

# LEARNING ENERGY MANAGEMENT PRACTICES IN SMALL AND MEDIUM HOTEL USING ENVIROTEL

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## Abstract

Nowadays, the competencies based curriculum has been chosen by many higher education institutions to equip students with adequate knowledge and appropriate skill in which needed for their future carrier. This condition implies a creative and effective lecture delivering as well as appropriate learning process. The challenge is to provide competencies for recent issues, include sustainable energy management to mitigate global warming. This paper presents an overview and application of ENVIROTEL, an interactive e-tool that is useful as one of learning resources in the subject of energy management, particularly in the area of tourism. The tool contains important features related to the energy and environmental practices in small and medium hotel which is attractively packaged. The students found this e-tool is helpful not only to generate competencies on energy and environmental management but also raise their awareness in keeping the resources in a sustainable manner.

**Keywords:** small and medium hotel, ENVIROTEL, sustainable energy management, global warming.

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## 1. Introduction

Utilization of energy based on fossil fuel mainly in the transportation and power generation sector is widely recognized as the main driver which resulted in environmental damage as well as ecological disturbance. Commercial sector is rarely mentioned among highly energy sector which consume large amount of energy such as industrial and residential, in aggregate. Nevertheless, its role should not be simply ignored compared to other sectors as greenhouse gas emitter due to non-renewable energy utilization. Tourism activities are no doubt having a quantifiable contribution to environmental emission, Mohanty (2009). Accommodation is one tourism sub sector that many types of resources, including electricity, gas, and water, are involved in the process. Generally, star rating hotels have no difficulty in carrying good practices on handling energy and environmental problems in their business process. Opposite condition occurs in small and medium scale hotel due to lack of resources and awareness to conserve energy and mitigate environmental damage. Regarding to the hotel physical size, as per regulation, small hotels are those hotels having up to 25 guest rooms whereas medium hotels are with up to 100 guest rooms, Adrianto (2010).

The higher education institutions in other side are now facing a great challenge to make real contribution towards sustainable development in any sectors including energy management and environmental protection. One effort is through applying the competencies based curriculum, some higher education institutions essentially attempts to deliver not only sufficient knowledge for their

students, but also adequate skills required for solving the real problem that they might find in the real situation during their study and in the future. Regarding to sustainable development issue through energy and resources management, students are need to be equipped with adequate competencies. Generally, the competencies can be seen in terms of capability in understanding the problem status, documenting relevant data, analyzing several opportunities and proposing possible solution and strategies.

This paper describes the ENVIROTEL, an interactive animation tool used in the class of energy system management in electrical engineering department Petra Christian University as one of lecturing resources based on multimedia. The key features of the tool are briefly discussed, followed by the tool practicing. Discussion and conclusion are finally presented.

## 2. Overview of ENVIROTEL

ENVIROTEL is an e-tool published by United Nation Environment Programme, Division of Technology, Industry and Economics (UNEP-DTIE) with funding from the French environment and Energy Management Agency (ADEME). This interactive animation module is appeared in the form of CD-ROM, in which may be reproduced in whole or in part in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made, United Nations Environment Programme (2009). Figure 1 presents the early page display of ENVIROTEL.



Figure 1. Early page display of ENVIROTEL

For the user benefit, the welcome section is provided to show the module objectives, contents, expected outcomes, and more importantly, information needed to access the e-tool, as depicted in Figure 2. Here, user should enter the hotel or resort name and the number of guest rooms. Based on this point, user shall see the relationship between information given to the module with the analysis result.

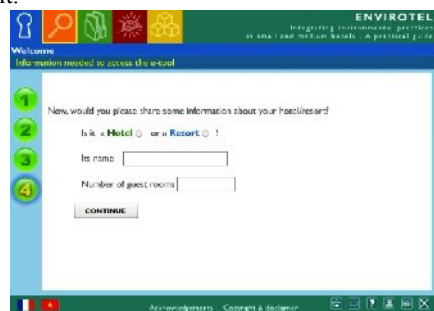


Figure 2. Information needed for analysis

The objectives of the module include to raise awareness of the need for environmental management, to draw attention to environmental management activities, and to provide basic knowledge and tips in increasing environmental management and resource efficiency in small and medium hotel. From this point, the key features are provided to assist decision maker in making the hotel greener and also provide examples of best practices. The resources aspects involved in the module are: communication, energy, water, waste, air quality and noise, and purchasing policy. Among the expected outcomes are the ability to track and improve the environmental performance of the hotel and enhancement of resources decision-making skills to reduce the operating costs and improve the quality of service. In the following description, only the energy aspect, which is mostly related to the energy system management subject, is covered throughout module features.

### 3. Assessing The Module Features

As depicted in Figure 1, module features consists of: environment and resource management status, documenting relevant data of the hotel,

sharing good environmental practices, and sustainable resources management strategies. Each feature along with its energy-related aspect is briefly described in the following sub sections. Here, the sub sections title are taken from the features title then they are modified by adding energy aspect to give a straightforward understanding.

#### 3.1 Energy Management Status

In this feature, the current status of hotel energy practices is assessed. There will be a few questions about existing energy-related practices in different areas of the hotel. The areas include: reception/lobby, guest rooms, administration office, kitchen and restaurant, laundry, swimming pool, and garden. User can choose which area of the hotel to be assessed. For example, if the guest room area is selected, after an icon representing energy in the left pane is click, a few questions about existing energy practices in the guest rooms will be arise to be answered. User need to click the applicable answer for each question by clicking one of available options: Yes, No, or N/A. Figure 3 shows a guest room display in this feature.



Figure 3. Guest room display in the environment and resource management status

As seen on Figure 4, after all applicable answers are submitted, there will be a corresponding comment. A "good" mark will be applicable if the hotel has adopted 2/4 good practices, with the additional comment "however there is still potential for improvement".



Figure 4. Mark and comment for applicable answer to energy practices in the guest room

### 3.2 Documenting Relevant Energy Data

The current energy consumption in a year is documented so user can better monitor their progress over time. Firstly, user has to type number of rooms sold per month (in room-nights). Then after, monthly electricity consumption (in kWh) should be entered. Finally, the specific energy consumption (in kWh/room-night) will be automatically calculated and appeared. Chart depicted monthly specific electricity consumption (SEC, in kWh/room-nights) as the calculation result is also provided altogether with the link for download a database file for analyzing future data.

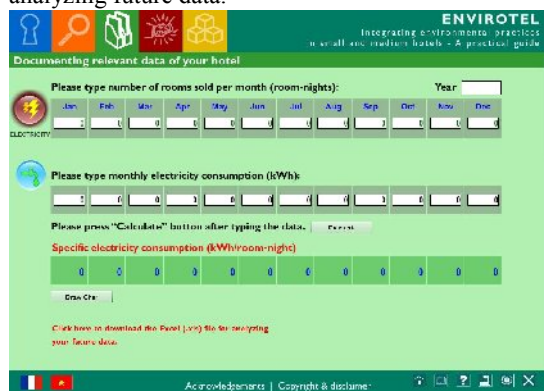


Figure 5. Documenting monthly electricity consumption to obtain SEC

### 3.3 Sharing Good Energy Practices

The e-tool has provided some good practices in which user can learn to make a resource-efficient and environment-friendly hotel. In the area of energy, user can go through an energy generation overview or directly select the hotel area to get information how energy can be used efficiently. In the overview part, there will be an animation how electricity is generated, transmitted, and consumed. In addition, the effect of applying energy efficiency measures through changing light bulb into energy efficient lamp is shown towards power loss and percentage energy saving.



Figure 6. Overview of combined energy efficient system with energy conservation practice

Suppose the guest room area is selected, there will be blinking signs in several points which represents appliance that gives information on how energy can be used efficiently. To get the specific information in a particular point, simply click the blinking signs in that point.



Figure 7. Possible good energy practices in several points at the guest room area

### 3.4 Sustainable Energy Management Strategies

In the last section of e-tool, sustainable resource management strategies are proposed so the user can think of better solutions when they retrofit or build a new hotel. In the area of energy, there are some topics covered in the strategy options, include sustainable design, appliances, and renewable energy. There also a discussion on important points such as: the necessity of saving energy, the main uses of energy in a hotel, and approach to save energy.



Figure 8. Example of energy management strategies on lighting appliances

## 4. Case Study Using ENVIROTEL

A visitation to a two-story small hotel having 26 guest rooms had been conducted. The objective of this activity was to get discussed with the responsible people who manage the hotel for the possibility in applying short assessment using this tool. Moreover, this was done as an effort to help small hotel understand and analyze their resource

status, especially those related to energy utilization. Important findings related to energy management status and energy data documentation are briefly presented in the following sub sections.

**4.1 Energy-Related Practicing Status**

A short survey accompanied with the person in charge had been carried out so that the energy-related practicing status can be captured. The surveyed areas for the small hotel include: lobby/reception area, guest room, administration office, laundry, and kitchen. The listed questions were entirely taken from the available questions on the e-tool. There are different questions for each area which have to be answered according to the current condition. In administration office for example, there are five questions on the basis of “Yes/No” answer as follows: Do you know the electricity price that your hotel is paying? Do you know the monthly electricity consumption of your hotel? Do you switch off computer monitors when not in use for more than 15 minutes? Do you turn off the photocopier during off-hours? Do you use fresh air by keeping the windows open when the outside conditions are favorable? The energy-related practicing status on each area is summarized in Table 1.

Table 1. Energy-related practicing status in a surveyed small hotel

Area and Question	Status
Lobby/reception	
Having use key-card or main switches to cut-off electricity in unoccupied guest room	No
Adopting energy saving light bulb	No
Making good use of day lighting and switch off lights during the day time	Yes
Kitchen	
Usually keep devices clean to maximize the heat transfer	Yes
Checking all burners for uneven or yellow flame to adjust them	No
Turning off the kitchen exhaust hood when possible	No
Using energy efficient appliances	No
Laundry	
Operating washing machines at full load	Yes
Avoiding laundry operation during the peak load	No
Favoring drying of wet clothes in the open or under the sun, when possible	Yes
Having energy efficient laundry appliances	No
Programming washing and drying machine	No
Guest room	
Adjusting temperature setting to ensure comfort level and minimum energy use	No

Keeping the doors and windows of air conditioned areas closed	Yes
Using shades and blinds to keep the direct sunlight out	Yes
Ensuring that air conditioning is switch off or not use more than necessary in unoccupied areas	Yes
Administration office	
Knowing the electricity price that hotel is paying	No
Knowing monthly hotel’s electricity consumption	Yes
Switching off computer monitors when not in use for more than 15 minutes	No
Turning off photocopier during off-hours	No
Using fresh air by keeping windows open when outside conditions are favorable	Yes

As revealed in Table 1, comments generated by the e-tool for the energy-related practicing status are differentiated with respect to each area as follows: “A lot of room for improvement with reviewing the activities”: kitchen; “Good with potential for improvement”: lobby, administration office, laundry; “Very good, maintain the status and continue improving”: guest room. Based on the survey result, we can infer that opportunities in improving the energy-related practicing status at the surveyed hotel are quite opened. In fact, only guest room is confirmed “Very good” whereas the other three areas i.e. lobby, administration office, and laundry are obtained “Good” mark without few good practices. In addition, less good practice in the kitchen area implies low environmental and energy efficiency awareness, thus future activities and appliances utilized in the kitchen could possibly be improved in accordance with the suggested energy-related practices in the module.

**4.2 Specific Electricity Consumption**

Monthly electricity consumption (kWh) of the hotel and number of room sold per month (room-nights) are collected based on available notes and several electricity billing statements for 2010. The required data and calculated specific energy consumption of the hotel are given in Table 2.

Table 2. Specific energy consumption of the surveyed hotel

Month	Number of room sold per month (room-nights)	Monthly electricity consumption (kWh)	Specific electricity consumption (kWh/room-night)
Jan	484	2591	5.35
Feb	422	2260	5.36
Mar	336	1762	5.24
Apr	308	1657	5.38

Month	Number of room sold per month (room-nights)	Monthly electricity consumption (kWh)	Specific electricity consumption (kWh/room-night)
May	332	1778	5.36
Jun	484	2598	5.37
Jul	407	2156	5.30
Aug	532	2827	5.31
Sep	390	2128	5.46
Oct	429	2340	5.45
Nov	410	2196	5.36
Dec	468	2368	5.06

Monthly SEC for a guest room can be calculated by multiplying the SEC (kWh/room-night) with number of day in a month. Thus, the monthly SEC per guest room will be in the range of 150-163.8 kWh. The least monthly SEC per guest room obtained for February whereas the highest one obtained for September. This index is better if compared to the average monthly SEC per guest room in other country, for example Uganda, Ministry of Energy and mineral Development (2007). Meanwhile, the average kWh per overnight stay is about 5.33. Converting the index into yearly electricity consumption in kWh/m<sup>2</sup>, the surveyed hotel rating will be around 60 kWh/m<sup>2</sup>, quite well for small hotel if compared to the given energy efficiency rating for small hotel in European Union, Bohdanowicz (2001), provided the total hotel area is 550 m<sup>2</sup> and electricity is obtained only from the grid.

Benefits of using ENVIROTEL are revealed from the case study. The module content and complexity is therefore sufficient to be used as resources in learning and analyzing energy-resources management, specifically for small and medium scale hotel. However, it might be better if option to documenting electricity measurement in the guest room or other areas is provided so that the SEC could be obtained on the basis of either overall electricity consumption or solely based on specific area's consumption.

## 5. Conclusion

Utilization of multimedia based resources for learning energy management in tourism sector is discussed in this paper. The role of such interactive module in the learning process is strategic as the higher education institutes are striving to develop students' knowledge and skill in the area of energy efficiency practice. Besides, the module has shown its benefit to track and analyze energy-related practice and consumption through the survey activity. Considering the benefit of ENVIROTEL, a research to investigate energy-related practicing status of small and medium hotel representing national condition is now being planned.

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