97-104

10. Kramer, B., (2007) *LEED*, M.Phil. thesis, Dept. Architecture, University of Cambridge, UK.

11. Karlsson, J.F., Moshfegh B., *Renewable Energy 32* (2007) 1830–1841

12. LEED® for Existing Buildings: Operations & Maintenance, U.S. Green Building Council, April 2008

13. Nordic Ecolabelling, (2007) *Swan labeling of Hotels and youth hostels*, Version 3.0, 14 June 2007 - 30 June 2012.

14. Scott, D., et. Al., (2007) Climate Change and Tourism: Responding to Global Challenges - Advanced Summary. Prepared for the Second International Conference on Climate Change and Tourism (UNWTO, UNEP, WMO), Davos, Switzerland, 13 October 2007

15. Sjödin J, Grönqvist S. Emissions accounting for use and supply of electricity in the Nordic market. *Energy Policy 2004*;32:1555–64.

16. UNEP, WTO., Making Tourism more Sustainable: A guide for policy makers, 2005.