THE UNIVERSITY OF CALGARY

An Environmental Management Strategy for the Auberge Mont – Royal d'Angkor Hotel, Siem Reap Town, Cambodia

By

Rachael B. Morris

A MASTER'S DEGREE PROJECT SUBMITTED TO THE FACULTY OF ENVIRONMENTAL DESIGN IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE DEGREE OF MASTER OF ENVIRONMENTAL DESIGN

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Abstract

An Environmental Management Strategy for the Auberge Mont – Royal d'Angor hotel, Siem Reap Town, Cambodia

By
Rachael B. Morris
June 2002

A Master's Degree Project Submitted to the Faculty of Environmental Design in Partial Fulfillment of the Requirements of the Degree of the Master of Environmental Design

Supervisor
William A. Ross

This Master's Degree Project applies environmental auditing methodology to the development of an environmental management strategy for the Auberge Mont-Royal d'Angkor Hotel in Siem Reap Town, Cambodia. This project acts as a contribution to the stakeholder consultation phase of a comprehensive environmental management plan for hotel development and operation in Siem Reap Town. The results of this project, primarily the operational cost savings associated with environmental management, are intended to be disseminated to other hotels in Siem Reap Town in an effort to contribute to the mitigation of the cumulative environmental impacts of hotel development and operation.

The major conclusions and recommendations of this project are: (1) Environmental auditing is an important and applicable precursor to the development of an environmental management strategy for hotels; (2) The potential and actual operational cost savings associated with environmental management at hotels are a driving force for hotels to participate in environmental initiatives. As a result, they should be disseminated as widely as possible in Siem Reap Town. The author recommends that this be done through workshops directed at hotel operators; (3) Any further environmental audits or management strategy development for hotels in Siem Reap Town should focus on the cumulative impacts of hotel operations; and (4) Further projects of this kind should be similarly aligned with the comprehensive environmental management plan referred to above.

Key Words: Environmental Auditing, Environmental Management, Hotel Operation, Sustainable Tourism, Good Housekepping, Siem Reap Town, Cambodia

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I would like to acknowledge and thank Mr. Phloeun Prim, Ms. Sophea Touch Srey, and all the staff at the Auberge Mont – Royal d'Angkor Hotel for having the foresight and courage to participate in this project, the first of its kind in Siem Reap Town.

Personally, I would like to thank my family who, from Calgary, Vancouver, and Ecuador provided unconditional support and encouragement. Lastly, I thank Nicole Sifton for bringing levity and perspective to this process and Stephen Entwisle for being the motivating voice of reason.

THE UNIVERSITY OF CALGARY

FACULTY OF ENVIRONMENTAL DESIGN

The undersigned certify that they have read, and recommend to the Faculty of Environmental Design for acceptance, a Master's Degree Project entitled: An Environmental Management Plan for the Auberge Mont-Royal d'Angkor Hotel, Siem Reap Town, Cambodia submitted by Rachael B. Morris in partial fulfillment of the requirements for the degree of Master of Environmental Design.

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Date: June 28, 2002

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Chapter 1: Introduction and Methodology

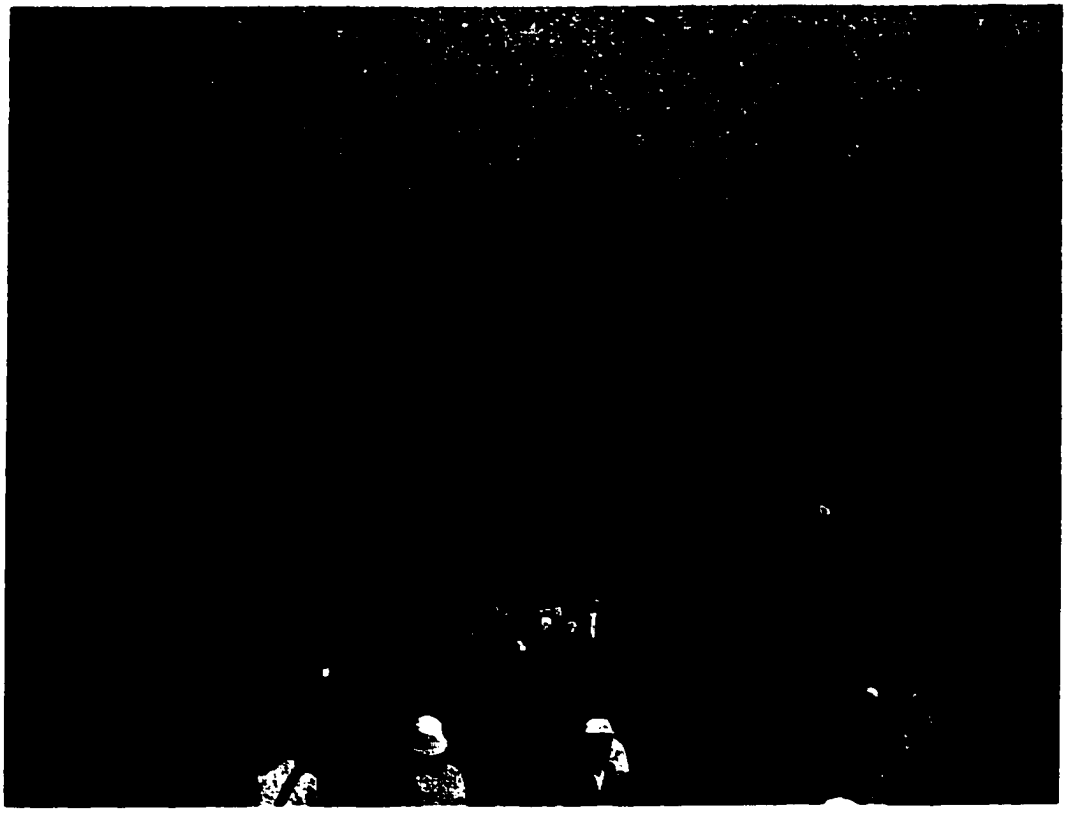
Introduction

For the past few decades political and economic volatility have made Cambodia inaccessible to all but a very few tourists (Ray 2000). However, recent movements towards political stability have inspired many travel guides, tour operators and tourism related businesses to praise the possibilities of Cambodia as a popular tourist destination. Bordered by Thailand to the northwest, Vietnam in the east, Lao PDR in the north and the Gulf of Thailand in the south (see Figure 1.0), Cambodia has much to offer tourists (Ray 2000).

Figure 1.0 Map of S.E. Asia

These attractions include national parks, beaches, rivers, and temples. The volume of tourism at these attractions has increased dramatically in recent years (World Tourism Organization 2001).

Cambodia in general is still quite underdeveloped and there do exist safety concerns (Ray 2000). As a result, much of the current tourism traffic is concentrated in several key areas. These include the capital city of Phnom Penh, the coastal city of Sihanoukville, and the UNESCO World Heritage Site of Angkor Wat located in the province of Siem Reap. The rapid increase in tourism numbers has been met with an equally rapid development of tourism related businesses such as hotels. This development is particularly apparent in the capital of Siem Reap province, Siem Reap Town (Botumroath 1995).



Tourists at the Temples of Angkor Wat

Heritage laws and regulations have been developed and enforced to protect the UNESCO World Heritage Site of Angkor Wat (Siphana and Denora No Date). This has resulted in a halt on development on the site itself. Siem Reap Town, located 6 km from the gates to Angkor Wat, has become the primary provider of services for tourists in the area. These services include businesses such as banks, transportation, shopping, restaurants and, hotels.

Hotel development in Siem Reap Town has been associated with several major environmental impacts (Skeith et al 2000). These impacts are, for the most part, a result of rapid hotel development that is quickly surpassing the capacity of the poor local infrastructure. These environmental impacts are outlined in an *Environmental Impact Assessment of Hotel Development in Siem Reap Town, Cambodia* (Skeith et al 2000). They include negative environmental impacts related to energy consumption, water consumption and quality, wastewater management and solid waste management.

The environmental impacts of hotel operation appear to vary depending on the size, occupancy, and the management capacity of hotel operators (Mohanty Pers. Comm. April 2001). It has been suggested though, that it is the cumulative impacts of all hotels in Siem Reap Town that presents the greatest threat to the local environment (Skeith et al 2000). As a result, any initiative aimed at mitigating the environmental impacts of hotel development and operation in Siem Reap Town should be directed at all hotels.

This document is a Master's Degree Project that was designed to contribute to the mitigation of the cumulative environmental effects of hotel development and operation in Siem Reap Town. Skeith et al 2000 have proposed a larger Environmental Management Plan for the hotel sector in Siem Reap Town. It contains measures directed at mitigating the environmental impacts identified during the Environmental Impact Assessment, which engage all stakeholders. The Environmental Management Plan involves a public consultation phase designed to assess the capacity of local stakeholders to participate and maintain an environmental initiative for hotels.

Hotel owners, as key stakeholders, are an important element of this consultation. Interviews with hotel owners in Siem Reap Town indicate that the major driving forces for environmental management are related to the associated business benefits. These include operational cost savings resulting from energy and water conservation, competitive advantages associated with an increasing movement towards environmental responsibility on the part of tourists and tour operators, and the effect of hotel operation on the capacity of the town to sustain tourism.

However, many hotel operators in Siem Reap Town are hesitant to implement environmental management initiatives because they perceive them to be complicated and expensive (Prim Pers. Comm. May 2001). This Master's Degree Project works with a project hotel, the Auberge Mont-Royal d'Angkor, in Siem Reap Town to design an environmental management strategy for the purposes of representing the business benefits of environmental impact mitigation and to demonstrate that the process need not be expensive or complicated.

This project is focused on the following components:

- Identifying the necessary resources and designing an appropriate methodology;
- Documenting the environmental management strategy design process and the potential environmental improvements and business benefits associated with implementation;
- Developing recommendations with respect to implementing the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel;
- Developing recommendations for disseminating the above to hotel operators in Siem Reap Town, and;
- Developing recommendations with respect to incorporating the project into the stakeholder consultation phase of the Environmental Management Plan development for the hotel sector in Siem Reap Town.

This document is organized into the following chapters:

Chapter 1 Introduction and Methodology: Outlines the types of literature and other information reviewed in preparation for and during the project.

Chapter 2 The Environmental Impacts of Hotel Operation: Mitigation Initiatives in Siem Reap Town, Cambodia: Discusses briefly the impacts of tourism and hotel operation on destinations, particularly in developing countries. Includes an overview of environmental management initiatives, including the Environmental Impact Assessment and recommendation for an Environmental Management Plan, in Siem

Reap Town. Outlines the role of the environmental management strategy in the development of the EMP and introduces the Auberge Mont-Royal d'Angkor hotel.

Chapter 3 Environmental Auditing and Environmental Management Strategies in Hotels: Relationships and Methodology: Focuses largely on the relationship between environmental auditing and environmental management strategy development and implementation. Reviews an environmental auditing methodology for hotels and outlines how it was applied to the project hotel.

Chapter 4 Audit Findings, Improvement Opportunities and Feasibility Assessment: Details the audit findings, improvement opportunities, feasibility assessments and implementation potential associated with the project. Presents the improvement opportunities selected by the owner/manager at the Auberge Mont-Royal d'Angkor hotel for potential implementation.

Chapter 5 From Environmental Audit to Environmental Management Strategy: Discusses the role of the environmental audit in the environmental management strategy as well as the necessary additional environmental management elements for the Auberge Mont-Royal d'Angkor hotel.

Chapter 6 Conclusions and Recommendations: Presents conclusions and recommends approaches to implementing the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel and its incorporation into the development of the larger Environmental Management Plan for Siem Reap Town.

Methodology

The background information collected in the preliminary phase of this project was acquired in the following ways:

- Literature review;
- Unstructured interviews;
- Working at the project hotel and carrying out various components of the Environmental Management Strategy; and
- Participation in a previous project involving the hotel sector in Siem Reap Town.

This information was collected primarily to assess the suitability of the initial methodology developed by the author for the Master's Degree Project proposal. It was used, in general, to fill methodological gaps, answer questions as they arose during the project, and to support the process of making project recommendations.

Literature Review

The author reviewed the literature to determine what methodologies exist for environmental auditing, environmental management and hotel operation. These materials included guidance documents on environmental management published for hotels, reports from previous environmental audits in hotels, postgraduate theses related to tourism and hotel operation in S.E. Asia and Cambodia in particular, environmental workshop proceedings from Siem Reap Town, and various support materials. The application and results of this review are distributed throughout this document and the literary resources are presented in the list of references.

Interviews

The interviews conducted by the author during this project were unstructured. This decision was made based on the socio-economic conditions discussed in Chapter 2. In short, many Cambodians are uncomfortable discussing business, environmental and financial issues outside of close confidence. The author's previous experience working with hotels in Siem Reap suggests that hotel operators, in particular, are likely to feel uncomfortable during highly structured interviews. This project relies, in large part on their participation. Therefore the author chose a less rigid interviewing style. The questions asked during the interviews provided the author with important information with respect to state of current business practices in the Siem Reap Town hotel sector and the capacity of local hotel operators to implement an environmental management strategy. The interviews were conducted with several key groups of people that included:

- **Mr. Phloeun Prim:** As the owner and general management of the Auberge Mont-Royal d'Angkor hotel, his input and support was crucial to the success of this project. The interviews took place every two to three days during the author's extensive fieldwork sessions in Siem Reap Town. The topics included the project methodology, details of operation at the hotel, assessment of the improvement opportunities and background information on the hotel sector in Siem Reap Town;

- **Various environmental management and engineering professionals:** These interviews were directed, much like the literature review, at determining the accuracy of the environmental audit methodology. The interviewees were

primarily faculty at the Urban Environmental Engineering Management Program at the Asian Institute of Technology in Bangkok, Thailand as that faculty does much work on sustainable tourism, environmental engineering, and environmental management in S.E. Asia; and

- **Hotel operators in Siem Reap Town:** These interviews were important as the hotel operators provided the author with background and contextual information on the hotel industry. Equally important was the feedback acquired through the interviews with respect to particulars of the project and the potential of future environmental management work with hotels in Siem Reap Town. Many of these hotel operators were involved in the author's previous environmental management work in Siem Reap Town (described below). As a result, they were familiar with environmental issues and, for the most part, willing to participate in an interview.

Work at the Project Hotel

The time spent at the project hotel allowed the author to observe operational details, management processes, and existing resources.

Previous Project Work

The previous project referred to in the methodology and in Chapter 2 was conducted by an interdisciplinary team that included the author. As part of the fulfillment of the requirements of a studio project, the team developed a possible strategy for involving the Siem Reap Provincial Department of Environment in environmental management in the Siem Reap Town hotel sector. This previous project provided much of the

background information and resources required to develop the proposal for the project described in this document.

The author has chosen to distribute the methodological details with respect to the environmental audit process which is designed to provide the preliminary information necessary to develop the environmental management strategy and the environmental management strategy development itself in the applicable document chapters. However, it is appropriate to discuss how these methods were developed.

The author developed a preliminary environmental audit methodology based on the following resources:

- The Canadian Universities Consortium *A Manual for Cleaner Production in Hotels* (Parasnis, Sevvingson and Mandke 2000): This guidance document is directed at hotels in Thailand and is based on United Nations methodology. The contents of the document are relatively academic compared to other resources reviewed by the author and provided a rigorous and systematic methodology. The author suggests that these guidelines are likely directed at larger hotels or hotels with a relatively large pool of resources.

- The IHA[1], IHEI[2] and UNEP[3]. *Environmental Action Pack for Hotels: Practical Steps to Benefit Your Business and the Environment* (IHA, IHEI and UNEP 1995): This document has been designed to act as an environmental

[1] International Hotels Association
[2] International Hotels Environment Initiative
[3] United Nations Environment Program

management resource for hotel operators. The content of this resource appear to be directed towards smaller and medium sized hotels or towards hotel operators with relatively little environmental management experience.

- The SPASI[4] and UNDP[5] *National Environmental Auditing Manual for Hotels* (Cehab et. al. 2001). The Government of Lebanon, in conjunction with the UNDP, has developed this guidance document. It was developed for hotels in Lebanon that may be subject to some of the same developing country issues as hotels in Cambodia such as limited resources and familiarity with environmental management. The author used these guidelines to supplement the development of the methodology. and

- The author used the information gathered through the literature review, interviews and previous experience to arrive at the final environmental auditing methodology.

The environmental management strategy methodology was developed similarly, using several resources. For example:

- The IHRA[6] and UNEP. 1996. *Environmental Good Practice in Hotels. Case Studies from the International Hotel and Restaurant Association Environmental Award* (IHRA and UNEP 1996): These case studies describe the environmental management initiatives at many international hotels. They

[4] Strengthening the Permitting and Auditing System for Industries
[5] United Nations Development Program
[6] International Hotel and Restaurant Association

include several S.E. Asian examples and comments on the processes involved in the development of the individual environmental initiatives. The author used these case studies to act as benchmarks for the development of the environmental management strategy methodology.

- The book *Tools for Environmental Management* (Thompson 2002): This book provides an outline of topics associated with environmental management. It contains a set of 22 environmental management tools and a description of how each tool should be applied to an environmental management initiative. and

- Several documents describing environmental management initiatives in tropical countries: These included a case study of the introduction of environmental management in the Jamaican hotel industry (Mead and del Monaco 2001), a guidance document for environmental management in the Thai hotel industry (Parasnis 1998), a review of environmental tactics used by hotels in Mexico (Revilla, Dodd, and Hoover 2001), and a strategy for increasing the participation of hotels in environmental management programs with a focus on Indian case studies (Mandke 1996). The author to ensure that the environmental management strategy methodology was appropriate for application in a tropical country examined these case studies, reviews and strategies. Special consideration was given to content in these resources with respect to climatic factors, motivation and awareness on the part of hotels, and available support resources for hotels as these aspects are likely to be applicable to hotels in Siem Reap Town.

Chapter 2:
The Environmental Impacts of Hotel Operation in Siem Reap Town

2.0 Sustainable Tourism and the Hotel Industry

In the past, tourism development has been touted as a low impact development opportunity with the potential to contribute substantially to economic and infrastructure development, particularly for developing countries (Gossling 2000). In reality, tourism, one of the worlds fastest growing industries, is sometimes associated with major environmental impacts (Revilla, Dodd and Hoover 2001). Although these impacts are often ascribed to degradation caused by visitor traffic, they can be attributed, in large part, to the operation of tourism related businesses such as hotels (Hobson and Essex 2001).

Butler (1980) suggests that the environmental degradation of a destination may result in a decline of tourism, directly affecting the survival of tourism related businesses. Consequently the sustainability of the tourism industry and the success of tourism related businesses rely, to a certain extent, on the quality of the environment. It is becoming recognized that the sustainability of tourism and, by association, the hotel industry, will hinge on the management of its environmental impacts. This realization has motivated the tourism industry to sanction the concept of sustainability (Hobson and Essex 2001).

In 1995 the International Hotel and Environment Initiative, in response to sustainability issues, published a manual guiding environmental improvements for hotels (IHA, IHEI and UNEP 1995). Other international hotel groups have also been involved in the development of environmental and sustainability initiatives (Hobson

and Essex 2001). These initiatives, regulatory requirements, and increasing environmental awareness on the part of tourists have stimulated an industry movement towards environmental management and responsibility.

2.1 Hotel Operation in Developing Countries

The World Tourism Organization (WTO) *Statistical Yearbook of Tourism* (WTO 1998) highlights an increase in the dependence of developing countries on tourism. Gossling (2000) points out that tropical developing countries in particular, are rapidly developing their tourism industries to strengthen their economies. Many of these countries lack the regulatory and economic infrastructure to sustain the intensity of the tourism they are soliciting. As a result, the environmental impacts of tourism related businesses, such as hotels, are often more significant in developing countries than elsewhere. An example of the potential environmental impacts of hotels in developing countries is presented in Table 2.0 on the following page:

Table 2.0 Potential Environmental Impacts of Hotels in Developing Countries

Human Impacts	Environmental Degradation	Resource Use
Noise Health of Staff Smell Crowding	CO2 Emissions CFC Emissions Smoke Location in Fragile Places	Wasting Energy Wasting Water Wasting Food Transportation Wastage Packaging Waste Building Materials

Source: (Adapted from Revilla, Dodd and Hoover 2001)

Hotels that operate in developing countries are motivated to implement environmental initiatives for several reasons:

- The viability of their operations is dependant, in part, on the quality of the environment in which they operate (Hobson and Essex 2001),
- Operating costs in developing countries are typically considerably higher than those in developed countries. Environmental efficiency and conservation will help to reduce operating costs (Revilla, Dodd and Hoover 2001),
- Many hotels are integrated with other tourism related businesses such as tour operators and travel agents (Kusluvan and Karamustafa 2001). Tour operators, for example, direct the current of visitors to specific destinations, services and accommodations through prearranged packages. In this sense, they act as an influence on the development of tourist amenities at destinations and represent a steady source of income to preferred operations. Many hotels in developing countries rely on packaged tours for a large percentage of their clientele (Kusluvan and Karamustafa 2001). Recent sustainability movements within

the tourism industry such as the UNEP[7], UNESCO[8] and WTO[9] Tour Operator's Initiative (WTO, UNESCO and UNEP 2001) are actively promoting a preference towards environmentally responsible businesses. This will result in competitive advantage being afforded to hotels that recognize and manage the impact of their operations on the environment,

- The growing number of hotels seeking certification from environmental schemes such as Green Leaf[10], Green Globe[11], and ISO 14001[12], suggests to the author that such programs are a selling point to the increasing number of environmentally conscious international tourists. Good environmental management will serve to divert business from less environmentally responsible hotels, and
- In some cases there are environmental regulations and/or industry standards that a hotel must adhere to (Mandar 1998).

The case studies presented in the UNEP "Environmental Good Practice in Hotels. Case Studies from the International Hotel and Restaurant Association Environmental Award" (UNEP IHRA 1996) are almost exclusively large hotels that belong to

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[7] United Nations Environment Program
[8] United Nations Educational, Scientific and Cultural Organization
[9] World Tourism Organization
[10] Green Leaf USA was developed to recognize environmental achievements through the allocation of one to five Leaves; one for a minimum of committing to a set of environmental principles and two through five for results in applying those principles (TerraChoice 2002). The Thai Hotels Association (THA) also has a Green Leaf program, which is based on a series of questionnaires and assessments; hotels are awarded a Green Leaf depending on their performance with respect to the questionnaire (Green Leaf Foundation 2001).
[11] Green Globe 21 is an organization that specializes in promoting environmental management and sustainability in the tourism industry. It does so by supporting hotels in their efforts to cut costs and improve environmental performance as well as establishing a set of standards. Hotels that meet the standards are awarded a Green Globe 21 stamp (Green Globe 21 2002).
[12] ISO 14001 is an environmental management standard that was established by the International Organization for Standardization to promote regulatory compliance with respect to the environmental issues associated with various types of business and industry (ISO 1996).

international groups. This suggests to the author that those hotels often possess the finances and economic and technical resources needed to manage their impacts on the environment. These individual hotels may also be obligated to comply with environmental standards set by the larger hotel group (Meade 2000). Therefore they are more likely to develop and implement environmental initiatives in developing countries.

Hobson and Essex (2001) suggest that the small and medium sized hotels operated by private or family businesses, the heart of the industry, are less likely to manage their environmental impacts because they are under fewer regulatory pressures and may not possess the capacity to do so. As a result, it may be these operations, not the large-scale international hotels that, cumulatively, have the most significant environmental impact on destinations.

2.2 The Hotel Industry in Siem Reap Town, Cambodia

Siem Reap Town is located in the northwestern province of Siem Reap, Cambodia. Located at the axis between the Siem Reap River and the National Highway Route 6, Siem Reap Town is the administrative and commercial center for the province (Figure 2.0). Recent movements towards political stability have resulted in a dramatic increase in the number of visitors to Cambodia. Siem Reap Town, as the major service provider for tourists visiting the UNESCO World Heritage Site of Angkor Wat has been the destination of choice for most tourists (Ray 2000).

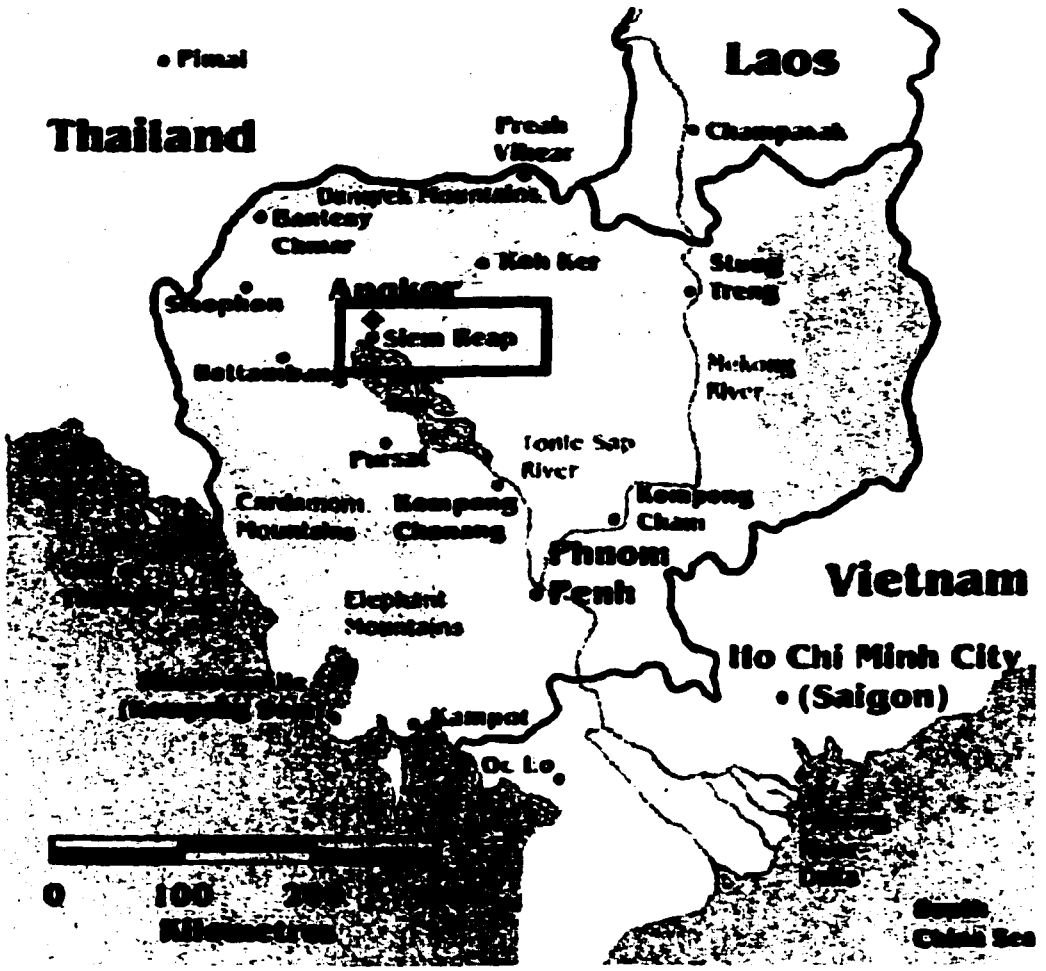


Figure 2.0 Location of Siem Reap Town in Cambodia (Adapted from Ray 2000)

Record tourism numbers were documented for 1999 and 2000 and dramatic increases have been forecasted for the immediate future (WTO 2001). For all intensive purposes, tourism has become the base of Siem Reap Town's economy. The local hotel sector has responded with substantial increases in construction and operation that is quickly surpassing the capacity of the town's infrastructure and environment (Mr. Phloeun Prim Pers. Comm May 2001, Skeith et al 2000).

New Hotel Development in Siem Reap Town

Decades of political unrest and poverty in Siem Reap Town have resulted in extremely poor infrastructure characterized by an expensive and unreliable public electricity grid, a defunct municipal water system and minimal formalized services for dealing with wastewater and solid waste (Skeith et al. 2000). These systems have proven incapable of handling the current level of hotel activity in Siem Reap Town and will continue to fail as development persists.

As a result, all hotels in Siem Reap Town are, to some extent, forced to generate their own energy, pump water from their own deep wells and devise their own strategies for dealing with waste streams. The individual environmental impacts of these activities vary from hotel to hotel. However, cumulatively they pose an extremely

serious and immediate threat to the sustainability of the tourism industry in Siem Reap Town (Skeith et al. 2000). The environmental impacts of hotel development are becoming increasingly visible. When interviewed by the author, some visitors have admitted that this has discouraged them from staying in Siem Reap Town longer than necessary. This represents a significant loss of potential revenue for the area.

Factors associated with energy, water and waste contribute substantially to the operating costs of individual hotels (Viet 2000). Competition is relatively fierce and the expectations of guests are high. As a result, most hotels are extremely service oriented; advertising air-conditioned rooms, hot water and, in some cases, swimming pools. These amenities are expensive to provide and, if not implemented and maintained properly, represent a substantial environmental risk to the area.

There are few consistently enforced environmental regulations that affect the hotel industry in Siem Reap Town (Siphana and Denora No Date). Environmental issues are not well understood by some of the hotel operators in Siem Reap Town. Interviews with hotel operators in Siem Reap Town conducted by the author indicate that the concept of environment is often confused with aesthetics and cleanliness, which are perceived to be cost intensive. Some hotel owners in Siem Reap Town have a basic understanding of environmental issues but are hesitant to amend their operations with respect to the environment for fear of upsetting valued guests, who may confuse conservation efforts with scrimping on service (Mr. Phloeun Prim Pers. Comm May 2001).

Recently, the lure of operational cost savings and environmentally conscious customers appears to be strong enough to have interested several local hotels in exploring the balance between operating economically and environmentally responsibly and continuing to provide their guests with a first class experience (Mr. Phloeun Prim Pers. Comm. May 2001, Walter Jameison Pers. Comm.. April 2001).

The hotel operators themselves may be willing to initiate the mitigation of the environmental impacts associated with hotel development in Siem Reap Town. This would be done not out of any regulatory obligation, but to cut down on significant operational costs, establish competitive advantage, and contribute to the sustainability of the local tourism industry. This 'voluntary' participation, as the author will demonstrate in this Master's Degree Project, has great environmental potential for Siem Reap Town.

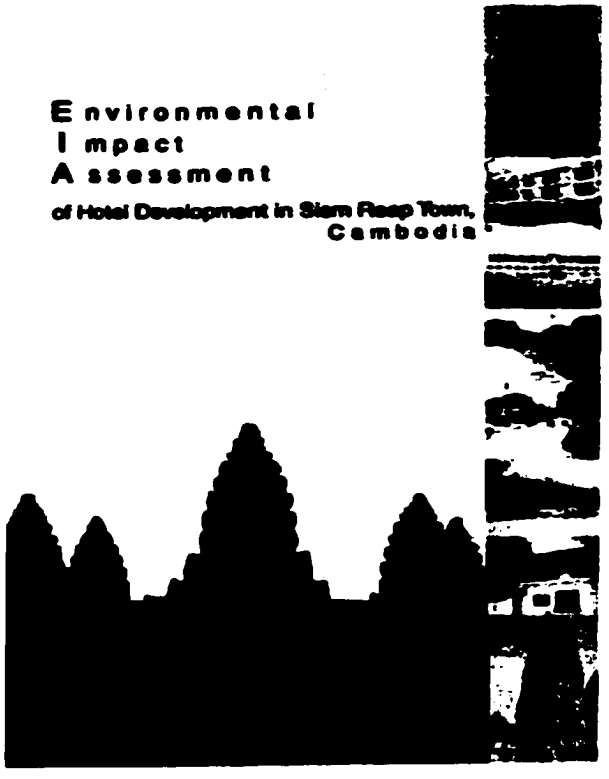
In 1999 the Canadian Universities Consortium Urban Environmental Management Project (CUC UEM) published *An Environmental Impact Assessment of Hotel Development in Siem Reap Town, Cambodia.* (Skeith et al, 2000) According to the CUC UEM Project Director, Walter Jamieson, the Environmental Impact Assessment was conducted with two objectives:

- To act as a demonstration of Environmental Impact Assessment practice; and
- To identify environmental issues related to hotel development in Siem Reap Town.

The environmental impact assessment document (Skeith et al. 2000) contains an assessment of the impacts of hotel development and provides recommendations for mitigating those impacts in four focus areas:

- Solid waste management through the reduction of waste produced through hotel construction and activities and the responsible disposal of wastes;
- Water and sewage management through ensuring a consistent supply of safe drinking water and the responsible disposal of wastewater and sewage
- Energy consumption and air quality through reduced energy use and reduced emissions to air; and
- Socio-economic impacts through an understanding of the effect of environmental impacts on human factors.

One of the major recommendations involves the development of an Environmental Management Plan based on the mitigation measures presented in the Environmental Impact Assessment, which would serve to mitigate the environmental impacts associated with hotel development in Siem Reap Town (Skeith et al. 2000).



An Environmental Impact Assessment of Hotel Development in Siem Reap Town

The document suggests that public consultation should be an important condition to ensure the implementation potential of the Environmental Management Plan. This process would serve to identify the capacity of stakeholders, including hotel owners in the local community to implement and sustain the impact mitigation measures outlined in the Environmental Management Plan. Also, it would highlight what training is required to increase the capacity of stakeholders with respect to environmental management.

The author participated in an interdisciplinary team project in the Siem Reap Town hotel sector in the fall of 2000. The project involved collecting background information through interviews with hotel owners, government departments and non-government organizations to determine the potential for environmental management

initiatives in the hotel sector (Northover et al 2000). Through consultation with hotel owners, the project identified the following issues with respect to participation in environmental management initiatives (Northover et al 2000):

- The connections between environmental management, the sustainability of the tourism industry and the profitability of individual hotels should be emphasized to motivate participation,
- An environmental management process, geared specifically to hotels, should be developed and demonstrated through the presence of a local benchmark. This will serve to demonstrate the business benefits of environmental management in hotels and encourage them to participate in the more inclusive Environmental Management Plan described above,
- Interviews with hotel owners conducted by the author in the spring 2001 suggest that the success of the demonstration project will rely, in part, on the following conditions:

  Participation should be voluntary: The hotel operator should understand the potential benefits and the process involved, be provided with examples and commit on his/her own terms;

  The project should involve internal staff: Training and awareness are crucial to the success of the process. Involving internal staff encourages participation and disseminates important concepts;

  The process should not be complicated: Many hotel operators have expressed frustration at not being able to relate to the technical vocabulary and processes often associated with environmental impact mitigation;

Participation should not be cost intensive: The point of participation is to save money. Hotel operators will be extremely reluctant to participate in an expensive process;

The process should be relatively benign: The strategy should not interfere significantly with day-to-day activities at the hotel. The process must be compatible with current operational practices; and

The benefits of participation should be tangible: The hotel operator must be able to identify proximate, tangible economic benefits even at the beginning of the process. Cost savings must be communicated in the context of the specific hotel.

The business benefits of the process should be available to all hotel operators: Interviews with hotel operators suggest that this would best be done in a workshop setting where questions and concerns can be addressed immediately.

The recommendations presented in chapter 6 have been developed with this advice in mind.

2.3 Environmental Management Strategy Demonstration Project

Developing an environmental management strategy for a hotel in Siem Reap Town, based on the above criteria, would serve several functions:

- It would help mitigate the environmental impacts of one hotel in the region;
- It would provide a tangible, local example of the types of operational cost savings and overall business benefits of environmental management for hotels; and
- It would contribute to the stakeholder consultation portion of the Environmental Management Plan development as described in the Environmental Impact Assessment recommendations.

The environmental management strategy demonstration project relies on two preconditions:

- A voluntary hotel participant; and
- An appropriate methodology that takes the following considerations into account:

  Cultural and Socio-Economic Factors – Years of political and economic instability have made many Cambodians insecure about expressing their personal opinions outside of close confidence (Mr. Phlouen Prim Pers. Comm. April 2001). This is particularly true with respect to business and financial issues. As a result, accurate information concerning the day-to-day operation of a hotel is occasionally difficult to acquire. Also, interviews associated with this project and conducted by the author indicate that the escalated competition between hotels in Siem Reap Town has led to an increase in what many hotels consider to be proprietary knowledge;

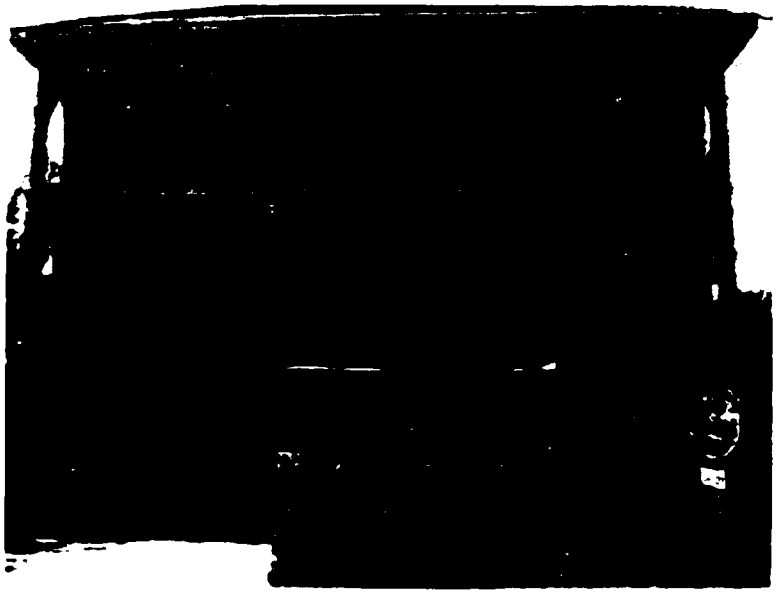
Terminology - Although most language barriers are effectively overcome through quality translation, some of the terms and concepts associated with environmental management are potentially subjective;

Measurement and Monitoring – The author toured several hotels in Siem Reap Town and conducted interviews with management and, in some cases, owners. These tours and interviews suggest that measurement and monitoring may not be well-understood concepts in Siem Reap Town. The lack of measurement practice in the form of metering and record keeping may present a methodological inhibition; and

Cumulative impacts – It has been determined that the major environmental impacts of hotel operation in Siem Reap Town are not the result of the operation any particular but are the result of the cumulative effects of all hotels in Siem Reap Town (Skeith et al. 2000). The methodology should be developed with cumulative effects in mind.

2.3 The Auberge Mont-Royal d'Angkor Hotel

The Auberge Mont-Royal d'Angkor hotel is situated on a quiet dirt road on the west side of Siem Reap Town. Wood construction houses and several small hotels and guesthouses surround it. The owner and general manager is Cambodian as are all of its staff members. French, English and Khmer (the national language of Cambodia) are spoken.



The Auberge Mont – Royal d'Angkor Hotel

Much of the hotel's business is derived from inbound European tour groups, most of them consisting of French nationals in the 35-50 age group (Phloeun Prim Pers. Comm.. May 2001). The hotel operates a website and receives some individual bookings electronically. Walk in customers are rare. The hotel's business is subject to the high and low season occupancy fluctuations typical of all hotels in Siem Reap Town[13] (Nov and Vachon 2001). Interviews with several hotel owners in Siem Reap Town suggest that many hotels rely on an annual average minimum occupancy rate of 35% to maintain their break-even profitability threshold.

The Owner and General Manager of the Auberge Mont-Royal d'Angkor hotel, Mr. Phloeun Prim, is Cambodian by birth but moved to Toronto, Ontario, Canada for post secondary schooling. At the time of this the project Mr. Phloeun Prim was planning to

[13] Interviews with hotel operators in Siem Reap Town indicate that occupancy rates may vary between 100% in the September to February high season and 12% during the April to August low season.

use the 2001 low season business lull as an opportunity to tighten up operations at the hotel (Phloeun Prim Pers. Comm. May 2001). This initiative would be focused on increasing operational efficiency and improving the quality of amenities offered to guests.

Mr. Phloeun Prim was introduced to environmental management in Canada and perceives the environmental management strategy to be an important aspect of his business. His initial response to an invitation to participate sent by the author expressed his interest in the project as a cost savings tool as well as an opportunity for him and his staff to reduce the impact of the hotel on the local environment. He also voiced significant concern over the sustainability of resources such as water and energy in the wake of rapid hotel development in Siem Reap Town. As a result, he offered to participate in the demonstration project.

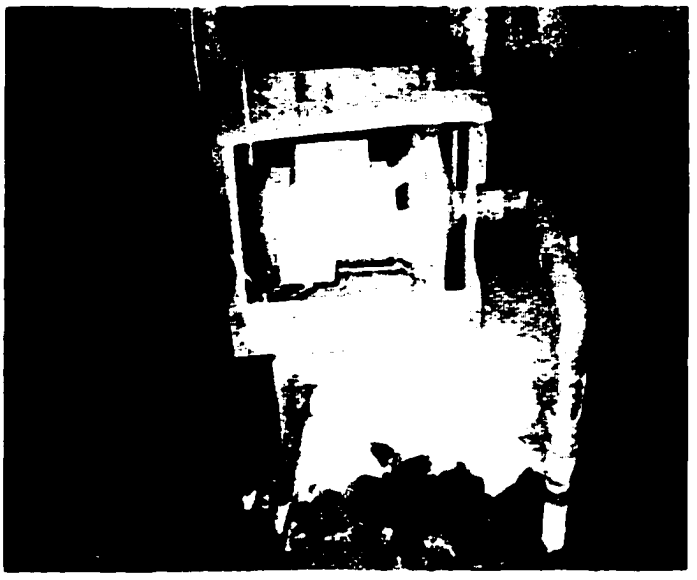
The Auberge Mont-Royal d'Angkor was established in 1998 by Mr. Phloeun Prim's parents who hired him to run the hotel as they live in Phnom Penh. Currently, the hotel has twenty-five double rooms and three single rooms with a maximum occupancy of fifty-three guests. Mr. Phloeun Prim indicated that the third floor and nine additional guestrooms were added in the fall of 2000. Construction of a freestanding coffee house and gallery was underway during the duration of this project. The hotel also operates a forty-seat restaurant that is supported by a small kitchen and has a roof top laundry facility.

The hotel employs three full time management level staff and fifteen full time and seasonal operational level staff. Although the staff has generalized job descriptions,

there is considerable task overlap. For example, housekeeping staff regularly contributes to food and beverage preparation and service and vice versa. In general, the operational staff is divided into the categories of housekeeping, front of house (reception), food and beverage, maintenance, and security (Mr. Phloeun Prim Pers. Comm. May 2001).

2.3.1 Operational Details

The hotel is equipped with nineteen in room hot water heaters. The newer nine guestrooms are supplied with hot water by the boiler used to provide hot water to the kitchen and service areas. There are five individual septic tanks on the property in various states of use and maintenance. The hotel uses the public electricity grid from 6:00am to 6:00pm while few guests are in the hotel as it is expensive and unreliable (Mr. Phloeun Prim Pers. Comm. May 2001). Two generators: one 90 kVA and one 25 kVA are used from 6:00pm to 6:00am when most of the energy is being used for air conditioning and lighting. Water is provided through a powered well pump but is not treated for consumption. Bottled water is provided in the guestrooms for drinking.



Well Pump at the Auberge Mont-Royal d'Angkor Hotel

Energy consumption estimations at the Auberge Mont-Royal d'Angkor Hotel are consistent with models of energy use in typical hotels in S.E. Asia. Table 2.1 presents energy use in typical hotels Figure 2.1 illustrates approximate energy use at the Auberge Mont-Royal d'Angkor hotel. The author through a review of the following compiled the information presented in Figure 2.1:

- Utility bills and diesel costs at the hotel;
- Approximate percentage of time that operational areas of the hotel are provided with electricity;
- The number and type of mechanical and electrical equipment in operational areas of the hotel: and
- Mr. Phloeun Prim's best approximations as to how energy is used at the hotel.

The figure is included here as an introduction to the nature of energy use at the hotel which will be useful in understanding why certain environmental improvement opportunities were selected over others as discussed in Chapter 4.

Table 2.1 Energy Use in a Typical Hotel

Operational Area	Percent of Energy Consumed
Heating, ventilation and air-conditioning (HVAC)	45%
Lighting	20%
Kitchen	17%
Refrigeration	11%
Miscellaneous	7%

Source: Juntrasook 1998

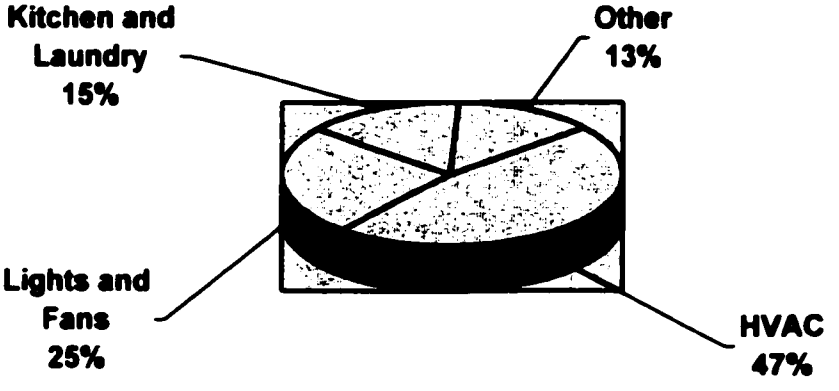


Figure 2.1 Approximate Energy Use at the Auberge Mont-Royal d'Angkor Hotel

Figure 2.2 depicts an estimation of the water consumed by the day-to-day operations of the Auberge Mont-Royal d'Angkor hotel. The data presented in these figures is based on observing activities that take place in the operational areas of the hotel. Areas of the hotel where intensive activities involving water consumption such as guest rooms, the kitchen and the laundry were compared to those areas where water consumption is not necessarily associated with operational activities.

The author discussed this assessment with Mr. Phloeun Prim and operational staff in an effort to verify the estimations. The author then compared the assessment against hotel benchmarks and incorporated it into a chart for presentation. The chart is presented here to help explain why certain environmental improvement opportunities were selected over others as discussed in Chapter 4.

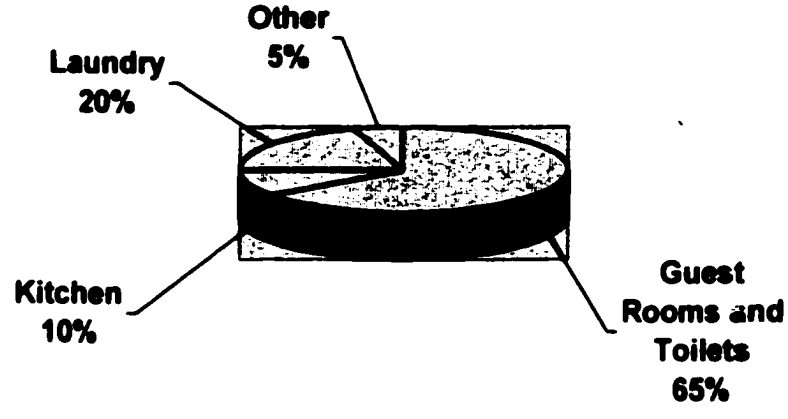


Fig. 2.2 Approximate Wastewater Sources for the Auberge Mont-Royal d'Angkor Hotel

An estimate of the composition of solid waste management is illustrated in Figure 2.3. It is presented here as an introduction to the environmental improvement opportunities described in Chapter 4. The author and Mr. Phloeun Prim through a review of the following developed this estimation:

- Purchasing records, which indicate the quantity of solid goods that come into the hotel;
- Municipal garbage collection fees, which represent the volume of solid waste going to the landfill. This waste does not include recyclable or resalable items such as food waste, plastic bottles, glass, cans, used oil and aerosol cans. The

comparative content of the waste going to landfills can be assessed in part by ruling out those contents in particular;

- Estimations of money recovered from the sales of recyclables and food waste. Resalable items vary in value. Understanding the various rates will help assess the quantity of those items that leave the hotel; and
- Discussions with operational staff, which are designed to confirm any estimation.

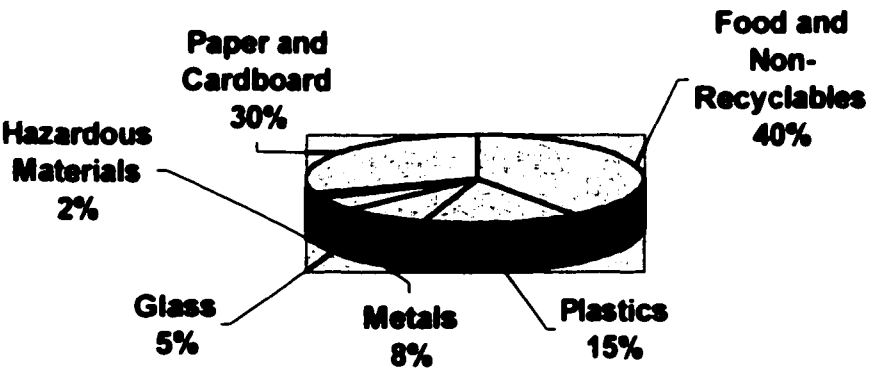


Fig. 2.3 Estimated Solid Waste Composition fo the Auberge Mont-Royal d'Angkor Hotel (percent by volume)

2.4 Environmental Management Strategy Development at the Auberge Mont-Royal d'Angkor Hotel

The purpose of developing the environmental management strategy for the Auberge Mont-Royal d'Angkor Hotel has been discussed in the context of mitigating the environmental impacts of hotel development in Siem Reap Town and contributing towards a larger Environmental Management Plan for the hotel sector in general. Keeping this in mind, it is also important to articulate the purpose of developing the

environmental management strategy for the Auberge Mont-Royal d'Angkor Hotel in particular. The environmental management strategy will assist the hotel in realizing the following management objectives:

- Operational cost savings and business benefits;
- Reduced impact on the local environment;
- Sustainability of the local tourism industry as the key business resource; and
- Cooperation from other hotel operators in protecting the local environment.

The approach to the environmental management strategy was developed with these objectives in mind and is discussed in detail in Chapter 3.

2.5 Conclusion

The environmental impacts of tourism can be attributed, in part, to the activities of tourism related business such as hotels. As a result, tourism related businesses, including hotels, must be involved in sustainable tourism. This is the case in developing countries where underdeveloped infrastructure and a decreased emphasis on environmental issues contribute to the impacts of hotels. This is true for Siem Reap Town, Cambodia. The environmental management strategy for the Auberge Mont-Royal d'Angkor, as a demonstration project, will contribute to the successful development and implementation of a larger Environmental Management Plan designed to mitigate the environmental impacts of hotel development in Siem Reap Town.

Chapter 3: Environmental Auditing and Environmental Management Strategies in Hotels: Relationships and Methodology

The hotel industry, in response to regulatory and consumer pressures, and sustainability considerations, have begun taking steps toward managing the environmental impacts related to their operations (Revilla, Dodd and Hoover 2001; Chehab et al 2001). An environmental management strategy contains a series of elements that allow a hotel to identify, prioritize, implement and monitor environmental improvement opportunities (International Organization for Standardization 1996). In many cases, hotels are responding to environmental pressures, concerns and attitudes that are specific to their operation. As a result, individual environmental management strategies range from basic hotel environmental policies to robust, operation wide environmental management systems.

Environmental auditing, defined by the International Chamber of Commerce (ICC), is "a management tool comprising a systematic, documented, periodic, and objective evaluation of the performance of the organization, management system and processes designed to protect the environment with the aim of facilitating management control of practices which may have impact on the environment and assessing compliance with company environmental policies" (Hillary 1993). It is an important precursor to the development of an environmental management strategy. It allows hotel operators to examine the hotel's current performance with respect to their environmental priorities (Parasnis, Sevnningsen, and Mandke 2000). The audit makes certain that all environmental initiatives accurately reflect operational and local conditions, management priorities, consumer concerns, and compliance factors.

The scope and scale of an environmental audit is determined, in large part, by management policies (Maltby 1995). Therefore, environmental audits contribute to the successful implementation of an environmental management strategy by acting as the initial information gathering and analysis needed to ensure successful implementation. In addition, environmental audits provide a level of assurance that the environmental management strategy is successfully integrated with all levels of operation and will be responsive to future operational changes (Chehab et al 2001).

For the purposes of this demonstration project, it was important that all savings opportunities, both material and economic, that were possible through the implementation of an environmental management strategy at the Auberge Mont-Royal d'Angkor hotel be quantified accurately, recorded understandably, and disseminated clearly to other hotel operators in Siem Reap Town. Conducting an environmental audit as a precursor to developing the strategy provided a systematic method of gathering, recording and analyzing the information necessary to ensure that these requirements were met. This chapter presents an environmental audit and environmental management strategy methodology for hotels and discusses how this method was applied to the Auberge Mont-Royal d'Angkor hotel.

3.0 Defining an Environmental Audit for a Hotel

Traditionally, hotels have used environmental auditing as a tool for assessing regulatory compliance (Maltby 1995). Currently, environmental auditing is being employed by many hotels in their efforts to go beyond compliance in their environmental performance.

In practice, hotels generally use environmental audits "as a tool to achieve optimal resource use and minimal waste production" (Chehab et al 2001), in effect mutually benefiting the hotel and the environment. Particularly, environmental audits are systematic procedures that are designed to assess current operational practices with respect to specific management priorities regarding environmental performance (Chehab et al 2001). As a result they are often a true reflection of the nature and scale of the products, services and management activities involved in the day-to-day operation of a hotel.

3.1 Types of Environmental Audits

The types of environmental audits vary in nature and scale (Wilson 1992). The environmental audit conducted at the Auberge Mont-Royal d'Angkor used guidelines associated with the following kinds of audit:

3.1.1 Cleaner Production Audits

A cleaner production audit investigates the hotel's application of a practical, integrated environmental management strategy with respect to processes, products and services (Parasnis, Sevnningsen, and Mandke 2000) for the purpose of assessing environmental efficiency and developing or improving upon a cleaner production plan.

The guidelines associated with cleaner production audits were integrated into the audit design for the Auberge Mont-Royal d'Angkor Hotel because they tend to be comprehensive in their scope, including many of the environmental issues associated

with day-to-day hotel operation (Parasnis, Sevnningsen, and Mandke 2000). These issues typically include: energy consumption; water consumption and wastewater management; solid waste management; hazardous materials management; and air quality issues.

3.1.2 Energy Audits

Energy audits examine current practice with respect to energy generation and consumption (Floresca 1994) for the purposes of assessing efficiency and, in many cases, cost (Parasnis, Sevnningsen, and Mandke 2000), as well as identifying opportunities for improvement that will make up the environmental management strategy. Energy efficiency was a management priority for the Auberge Mont-Royal d'Angkor hotel.

3.1.3 Water Audits

In water audits, generation, consumption, treatment, and disposal are examined for the purposes of assessing efficiency and quality and identifying the individual improvement opportunities that will make up an environmental management strategy for a hotel (Gagnon 1984). Water conservation and quality was a management priority for the Auberge Mont-Royal d'Angkor hotel.

3.1.4 Waste Audits

In a waste audit, the solid, liquid, and hazardous wastes generated during the day-to-day operation of a hotel, as well as current waste management practices are investigated for the purpose of identifying waste minimization opportunities and developing improvement opportunities (Alberta Environmental Protection Action on

Waste No Date). Solid waste management was a management priority for the Auberge Mont-Royal d'Angkor hotel.

3.1.5 Environmental Management System Audits

These audits consider whether a hotel has developed and implemented a suitable environmental compliance management system, which strives to meet the legal and regulatory compliance obligations, or the industry and association conformance obligations associated with an environmental management system (Chehab et al 2001). They may vary in content depending on the type of environmental management being investigated. These approaches cover many key aspects of an environmental management strategy such as measurement and monitoring. As a result, the guidelines are useful despite the fact that the Auberge Mont-Royal d'Angkor hotel did not have an environmental management system in place.

3.1.6 Compliance Audits

A compliance audit investigates a hotel's compliance and/or conformance with applicable environmental laws, regulations, and industry or association standards or requirements (Chehab et al 2001). Although regulatory compliance was not a priority for the Auberge Mont-Royal d'Angkor hotel, a review of existing regulations in Cambodia and abroad served to illustrate the minimum standard that the hotel should be striving for.

3.2 First Time vs. Follow Up Environmental Audits

Environmental audits in general fall into two categories: *first time audits* and *follow up audits* (Wilson 1992). The environmental audit performed for the Auberge Mont-

Royal d'Angkor was a first time audit. First time audits focus on the collection of organization specific data for the purposes of establishing a point of reference with respect to environmental performance objectives. Follow up audits are used to measure progress with respect to the results of the first time audit (Wilson 1995; IHRA and UNEP No 1996).

First time audits are crucial to the development of a successful environmental management strategy. They contribute valuable organization specific information that guides individual environmental practices and, importantly, sets the framework for the design and implementation of an environmental management strategy. For that reason, environmental auditing in this document will refer to first time audits unless otherwise specified.

3.3 Environmental Audit Scope

The scope an environmental audit may vary between organizations (Wilson 1992). For hotels these discrepancies are often the result of one or several of the following variables:

- The driving forces behind the environmental audit initiative with respect to environmental issues covered and management priorities. The environmental audit may be conducted for the purposes of investigating a specific aspect of environmental performance such as regulatory compliance or conformance with an industry standard or certification requirements. Further it may be conducted for the purposes of investigating a specific environmental

characteristic of the hotel operation such as energy, water or waste (Chehab et al 2001).

- The environmental sphere that hotel operation affects or *functional scope* (Greeno et. al. 1987). This may include air emissions, wastewater discharge, or solid waste disposal. The environmental audit may be conducted with the purpose of investigating current practice with respect to a particular environmental aspect associated with hotel operation.
- The nature and scale of the hotel or *operational scope* (Greeno et. al. 1987). This includes services offered, organizational divisions, and the physical structure itself. The environmental audit may be conducted with the purpose of investigating a particular department, such as housekeeping or food and beverage service. In addition, the environmental audit may be conducted for the purposes of investigating one physical part of the hotel such as a laundry facility or a spa.
- The business phase or age of the hotel. The environmental audit may be conducted during the initial phases of hotel operation or at any time during operation. Mandke (1999) suggests that environmental management programs differ between new and established hotels. New hotels have the opportunity to incorporate environmental initiatives during the early stages of business and should, therefore, start with high environmental standards. Existing hotels should begin with applicable, perhaps lower standards and endeavor to reach toward higher standards as they continually improve.

3.4 Environmental Auditing Methodology for Hotels

There are several environmental auditing models that have been developed for hotels (Chehab et al 2001; Parasnis, Sevnningsen, and Mandke 2000), many of which are based on general environmental auditing guidelines that have been developed for other types of industry. These models differ to a degree with respect to scope, terminology, presentation and comprehensiveness. However, they appear to be consistent enough to be incorporated into a general presentation of the phases and steps involved in an environmental auditing methodology for hotels. Environmental audits for hotels typically have three phases (Chehab et al 2001; Wilson 1995; Cahill and Kane 1989). These are illustrated in figure 3.0:

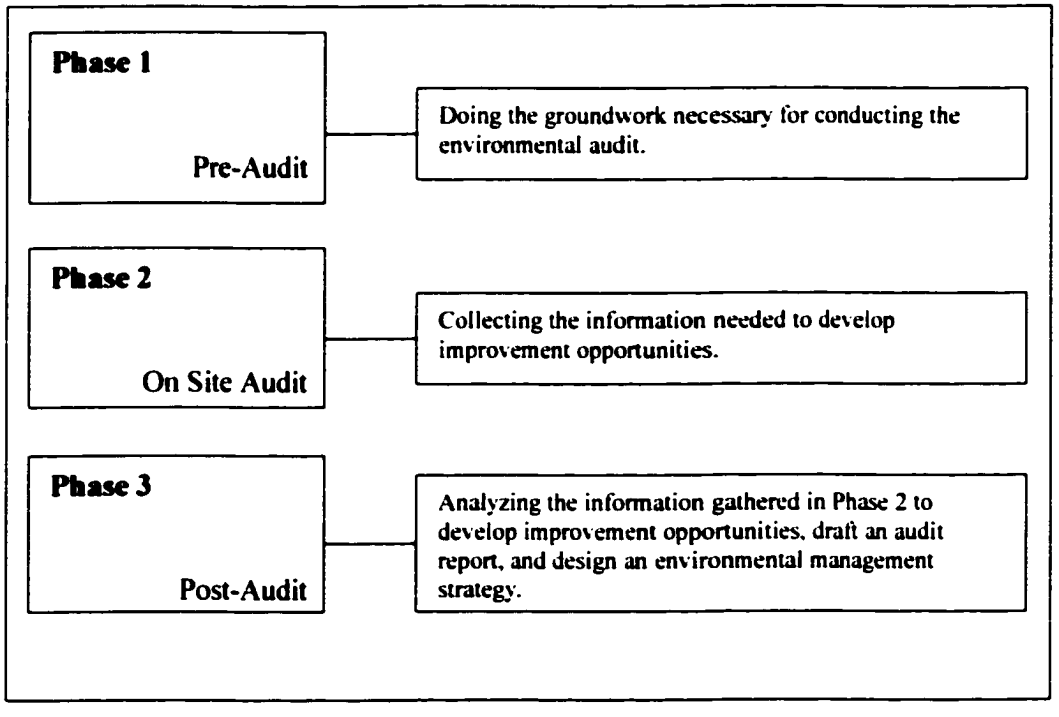


Figure 3.0 Environmental Auditing Phases for Hotels

Phase 1: Pre-Audit

The Pre-Audit is arguably the most important phase in an environmental audit. Methodical preparation is the key to an efficient, accurate and cost effective audit. Pre-Audits for hotels generally contain the following steps (Chehab et al 2001):

- Confirmation of commitment from top management;
- Setting audit purpose, objectives, and scope;
- Forming the audit team;
- Collecting available documentation;
- Developing the pre-audit questionnaires; and
- Defining terminology and terms of reference

A synopsis of the activities in the pre-audit phase should be made available to top management. This will act to confirm their support before moving to the on site portion of the audit (Chehab et al 2001).

Confirmation of Commitment from Top Management.

It is extremely important that top management understands and commits to the entire environmental audit process. This includes a discussion of the steps involved, resources required, and what to expect from the process. Wilson (1995) outlines three major reasons for confirming top management commitment:

- The environmental audit will require company resources (human and financial);
- It sends a clear message to the rest of the people involved in the operation that cooperating with the environmental audit and audit team is a management directive. It also adds credibility to the audit process; and

- In cases where regulatory compliance is a factor, a company must be willing to pay for the corrective actions and/or improvement opportunities outlined in the audit report.

Top management commitment and understanding is an extremely important step for hotels because of their focus on service. Management must understand to what degree the environmental audit will affect or involve hotel guests. Once the audit methodology was designed, a draft was reviewed with Mr. Phloeun Prim to ensure that he understood what was involved in the process and what could be expected by participating.

Setting Audit Purpose, Objectives and Scope

Setting the purpose and objectives of the environmental audit is an important precursor to defining the audit scope (Maltby 1995). The intention of the audit could be to investigate current practice for the purpose of assessing any one of the variables listed in the audit types above i.e. regulatory compliance, energy efficiency, or waste. Objectives should include quantifiable targets and a timeline to ensure that the audit is conducted efficiently and progress can be assessed (Chehab et al 2001).

For the Auberge Mont-Royal d'Angkor hotel, the purpose of the environmental audit was to investigate current practice with respect to energy efficiency, water conservation, wastewater management and solid waste management best practices in the interests of determining areas where cost savings could be realized. The timeline for the audit and development of the environmental management strategy was May 1, 2001 to June 10, 2001. Several short-term targets, related to specific methodological

steps, were set at the beginning of the process. The author and Mr. Phlouen Prim in an introductory meeting at the beginning of the project developed these targets. The targets focused on completion dates for the three audit phases and the development of the environmental management strategy.

The scope of an environmental audit refers to the functional and operational parameters of the audit. It is based, in part, on the specifics outlined in the purpose and objectives as well as management priorities.

The following audit scope for the Auberge Mont-Royal d'Angkor hotel was determined through consultation with Mr. Phloeun Prim:

- The audit will be facility wide and include all of the physical property owned and used by the Auberge Mont-Royal d'Angkor hotel;
- It will cover operating conditions in both high and low season and will look at trends from the opening of the hotel 3 years ago where possible;
- The audit will focus on the areas of energy conservation, water conservation and solid waste and wastewater management;
- The audit will focus on cost savings measures, including cumulative and long-term considerations; and
- The audit process and findings will be made publicly available as a regional benchmark. However, details with respect to the hotels operation that are not directly related to the project will remain confidential.

Forming the Audit Team

An environmental audit team should be comprised of individuals with diverse skills. All operational departments in the hotel should be represented (Parasnis, Sevnningsen, and Mandke 2000). In addition, the team members should be familiar with the overall operation of the hotel, the relevant environmental issues, and the audit process.

The size of the audit team depends on the size of the hotel (Parasnis, Sevnningsen, and Mandke 2000; Chehab et al 2001). For example, a small hotel may only require an audit team of 2-4 members, whereas a large hotel would require a large team organized into specialized units. The audit team may consist of internal and external members or be an assortment of both. Internal team members are extremely valuable as they are most likely to have a comprehensive understanding of the day-to-day operations at the hotel. However, external team members may offer professional expertise or past experience to the process (Parasnis, Sevnningsen, and Mandke 2000; Chehab et al 2001). In *A Manual for Cleaner Production in Hotels*, Parasnis, Sevnningsen, and Mandke (2000) suggest that the typical make up of a hotel audit team would be as follows:

- General Manager or owner as team leader or advisor;
- Chief Engineer/Environmental Manager as lead auditor;
- Food and Beverage Manager;
- Housekeeping Manager;
- Chef;
- Chief Steward;
- Stores/Purchasing Manager;
- Personnel Representative;

- Security/Safety Officer; and
- Gardener

In some cases Mr. Phloeun Prim may not have the time to act as the audit team leader or advisor. The UNEP-SPASI National Environmental Auditing Manual for Hotels (Chehab et al 2001) lists the following attributes of a team leader:

- Accustomed to the hotel's practices;

Familiar with the different environmental principles such as waste minimization;

- Acquainted with environmental regulations;
- Experienced in analyzing technical data; and
- Equipped with good communication skills.

A representative from senior management should be included in the audit team. He or She will help ensure that audit activities are aligned with management priorities and will act as a liaison between the audit team and top management.

The Auberge Mont Royal d'Angkor hotel has 28 rooms and 16 full time and seasonal employees. Many of the operational staff members have responsibilities in all areas of the hotel. As a result, they understand and are familiar with the activities of many departments. The audit team was small, consisting of three individuals: Mr. Phloeun Prim, a representative of the operational staff, Miss Touch Srey Sophea, and an external team member, the author. The external team member shared the responsibility of audit team leader with Mr. Phloeun Prim for the following reasons:

- The author was most familiar with the environmental auditing methodology;
- The author had experience with analyzing environmental data;

- Mr. Phloeun Prim had a thorough understanding of the operational details of the hotel; and
- Mr. Phloeun Prim was familiar to and with the operational staff and guests.

Developing the Pre-Audit Questionnaires

The purpose of a pre-audit questionnaire is to gain a thorough understanding of hotel operations and the environmental impacts associated with them (Parasnis, Sevnningsen, and Mandke 2000). In effect, it catalogues existing practice for later assessment (Rural Development Commission No Date). This information is gathered through the review of hotel records and reports, interviews with operational staff, and site tours. This will become the foundation for the environmental audit. Questionnaires may be developed independently or an audit team may decide to adapt an existing pre-audit questionnaire to the particular hotel. In either case the questionnaire should seek accurate and comprehensive information with respect to all of the physical, service and organizational characteristics of the hotel.

The pre-audit questionnaire developed for the Auberge Mont-Royal d'Angkor hotel was adapted from the Questionnaire for Pre-Assessment in Hotels designed by Prof. Dr. Thamrongrat Mungcharoen at Kasetsart University in Bangkok, Thailand (Mungcharoen 2000). This questionnaire has been included in a clean production reference published by the Asian Institute of Technology in Bangkok (Parasnis, Sevnningsen, and Mandke. 2000). The author chose it because it contains several sections particular to issues associated with hotel operation in S.E. Asia such as the operation and maintenance of air conditioning equipment. These are briefly summarized in Table 3.0 and presented in full in Appendix 1.

Table 3.0 A Summary of the Pre-Audit Questionnaire Developed for the Auberge Mont-Royal d'Angkor

Information Requested (Topics)	**Comments**
General Information	Address, phone number, name of operator, age of operation, management, type of operation, facilities, area and engineering data.
Input and Output Information	Energy consumption, water consumption, chemical consumption, wastewater generation, air pollution, solid waste generation.
Support Documentation	Policies, manufacturer's specifications, waste removal manifests, layout plans, historical documents.

Defining Terminology and Terms of Reference

The audit team members should be clear on the terminology used during the audit process. This includes any quantitative or qualitative references and terms related to the characteristics of the hotel and environmental impacts. They should also be familiar with the terms of reference of the audit (the purpose, objectives and scope). The terms of reference may also include the responsibilities of individual audit team members. This will ensure that the audit is conducted efficiently and is focused on important issues and management priorities.

Roles and responsibilities with respect to the management and operational staff at the Auberge Mont-Royal d'Angor hotel were discussed in a lengthy, informal meeting between the author and Mr. Phlouen Prim. The discussion was important as it familiarized the author with the staff and their working relationships with each other

and management, information that proved to help guide the selection of environmental improvement opportunities with respect to implementation and maintenance potential. It took the form of reviewing the audit methodology and timeline and addressing any questions with respect to what was expected of the individual team members, including the author as the external member.

Defining terms of reference was an important step for the audit at the Auberge Mont-Royal d'Angkor hotel. Although all three team members were familiar with the audit methodology and general environmental concepts, specific terminology was unfamiliar. A set of definitions compiled by the author were reviewed with Mr. Phloeun Prim in a short meeting to ensure that the audit findings were accurate and consistent with the parameters set out in the purpose and scope.

Phase 2: On Site Audit

The on site portion of an environmental audit for a hotel involves the following steps (Parasnis, Sevnningsen, and Mandke 2000; Chehab et al 2001):

- Opening meeting with the audit team and hotel staff;
- Collect available benchmarks and standards for comparison;
- Hotel walk through;
- Preliminary review of the data collected;
- Develop recommendations for improvement opportunities; and
- Closing meeting, which includes a revistation of earlier steps, based on the potential discovery of further information needs.

Effectively, the on site portion of the audit refers to all audit related activities that necessarily take place at the hotel.

Opening Meeting with the Audit Team and Hotel Staff

The purpose of an opening meeting is twofold. It provides an opportunity for the audit team members to clear up any confusion with respect to the audit process and their individual roles and responsibilities. Also, by including hotel staff, it acts to gain the necessary internal support needed to ensure that the audit findings are a reflection of actual conditions. The *UNEP-SPASI National Environmental Auditing Manual for Hotels* (Chehab et al 2001) suggests that the following items be included in an opening meeting agenda:

- The purpose, objectives, scope, and benefits of the environmental audit;
- A question and answer period to address concerns;
- Introduction of the audit team members with a brief description of their individual responsibilities; and
- Introduction of the general areas of investigation (energy, water, waste, etc.).

Wilson (1995) suggests that the following also be included in an opening meeting for organizations in general:

- A protocol for emergency situations during the audit; and
- A list of contacts for support and assistance during the on site portion of the audit.

The opening meeting at the Auberge Mont-Royal d'Angkor hotel was hosted by the author and attended by Mr. Phloeun Prim and a group of operational staff. It served several important purposes:

- It introduced the author to the operational staff and helped establish trust and cooperation;
- It ensured that all operational staff understood that, although they are required to participate, anything that they say (including negative comments) with respect to the hotel's operations will not affect their job status;
- It introduced the project in terms that operational staff could understand, such as a better work environment, more guests and operational cost savings; and
- It provided them with the opportunity to ask questions.

Signs were posted in the service areas of the hotel consisting of a simple, graphic representation of the steps involved in the project and whom to go to with questions or concerns.

Collect Available Benchmarks and Standards for Comparison

Environmental auditing is a process that assesses current practice with respect to a set of priorities, goals, standards, and benchmarks. As a result, a series of context specific standards need to be assembled for comparison with actual conditions. Depending on the scope of the environmental audit, these standards could be based on material consumption benchmarks, waste management standards, management priorities, and any legal, industry or association conformance standards that apply (Parasnis, Sevnningsen, and Mandke 2000).

There are few consistently enforced environmental regulations that affect the hotel industry in Siem Reap Town. Further, the Auberge Mont-Royal d'Angkor hotel is not a member of any industry associations and therefore is not obliged to conform to any

of their standards. As a result, the standards assembled for the purposes of this audit came from the following sources:

- Regional benchmarks for environmental good practice in hotels including the Hotel Majestic in Saigon, Vietnam, the Hotel Nikko in Hong Kong, and the Phuket Yacht Club and Dusit Hotels and Resorts in Thailand. Many of these hotels are featured in the IHRA and UNEP *Environmental Good Practice in Hotels: Case Studies from the International Hotel and Restaurant Association Environmental Award* (IHRA and UNEP 1996);

- Guidance documents for environmental improvements in hotels including:
  - IHA, IHEI and UNEP *Environmental Action Pack for Hotels: Practical Steps to Benefit Your Business and the Environment* (IHA, IHEA, UNEP 1995);
  - *A Manual for Cleaner Production in Hotels* (Parasnis, M., Sevnningsen, N. and P. Mandke 2000);
  - The USAID/Jamaica EAST Project (Mead and del Monaco 2001); and
  - *Environmental Management in Thai Hotel Industry* (Canadian Universities Consortium Urban Environmental Management (CUC UEM Private Sector Initiative 1998).

- Requirements outlined by various environmental certification schemes with respect to hotels. For example:
  - Green Globe;
  - Green Leaf;
  - ISO 14001; and

- The Green Key

These sources were reviewed and sections that applied directly to the management priority of operational cost savings and competitive advantage were included in the project.

Hotel Walk Through

This exercise is intended to either confirm or dispute the information gathered from the pre-audit questionnaire and to compare actual conditions against the benchmarks, priorities, and standards collected in the previous step. The information gathered in this step can be collected through visual observations, revisiting records, interviewing operational staff, and reviewing the pre-audit questionnaire for any gaps in information.

There are several methodologies that have been suggested for guiding this process and recording the data collected. The *UNEP-SPASI National Environmental Auditing Manual for Hotels* (Chehab et al 2001) outlines a more rigorous methodology that appears to be closer in approach to those found in environmental auditing protocols for other types of industry. This approach involves filling out a comprehensive full audit questionnaire. The questionnaire includes a series on inclusive checklists that provide guidance for collecting information on areas such as water consumption, wastewater generation, air emissions, solid waste generation, energy consumption, and safety. These checklists act to direct the data collection process in a formal manner and would be particularly useful for environmental audits at large hotels or in cases where a hotel has set a particularly wide audit scope.

Parasnis, Sevnningsen, and Mandke (2000), suggest that audit team members tour the hotel in a group armed with a pencil and pad. The team members are encouraged to note any relevant detail, even if it appears trivial. The audit team is motivated by an understanding of the audit scope and should focus its attention accordingly (on management practices or compliance issues etc.). In this methodology, a team meeting where the findings are discussed and compiled by the team leader follows the walk through.

The informal nature of this methodology suggests that it would be well suited to smaller hotels. This was the method of choice for the Auberge Mont-Royal d'Angkor hotel. The walk through was conducted over a three-day period. This was necessary because the audit team was small and included key staff members who had other obligations with respect to the operation of the hotel. The audit team began the walk through by investigating the grounds outside of the hotel structure and proceeded to move through the hotel floor by floor.

Although the walk through was focused by the scope and the pre-audit questionnaire, it was informal allowing the team members to comfortably record observations at their own pace. This was important, as the audit process was new to most of the team. A meeting, referred to in the next section, followed the walk through where all observations and diagrams were discussed.

Preliminary Review of the Data Collected

The audit team should review and assess the information collected to date before concluding the on site phase of the environmental audit (Wilson 1992). This provides assurance as the to the accuracy and consistency of the data collected. Further, it provides an opportunity for the audit team to ensure that it has collected an appropriate amount of information. This is important because the hotel may not be open to the suggestion of another walk through or additional intrusive information collection (Wilson 1992).

This is the stage where preliminary observations and recommendations can be made (Chehab et al 2001). Conclusions need not be made during the on site phase of the audit (Wilson 1992). However, this step will serve to highlight areas where immediate intervention is necessary and potentially possible. These should be summarized and documented (Chehab et al 2001).

The audit team in the meeting referred to in the last section reviewed the information collected during the walk through. The meeting took place outside of the hotel to facilitate a comfortable and objective analysis. The meeting began with an informal discussion of the general walk through experience and findings and moved towards an observation-by-observation review.

The review of the data collected through the walk through at the Auberge Mont-Royal d'Angkor served several purposes:

- It allowed the audit team to compile their observations into a single format for easy review;

- It identified areas that were missed during the walk through that may need to be revisited: and
- It highlighted immediately implementable improvement opportunities.

Closing Meeting

The information gathered throughout the audit process is presented to hotel management in a closing or exit meeting (Wilson 1992). This provides an opportunity for the audit team and management to discuss the following points (Chehab et al 2001):

- The audit findings/information gathered;
- The strengths and weaknesses of the audit process;
- Management suggestions for corrective action;
- Areas for immediate intervention;
- Outstanding issues; and
- Outlining the steps involved in the final phase of the audit.

The closing meeting at the Auberge Mont-Royal d'Angkor hotel involved the members of the audit team and several operational staff members who were identified as having potential responsibilities in the environmental management strategy. It focused largely on the audit findings and a discussion of potential improvement opportunities.

Phase 3: Post Audit

The post audit phase includes the final steps involved in the audit process. It includes the following steps (Chehab et al 2001):

- Writing the environmental audit report; and
- Developing a plan of action for executing audit recommendations

These steps act as the necessary precursor to the development and implementation of a hotel wide environmental strategy.

Writing the Environmental Audit Report

The audit report should consist of a presentation of the findings and recommendations made by the audit team (Wilson 1992). There are various methodologies for writing an audit report. The *UNEP-SPASI National Environmental Auditing Manual for Hotels* (Chehab et al 2001) suggests guidelines with respect to writing an audit report for a hotel. The author used these guidelines in the preparation of the audit report for the Auberge Mont-Royal d'Angkor hotel. For example:

The table of contents included:

- An introduction with respect to the purpose, objectives, scope, and people involved in the audit;
- A description of the hotel layout, departments and operations; and
- A summary of the audit findings and related recommendations.

The audit report was written in an unambiguous, succinct, and objective style.

The first draft should was submitted to Mr. Phloeun Prim for review. His comments were taken into consideration while preparing the final draft. These comments focused on areas in the hotel that he would have liked further investigation of such as the kitchen and laundry operations. The author and the audit team revisited these areas to Mr. Phloeun Prim's satisfaction.

The final draft was submitted to Mr. Phloeun Prim for his reference. Copies were delivered to the Royal Cambodian Ministry of Tourism, the Royal Cambodian Ministry of the Environment, and the Siem Reap Provincial Department of the Environment. Permission was given by Mr. Phloeun Prim at the beginning of the project to use the information included in the audit report in future environmental management efforts in Cambodia.

Selecting and Assessing Improvement Opportunities for Implementation

This is, ostensibly, the foundation of what will eventually become the environmental management strategy. As a process, it is focused on the priority issues described in the audit report. It includes a description of the specific tasks involved in alleviating environmental problems.

The improvement opportunities described in the next chapter, for the Auberge Mont-Royal d'Angkor focus mainly on unnecessary consumption of energy, water and solid goods and were based on the principles of good housekeeping. They were developed based on precedents and literature reviewed prior to the project. As an environmental improvement guideline, good housekeeping is designed to reduce unnecessary material consumption involved in operation through the management and motivation of operational staff; it is discussed in detail in the following chapter (Parasnis, Sevnningsen, and Mandke 2000). The improvement opportunities include an analysis of feasibility and implementation potential and are supplemented, where possible, with an evaluation of the capital investment in materials and time as compared to payback in operational cost saving.

From Environmental Audit to Environmental Management Strategy

The audit findings and improvement opportunities act as the basis for a hotel wide environmental management strategy. They have been analyzed and developed at the tail end of an environmental audit process, the purpose, objectives, and scope of which have been determined based on management priorities. As a result, it can be assumed that they reflect actual conditions at the hotel, providing a degree of assurance as to the appropriateness of the recommendations included in the document.

An environmental management strategy is comprised of the organizational elements needed to implement, monitor, and continuously improve environmental practices at a hotel. An environmental management strategy may include the following components (International Organization for Standardization 1996; Parasnis, Sevnningsen, and Mandke 2000; UNEP, IHEI and UNEP 1995):

- An initial assessment or environmental audit;
- A list of improvement opportunities;
- An assessment of the feasibility of the improvement opportunities with respect to the specific hotel and implementation potential;
- A set of objectives and targets regarding the implementation of the improvement opportunities;
- Specific roles and responsibilities with respect to implementing the improvement opportunities;
- A system of measurement and monitoring for the purposes of continuous improvement which may include a regular auditing program; and
- A set of specific management tools.

An assessment or audit can be performed based on the methodology in the last section. One of the key products of an environmental audit is the identification and recommendation of improvement opportunities. Developing an environmental management strategy depends on an assessment of the feasibility and implementation potential of each improvement opportunity (Parasnis, Sevnningsen, and Mandke 2000). The feasibility assessment at the Auberge Mont-Royal d'Angkor included technical, economic, end environmental analyses where possible (Parasnis, Sevnningsen, and Mandke 2000).

The technical evaluation may consist of an assessment of the availability of technologies, their compatibility with existing installations, and operating and/or maintenance capability (Viet 2000).

An economic evaluation is used to assess the capital costs of implementing each environmental improvement option as well as the operating costs and savings realized. For some improvement options, an economic evaluation should include an assessment of the operational cost savings realized. For example: Energy cost savings in lighting or energy cost savings in heating and cooling (TRANS ENERG 1999).

Parasnis, Sevnningsen, and Mandke (2000) suggest that an economic evaluation for large, expensive improvement options be done through a profitability analysis that includes the measurement of payback period or amount of time taken to recover initial money invested through operational cost savings. The economic evaluation for the Auberge Mont-Royal d'Angkor focused largely on the operational cost savings

associated with the improvement opportunities and was constrained by several factors outlined in Chapter 4.

Environmental evaluations, although not as quantitative as technical and economic evaluations, are used to evaluate the net effect of an improvement opportunity on the environment. In many cases, the environmental evaluation can be tied to the cost savings quantified in the economic evaluation (TRANS ENERG 1999).

These evaluations, when compared with each other and combined with a review of current practice, can be used to assess the implementation potential of individual improvement options (Parasnis, Sevnningsen, and Mandke 2000).

Once the feasibility and implementation potential of the improvement opportunities has been assessed, a set of objectives and targets should be developed. These will act as a series of general purposes and specific milestones with respect to an environmental aspect associated with a hotel's operation. An objective is a general value statement that contains references to temporal or quantitative criteria. A target includes details with respect to temporal and quantitative criteria (City of Calgary 2000). Figure 3.3 illustrates the distinction between objectives and targets.

Environmental Aspect – Energy Efficiency	
Objective	**Target**
Decrease the amount of energy used to cool the hotel guestrooms.	Decrease the amount of energy used to cool all hotel guestrooms by 25% by January 2003.

Figure 3.3 Objectives and Targets. Adapted from City of Calgary Environmental Management System Initiative Training Materials (City of Calgary 2000).

These objectives and targets can be used to direct and prioritize the implementation of improvement opportunities. They may also be used as benchmarks for assessing performance and identifying areas for further enhancement. The author worked with Mr. Phloeun Prim at the Auberge Mont-Royal hotel to set realistic objectives and targets pertaining to the improvement opportunities that he had chosen to implement. They are included in Chapter 5.

It is important that all management and operational staff understand their roles and responsibilities with respect to the environmental management strategy (International Organization for Standardization 1996). This will facilitate the implementation of improvement opportunities and ensure that progress is measured and monitored effectively. Also, by assigning roles and responsibility, staff members are made aware their importance to the success of the environmental management strategy and may be more likely to participate.

Because the Auberge Mont-Royal d'Angkor has a small number of staff the author suggested that Mr. Phloeun Prim and two operational employees would be able manage and monitor the environmental management strategy. Mr. Phloeun Prim would have the responsibility of overseeing the initiative in general and would monitor any technical adaptations. The two operational staff members would be assigned the roles of overseeing Guestroom management related initiatives and service area management initiatives respectively. This is discussed in chapter 5.

The success of the environmental management strategy relies, in large part, on the ability to measure progress and identify areas for improvement (International Organization for Standardization 1996). Accurate measurement is required in order to assess and monitor the economic and environmental benefits of improvement opportunities. Measurement and monitoring can take the form of a follow up audit that investigates current conditions with respect to an established benchmark or standard (Wilson 1992). However, monitoring can be as simple as setting up a regular procedure for periodically documenting consumption or emissions associated with an environmental aspect. Several measurement and monitoring strategies were developed for the Auberge Mont-Royal d'Angor hotel. They are discussed in Chapter 5.

There are several environmental management tools available to hotels. These instruments may be used on their own or in conjunction with the other elements of an environmental management strategy. These tools may include (Thompson 2002):

- An environmental policy, which is appropriate to the nature and scale of the hotel and its activities (International Organization for Standardization 1996). By acting as a clear, comprehensive value statement with respect to the environment, the policy will help a hotel communicate its environmental efforts to various stakeholders and may act as a benchmark for future assessments of environmental performance at a management level;
- Lifecycle assessment, which can be used to conduct a robust analysis of the environmental issues associated with the manufacture, distribution, use, and

eventual disposal or recycling of a product (Fiksel, McDaniel and Spitzley 1998);

- Purchasing guidelines, which can be used to select products and suppliers that are environmentally responsible (Natrass and Altomare 1999);
- Environmental risk communication, which ensures that the local community is aware of the potential effects a hotel could have on the environment. This will ease the resolution of community – hotel conflicts by producing an educated public that will be able to participate in the development of mutually agreeable solutions (Mulligan 1999);
- Education and training, which are extremely important tools, as they will help ensure that all hotel management and staff understand the environmental aspects associated with their work and their individual roles in the success of the environmental management strategy (International Institute for Standardization 1996); and
- Collaboration with potential stakeholders, which sets the stage for the sharing of resources directed at environmental improvement (Parasnis 1998).

Thompson (2002) suggests that the individual tools or groups of tools chosen will vary depending on the specific circumstances at an organization. In effect, an individual hotel can choose to implement one or several instruments to tailor their environmental management strategy. The strategies chosen for the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel are included in Chapter 5.

3.5 Conclusion

Hotels, including the Auberge Mont-Royal d"Angkor, are becoming increasingly aware of the impacts of their operation on the environment. In addition, the operational cost savings associated with environmental performance are becoming a driving force for environmental improvement initiatives. As an environmental improvement tool, an environmental management strategy contains a series of elements needed to identify, prioritize, implement and monitor environmental improvement opportunities (International Organization for Standardization 1996).

Environmental auditing is an important precursor to the development of an environmental management strategy (Parasnis, Sevnningsen, and Mandke 2000). An environmental audit is intended to investigate current practice with respect to a set of standards, priorities and benchmarks. Therefore, if conducted properly, it will produce results and recommendations that will form the foundation for further environmental initiatives and ensure that the environmental management strategy implementation is integrated with all aspects of a hotels operation (Chehab et al 2001). For this reason the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel was developed through a methodology that was initiated with an environmental audit and supplemented by several environmental management elements.

Chapter 4: Audit Findings, Improvement Opportunities and Feasibility Assessment

Chapter 3 introduced the concept of good housekeeping. This approach is not cost intensive or complicated. It hinges on staff motivation, management and monitoring (Sustainable Business Associates 1998). This makes it a practical, management-based, approach to developing, organizing and implementing improvement recommendations. Good housekeeping applies to all hotel operations and departments in this case. As a result, it would be helpful if the activities at the hotel were categorized into groups to facilitate the identification of improvement opportunities. The size of the Auberge Mont-Royal d'Angkor hotel allows it to operate with a relatively small staff. The daily work duties for staff often include activities in different functional areas of the hotel. As a result, it is not appropriate to refine good housekeeping based on the division of operational departments.

For the purposes of this project, the audit findings, improvement recommendations, and feasibility assessments that are discussed in the context of good housekeeping and management-based improvement opportunities have been organized into the following categories that represent physical operational areas of the hotel:

4.1 Improvement opportunities through guestroom management; and

4.2 Improvement opportunities through the management of service areas

These categories cover all activities and physical areas of the hotel and are not dependant on a clear distinction of operational departments.

Improvement recommendations that involve up front capital expenditures and non-management centered improvements are grouped under:

4.3 Improvement opportunities through technical adjustments or physical adaptations.

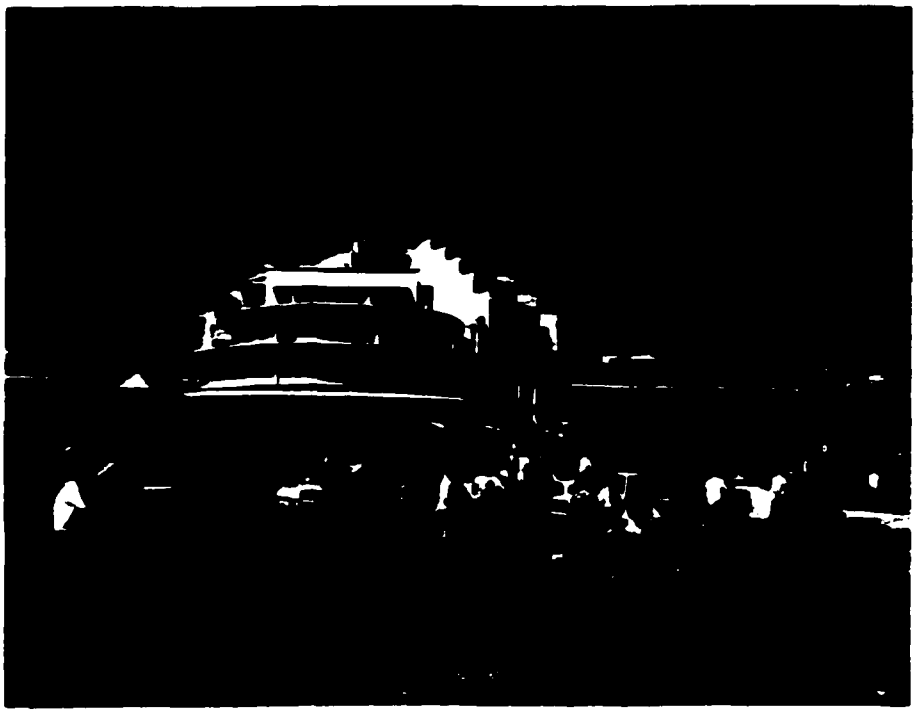
These recommendations are supplemented, where possible, with an evaluation of the capital investment in materials and time as compared to payback in operational cost savings. The distinction of "where possible" is important as it indicates that this analysis was not done for all technical improvement opportunities because the required information was not always readily available. For example, some of the materials involved in improvement opportunities are not available in Cambodia so pricing them was not possible. This is problematic as the analysis of operational cost savings related to improvement opportunities is weak without a presentation of the upfront costs involved.

The audit findings, improvement opportunities and feasibility assessments presented in this chapter were identified by Mr. Phloeun Prim as being the most attractive financially and most easily implemented. Mr. Phlouen Prim and the author held four meetings in which each of the audit findings and improvement recommendations were evaluated based on the following factors:

- The ability of operational staff to implement, monitor and maintain the improvement opportunity;
- The cost of implementation and potential for future return in the form of operational costs;
- The compatibility with existing physical and technological aspects of the hotel;
- The perceived benefit to the environment;
- The compatibility with existing management and business practices; and

- The effect on the quality of guest service.

The improvement opportunities selected by Mr. Phloeun Prim are primarily management-based. Mr. Phloeun Prim and the author suspected that many of the materials, resources and equipment required to implement technical or physical adaptations were either unavailable locally or were extremely expensive. This was confirmed through a three day 'buying trip'. Mr. Phloeun Prim agreed to accompany the author on a trip to Phnom Penh in an effort to locate and price materials. This buying trip represented an extremely significant aspect of the project. It was a tangible demonstration of Mr. Phloeun Prim's overwhelming commitment to developing an environmental management strategy for the Auberge Mont-Royal d'Angkor hotel. Also, to the best of the author's knowledge, this type of investigation had not been done in any formal manner in Cambodia previously.



The Central Market in Phnom Penh

The buying trip focused on locating energy efficient compact florescent light bulbs, low flow shower heads, water efficient toilets and motion activated light switches in Phnom Penh's industrial districts, hardware and utility stores and markets. The results of the buying trip indicated that many of these materials are available. However, they are limited in quantity, prohibiting necessary replacement. Also, they are expensive and, often, of poor quality. The author and Mr. Phloeun Prim spoke with other hotel operators in Siem Reap Town about the possibility of importing these materials from Bangkok, Thailand and subsequently determined that the associated costs and procedures made it an unattractive option.

Also, the hotel is relatively new and major renovations were done in the fall of 2000. Mr. Phloeun Prim has expressed his hesitance in investing a substantial sum of money on further physical changes. As mentioned previously, the management or good housekeeping based improvement opportunities do not involve substantial start up costs. As a result, Mr. Phloeun Prim perceived that these opportunities would result in the quickest and most substantial rate of return.

Also, as mentioned in Chapter 2, Mr. Phloeun Prim is embarking on an initiative to improve the management and operation of the hotel in preparation for an increase in business associated with predicted future tourism numbers. He perceives the management-based improvement opportunities as a mechanism for achieving this goal because they involve both management and operational staff, incorporate training, and rely on monitoring for success.

4.1 Guestroom Management

Informal interviews with operational staff indicated that most of the resource consumption and waste generation that occurs in the Auberge Mont-Royal d'Angkor Hotel takes place in the twenty eight guestrooms through guest and hotel activities. Guestroom management, in this document, refers to all of the processes, activities, and work instructions involved in creating and maintaining an environment for hotel guests.

The table on the following page is based on information gathered through brief, unstructured interviews with staff and management as well as the author's observations while occupying a guestroom for more than 30 days. It presents the typical consumption (materials and labor), and products (wastes and expenses) involved in the maintenance and occupation of guestrooms at the Auberge Mont-Royal d'Angkor Hotel:

Table 4.0 Material Consumption and Products Associated with Guestroom Management at the Auberge Mont-Royal d'Angkor Hotel

Consumption	Products
Energy Grid Electricity and Electricity from Diesel (Lighting, Air-conditioning, Fan Operation, Refrigeration, Pumping and Heating Water) **Water** Potable and Non-Potable (Bottled, Washroom, Laundry, Room Maintenance) **Amenities** Soaps, Glassware, Linens, Towels, Laundry Bags, Paper Goods, Refreshments **Maintenance Supplies** Cleaning Products, Rags, Laundry Facilities, Replacement Bulbs and Fixtures **Labor** Housekeeping, Maintenance	**Energy Expenses** Electricity Tariffs, Diesel Fuel Costs **Energy Wastes** Air Emissions, Fuel Leaks to Ground and Water **Water Expenses** Wastewater Treatment Costs, Energy Costs Associated with Pumping and Heating **Water Wastes** Wastewater Release to Waterways and Ground, Consumption of Clean Water **Solid Waste Expenses** Municipal Collection and Disposal Fee, Revenue from Selling Recyclables **Solid Wastes** Landfill Use, Hazardous Materials Spillage, Litter **Labor Expenses** Wages and Salary

The improvement opportunities with respect to guestroom management were developed based largely on information gained through the literature described in the methodology section of this document to decrease the consumption of materials and production of wastes and materials involved in the maintenance and operation of the hotel.

Most guests at the Auberge Mont-Royal d'Angkor travel to Siem Reap Town to visit the UNESCO World Heritage Site of Angkor Wat. Interviews with hotel operators

indicated that many guests leave the hotel for Angkor Wat between 6:00 am and 8:00 am returning late in the afternoon to shower and relax before dinner. Guest activity in the hotels typically calms down early in the evening.

This pattern has an effect on the schedule of services at the hotel that correlates with the levels of guest activities. This includes the number of staff members on duty and the operation of mechanical equipment. One strategy used by hotels is a key card system for the operation of guestroom lights, fans and air conditioning. All room keys are attached to a card or plastic form that must be fitted into a slot in the room before any energy consuming amenities can be activated.

The hotel walkthrough at the Auberge Mont- Royal d'Angkor showed that, in many cases, the air conditioning units and fans in the guestrooms are in operation when the rooms are unoccupied during the day. Although the Auberge Mont-Royal d'Angkor has installed a key card activated system in the rooms, guests often remove the card from the key and leave it in the slot while they are gone for the day in order to keep the room cool while they are away.

The improvement opportunity was developed based on the following criteria:

- It could not involve "nagging" guests;
- It could not involve switching to an alternative key card system that would be expensive: and
- It had to be possible with the current number of operational staff.

It was concluded that reception staff could inform housekeeping when guests depart to Angkor Wat for the day so that they may immediately check the guestroom(s) to ensure that lights, fans and air conditioning are turned off. This will eliminate unnecessary energy consumption. In the interests of guest comfort housekeeping should ensure that curtains and windows are closed to reduce heating of the room. Mr. Phloeun Prim would be responsible for monitoring the initiative.

This is a management-based opportunity that requires only training and occasional monitoring. It should be fairly easy to implement. It will decrease the amount of energy used in the guestrooms and will save the hotel money according to the following logic:

- Mr. Phloeun Prim indicated that the hotel usually operates on the public electricity grid from 9:00 am to 6:00 pm and 9:00 pm to 6:00 am daily. Public electricity tariffs for fan and air conditioning operation = $5.00 USD/guestroom/night = $0.56USD/guestroom/hour. Immediate checking of guestrooms will save the hotel $0.14USD/guestroom/15 minutes.
- During low season a small generator is occasionally used 24hours/day. The small generator uses diesel to power fans and AC units at a rate of approximately 10 L/guestroom/night = 1.1 L @ $0.65/L /guestroom/hour. Immediate checking of guestrooms will save the hotel 0.3 L/guestroom/15minutes. At the time of the project the cost of diesel was 1500 Cambodian Riel/L which, when converted on May 17, 2002, is equal to $0.65 USD/L.

Discussions with energy efficiency specialists at the Asian Institute of Technology in Bangkok, Thailand indicated that many operations, including hotels, expend considerable energy on unnecessary air conditioning (Mohanty Pers. Comm. April 2001). The literature indicates that a comfortable temperature for human beings in a tropical climate is 24C (Viet 2000; Parasnis 1998). However, many hotels, including the Auberge Mont-Royal d'Angkor, set their air conditioning thermostats much lower thinking that they are meeting the needs of guests. However, the author spoke with many tourists who found their respective hotels uncomfortably cold.

Installation of a Wall Mounted Air Conditioning Unit at the Auberge Mont-Royal d'Angkor Hotel

It was suggested that the Auberge Mont-Royal d'Angkor hotel increase the temperature on the air-conditioning thermostats from 18C to 24C. However, Mr. Phloeun Prim was concerned that his guests would be upset with a 6C change. He agreed to increase the thermostat setting to 22C, a 4C temperature change. Guests

should be encouraged to use the ceiling fans to distribute the cool air in the room as they use considerably less energy (Brahamand Mohanty Pers. Comm. April 2001). Maintenance would be responsible for increasing the thermostat settings, housekeeping would be responsible for occasionally checking the settings, and management would be responsible for periodically ensuring that the above responsibilities are being fulfilled.

This is an easily implementable opportunity that requires a minor technical adjustment and monitoring. It would serve to reduce energy consumption and save money. The thermostat setting on an AC unit is designed to maintain a temperature setting once that temperature has been reached (Mohanty Pers. Comm.). Setting a low temperature on the thermostat does not cool the room faster. The AC unit works to cool the entire thermal envelope (walls and other surfaces), not just the air in the room. Using a ceiling fan to distribute the cool air is much more effective and efficient (Viet 2000).

The occupancy rates at most hotels in Siem Reap Town fluctuate radically between the high and low tourism seasons (Nov and Vachon 2001). According to Mr. Phloeun Prim the Auberge Mont-Royal d'Angkor hotel occupancy fluctuates from 100% during high season and 18 – 20% during low season.

Currently, the hotel uses all guest floors in low season. This requires that air conditioners, fans and lights be in operation in almost all parts of the hotel. Mr. Phloeun Prim agreed that it made sense to cluster guests into one section of the hotel during low season so that energy does not have to be provided to the entire building.

Most of the guestrooms are of similar size and offer similar amenities. As a result, it should be fairly easy to cluster guests. Clustering guests on a particular floor would allow the hotel to avoid switching on lights, fans and other energy consuming equipment on unoccupied floors.

One of the amenities provided in the guestrooms is mini refrigerators stocked with canned pop and beer. The hotel walkthrough demonstrated that these mini refrigerators are often set at a high setting, keeping them colder than necessary, wasting energy and reducing their life span. Checking the temperature in the mini refrigerators could be added to the list of tasks involved in daily room maintenance. They should be set between #2 and #3 at all times as per manufacturers instructions for Toshiba model GR-B5V (Toshiba 1998).

Mr. Phloeun Prim suggested that housekeeping could be responsible for checking the temperature settings on the refrigerators and management could be responsible for monitoring the initiative. This opportunity is a management-based initiative that involves adding a small step to an existing routine. The GR-B5V mini refrigerators are designed to operate to their maximum life cycle at the #2 and #3 settings. Replacement rates will decrease significantly if manufacturer's specifications are followed (Toshiba GR-B5v Operating and Maintenance Manual 1998).

According to the manufacturer, the lifecycle of the mini refrigerators will be longer if they are operated at the specified setting while guestrooms are empty during the day rather than being switched off and on (Toshiba GR-B5v Operating and Maintenance Manual 1998). In addition, switching the refrigerators on and off consumes a

substantial amount of energy as much of the initial energy is spent cooling the refrigerator walls, not the beverages inside increasing the length of time that it takes to cool the beverages (Brahamand Mohanty Pers. Comm. April 2001). This is problematic as it inhibits the ability of the hotel to offer cold drinks to guests when they first check in and may increase energy costs. It is more cost effective both in terms of lifecycle extension and guest services to leave them running (at the specified setting). Obvious exceptions include guestrooms that are unoccupied for extended periods of time.

Guestrooms at the Auberge Mont-Royal d'Angkor hotel are equipped with individual hot water heaters. These heaters use electricity and are operated by guests who choose the water temperature that they are comfortable with. There is a mechanism in these heaters that sets a maximum temperature. According to the Toshiba operational manaual (Toshiba GR-B5v Operating and Maintenance Manual 1998), the maximum temperature on the hot water heaters at the Auberge Mont-Royal d'Angkor hotel is set higher than need be In addition, a power button that does not automatically shut off when the water tap is closed operates them.

Most hotels in Siem Reap Town draw their water from deep wells (Skeith et al 2000.) as the municipal water supply network only supplies the very core of Siem Reap Town. Hotels have been identified as major contributors to a sharp increase in water demand in Siem Reap Town (Skeith et al 2000.). This increased water demand may eventually deplete the aquifers that provide water to private wells. Water conservation in hotels is the key to ensuring the long life of aquifers.

The hotel walkthrough at the Auberge Mont-Royal d'Angkor highlighted several areas where water efficiency could be improved. These included reducing the volume of water used in guestroom maintenance and monitoring the guestrooms for leaks.

Many hotels provide the opportunity for their guests to request less than daily laundry service (IHA, IHEI and UNEP 1995). This activity is not currently taking place at the Auberge Mont-Royal hotel. As a result, towels and linens are laundered after one use. The volume of water used in laundering towels and linen can be reduced if housekeeping does not replace towels that haven't been used and guests choose not to have their linens washed everyday. This improvement opportunity will result in water and energy savings and will reduce the amount of wastewater created through laundry. Washing linen and towels every second day can cut water consumption for laundry by 50% per guestroom (UNEP IHA 1995).

Laundry Facilities at the Auberge Mont-Royal d'Angkor Hotel

Many hotels have switched to low flow, water efficient toilets (Juntrasook 1998). They have proven to save substantial volumes of water. However, as mentioned before, some of these technologies are not readily available or are extremely expensive in Cambodia. Low flow toilets are available in Phnom Penh.

However, the buying trip to Phnom Penh conducted by Mr. Phloeun Prim and the author showed that they are four to five times more expensive than in neighboring Thailand and would have to be shipped to Siem Reap Town by boat or truck, both of which are costly and inefficient. A low cost alternative to low flow toilets involves placing full 750-1000 mL water bottles into the cisterns on the back of all toilets. This will displace the corresponding volume in the cistern and, therefore, conserve that volume of water per every flush.

Also, the walkthrough illustrated that several of the guestrooms have leaking pipes and fixtures. The improvement opportunity suggested alleviating leaks involved 2 steps:

- Identify and document existing leaks; and
- Repair leaks and monitor. This involves regular checks of the washrooms in empty guestrooms to ensure that the taps are not dripping, the toilets are not running and that the showers are not leaking. This includes a regular check for water puddles on the floor under the sink and beside the toilets.

This improvement opportunity will conserve water by preventing unnecessary water loss and ensuring that 'clean' water is prevented from being diverted to the septic

system. It requires coordination between management, housekeeping and maintenance but is not cost intensive.

Monitoring housekeeping activities showed that water is often left running while guestrooms are being cleaned. Mr. Phloeun Prim saw this audit finding as a perfect occasion to begin working with housekeeping staff to improve the efficiency of the operations at the Auberge Mont-Royal d'Angor hotel because it involves a minor change in routine, an element of training, and an opportunity to begin monitoring.

Housekeeping would be instructed to not leave water running continuously anywhere in the hotel and to use buckets and basins while cleaning guestrooms. This opportunity is easily implemented and would save the hotel a considerable amount of water (Habitat Suites Hotel No Date).

The volume of solid wastes produced by hotel operations in Siem Reap Town, combined with the activities of other tourism related business will inevitably surpass the capacity of the local environment (Skeith et al 2000.). Although this problem is the result of the cumulative impacts of hotel operations, each individual hotel has a role to play in managing its solid wastes.

The occupation and maintenance of guestrooms is associated with the creation of solid wastes at the Auberge Mont-Royal d'Angkor hotel. This costs the hotel money for several reasons:

- It requires labor to collect, store and dispose of;

- The hotel is charged by volume to have solid waste collected and brought to the landfill;
- Solid waste, if not properly stored and disposed of may contaminate soil and groundwater, creating clean up costs for the hotel and negatively affecting the aesthetics of the property.

The hotel walkthrough highlighted several areas where better solid waste management can be practiced. Mr. Phloeun Prim selected the following improvement opportunities for the hotel based on cost savings potential and ease of implementation.

There is an ad hoc recycling system in place in Siem Reap Town. Pig farmers will occasionally pay for food wastes as livestock feed, plastic water bottles can be sold by volume, and independent buyers travel by bicycle purchasing aerosol cans and used oil. However, all hotels do not regularly utilize these systems. Although the Auberge Mont-Royal d'Angkor hotel does recycle where possible, guestroom wastes are not always sorted properly, confounding efficient recycling. Awareness on the part of housekeeping staff should be increased. This improvement opportunity requires awareness on the part of housekeeping and monitoring on the part of management. Plastics, aerosol cans, and food waste are resalable.

Ad Hoc Recycling in Siem Reap Town

Also, cleaning products are used in abundance during guestroom maintenance. These are potentially hazardous if they are not disposed of properly, leaching into the ground and spilling into the septic system. They are also expensive to purchase. Minimizing the use of detergent and cleaning supplies will save the hotel money on purchasing and reduce the amount of chemicals added to the septic system.

Guests have the potential to contribute to environmental management at the Auberge Mont-Royal d'Angkor hotel. Currently, there are no mechanisms in place to make guests aware of the impacts of hotel operation on the environment and what they can do to contribute to mitigation. Mr. Phloeun Prim was interested in the possibility of involving guests in environmental management at the hotel.

Like many hotel owners in Siem Reap Town, Mr. Phloeun Prim is a bit hesitant to implement environmental improvement opportunities because he his concerned about

the possible effects on the quality of his guest's stay. This is a legitimate concern. As a result, the Auberge Mont-Royal d'Angkor hotel needs to learn where the balance is for its individual operation between providing a first class experience to their guests and operating economically and responsibly. This is particularly true in Auberge Mont-Royal d'Angkor hotel where operating expenses and environmental impacts are high and so are guest's expectations.

Many hotel operations have had success by communicating their environmental efforts through notices in the guestrooms and have found that their guest's have not commented on reduced quality of service (Viet 2000). Implementing this at the Auberge Mont-Royal d'Angkor will allow the hotel to acquire a good environmental reputation communicated through individual guests and tour operators. This is not a difficult opportunity to implement so long as the information on the guestroom notices is clear and accurate. A sample guest notice was drafted by the Author and Mr. Phloeun Prim and is presented in Figure 4.0 on the following page:

To Our Valued Guests

Electricity and clean water are fast becoming scarce and expensive resources in Siem Reap. Wastewater treatment and solid waste disposal are also major concerns. The Auberge Mont Royal d'Angkor has implemented an environmental management strategy in response to these issues. As a valued guest, you have an opportunity to contribute to the success of this strategy by considering the following actions:

Not letting the tap run continuously when brushing your teeth and shutting it off completely when finished. This alone conserves up to 32 L of water.

Informing housekeeping staff if you do not need your linen and towels laundered daily, rather every second day. This can reduce the amount of fresh water used in laundry by up to 50%.

Ensuring that all lights, fans and air conditioners are shut off and your curtains and windows are closed when you leave the guestroom. Your room will only take a few minutes to cool upon your return.

Placing cans and bottles (plastic and glass) in the bin provided in the guestroom, rather than the wastebasket.

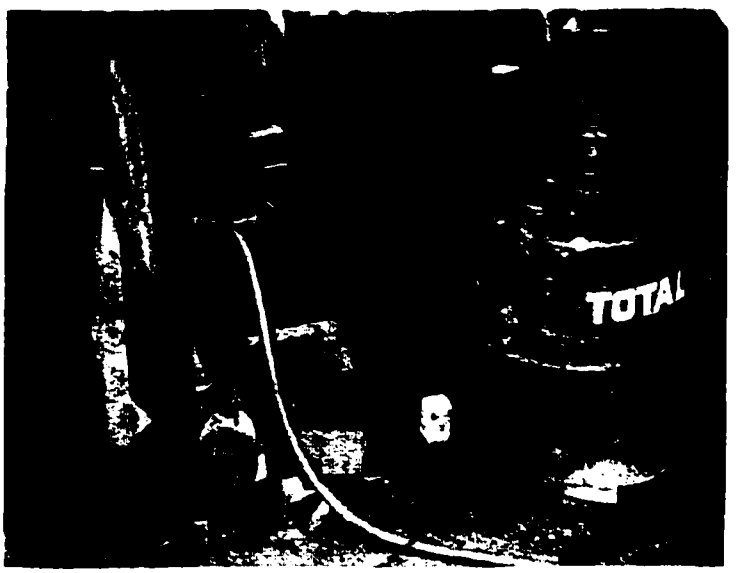
The management and staff of the Auberge Mont Royal d'Angkor would like to thank you sincerely for your contribution to the well being of Siem Reap's environment.

Figure 4.0 A Sample Guest Notice for the Auberge Mont-Royal d'Angkor Hotel

4.2. Improvement Opportunities Through Management of Service Areas

In this document, service areas in the Auberge Mont-Royal d'Angkor hotel consist of all areas that are off limits to guests. These include the kitchen, laundry facilities, rooftop, employee living spaces, maintenance areas, generator storage shed, septic tanks, administrative office, storage areas, and garden shed. The following improvement opportunities were developed to minimize the materials consumed and wastes produced through the day-to-day maintenance and operation of the hotel.

As mentioned previously, the storage and disposal of solid wastes is an important aspect of environmental management at the Auberge Mont-Royal d'Angkor hotel. The wastes associated with the management of services areas do not differ significantly from those associated with guestroom management with the exception of hazardous materials and construction related products. Hazardous materials must be stored and handled properly to ensure that they do not contaminate soil or water. Also, their proper storage will help to ensure operational health and safety.



Diesel Storage at the Auberge Mont-Royal d'Angkor Hotel

Currently, there is no official protocol for the handling and storage of hazardous wastes such as fuels and paints at the Auberge Mont-Royal d'Angkor hotel. It was suggested that a protocol be drafted and posted in relevant service areas. Mr. Phloeun Prim identified this as an important improvement opportunity because he values the safety and health of his operational staff and guests.

This improvement opportunity requires a level of training and periodic monitoring. It should not be undertaken without some sort of consultation for the following reasons:

- Certain chemicals (including fuel) cannot be stored near each other.
- The storage area should have an impermeable 'pad' or floor.
- The storage area should be equipped with a containment system such as a burm.
- Access to this area should be controlled. Restricted admittance to the hazardous materials storage area is extremely important, as it will help ensure that no hazardous substances are introduced to the soil or groundwater.

Other issues with respect to solid waste management at the Auberge Mont-Royal d'Angkor hotel have to do with the unnecessary creation of wastes. The Auberge Mont-Royal d'Angkor does not have policies in place to guide purchasing decisions. As a result, the hotel has little or no control over the amount of waste that accompanies the supplies that it purchases. This waste, in the form of packaging and damaged goods cost creates storage problems for the hotel and costs money for disposal. However, interviews with Mr. Phlouen Prim led the author to conclude that currently there are not enough local suppliers or product choices to support a purchasing policy. However, Mr. Phloeun Prim agreed that initiating a discussion

with suppliers with respect to the cost savings associated with reduced packaging might encourage them to move in the right direction.

The hotel walkthrough highlighted several areas where wastes are created unnecessarily. The guest registration forms, for example, are printed on one side of a full piece of paper. However, the information requested only takes up a quarter of the space on the page. It was suggested that the hotel begin using half sheets to cut down on the amount of paper sent to the landfill. Mr. Phloeun Prim was hesitant initially pointing out that full sized sheets are easier to file. However, in cooperation with the author, a new filing system was devised to accommodate the smaller sheets.

Another improvement opportunity involved securing the support of operational staff by posting bold reminder notices with respect to saving energy and water and managing solid waste in kitchen, laundry and service areas. The notices will facilitate the successful implementation of improvement opportunities and decrease the amount of time spent monitoring staff. If the notices also make a short statement that solicits suggestions, staff may prove to be a source of new, money saving ideas and could be rewarded for doing so.

The hotel walkthrough and discussions with operational staff demonstrated that reorganizing tasks and the arrangement of service areas could alleviate much of the unnecessary energy use at the Auberge Mont-Royal d'Angkor hotel. For example: at the time of the walkthrough cleaning and laundry tasks were not scheduled according to energy efficiency criteria. The author suggested that the housekeeping staff perform

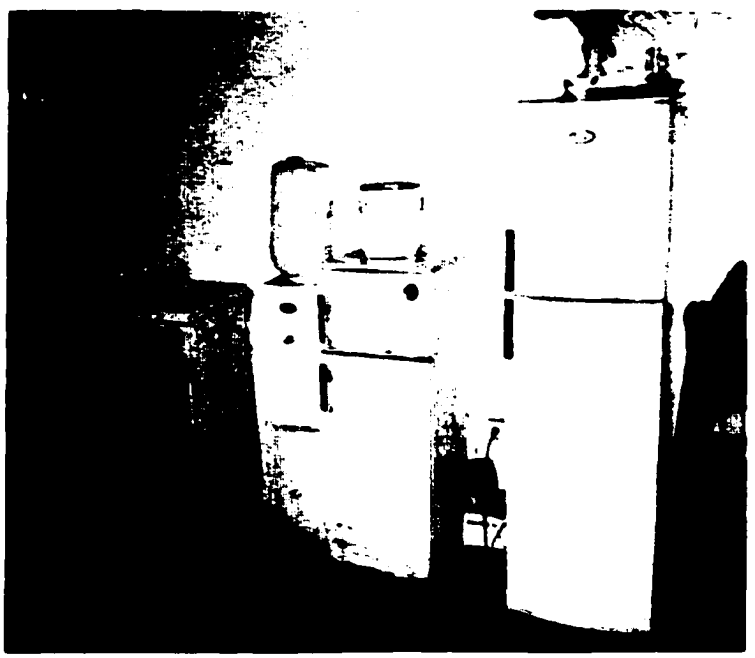
cleaning and laundry tasks that require the use of electricity between 6:00pm and 6:00am when the generator is on, not during use of the public grid.

Unlike the public supply, generator efficiency increases (to a point) with load. Generators operate at very low efficiency when the energy load they are supplying is low, consuming more diesel than when operating at a high capacity (TRANS ENERG 1999). Also, the reliability of public electricity supply in Siem Reap may vary depending on variables such as high a low tourism season demands. Electricity in Cambodia is provided by twenty-two isolated systems. A national grid does not yet exist. As a result, electricity in Cambodia is the most inconsistent and expensive in the region (including Thailand and Vietnam) (ASEAN Center for Energy 2001).

Manipulating task schedules to coincide with generator operation will decrease reliance on an unreliable and expensive electrical grid and increase the efficiency of generator operation, which would serve to offset the cost of diesel and electricity. This will require training, and reorganization of the housekeeping task schedule by management.

Also, the refrigerator and stove in the kitchen are positioned right next to each other and are often used at the same time. In addition the door between the hot kitchen and air-conditioned dining room is often kept open. These factors result in energy losses due to simultaneous heating and cooling in service areas (Brahamand Mohanty Pers. Comm.. April 2001). Simultaneous heating and cooling could be alleviated in the kitchen through the following management-based actions:

- Keep opening and closing of refrigerator and freezer doors to an absolute minimum;
- Check that all oven, refrigerator and freezer door seals are working properly;
- Avoid putting hot food in the refrigerator, cool on counter first;
- Move refrigerators and freezers away from the stove and oven;
- Cover pots with lids at all times and use the smallest possible pans for each task;
- Keep oven-preheating times to a minimum; and
- Keep door between kitchen and dining room closed to reduce heating of dining area.



The Kitchen at the Auberge Mont-Royal d'Angkor Hotel

This opportunity requires minor changes in the day-to-day jobs of kitchen staff. The challenge for management may be in promoting awareness. Keeping the refrigerators away from heating appliances, minimizing opening and closing and checking the seals

will increase their efficiency and cut down on the amount of energy wasted by simultaneous heating and cooling.

Many of the lamps, bulbs and lighting fixtures at the Auberge Mont-Royal d'Angkor hotel are dusty, preventing full illumination. Siem Reap Town is extremely dusty during most times of the year and much of it collects on lighting fixtures, which diminishes their effectiveness and may require other lighting to be switched on. A lot of the fixtures at the Auberge Mont-Royal d'Angkor are fitted with domed reflective surfaces, designed to intensify and direct light. This opportunity is easy to implement and will save the hotel money on the energy consumed in lighting.

As illustrated in Figure 2.3, Chapter 2, service activities at the Auberge Mont-Royal d'Angkor account for 30 – 35% of the water consumed at the hotel. The walkthrough identified several key areas where water consumption could be reduced. Mr. Phloeun Prim considered the following a priority:

- There are several water leaks in the service areas; and
- The kitchen uses unnecessary volumes of water.

Mr. Phloeun Prim and the author developed the following improvement opportunities with respect to water consumption at the hotel:

- Conduct a walkthrough to ensure that there are no water leaks in any pipes or hoses. Write down and report the location of any leaks and repair where possible. In addition to discovering unnecessary water losses, this easily implemented opportunity will help hotel staff learn where leaks may most often occur, directing future checks; and

- Make kitchen staff aware of the need for water conservation and decrease the volume of water used in kitchen operations. This includes actions such using less water to defrost food, not letting water continuously run, even when washing food or dishes, using a basin or bucket if necessary, and ensuring that there are no leaky taps, hoses or pipes in any of the kitchen areas. This opportunity is easy to implement and hinges on the ability of management to motivate kitchen staff to save water. Significant water savings are possible.

Wastewater is poorly managed in many hotels in Siem Reap. The Auberge Mont-Royal d'Angkor does have a septic tank but it is not regularly maintained. Wastewater generation and treatment are a serious concern in Siem Reap Town. There are no municipal treatment systems and most hotels rely on small, ill maintained septic systems to treat wastewater before it is discharged into the Siem Reap River.

Interviews conducted throughout this project indicate that most hotel operators do not understand how to maintain their septic systems and have no way of being certain of the quality of the discharge water. This document does not provide technical details regarding septic system operation or maintenance but does make a very strong recommendation for the development of a septic tank maintenance workshop for hotel operators in Siem Reap Town.

Other improvement opportunities include (Habitat Suites Hotel No Date):

- Installing a grease trap or screen in pipe leaving the kitchen.

- Refraining from dumping any chemicals, oils or other toxins into the drains. Store them in marked containers and dispose of them with hazardous waste.
- Using wastewater from washing vegetables to water flowers and plants in the dining room.
- Reusing rinse water in the laundry area.

4.4 Improvement Opportunities Through Technical Adaptations

In this audit technical adaptations refer to retrofits, including fixture replacements, and structural changes made to the hotel. These may include actions such as changing lighting fixtures; fitting taps with flow restrictors or covering windows with reflective film. Choosing technical adaptation options involves an assessment of the availability of individual technologies, their compatibility with existing installations, and operating and/or maintenance capability (Viet 2000).

As alluded to earlier, availability of technologies was an inhibiting factor in the audit methodology. As a result, this assessment was not always possible. Technical adaptations often require an initial capital investment. As a result, they should be evaluated based on the capital costs of implementing each adaptation as well as the operating costs and savings realized.

Equipment, electrical, maintenance and otherwise, is almost always accompanied by instructional materials and manufacturer's specifications. These items are intended to advise on the proper use and maintenance of the equipment. Following these instructions and specifications helps to ensure safe and efficient operation and adds to the lifetime of the equipment (Mohanty Pers. Comm April 2001). Document reviews

and the hotel walkthrough demonstrated that not all equipment at the Auberge Mont-Royal d'Angkor hotel is operated according to manufacturer's specifications.

The management should review the manufacturer's specifications for all of the hotel equipment and ensure that they are followed. This opportunity will require training and monitoring. It will result in operational cost savings because equipment will operate more efficiently if operated and maintained properly, maximizing the use of energy used to operate. Also, equipment will last longer and maintain a higher resale value if operated and maintained according to manufacturer's specifications.

Many of the technical and physical improvement opportunities presented in the audit report were determined by Mr. Phloeun Prim to be undesirable for implementation. These decisions were based on the following factors:

- Some of the materials needed to implement the improvement opportunities were not locally available;
- The up front capital costs were too high;
- The improvement opportunities that involved physical adaptations to the hotel building may inconvenience valued guests during the upcoming high season; and
- There are few, if any, local benchmarks that demonstrate the cost savings of some of the improvement opportunities.

However, several technical improvement opportunities were selected for implementation.

As mentioned in Chapter 2, 25% of the energy consumed by the Auberge Mont-Royal d'Angkor hotel can be attributed to lighting. At the time of the audit the hotel was fitted with low efficiency incandescent light bulbs. Although the buying trip to Phnom Penh demonstrated that energy efficient light bulbs are expensive and not easy to find, Mr. Phloeun Prim decided that the cost savings associated with a lighting retrofit made implementation worthwhile.

The improvement opportunity involved replacing the existing 40 W and 60 W incandescent bulbs with 11 W and 13 W compact fluorescent bulbs in the foyer, hallways and stairwells. Compact fluorescent bulbs are highly energy efficient, long lasting and provide good quality, dimmable light. The initial capital expenses involved in replacing bulbs is balanced by the following (Bleeker 1992):

- Compact fluorescent bulbs last an average of 9 times longer than incandescent bulbs.
- Each 13 W compact fluorescent bulb saves 47 W of electric power and emits the same light.
- Each 11 W compact fluorescent bulb saves 29 W of electric power and emits the same light.

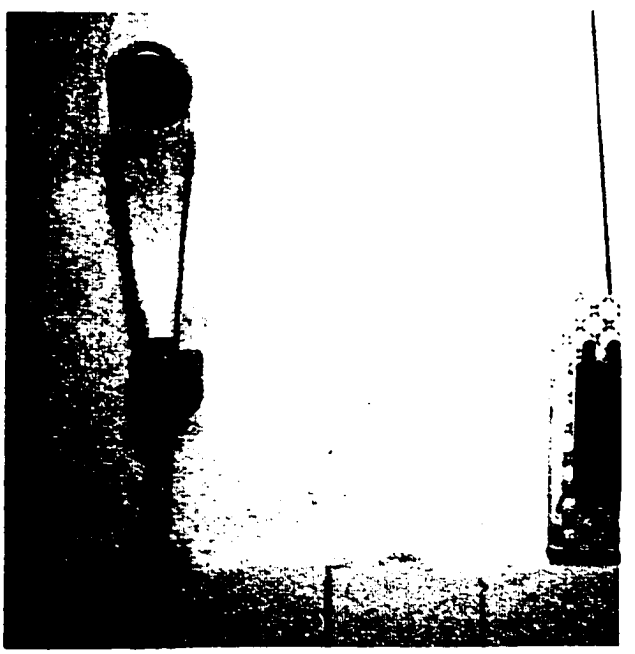
As mentioned in Chapter 2, guestrooms and public washrooms account for approximately 65% of the water consumed at the Auberge Mont-Royal d'Angkor hotel. There are several opportunities to save water in guestrooms and public washrooms:

- Install flow restrictors on guestroom water pipes. Flow restrictors are cost intensive initially. However, water flow will be reduced from 20.5 L/min. to

9.1 L/min (Habitat Suites Hotel no date) in the guestrooms, a water savings of >50% that translates directly into energy savings from decreased pump operation.

- Install water saving showerheads in guestrooms. Water flow in the showers will be reduced from 22.8 L/min. to 9.5 L/min (Habitat Suites Hotel no date). a water savings of >50% that translates directly into energy savings from decreased pump operation.

- Install aerators on guestroom and public taps. As the water leaves the nozzle it is split up and mixed with air, giving it the appearance of normal water flow but only using 60% of the water that would normally be used. This translates into a 40% savings in pump energy for guestroom taps.



Inefficient Shower Head at the Auberge Mont-Royal d'Angkor Hotel

4.5 Conclusion

The environmental improvement opportunities outlined in this chapter have been identified through the environmental audit. They are a reflection of the good housekeeping approach to environmental management. Good housekeeping is a low cost, management-based opportunity that focused largely on training, awareness and monitoring. The improvement opportunities for the Auberge Mont-Royal d'Angkor hotel were organized into three categories: Improvements through guestroom management, improvements through management of service areas, and improvements through technical adaptations.

Mr. Phloeun Prim reviewed the improvement opportunities and selected several, mainly management-based, opportunities for implementation. These improvement opportunities combined with the elements described in Chapter 3, will make up the environmental management strategy for the Auberge Mont-Royal d'Angkor hotel.

Chapter 5:

Developing the Environmental Management Strategy

The improvement recommendations described in Chapter 4 are key to the environmental impact mitigation for the Auberge Mont-Royal d'Angkor hotel and will form the foundation of the environmental management strategy. However, they need to be supported by additional environmental management elements in order to facilitate and maintain implementation. It follows that the elements selected for the management strategy have a direct effect on implementation success.

It is important that the environmental improvement opportunities and associated elements be a reflection of actual conditions at the hotel. The environmental audit, described in Chapter 3, acted to ensure that the improvement opportunities were tailored to the operations at the Auberge Mont-Royal d'Angkor Hotel. Adapting existing environmental management models to the hotel will make certain that the elements are also compatible with current operational conditions.

There are many environmental management models that can be applied to hotels. The ISO 14001 *Environmental Management Systems – Specification with Guidance for Use* (International Organization for Standardization 1996) outlines a procedure that is based on the identification of environmental aspects. Environmental aspects are to be developed through the identification of positive or negative impacts of the organization's activities on the natural environment. They then become the basis for objectives and targets that make up individual environmental management programs. Sections of the ISO 14001 environmental management system model are applicable to the development of the environmental management strategy for the Auberge Mont-

Royal d'Angkor hotel. However, it has been adapted significantly in this case for several reasons:

- It does not provide a simple mechanism for comparing actual to ideal conditions outside of legal requirements;
- It does not require a commitment to implementation:
- It contains potentially confusing terminology;
- It is paper intensive rather than people intensive;
- It contains specifications on measurement and monitoring that cannot be met at most hotels in Siem Reap Town; and
- Certification is expensive.

As mentioned in previous chapters, environmental auditing provides a means for individual hotel operators to pinpoint operational cost savings opportunities, establish competitive advantage and help sustain the influx of important tourism dollars on their own terms. As a tool, auditing facilitates the comparison of current operating conditions to a set of standards, objectives and management priorities that are determined by the individual hotel, not just regulatory requirements (Chehab et al 2001). The environmental improvement opportunities are more likely to be implemented, as a result.

In contrast to the ISO 14001 process, the scale and timing Of an environmental audit are often determined by the needs and concerns of the individual hotel. They can be conducted internally and, as a result, give the hotel operator, management and staff the opportunity to better understand the hotel's operations. This will facilitate the implementation of environmental management elements such as measurement and

monitoring. These characteristics suggest that an environmental management auditing procedure, adapted specifically for the Auberge Mont-Royal d'Angkor hotel would be an appropriate precursor to the development of an environmental management strategy.

5.1 The Environmental Management Cycle

Environmental management and environmental management systems typically follow an environmental management cycle (IHA, IHEI and UNEP 1995) (figure 5.0):

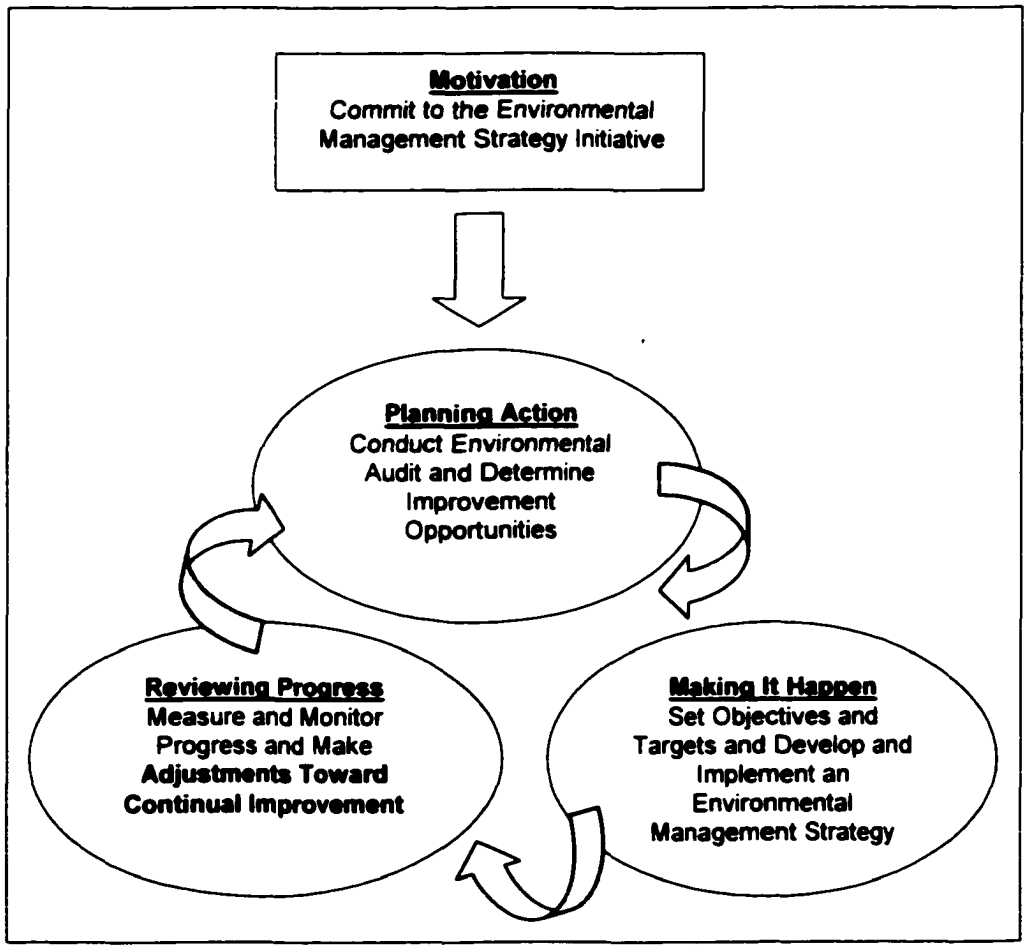


Figure 5.0 Environmental Management Cycle

Source: Adapted From IHA, IHEI and UNEP1995

This management cycle depicts the relationship between the environmental audit, identification of improvement opportunities and the other elements involved in the environmental management strategy. Once the commitment has been made to an environmental management initiative, action, in the form of an environmental audit, is taken to assess existing operations with a set of standards and objectives for the purpose of identifying opportunities for improvement.

Objectives and targets are set with respect to implementing the improvement opportunities and environmental elements or tools are selected to facilitate this process. A strategy for measuring and monitoring the success of the improvement opportunities is developed and changes are made to the objectives, targets and elements if needed for improvement (City of Calgary 1999).

5.0 Elements of the Environmental Management Strategy

The elements of environmental management strategies are outlined in chapter 3. For the purposes of review they include (Hagler Bailly 1999):

5.1 An initial assessment or environmental audit;

5.2 A list of improvement opportunities;

5.3 An assessment of the feasibility of the improvement opportunities with respect to the specific hotel and implementation potential;

5.4 A set of objectives and targets regarding the implementation of the improvement opportunities selected for implementation;

5.5 Specific roles and responsibilities with respect to implementing the individual improvement opportunities and the environmental management strategy;

5.6 A system of measurement and monitoring for the purposes of assessing progress and working towards improvements;

5.7 A set of specific environmental management tools; and

5.8 Communication and motivation

5.1, 5.2 and 5.3 Environmental Audit, Improvement Opportunity Identification and Feasibility Assessment

These elements of the environmental management strategy were the preliminary steps of the project. They served to ensure that the environmental management strategy is a refection of current operating conditions at the Auberge Mont-Royal d'Angkor hotel, facilitating implementation of the individual improvement opportunities. They are described in detail in Chapters 3 and 4.

5.4 Objectives and Targets

As mentioned in Chapter 3 an objective is a goal statement that does not make reference to qualitative or quantitative details. A target includes both qualitative and quantitative details where appropriate. Objectives and targets help guide the environmental management process and act to keep individual improvement opportunities in line with the rest of the environmental management strategy (City of Calgary 2000).

Several factors were taken into account in the development of the objectives and targets for the Auberge Mont-Royal d'Angkor hotel:

- The tourism industry in Siem Reap Town is subject to extreme high and low season fluctuations (Botumroath 1999).

Discussions with hotel owners indicate that hotels typically experience fluctuations in occupancy that range from 100% in high season to 18-20% in low season. This has an effect on the amount of financial and human resources available to implement environmental improvement opportunities at certain times of the year;

- The Auberge Mont-Royal d'Angkor hotel is a small, family owned operation. As a result, it does not have access to all of the resources needed to implement all of the improvement opportunities described in Chapter 4. This has an effect on the qualitative and quantitative details of targets extending deadlines and, in some cases, affecting goals with respect to efficiency initiatives; and

- Some of the improvement opportunities require substantial training and awareness that will affect temporal aspects of certain targets.

For the purposes of this project, objectives and targets were developed with Mr. Phloeun Prim for all of the improvement opportunities that he felt could be implemented with the current resources at the hotel. As mentioned in Chapter 4, most of the chosen improvement opportunities are management – based and have the following characteristics:

- Implementation is not cost intensive;

- Operational costs are realized quickly;
- They are relatively simple; and
- They are easily implemented.

The objectives and targets for the selected improvement opportunities are summarized in Table 5.0.

Table 5.0 Objectives and Targets for Environmental Improvement Opportunity Implementation at the Auberge Mont-Royal d'Angkor Hotel.

Improvement Opportunity	**Objective**	**Target**
Have reception inform housekeeping staff when guests leave for the day, facilitating immediate confirmation that lights, fans and AC units are turned off.	Cut down energy consumption and costs through good housekeeping.	Train all housekeeping and reception staff on the improvement opportunity by the start of the 2001 high season.
Have housekeeping check that mini bar fridges are not set above 3.	Conserve energy and extend the life of refrigerators.	Adjust all settings to 2 by August 2001and check weekly.
Increase temperatures on air-conditioning thermostats to 22C from 18C.	Cut down energy costs and increase guest comfort through a minor adjustment.	Adjust all of the thermostats to 22C by August 2001 and check monthly.
Have housekeeping check that the shower heaters are turned off and that the temperature setting is at a minimum.	Cut down energy consumption and costs through good housekeeping.	Train all housekeeping staff on the improvement opportunity by the start of the 2001 high season.
Cluster guests in sections of the hotel during low season.	Cut down energy consumption and costs through good housekeeping. Save energy during the low season.	Implement cluster strategy by the 2002 low season and monitor energy savings and guest reactions.
Place notices informing	Improve environmental	Draft signs for review

Improvement Opportunity	Objective	Target
guests of the hotel's environmental efforts in the guest rooms.	performance through guest cooperation.	immediately. Have the posted by the start of the 2001 high season.
Do not replace towels or linen daily unless requested by guest.	Environmental improvements through guest cooperation and good housekeeping.	Implement strategy by the 2002 low season and monitor energy savings and guest reactions.
Regularly check guest room washrooms for any water leaks.	Save water and energy through good housekeeping.	Implement immediately. Schedule checks monthly.
Never leave water running continuously when cleaning guest rooms.	Save water and energy through good housekeeping.	Implement immediately.
Reuse guestroom amenities where possible. E.G. use discarded soaps.	Solid waste management and cost savings through good housekeeping.	Implement immediately. Monitor monthly.
Separate guest room wastes and reuse, recycle or resell where possible.	Solid waste management and cost savings through good housekeeping.	Host informal workshop at start of August 2001. Begin implementation and monitoring by start of 2001 high season.
Minimize the use of detergents and cleaning agents involved in cleaning guest rooms.	Solid waste management and cost savings through good housekeeping.	Implement immediately. Monitor monthly through receipts for products and garbage disposal.
Save laundry and energy consuming tasks for times when the generator is producing electricity.	Reduce energy costs by using a reliable supply for tasks and increasing the efficiency of generator use.	Host information session with housekeeping staff in August 2001. Begin implementation and monitoring by start of 2001 high season.
Ensure that all equipment is operated and maintained according to manufacturer's specifications.	Conserve energy and extend the life span of equipment.	Begin collection, review, and storage of manufacturer's specification documents immediately. Have maintenance check all equipment with respect to these documents and

Improvement Opportunity	Objective	Target
		make necessary repairs.
Avoid simultaneous heating and cooling in kitchen and dining areas.	Energy savings through good housekeeping.	Rearrange the kitchen by start of 2001 high season. Host information session with kitchen staff in August 2001.
Regularly clean lamps, lighting tubes, fixtures and luminaires.	Energy savings through good housekeeping.	Implement immediately.
Reuse rinse water in laundry and kitchen areas where possible.	Water savings through good housekeeping.	Implement immediately.
Never let water run continuously in kitchen or laundry areas, use basins where necessary.	Water savings through good housekeeping.	Implement immediately.
Change guest reservation sheet format to a half page and use both sides of paper for administrative tasks.	Solid waste management through good housekeeping.	Implement immediately.
Ensure that hazardous materials and stored and disposed of in a safe, responsible manner.	Solid waste management through good housekeeping.	Host information session in September 2001.
Collect all waste oil for resale.	Solid waste management through good housekeeping.	Implement immediately.
Prevent oil and chemicals from entering the septic system.	Wastewater management through good housekeeping.	Host information session in September 2001.
Replace incandescent bulbs with compact fluorescent lamps.	Energy saving through efficient lighting.	Cost replacement bulbs in August 2001 and compare to energy savings. Make an implementation decision at start of 2002.
Install flow restrictors and aerators in guest rooms.	Water savings through physical adaptation.	Cost fixtures in August 2001 and compare to water savings. Make an implementation decision at

Improvement Opportunity	Objective	Target
		start of 2002.
Place full 1 L water bottles in toilet cisterns.	Water savings through simple physical adaptation.	Implement immediately.
Initiate a composting program for kitchen and garden wastes.	Solid waste management through recycle and reuse.	Investigate immediately.

5.5 Specific Roles and Responsibilities with Respect to Implementing the Improvement Opportunities

The delegation and definition of roles and responsibilities with respect to the environmental management strategy at the Auberge Mont Royal d'Angkor hotel is important for several reasons:

- It ensures accountability for improvement opportunities;
- It provides a sense of ownership and motivation to operational staff with respect to the environmental management strategy;
- It facilitates the documentation needed for monitoring the success of the improvement opportunities; and
- It helps keep the environmental management strategy in line with the objectives and targets.

It is important here to articulate the distinction between role and responsibility *for the purposes of this document.* A role is a position, given to an interested staff member, who helps manage the overall implementation and operation of the environmental

management strategy. A responsibility is an element of an individual's work instructions that contributes to the success of the individual improvement opportunities, thus adding to the success of the environmental management strategy.

The author worked with Mr. Phloeun Prim to review the current responsibilities of staff at the hotel and identify interested individuals for roles in the environmental management strategy. Responsibilities with respect to the individual implementation strategies were listed and incorporated into the existing job descriptions of staff members. In an interview Mr. Phloeun Prim communicated that he agreed that an internal workshop would be necessary to ensure that all operational staff understand the environmental management strategy and their respective roles and responsibilities and convey the associated operational cost savings and potential benefits to operational staff.

5.6 Measurement and Monitoring

The goal of the environmental management strategy is to improve the environmental performance of the Auberge Mont-Royal d'Angkor hotel for the purposes of mitigating the environmental impacts of hotel development in Siem Reap Town. Other environmental management projects in the hotel industry illustrate that the environmental and economic benefits of an environmental management strategy rely, in part, on the frequency of monitoring and management supervision (Meade and del Monaco 2001). Accurate measurement is required in order to assess and monitor the economic and environmental benefits of the environmental improvement opportunities at the Auberge Mont-Royal d'Angkor hotel. However, the hotel does

not have all of the formal mechanisms in place needed to measure and monitor its operations with respect to the environment.

Traditional models for measuring and monitoring improvement opportunities for impacts such as water and electricity consumption are often technology intensive. These are unsuitable in this case for several reasons:

- They are typically expensive by Siem Reap Town standards;
- They may not be locally available; and
- They may not be well understood amongst hotel operators in Siem Reap Town.

Measurement and monitoring procedures, in this case, can be as simple as utilizing management and existing human resources (IHA, IHEI and UNEP 1995), and existing technologies. The author and Mr. Phloeun Prim reviewed several existing models for measurement and monitoring in hotels and decided that the Auberge Mont-Royal d'Angkor hotel, in its existing state, could use the following strategies to measure and monitor energy and water consumption and solid waste management.

Measuring energy use can be as straightforward as documenting the following:

- Monthly occupancy;
- Energy tariffs for the public supply in Siem Reap Town, including any seasonal, temporal or quantitative variations;
- The cost of diesel (L/hour) of running the 25 kVA and 90 kVA generators;
- Monthly energy expenses; and

- An inventory of all energy consuming appliances with their maintenance specifications and any comments on their current condition that would alter normal energy consumption.

An example of how this information could be used to assess an improvement opportunity follows is outlined on the following page in Figure 5.1:

A hotel increases the set temperature on the guest room air conditioning thermostats by 4 degrees Celsius. All air conditioning units operate at this temperature for one month, at which time, the hotel operator wishes to assess the cost savings associated with this strategy. He compares the energy costs from the test month to the month before and notices that, although there is a slight decrease, it is less than he anticipated.

He wonders whether this is because the strategy is not as effective as he anticipated. He considers the information in the bulleted list above and discovers the following:

- The energy expenses for the test month are typically higher than the previous month because it is busier.
- The cost of diesel has increased by $0.10/L during the test month.

He takes that information and, rather than compare the test month with the previous, slower month, compares it with the same month last year or a month of similar occupancy. In addition, he adjusts the cost of diesel to reflect that of the test month. The new, more accurate comparison demonstrates cost savings that are more in line with his expectations and he decides to maintain the increased thermostat temperature.

Figure 5.1 An Example of Simple Energy Monitoring in a Hotel

The author suggests that the relative lack of technical expertise at the Auberge Mont-Royal d'Angkor hotel requires that more complicated assessments such as the identification of the threshold where, based on occupancy, the public electricity supply is less expensive than operating either generator are best achieved through an

energy audit. An energy audit need not be expensive but it must yield accurate, hotel specific information, particularly when assessing the energy efficiency of the operation and analyzing the profitability of technical improvement opportunities (Floresca 1994). As a result, a professional should conduct it. Interviews indicate that there are capable auditors located in Phnom Penh[14].

As with energy, the effectiveness of various water and wastewater management strategies at the Auberge Mont-Royal d'Angkor hotel cannot be assessed without accurate measurement of current practice. Again, the benefits of various improvement opportunities will only be appreciated if they can be quantified. Hotels use various strategies to measure their water consumption and wastewater discharge. These range from full-scale water audits to metering to simple, low cost monitoring. The Auberge Mont-Royal d'Angkor hotel has several options:

- Hire a consultant to conduct a water audit of the hotel: This option is preferable but probably not cost effective for the size of the Auberge Mont-Royal d'Angkor hotel;

- Install a series of water meters: This option is feasible and would produce good data but is initially cost intensive; and

- Develop a simple, management based monitoring program that involves existing staff: This option may prove to be the most cost effective for the

[14] Mr. Sat Sarry at the Ministry of Industry and Energy in Phnom Penh can be contacted for more information (Chev Phal Pers. Comm. June 2001)

hotel and could be implemented in two relatively simple ways at the Auberge Mont-Royal d'Angkor hotel:

1. Monitor Pump Operation:

Have a log sheet next to the well pump which is operated manually. Table 5.1 demonstrates an example:

Table 5.1 A Sample Water Pump Log Sheet for the Auberge Mont-Royal d'Angkor Hotel

Date	Time On	Time Off	Initial
June 1, 2001	8:00am	10:15am	RM

Adding up the minutes of pump operation can be used to monitor water use on daily, monthly or annual units or at various occupancy rates. Those units can be compared to each other to assess trends or monitor the results of implementing various conservation opportunities. Although the hotel does not pay for the water that it consumes, this strategy would help the hotel assess the amount of energy that is required to pump and treat water.

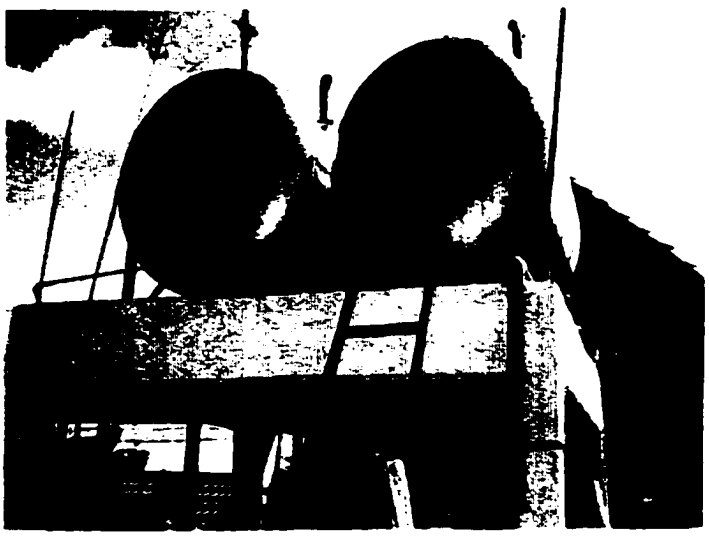
2. Monitor Water Storage Tanks:

The hotel stores water in two – 2000 L tanks on the roof. Water consumption could be measured by filling both the tanks and noting the length of time it takes to empty one. This exercise could be repeated at various times during the year to assess variances during high and low season. Because this measurement is volume, it can be converted to approximate the Auberge Mont-Royal d'Angkor hotel's water efficiency rating using table 5.2:

Table 5.2 Water Usage Efficiency in Hotels

m^3/bed/year	Good	Fair	Poor
4-50 bed hotels	<120	120-140	>140
50+ bed hotels	<160	160-185	>185

Source: IHA, IHEI and UNEP. 1995.



Water Storage Tanks at the Auberge Mont-Royal d'Angkor Hotel

The Auberge Mont Royal d'Angkor Hotel can address its contribution to the negative impacts of solid waste generation in Siem Reap by reducing consumption of materials, reusing and recycling where possible and ensuring proper storage and disposal of waste. Simple measures such as keeping track of purchasing records and waste disposal manifests can demonstrate the success of any solid waste management strategies. For example, if the hotel is charged by the size of the waste load by the municipal collection service, decreased charges mean less waste. Similarly, decreases in the consumption of items such as paper and guest room amenities would be reflected in purchasing records.

5.7 A Set of Specific Environmental Management Tools

Chapter 3 provides examples of the types of management tools that can be utilized to contribute to the success of environmental management strategies. These were compiled and reviewed with Mr. Phloeun Prim during a brief meeting that focused on the practicality, feasibility and costs associated with each strategy. The following tools were identified as possible alternatives:

5.7.1 An environmental policy;

5.7.2 Purchasing guidelines;

5.7.3 Education and training; and

5.7.4 Collaboration with potential stakeholders.

5.7.1 Environmental Policy

According to ISO 14001, an environmental policy is "a statement by the organization of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental

objectives and targets" (International Organization for Standardization 1996). An environmental policy would act as a clear and succinct declaration of the Auberge Mont-Royal d'Angkor hotel's goals and management priorities with respect to its impacts on the local environment.

A sample environmental policy was drafted for the Auberge Mont-Royal d'Angkor hotel and is illustrated in figure 5.2:

> The Auberge Mont-Royal d'Angkor hotel values the quality of the environment in Siem Reap Town. We endeavor, without compromising the quality of the services that we provide to our valued guests, to operate our hotel in an environmentally responsible manner through focusing our activities on the following areas:
>
> - Energy efficiency;
> - Reduced water consumption;
> - Reduced production of solid waste;
> - Reuse and recycling; and
> - Awareness.
>
> We commit to abiding by all environmental laws and regulations in Siem Reap Town and endeavor to continuously improve our operations with respect to environmental management.

5.7.2 Purchasing Guidelines

Purchasing guidelines can be used by the Auberge Mont-Royal d'Angkor hotel to reduce the costs associated with the environmental management strategy, particularly in the area of solid waste management. For example:

- Purchasing products with minimal packaging decreases the amount of storage space needed at the hotel and cuts down on the amount of waste being deposited in the landfill;
- Purchasing high quality products ensures a longer user period;

- Purchasing appliances and fixtures with energy and water efficiency in mind will save on consumption related costs; and
- Purchasing locally produced goods reduces costs related to transportation and redistributes money into the local economy.

Information gathered through hotel operators and suppliers indicate that it may be difficult to find local or regional suppliers that can comply with these purchasing guidelines. However, Mr. Phloeun Prim believes that, if the demand is great enough, a local supplier may be willing to work with hotels to find a solution. In addition, he perceives that the benefits of responsible purchasing on the local economy will warrant the extra work involved in trying to abide by self-imposed guidelines.

5.7.3 Education and Training

The Document *Environmental Management in Thai Hotel Industry* (Parasnis 1998) discusses the importance of education and training to environmental management initiatives in hotels. The author suggests that training is important for hotel management, operational staff and hotel guests as cooperation from all of these groups is crucial to the success on any environmental management initiative. Mr. Phloeun Prim, based on the success of the meetings associated with the environmental audit, has suggested that regular staff meetings and information sessions may be the most effective way of ensuring that all management and operational staff are up to date on the environmental management strategy and the improvement opportunities associated with it.

5.7.4 Collaboration and Communication with External Stakeholders

Collaboration and communication with external stakeholders will serve to establish and strengthen relationships that will be important to the successful implementation of the environmental management strategy (Mandke 1999). Table 5.3 outlines the stakeholders involved in environmental management for hotels in Siem Reap Town and their potential role in the implementation of the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel:

Table 5.3 External Stakeholders Involved in Environmental Management at the Auberge Mont-Royal d'Angkor Hotel

Stakeholder(s)	**Role(s)**
Provincial Department of the Environment (DOE)	The DOE is involved, in principle, in developing and enforcing environmental regulations in Siem Reap Town. However, after reviewing the operations at the DOE through interviews, the author suggests that the department has a limited capacity for enforcing environmental regulations.
Royal Cambodian Ministry of Tourism (MOT)	The MOT has drafted a National Tourism Plan, which includes guidelines for hotel operations in Cambodia.
Hotel Owners in Siem Reap Town	Hotel owners in Siem Reap Town play several important roles: - The ones that practice environmental management provide an example; - They will be the recipients of an outline of the operational cost savings realized through the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel; and - They are key to mitigating the cumulative impacts of hotel development through the

Stakeholder(s)	Role(s)
	development of the larger Environmental Management Plan discussed in Chapter 2.
Non-Government Organizations (NGO)	NGOs in Cambodia and abroad are a source of resources in the form(s) of: guidance documents, training support, financial support and human or technical resources.
Tour Operators	The extremely important role of tour operators in the success of tourism related businesses such as hotels is discussed in Chapter 2. The Auberge Mont-Royal d'Angkor hotel relies largely on its relationship with tour operators for business. Tour operators in general are directing their business to environmentally responsible tourism related businesses (Tour Operator's Initiative 2000).
Individual Guests	Individual guests can be an influential pressure group (Mandke 1999). They are increasingly demanding environmental responsibility from hotels Glanzrock 1995). Also, many of the environmental impacts of hotel operation are associated with the activities of guests. Education and awareness with this stakeholder group will facilitate the implementation and maintenance of the improvement opportunities that make up the environmental management strategy.
Local Community	The local community is an important stakeholder as it is directly affected by the environmental impacts of hotel operation in Siem Reap Town. Making the community aware of environmental management initiatives in the hotel industry may help to secure support for environmentally responsible operations. This could provide additional business through word of mouth via contact with

Stakeholder(s)	Role(s)
	tourists in the area.
Local Media	Many tourists in the area read the local guides to Siem Reap Town and Angkor Wat. They provide descriptions of local accommodations, dining and entertainment and could act as an advertisement for environmental initiatives in hotels.

5.8 Communication and Motivation

As with education and training, the successful implementation of the environmental management strategy relies on the ability of the staff to understand the role of their individual activities in the larger picture. As a result, it is of key importance that staff are informed and motivated. Suggested strategies for motivating and communicating with staff at the Auberge Mont-Royal d'Angkor hotel include:

- Translating the cost savings into units staff members relate to and rewarding in those units. For example, if an opportunity would save $0.30/hour in energy costs, calculate that amount in staff wages. This strategy serves 4 purposes:

    - It demonstrates to individual staff members in tangible terms that, if the opportunity is not implemented, the money (equivalent to X wages) is being 'thrown away';

    - It sets the initial framework for an incentive program. If certain individuals or departments are key in ensuring that the money is not being 'thrown away', then a portion of that money could be used to supplement their salaries as a reward for participation;

- It demonstrates to employees the importance of each individual to the efficient operation of the hotel; and

- It helps explain to individual staff members the connection between their activities, the environment and cost savings in terms they can easily understand.

- Encourage staff input. Allowing for participation helps create a sense of ownership.

- Provide support. Staff should feel like the necessary resources are in place to support their activities. This includes proper training.

Communication with guests can be facilitated through posting the environmental policy in a public area of the hotel and implementing the improvement opportunity that recommends posting notices in guestrooms.

As mentioned in a previous section, communication with external stakeholders is also important. Communication with tour operators in particular would be an extremely valuable strategy for the Auberge Mont-Royal d'Angkor hotel. Tour operators are becoming increasingly concerned about the environmental impacts of tourism on destinations (WTO, UNESCO and UNEP 2001) and their activities represent what is arguably the highest source of income for most hotels in Siem Reap Town (Mr.

Phlouen Prim Pers. Comm. April 2001). Communicating environmental management efforts to tour operators has great potential for increased business.

Conclusion

The environmental audit was conducted to ensure that the environmental management strategy was compatible with operating conditions at the Auberge Mont-Royal d'Angkor hotel. The improvement opportunities, based on the audit, are the foundation of the environmental management strategy. However, they need to be supported by environmental management elements that will ease and maintain implementation and monitoring successes and shortcomings.

Chapter 6: Conclusions and Recommendations

The approach, methodology, analysis, and results of this Master's Degree Project have been described in the previous chapters. Upon review of these items, the author has formed the following conclusions and recommendations.

The approach of this project is outlined in Chapters 1 and 2. It was developed by the author based on background information and interviews, described in the methodology section, that suggest that the cost benefits associated with environmental management would secure a participating hotel and encourage other hotels to be involved in environmental management initiatives.

In addition, because the most serious environmental impacts of hotel operation are not necessarily associated with any single operation, rather with the cumulative impacts of all hotels, the project was positioned as a part of a larger, more inclusive environmental management plan for the hotel industry in Siem Reap Town. The results of this project suggest to the author that this approach was both contextually appropriate and has potential for successful implementation.

The business benefits to hotels of energy conservation, water conservation, wastewater management and solid waste management appear to be strong driving forces for environmental management at hotels in Siem Reap Town. These benefits include operational cost savings, increased competitive advantage through attracting environmentally conscious guests, forming relationships with tour operators, and contributing to the sustainability of the tourism industry.

Interviews with Mr. Phloeun Prim late in the project suggest that positioning this project as a part of the larger environmental management plan for hotels in Siem Reap Town contributed significantly to his understanding of cumulative effects. In addition, Mr. Phloeun Prim has indicated that aligning the project with the environmental management plan provided him a level of assurance that his individual participation would have a positive impact on the quality of the local environment outside of the Auberge Mont-Royal d'Angkor hotel.

Participation, in the form of interviews, of other hotel operators in this project has been referred to in previous chapters. Several of the hotel operators interviewed indicated that they had a limited understanding as to how to approach the mitigation of the cumulative impacts of hotel operation in Siem Reap Town. The author recommends that, in order to ensure that the cumulative impacts of hotel operation in Siem Reap Town continue to be addressed, future project results, such as environmental audits and management strategies, be similarly positioned in the environmental management plan. This recommendation requires organization on the part of the individual(s) or organization responsible for the development and implementation of the environmental management plan to coordinate the various current and future environmental management projects taking place in the Siem Reap Town hotel sector.

This document describes the application of environmental auditing as a precursor to the development of an environmental management strategy. The author has concluded that environmental auditing was a useful method of accurately assessing the operational and physical conditions at the Auberge Mont-Royal d'Angkor hotel. This

is due to the fact that environmental audits are designed to investigate aspects of a hotel's operation with respect to a set of objectives, standards, and regulations that have been reviewed by top management. The results therefore are a reflection of management priorities and compliance issues specific to the individual hotel, in effect ensuring that any improvement recommendations have implementation potential.

The objective of the project, as outlined in Chapter 2, was to develop an environmental management strategy. Chapter 5 describes a set of environmental management tools directed at incorporating the environmental audit findings and improvement opportunities into an environmental management strategy. Having completed the project and reviewed the implementation potential with Mr. Phloeun Prim, the author concludes that these tools are necessary in order to implement and maintain the improvement opportunities outlined in Chapter 4.

The author recommends the following with respect to further application of environmental auditing to hotels in Siem Reap Town:

- That the process be thoroughly reviewed with the management at all hotels that are participating in future environmental audits to ensure that those individuals understand the steps involved, time commitments and expected results. This will act to secure commitment to the entire process and ensure that the audit is a reflection of management priorities;

- That traditional environmental auditing methodology is applied in a relatively flexible manner that reflects the operational, financial, and physical

characteristics of the hotel. A smaller hotel, based on the author's experience with this project, is likely to be discouraged from participating in an environmental audit if the process appears time consuming, complicated and expensive;

- That, keeping the previous conclusions with respect to the project approach in mind; the audit findings and improvement opportunities should be initially presented to management in the context of potential business benefits; and

- That the environmental audit be incorporated into an environmental management strategy that consists of the tools necessary to implement and maintain the improvement opportunities. These tools should be developed with hotel management to ensure that they are understood and accepted and are appropriate to the nature and scale of the hotel's operations.

Chapter 3 describes the audit process at the Auberge Mont-Royal d'Angkor hotel. The results of the audit were a set of findings that represented areas for potential environmental management improvements. These environmental management improvement opportunities were subject to a feasibility analysis, which included an assessment of the economic, technological and environmental aspects of implementation.

The author has concluded that this feasibility analysis was necessary to determine which improvement opportunities were attractive to the hotel operator for implementation. The economic evaluation provided an immediate and tangible

demonstration of the costs involved and potential benefits gained with respect to each environmental improvement opportunity. The author recommends that, due to the fact that operational costs are of primary importance to many hotel operators in Siem Reap Town, the economic evaluation should be conducted, with participation from senior hotel management, prior to the environmental and technical analyses.

The improvement opportunities chosen by Mr. Phloeun Prim for implementation were primarily management based. The author has concluded that these were attractive because they are relatively low cost and easy to implement with the resources available at the hotel. This is significant as it represents a potential selling point for environmental management in hotels in Siem Reap Town, as these opportunities are largely inexpensive and easy to implement.

The implementation and maintenance of the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel is clearly the desired outcome of this project. There are several key resources, referred to in previous chapters, that act to guide hotels through the process of implementing and maintaining management based environmental improvement opportunities. These are chiefly based on the concept of good housekeeping as described in Chapter 4.

To the best of the author's knowledge these resources are not currently available in Siem Reap Town. These resources or excerpts from these resources should be made available to other hotel operators in Siem Reap Town to demonstrate that environmental management need not be expensive or complicated. The author has made these resources available to Mr. Phloeun Prim for his reference. It is

recommended that Mr. Phloeun Prim also forward these resources to the Siem Reap Provincial Department of the Environment so that they are available to other hotel operators in Siem Reap Town.

The author recommends that the potential business benefits associated with the environmental management strategy at the Auberge Mont-Royal d'Angkor hotel be disseminated by the individual(s) or organizing body responsible for the development and implementation of the environmental management plan to other hotels in Siem Reap Town in order to encourage environmental awareness elsewhere in the sector and support the intent of the environmental management plan as described in Chapter 2. Previous experience by the author in the Siem Reap Town hotel sector, referred to in Chapter 2, suggests that this would be best done proximately through a brief workshop.

The author recommends that this workshop be developed in conjunction with the Siem Reap Provincial Department of the Environment, and Mr. Phlouen Prim. As alluded to in Chapter 5, the Siem Reap Provincial Department of the Environment, in its current state, has a limited capacity to manage the environmental impacts of hotel operation. The author suggests that the possibility of capacity building for the Siem Reap Provincial Department of the Environment be explored by one or several of the non governmental agencies operating in Siem Reap Town, which are referred to in the introductory section of this document. This in conjunction with participation in the workshop development and delivery process would serve to facilitate capacity building for the Siem Reap Provincial Department of the Environment by having them participate in the workshop development and delivery process.

This project is intended to contribute to the stakeholder consultation phase of the environmental management plan as an example of the level of commitment that hotel operators in Siem Reap Town have with respect to environmental management. The author recommends that the potential cost savings and other business benefits associated with environmental management should be included in the environmental management plan to encourage other hotels in Siem Reap Town to participate in a larger strategy aimed at mitigating the environmental impacts of hotel operation in general.

The author strongly recommends that the individual(s) or organizing body responsible for the environmental management plan review the potential role of this project in the environmental management plan for hotels in Siem Reap Town in a timely manner. Statistics and predictions from the World Tourism Organization, referred to in previous chapters, suggest that tourism in Siem Reap Town will continue to increase rapidly in the next few years. Unfortunately, recent information given to the author by Mr. Phloeun Prim indicates that little, if anything, has been done recently to improve the local infrastructure that is necessary to support tourism related businesses, such as hotels.

As stated in Chapter 2, the hope may lie with participation from the individual hotel owners. However, they appear to need incentives and support. The author suggests that communicating the business benefits of environmental management to other hotel operators in Siem Reap Town, using the environmental management strategy at the

Auberge Mont-Royal d'Angkor hotel as an example, would be an effective place to start.

References

Alberta Environmental Protection Action on Waste. *Waste Minimization Manual: Food and Beverage Service Industry.* Edmonton, Canada: Alberta Government, No Date.

Bleeker, N.C.. *Benefits of Energy Efficient Lights.* California. Regional Energy Resource Center, 1992.

Botumroath, Sao. A Strategy for Guiding Urban Development in Siem Reap Town, Cambodia. AIT Thesis. Bangkok, Thailand: Asia Institute of Technology, 1999

Cahill, L.B. and R.W. Kane. *Environmental Audits*, 6th Edition. Rockville, MD.: Government Institutes, Inc., 1989.

Cehab, E., Hoteit, H,. Kouzi, S. and C. Sayegh. National Environmental Auditing Manual for Hotels. Lebanon. UNEP, SPASI, 2001.

City of Calgary. *Environmental Management System City Business Units Support Documents.* Calgary, Canada: Corporation of the City of Calgary, 2000.

City of Calgary. *Environmental Management System Core Manual.* Calgary, Canada: Corporation of the City of Calgary, 2000.

CUC UEM Project. "A Manual for Composting in Hotels." *CUC UEM Outreach Series.* Bangkok, Thailand: Asian Institute of Technology, 2000.

Fiksel, J., J. McDaniel, and D. Spitzley. *Measuring Product Sustainability.* Columbus, Ohio: Batelle Memorial Institute Life Cycle Management Group, 1998.

Floresca, E.L.C. *Energy Audit and Conservation in a Hotel.* AIT Thesis. Bangkok, Thailand: Asian Institute of Technology, 1994.

Gagnon, G. A. "The Role of Water Audits in Water Conservation," *Journal of Water Resources Planning and Management* 110, No.2 (1984): 129-140.

Glanzrock, P. "Green Hotels Cut Wastes and Woo Guests," *Facilities Design and Maintenance* 14(1) (1995): 33-35.

Gonzalez, M. and C. Leon. "The Adoption of Environmental Innovation by the Hotel Industry of Gran Canaria," *Tourism Economics* 7(2) (2001): 177-190.

Gossling, S. "Sustainable Tourism Development in Developing Countries: Some Aspects of Energy Use," *Journal of Sustainable Tourism*, 8(5) (2000): 410-425.

Green Globe 21. "What We Do." Available from http://www.greenglobe21.com/index_cp.html. Internet; accessed on May 20, 2002.

Green Leaf Foundation. "Save Money, Save the Environment". Available from http://www.hotelthailand.com/greenleaf/. Internet; accessed on May 20, 2002.

Greeno, J.L., G.S. Hedstrom, and M. DiBerto. *Environmental Auditing: Fundamentals and Techniques*, Second Edition. Center for Environmental Assurance: Arthur D. Little, Inc, New York. 1987.

Habitat Suites Hotel. *Case Study: Water Quality and Conservation.* No Date.

Hagler Bailly. *Performance Monitoring Report and EAST Project Demonstration Hotels.* Arlington, Virginia: 1999.

Haight, M. and P. Taylor. *A Manual for Composting in Hotels.* CUC UEM (Canadian Universities Consortium Urban Environmental Management Project). Asian Institute of Technology. Bangkok, Thailand. 2000.

Hillary, R. *The Eco-Management and Audit Scheme: A Practical Guide*. Letchworth: Technical Communications Publishing, Ltd. 1993.

Hobson, K. and Essex, S. "Sustainable Tourism: A View From Accommodation Businesses," *The Services Industries Journal* Vol. 21(4) (2001): 133-146.

Hunter, C. and Green, H. 1995. *Tourism and the Environment. A Sustainable Relationship.* Routledge. London, New York.

IHA, IHEI and UNEP. *Environmental Action Pack for Hotels: Practical Steps to Benefit Your Business and the Environment*. Also presented as *UNEP Industry and Environment Technical Report No.31*. 1995.

IHRA and UNEP. *Environmental Good Practice in Hotels. Case Studies from the International Hotel and Restaurant Association Environmental Award.* UNEPIE. 1996.

International Organization for Standardization. *ISO14001: Environmental Management Systems – Specification with Guidance for Use.* International Organization for Standardization: Geneva, Switzerland, 1996.

Jameison, Walter. 2001. Personal Communication.

Juntrasook, Sira. *Green Hotel: Environmental Implications for the Hotel Industry.* AIT Thesis. Bangkok, Thailand: Asia Institute of Technology, 1998

Kusluvan, S. and K. Karamustafa. "Multinational Hotel Development in Developing Countries: an Exploratory Analysis of Critical Policy Issues," *International Journal of Tourism Research* 3 (2001): 179-197.

Maltby, J. "Environmental Audit: Theory and Practices." *Managerial Auditing Journal* Vol. 10(8) (1995): 15-23.

Mandke, P. *Developing a Strategy to Increase the Participation of Hotels in Environmental Management Programs.* CUC UEM Project. Bangkok, Thailand: Asian Institute of Technology, 1996.

Mead, B. and A. del Monaco. "Introducing Environmental Management in the Hotel Industry: A Case Study of Jamaica"' *International Journal of Hospitality and Tourism Administration* Vol. 1(3/4) (2001):111-127.

Mead, B. and A. del Monaco. "Introducing Environmental Management in the Hotel Industry: A Case Study of Jamaica," in *Tourism in South America,* ed. by Gui Santana. New York: Hawthorn Hospitality Press Inc., 2001.

Meade, Bill. *"Going Green": Market Trend or New Operating Standard.* CERES (Coalition for Environmentally Responsible Economies). Green Hotel Conference Atlanta Georgia. October 11 2002.

Mohanty, Brahamand. 2001. Personal Communication.

Nattrass, B. and M. Altomare. *The Natural Step for Business: Wealth Ecology and the Evolutionary Corporation.* Gabriola Island, British Columbia: New Society Publishers, 1999.

Northover, C., A. Randall, T. Braat and R. Morris. *A Strategy for Capacity Building for the Siem Reap Provincial Department fo Environment with Respect to Hotels.* EVDS 702 Studio Project. University of Calgary, Canada. 2000

Nov, A. and M. Vachon. "Hotels go Online to Chase Wet Seasons Fewer Tourists." Available from http://www.gocambodia.com/travel/hotel_tourists.asp. Internet: Accessed on May 3 2002.

Parasnis, M., Sevnningsen, N. and P. Mandke. *A Manual for Cleaner Production in Hotels*. CUC UEM (Canadian Universities Consortium Urban Environmental Management Project). Asian Institute of Technology. Bangkok, Thailand. 2000.

Parasnis, Mandar. *Environmental Management in the Thai Hotel Industry* Bangkok, Thailand: CUC UEM (Canadian Universities Consortium Urban Environmental Management Project) and TEI (Thailand Environment Institute). 1998.

Prim, Phloeun. 2001. Personal Communication.

Prof. Dr. Thamrongrat Mungcharoen. *Questionnaire for Pre-Assessment in Hotels*. Bangkok, Thailand: Kasetsart Universtity, 2000.

Revilla, G., Dodd, T. and L.C. Hoover. "Environmental Tactics Used by Hotel Companies in Mexico," *International Journal of Hospitality and Tourism Administration* Vol. 1(3/4) (2001): 111-127.

Revilla, G., Dodd, T. and L.C. Hoover. "Environmental Tactics Used by Hotel Companies in Mexico" in *Tourism in South America* ed. by Gui Santana. New York: Hawthorn Hospitality Press Inc. 2001

Rural Development Commission. No Date. *The Green Audit Kit*. English Tourism Board. Pp.4

Siphatha, S. and S, Denora. *Laws and Regulations on Environment, Biodiversity, and Protected Areas.* Phnom Penh, Cambodia: The Cambodian Legal Resources Development Centre. No Date.

Skeith, Kelly, G. Koh, J. Husack, H. Luu, W. Ross and W. Jamieson. *Environmental Impact Assessment of Hotel Development in Siem Reap Town, Cambodia.* Bangkok, Thailand: Asian Institute of Technology, 2000.

Snell, John. May 2001. Personal Communication.

Sustainable Business Associates. *Good Housekeeping Guide for Small and Medium Enterprises.* Bonn, Germany. GTZ Pilot Programme for the promotion of Environmental Management in the Private Sector of Developing Countries (P3U), 1998.

TerraChoice Environmental Services. "Green Leaf Eco Rating Program." Available from http://www.terrachoice.ca/hotelwebsite/indexusa.htm. Internet; accessed May 20, 2002.

Toshiba. *GR B5V Operation and Mechanical Manual.* Japan: Toshiba International. 1998.

TRANS ENERG. *Energy Conservation Opportunities in Majestic Hotel: Study and Implementation Report.* Thailand: TRANS ENERG, 1999.

UNESCO, UNEP, and WTO. *Tour Operators Initiative for Sustainable Tourism Development.* Activity *Report.* Madrid, Spain: World Trade Organization, 2001.

Viet, T. H. *Business Benefits from Green Activities in Majestic Hotel* Document prepared for the Sustainable Community Destination Management Conference, Bangkok, Thailand. 2000.

Wilson, M.J. *Environmental Auditing: Principles and Applications.* Master's Degree Project, Faculty of Environmental Design, University of Calgary. Calgary, Canada. 1992.

WTO. *Statistical Yearbook of Tourism.* Madrid, Spain: World Trade Organization 1996.

WTO. "Mellinium Tourism Boom in 2000". Available from http://www.world-tourism.org/newsroom/Releases/more_releases/R0102001.html; accessed June 1, 2002.

Appendix 1: Questionnaire for Pre-Assessment in Hotels

Adapted from the questionnaire designed by Thailand Environment Institute and Prof. Dr. Thamrongrat Mungcharoen, Kasetsart University, Bangkok, Thailand (Prof. Mungcharoen 2001).

.

A. General Information

1. Name of Hotel:

2. Address:

3. Contact Person: 1.

2.

4. Telephone: Fax: Email:

5. Registered Capital:

6. Year of Establishment:

7. Expansion / Other Modifications after establishment:

8. Management:

Division	**Number of Staff**	
	Management Level	Operator Level
Management		
Food and Beverage		
Front Office		
Housekeeping		
Engineering		
Administration		

Other		
Total		

9. Types of Accommodation:

Type	Capacity of Room	Total Number of Rooms
Single		
Double		
Total		

10. Other Facilities:

Restaurant numbers _____ Capacity: _____ persons

Swimming Pool No. _____ Size(s): _____ cu.m.

Other (specify) 1._____

2._____

Kitchens No._____ Types:

Laundry

Gift Shop

11. Area:

Total Area_____m 2

Building Area_____ m 2

12. Experience with Environmental and related projects:

1._____

2._____.

13. Engineering Data:

Item	Size	Numbers	Comments
Generators			
HVAC			
Laundry Machines			
Septic Tanks			
Water Pumps			
Air Pollution Prevention Equipment			
Other			

B. Input-Output Information

Please provide the timeframe used as the baseline for the information in this section.

From : Month_____Year _____ Up to Month_____Year_____

Total _____Months

Average / Monthly Occupancy During this period: ____ % or No. of Guests

B.1 Input Side

1.0 Energy Consumption

1.1 HVAC

Lighting _____% of total (estimated)

Air Conditioning _____% of total (estimated)

Others _____% of total (estimated)

1.2 Management of Electric Consumption

Participate in EGAT's energy conservation programs

Key tag system for automatic lights switch-off

Other (Specify)_____

Have policy for purchaing energy saving appliances

1.3 Details of Electricity Consumption

	Month	**Consumption** KWh/ M	**Peak Load** KVAR	**Cost** USD/Month
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				

12.				
Total				

2.0 Fuel

2.1 Type of Fuel

Fuel Oil _____

Diesel

Sawdust / Chipped Wood

Solar Energy

Other (Specify)_____

2.2 Management of Fuel

Have a trained and responsible person certified by EGAT_____

Have safety management for fuels_____

Other (Specify)_____

1.4 Fuel Consumption Details

	Month	**Quantity Used** L/ Month	**Cost** USD/ Month
1.			
2.			
3.			
4.			

5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
Total			

Remark: In case of more than one fuel, provide separate details for each type.

3.0 Water

3.1 Source

Municipal_____

Open well_____

Groundwater_____

Other (Specify)_____

3.2 Water Management

Details about Pre-treatment (if any)_____

Filter System_____

UV treatment_____

De-Ionization_____

Other (Specify)_____

Have water conservation policy_____

3.3 Water Consumption Details

	Month	**Quantity Used** Cubic Meters/ Month	**Cost** USD/ Month
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
Total			

Remark: In case your hotel uses more than one source of water, please provide details separately for each category.

4.0 Utilities / Auxiliaries

4.1 Type/ Quantity / Cost

Material Type	**Quantity**	**Cost**
Used in Office		
1. Paper		
2.		
3.		
4.		
Used in Guestrooms		
1. Tissue		
2. Soap		
3.		
4.		
5.		

4.2 Materials Management

Have a policy for purchasing environmentally-friendly products_____

Have a policy for reduced packaging_____

Other (specify)_____

5.0 Chemical Consumption.

5.1 Type of Chemical/Amount/Cost

Area of Use	Type of Chemical	Amount (Unit/Year)	CostUSD/Year
Boiler			
1.			
2.			
Laundry			
1.			
2.			
Air Conditioning			
1.			
2.			
Grounds			
1.			
2.			
Housekeeping			
1.			
2.			

5.2 Chemical Management

Have a policy to purchase environmentally-friendly chemicals_____

B.2 Output Side

1.0 Wastewater

1.1 Source of Wastewater

Estimated break-up (%) of the various sources of wastewater

- From guest rooms / toilets / office_____% of total

(estimated)

- Laundry _____% of total (estimated)

- Kitchen _____% of total (estimated)

- Others (Specify)

1.2 Wastewater Management

Have wastewater recycling program_____

Have a screen / grease trap for removing oil and grease from kitchen waste_____

Have wastewater treatment plant in hotel_____

Monitor / test wastewater before discharging outside the hotel premises_____

Type of wastewater discharged without treatment_____

Guest Rooms / Toilets_____

Floor Cleaning_____

Other (Specify) _____

Wastewater leaving the hotel after treatment

From Laundry _____% of total (estimated)

From Kitchen_____% of total (estimated)

Other (Specify) _____

Details on wastewater management / treatment

Add chemicals_____ Cl2_____Other (Specify)_____

Aeration of wastewater

Activated Sludge Process_____

Other (Specify)

1.3 Details of wastewater generation / discharge

Month	**Total Volume** **Meters Cubed**	**Cost for Treatment** **USD/Year**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
Total		

2.0 Solid Waste / Garbage

2.1 Type of solid waste

Estimated composition

Food Waste _____% of total (estimated)

Plastics / Packaging _____% of total (estimated)

Paper_____% of total (estimated)

Clear Glass _____% of total (estimated)

Colored Glass _____% of total (estimated)

Aluminum cans_____% of total (estimated)

Other Metal _____% of total (estimated)

Garden Waste _____% of total (estimated)

Hazardous Waste (Battery / bulbs etc) _____% of total

(estimated)

Other (Specify)

2.2 Management of solid waste and utilities material

Reuse back side of paper_____

Anaerobic digestion of solid waste for generating methane (biogas)_____

Solid waste segregation_____

Segregate wet waste from dry waste_____

Segregate hazardous waste from other solid waste_____

Have separate garbage area_____

Area _____m 2 Storage Capacity_____m 3

Solid waste management practice_____

Incinerator on site_____

Send to municipal landfill_____

Other (Specify)_____

2.3 Solid Waste Generation Data

Wet Waste

	Month	**Month Total Quantity Meters Cubed/Day**	**Cost for Disposal USD/ Month**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
Total			

Dry Waste

	Month	**Month Total Quantity** **Meters Cubed/Day**	**Cost for Disposal** USD/ Month
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
Total			

3.0 Air Emissions

3.1 Source

Boiler_____

Parking_____

Other (Specify)_____

3.2 Air emission control

Use low sulfur/special fuel oil for reduced emissions_____

Have air emissions monitoring and control program_____

Other (Specify)_____

C Supporting Documentation *(Attach if available)*

Documents	**Have**	**Don't Have**	**Not Available**	**Comments**
1.0 General **1.1** Layout Plan **1.2** Floor Plan **1.3** Utilities · HVAC (Heating&Ventilation&Air Conditioning · Domestic Hot Water System · Steam System · Chiller Water System · Machines Layout + Machine List for eng./ workshop **1.4** Electrical · Lighting Systems · Electricity for other appliances **2.0 Management** **2.1** Policy				

Documents	**Have**	**Don't Have**	**Not Available**	**Comments**
· Mission Statement · Policy · Environmental Policy **2.2** Organizational · Organization Structure/Chart **2.3** Ongoing Programs · Good Housekeeping · Preventative Maintenance · Training · Operational Health & Safety · Inventory Control · Purchasing Policy **3.0 History / Background information about hotel** **4.0 Applicable laws and regulations** *(w/w, boiler, transforrner etc.)*				

Appendix 2: Environmental Audit Findings, Improvement Opportunities and Feasibility Comments for the Auberge Mont-Royal d'Angkor Hotel

Audit Finding - Air conditioning units and fans in the guestrooms are in operation when the rooms are unoccupied. Although the Auberge Mont-Royal d'Angkor has installed a key chain activated system in the rooms, guests often remove the key chain and leave it in the consol slot while they are away from the room to keep it cool while they are away.

Improvement Opportunity - Reception staff could inform housekeeping when guests depart for the day so that they may immediately check the guestroom(s) to ensure that lights, fans and air conditioning are turned off. This will eliminate unnecessary energy consumption. In the interests of guest comfort housekeeping should ensure that curtains and windows are closed to reduce heating of the room.

Responsible Department(s) - Reception staff is responsible for alerting housekeeping when guests leave the hotel for the day. Housekeeping is responsible for immediately checking the room. Owner and General Manager is responsible for monitoring the initiative.

Feasibility Assessment - This is a management-based opportunity that requires only training and occasional monitoring. It should be fairly easy to implement. It will decrease the amount of energy used in the guestrooms and will save the hotel money according to the following logic:

The hotel usually operates on the public electricity grid from 9:00 am to 6:00 pm and 9:00 pm to 6:00 am daily. Public electricity tariffs for fan and air conditioning operation = $5USD/guestroom/night = $0.56USD/guestroom/hour. Immediate checking of guestrooms will save the hotel $0.14USD/guestroom/15 minutes.

During low season a small generator is occasionally used 24hours/day. The small generator uses diesel to power fans and AC units at a rate of approximately 10 L/guestroom/night = 1.1 L/guestroom/hour. Immediate checking of guestrooms will save the hotel 0.3 L/guestroom/15minutes.

Audit Finding - The guestrooms contain mini refrigerators for guest convenience. They are often set at higher setting than necessary, using energy and reducing the life span of the refrigerators.

Improvement Opportunity - The checking the temperature in the mini refrigerators could be added to the list of tasks involved in daily room maintenance. They should be set between #2 and #3 at all times as per manufacturers instructions for Toshiba model GR-B5V.

Responsible Department(s) - Housekeeping is responsible for checking the temperature settings on the refrigerators. Management could be responsible for monitoring the initiative.

Feasibility Assessment - This opportunity is a management-based initiative that involves adding a small step to an existing routine. The potential cost savings associated with the improvement opportunity are as follows:

GR-B5V mini refrigerators are designed to operate to their maximum life cycle at the #2 and #3 settings. Replacement rates will decrease significantly if manufacturer's specifications are followed.

According to the manufacturer, the lifecycle of the mini refrigerators will be longer if they are operated at the specified setting while guestrooms are empty during the day rather than being switched off and on. In addition, when the mini refrigerators are allowed to warm to room temperature and are then plugged in, much of the initial energy is spent cooling the refrigerator walls, not the beverages inside (Brahamand Mohanty Pers. Comm. April 2001). It is more cost effective both in terms of lifecycle extension and cooling costs to leave them running (at the specified setting). Obvious exceptions include guestrooms that are unoccupied for extended periods of time.

Audit Finding - The air conditioning thermostats are set at an unnecessarily low temperature.

Improvement Opportunity - Increase the air-conditioning thermostats from 18C to 22C. According to the Environmental Management in Thai Hotel Industry document, 22C is still 2C below the recommended comfort temperature. Guests should be encouraged to use the ceiling fans to distribute the cool air.

Responsible Department(s) - Maintenance is responsible for increasing the thermostat settings. Housekeeping is responsible for periodically checking the settings. Management could be responsible for monitoring the initiative.

Feasibility Assessment - This is an easily implementable opportunity that requires a minor technical adjustment and monitoring. It would serve to reduce energy consumption and save money. The thermostat setting on an AC unit is designed to maintain a temperature setting once that temperature has been reached (Brahamand Mohanty Pers. Comm. April 2001). Setting a low temperature on the thermostat does not cool the room faster. The air conditioning unit works to cool the entire thermal envelope (walls and other surfaces), not just the air in the room. Using a ceiling fan to distribute the cool air is much more effective and efficient. The energy savings associated with a 4C temperature increase could be as high as 27% (Viet 2000).

Audit Finding - The maximum temperature on the hot water heaters is set higher than need be. In addition, a power button that does not automatically shut off when the water tap is closed operates them.

Improvement Opportunity - Reset hot water maximum temperatures from 60 to 45 degrees on all guestroom water heaters. Alternatively, have housekeeping check that the electrical power button is off when they go through the rooms.

Responsible Department(s) - Maintenance is responsible for lowering the maximum temperature. Housekeeping is responsible for checking that the power buttons are in

the off position in unoccupied rooms. Management could be responsible for monitoring.

Feasibility Assessment - Lowering the maximum temperature on the water heaters involves a minor technical adjustment. The hotel has 19 rooms that are equipped with an electric hot water heater. This improvement opportunity will reduce the amount of energy used those rooms during shower use.

Audit Finding - Guests are scattered throughout the hotel during the low season. This requires that more areas of the hotel be lit and cooled than necessary.

Improvement Opportunity - Cluster guests in sections of the hotel during low season.

Responsible Department(s) - Management and Reception are responsible for coordinating the use of guestrooms during low season.

Feasibility Assessment

Most of the guestrooms are of similar size and offer similar amenities. As a result, it should be fairly easy to cluster guests. Clustering guests on a particular floor would allow the hotel to avoid switching on lights, fans and other energy consuming equipment on unoccupied floors.

Audit Finding - Guests have the potential to contribute to environmental management. There are no mechanisms in place to make them aware of the impacts of hotel operation on the environment and what they can do to contribute to mitigation.

Improvement Opportunity - Attempt to acquire the support of guests by communicating the need for energy and water conservation and the hotel's environmental commitments in the form of a written notice placed in the guestroom.

Responsible Department(s) - Management is responsible for drafting the notices, placing them in the guestrooms and public areas, and for responding to questions of comments from guests.

Feasibility Assessment - Some hotels are hesitant to implement environmental improvement opportunities because they are concerned about the possible effects on the quality of their guest's stay. This is a legitimate concern. As a result, hotels need to learn where the balance is for their individual operation between providing a first class experience to their guests and operating economically and responsibly. This is particularly true in the Siem Reap hotel sector, where operating expenses and environmental impacts are high and so are guest's expectations.

Many operations have had success by communicating their environmental efforts through notices in the guestrooms and have found that their guest's have not commented on reduced quality of service (Viet 2000). This will help the hotel acquire a good environmental reputation communicated through individual guests and tour

operators. This is not a difficult opportunity to implement so long as the information on the guestroom notices is clear and accurate. A guest notice could look like this:

To Our Valued Guests

Electricity and clean water are fast becoming scarce and expensive resources in Siem Reap. Wastewater treatment and solid waste disposal are also major concerns. The Auberge Mont Royal d'Angkor has implemented an environmental management strategy in response to these issues. As a valued guest, you have an opportunity to contribute to the success of this strategy by considering the following actions:

- √ **Not letting the tap run continuously when brushing your teeth and shutting it off completely when finished. This alone conserves up to 32 liters of water.**
- √ **Informing housekeeping staff if you do not need your linen and towels laundered daily, rather every second day. This can reduce the amount of fresh water used in laundry by up to 65%.**
- √ **Ensuring that all lights, fans and air conditioners are shut off and your curtains and windows are closed when you leave the guestroom. Your room will only take a few minutes to cool upon your return.**
- √ **Placing cans and bottles (plastic and glass) in the bin provided in the guestroom, rather than the wastebasket.**

The management and staff of the Auberge Mont Royal d'Angkor would like to thank you sincerely for your contribution to the well being of Siem Reap's environment

Audit Finding - Towels and linens are laundered after one use.

Improvement Opportunity - Reduce the volume of water used in laundering towels and linen. Do not replace towels that haven't been used and ask guests if they need their linens washed everyday.

Responsible Department(s) - Housekeeping is responsible for leaving unused towels in guestrooms and not laundering linens daily in guestrooms that have not requested it.

Feasibility Assessment - Many hotels ask their guests whether they require daily laundry service. This is not a difficult opportunity to implement, however it does require housekeeping to keep track of which rooms need daily laundry and which do not. This opportunity will result in water and energy savings and will reduce the amount of wastewater created through laundry. Washing linen and towels every second or third day can cut water consumption for laundry by 50% per guestroom (IHA, IHEI and UNEP 1995).

Audit Finding - Water is wasted when toilets are flushed.

Improvement Opportunity - Place full 750-1000 mL water bottles into the cisterns on the back of all toilets.

Responsible Department(s) - Maintenance is responsible for placing the water bottles in the cisterns.

Feasibility Assessment - This opportunity is easily implemented and will decrease the amount of water used in toilet flushing by the corresponding volume per flush.

Audit Finding - Several of the guestrooms have leaking pipes and fixtures and running toilets.

Improvement Opportunity - Monitor guestrooms for any water leaks. Regularly check washrooms in empty guestrooms to ensure that the taps are not dripping, the toilets are not running and that the showers are not leaking. This includes a regular check for water puddles on the floor under the sink and beside the toilets.

Responsible Department(s) - Housekeeping and maintenance are responsible for regularly checking guestrooms for leaks and reporting them to management. Management is responsible for recording and monitoring leaks and arranging repairs.

Feasibility Assessment - This improvement opportunity will conserve water by preventing unnecessary water loss and ensuring that 'clean' water is prevented from being diverted to the septic system. It requires coordination between management, housekeeping and maintenance but is not cost intensive.

Audit Finding - Water is left running while guestrooms are being cleaned.

Improvement Opportunity - Do not leave water continuously running any where in the hotel, use buckets or basins for cleaning guestrooms.

Responsible Department(s) - Housekeeping is responsible for using buckets and basins for cleaning guestrooms. Management is responsible for monitoring the initiative.

Feasibility Assessment - This opportunity is easily implemented and would save the hotel a considerable amount of water. For example: A tap running for as long as would take to quickly brush your teeth looses 33 L of water (Habitat Suites Hotel no date).

Audit Finding - Guestrooms are equipped with individually wrapped miniature soap bars that are discarded after one use.

Improvement Opportunity - Use left over soaps from guestrooms in staff areas or to clean other areas of the hotel such as floors.

Responsible Department(s) - Housekeeping is responsible for keeping soaps from guestrooms and reusing them in cleaning activities. Management is responsible for monitoring the initiative.

Feasibility Assessment - Reusing guestroom soaps is not a difficult initiative to implement. However, it would be preferable if the hotel went with a liquid soap dispenser in the guestrooms. The hotel management is not prepared to make the change as they view the individual soaps as an advertising opportunity. Reusing the soaps will help to recover some of the purchasing costs and reduce solid waste. The hotel pays approximately $0.05/per soap for the guest amenity and the cost of cleaning products is high in Siem Reap. Reuse of soaps could buffer both expenses.

Audit Finding - Not all guestroom wastes are separated for ruse or recycle.

Improvement Opportunity - Ensure that all bottles and cans are separated from wastebaskets and that they are placed in the appropriate storage areas. Collect expired plant cuttings and flowers from the guestrooms for compost.

Responsible Department(s) - Housekeeping is responsible for separating guestroom wastes during daily cleaning. Management is responsible for monitoring the initiative.

Feasibility Assessment - The separation of guestroom wastes is a part of current practice but is not consistently monitored. This opportunity requires awareness on the part of housekeeping and monitoring on the part of management. Plastics, aerosol cans, and food waste are resalable. Farmers buy food wastes for pigs. Independent collectors pay for plastic water bottles by the kilogram and aerosol cans by the piece.

Audit Finding - Cleaning products are used in abundance during guestroom maintenance.

Improvement Opportunity - Minimize usage of detergent and cleaning supplies.

Responsible Department(s) - Housekeeping is responsible for being aware of the amount of cleaning products they are using in the guestrooms. Management is responsible for monitoring the amount of money being spent on cleaning supplies.

Feasibility Assessment - This opportunity is easily implemented and monitored. It will save the hotel money on purchasing and reduce the amount of chemicals added to the septic system.

4.2.2 Improvement Opportunities Through Management of Service Areas

Service areas in the Auberge Mont-Royal d'Angkor hotel consist of all areas that are off limits to guests. These include the kitchen, laundry facilities, rooftop, employee living spaces, maintenance areas, generator storage shed, septic tank, administrative office, storage areas, garbage storage, and garden shed. The following improvement opportunities were developed to minimize the materials consumed and wastes produced through the day-to-day maintenance and operation of the hotel.

Audit Finding - There are no programs in place to ensure that waste oil is being collected for resale.

Improvement Opportunity - Train maintenance staff to collect waste oil for resale. Monitor resale manifests to ensure that oil is being collected.

Responsible Department(s) - Maintenance is responsible for collecting waste oil for resale. Management is responsible for monitoring resale manifests to ensure that the collection is being done.

Feasibility Assessment - Waste oil is currently being collected. This opportunity involves ensuring that it is being done all of the time. This is easily implemented and will recover a portion of the cost of oil for the hotel while reducing the volume of oil discarded to landfill or accidentally introduced to the septic system.

Audit Finding - There is no protocol in place for the proper storage of hazardous materials and fuels.

Improvement Opportunity - Ensure, through a protocol, that all hazardous substances such as diesel, chemicals and oil are stored safely and securely.

Responsible Department(s) - Management is responsible for drafting a protocol for the storage of fuel and hazardous chemicals and ensure that it is followed. Maintenance is responsible for following the protocol.

Feasibility Assessment - This improvement opportunity requires a level of training and periodic monitoring. It should not be undertaken without consultation for the following reasons:

- Certain chemicals cannot be stored near each other.
- The storage area should have an impermeable 'pad' or floor.
- Access to this area should be restricted. It is extremely important, as it will help ensure that no hazardous substances are introduced to the soil or groundwater.

Audit Finding - The Auberge Mont-Royal d'Angkor hotel does not have a policy or guidelines in place with respect to purchasing.

Improvement Opportunity - Develop a series of guidelines with respect to purchasing goods and services for the hotel that includes items such as:

- Purchasing locally produced goods in season.
- Avoiding the purchase of packaged goods.
- Purchasing items that can be put into refillable containers for use.
- Purchasing items that can be reused or recycled.

Responsible Department(s) - Management is responsible for drafting the guidelines and applying them to purchasing decisions.

Feasibility Assessment - The purchasing guidelines would serve to reduce the amount of materials that enter the hotel as well as cut down on transportation costs. Implementing purchasing guidelines may be difficult for the Auberge Mont-Royal d'Angkor hotel as access to some products is limited locally. Cost is also a factor.

Audit Finding - The guest registration forms are one sided and printed on a large sheet of paper and are often used as scrap paper.

Improvement Opportunity - Change the guest registration form to a two sided-half page rather than a one sided-full page format. Use recycled paper for scrap and guest notes such as directions.

Responsible Department(s) - Management is responsible for reformatting the guest registration sheets and advising reception staff to reuse paper as scrap. Reception staff is responsible for being conscious of paper consumption.

Feasibility Assessment - This is an easily implemented opportunity that would serve to conserve paper and act as a good conservation example to guests. However, full sized sheets of paper are easier to file.

Audit Finding - Compostable wastes go to the landfill.

Improvement Opportunity - Initiate a composting program to recycle kitchen and garden wastes.

Responsible Department(s) - Management is responsible for researching and implementing a composting program. Maintenance staff is responsible for maintaining the compost pile(s).

Feasibility Assessment - Although composting does not require specialized machinery or chemicals, it does require adequate space and regular attention (Haight and Taylor 2000). However, composting diverts waste from the municipal landfill and creates a valuable end product that will save the hotel money on fertilizers and soil for landscaping and gardening applications.

Audit Finding - There are no notices with respect to energy and water conservation or solid waste management in the service areas.

Improvement Opportunity - Put up bold reminder notices with respect to saving energy and water and managing solid waste in kitchen, laundry and service areas.

Responsible Department(s) - Management is responsible for drafting and posting the notices and ensuring that they are kept up to date.

Feasibility Assessment - The notices will facilitate the successful implementation of improvement opportunities and decrease the amount of time spent monitoring staff. If the notices also make a short statement that solicits suggestions, staff may prove to be a source of new, money saving ideas.

Audit Finding - Cleaning and laundry tasks are not scheduled according to energy costs.

Improvement Opportunity - Save cleaning and laundry tasks that require the use of electricity for times when the generator is on, not during use of public electricity.

Responsible Department(s) - Housekeeping is responsible for scheduling cleaning and laundry during times of generator operation. Management is responsible for monitoring the initiative.

Feasibility Assessment - Unlike the public supply, generator efficiency increases (to a point) with load. Generators operate at very low efficiency when the energy load they are supplying is low, consuming more diesel than when operating at a high capacity (TRANS ENERG 1999). Also, the reliability of public electricity supply in Siem Reap may vary depending on variables such as high a low tourism season demands. Manipulating task schedules to coincide with generator operation will decrease electricity bills and increase the efficiency of the diesel purchased for generator operation. This will require a reorganization of the housekeeping task schedule.

Audit Finding - Not all equipment is operated according to manufacturer's specifications.

Improvement Opportunity - Review the manufacturer's specifications for hotel equipment and ensure that they are followed.

Responsible Department(s) - Management is responsible for collecting materials on manufacturer's specifications and training housekeeping and maintenance staff.

Feasibility Assessment - This opportunity will require training and monitoring. It will result in operational cost savings because equipment will operate more efficiently if operated and maintained properly, maximizing the use of energy used to operate. Also, equipment will last longer and maintain a higher resale value if operated and maintained according to manufacturer's specifications.

Audit Finding - The refrigerator and stove in the kitchen are positioned right next to each other and are often used at the same time. In addition the door between the hot kitchen and air-conditioned dining room is often kept open. These factors result in energy losses due to simultaneous heating and cooling in service areas.

Improvement Opportunity - Avoid simultaneous heating and cooling in kitchen and dining areas:

- Keep opening and closing of refrigerator and freezer doors to an absolute minimum.

- Check that all oven, refrigerator and freezer door seals are working properly.

- Never put hot food in the refrigerator, cool on counter first.

- Move refrigerators and freezers away from the stove and oven.

- Cover pots with lids at all times and use the smallest possible pans for each task.

- Keep oven-preheating times to a minimum.

- Keep door between kitchen and dining room closed to reduce heating of dining area.

Responsible Department(s) - Management is responsible for making kitchen staff aware of the energy lost through simultaneous heating and cooling and related monitoring. Kitchen staff is responsible for being conscious of their activities in that respect.

Feasibility Assessment - This opportunity requires minor changes in the day-to-day jobs of kitchen staff. The challenge for management may be in promoting awareness. They will result in operational cost savings. For example, keeping lids on cooking

pots can reduce the energy needed to cook by 35%. Keeping the refrigerators away from heating appliances, minimizing opening and closing and checking the seals will increase their efficiency and cut down on the amount of energy wasted by simultaneous heating and cooling.

Audit Finding - Many of the lamps, bulbs and lighting fixtures are dusty, preventing full lumination.

Improvement Opportunity - Regularly clean lamps, florescent lighting tubes, fixtures and luminaires to maximize exploitation.

Responsible Department(s) - Maintenance is responsible for periodically dusting the lighting fixtures.

Feasibility Assessment - Siem Reap Town is extremely dusty during most times of the year and much of it collects on lighting fixtures, which diminishes their effectiveness and may require other lighting to be switched on. Many of the fixtures at the Auberge Mont-Royal d'Angkor are fitted with domed reflective surfaces, designed to intensify and direct light. This opportunity is easy to implement and will save the hotel money on the energy consumed in lighting.

Audit Finding - The kitchen refrigerator is set at an unnecessarily low temperature.

Improvement Opportunity - Increase the refrigerator temperature as much as possible without risking food quality or safety.

Responsible Department(s) - Kitchen staff is responsible for increasing the refrigerator temperature.

Feasibility Assessment - This is an easily implemented opportunity that will save the hotel money. A 10% reduction in temperature will result in a savings of 25% (TRANS ENERG 1999) of the energy needed to run them.

Audit Finding - There are several water leaks in the service areas.

Improvement Opportunity - Conduct a walkthrough to ensure that there are no water leaks in any pipes or hoses. Write down and report the location of any leaks and repair where possible.

Responsible Department(s) - Management is responsible for organizing maintenance staff to do a walkthrough as well as monitor the documented leaks.

Feasibility Assessment - In addition to discovering unnecessary water losses, this easily implemented opportunity will help hotel staff learn where leaks may most often occur, directing future checks.

Audit Finding - The kitchen uses unnecessary volumes of water.

Improvement Opportunity - Make kitchen staff aware of the need for water conservation and decrease the volume of water used in kitchen operations.

Responsible Department(s) - Management is responsible for training kitchen staff on water conservation and monitoring the initiative. Training could include actions such as not using water to defrost food, not letting water continuously run, even when washing food or dishes, using a basin or bucket if necessary, and ensuring that there are no leaky taps, hoses or pipes in any of the kitchen areas.

Feasibility Assessment - This opportunity is easy to implement and hinges on the ability of management to motivate kitchen staff to save water. Significant water savings are possible.

Audit Finding - Laundry operations are very water intensive.

Improvement Opportunity - Reduce the volume of water used in laundry operations:

- Reuse soaking water where possible.
- Check regularly that there are no leaks in any of the hoses, tubes or taps in the laundry area.
- Ensure that the laundry machine is being used according to manufacturer's specifications with respect to

maximum loads and the amount of water required per cycle.

- Do not use laundry machine until you have a full load.

Responsible Department(s) - Management is responsible for ensuring that housekeeping staff is aware of the need for water conservation. Housekeeping staff is responsible for followir.g the above recommendations.

Feasibility Assessment - This opportunity is easy to implement and hinges on the ability of management to motivate housekeeping staff to save water. Significant water savings are possible.

5.2.3 Improvement Opportunities Through Technical Adaptations

In this audit technical adaptations refer to retrofits and structural changes made to the hotel. These may include actions such as changing lighting fixtures; fitting taps with flow restrictors or covering windows with reflective film. Choosing technical adaptation options involves an assessment of the availability of individual technologies, their compatibility with existing installations, and operating and/or maintenance capability (Viet 2000). Technical adaptations often require an initial capital investment. As a result, they should be evaluated based on the capital costs of implementing each adaptation as well as the operating costs and savings realized.

Audit Finding- The hotel is fitted with low efficiency incandescent light bulbs.

Improvement Opportunity - Replace 40 W and 60 W incandescent bulbs with 11 W and 13 W compact fluorescent bulbs in foyer, hallways and stairwells. Compact fluorescent bulbs are highly energy efficient, long lasting and provide good quality, dimmable light.

Responsible Department(s) - Management is responsible for assessing the best lighting solutions. Maintenance is responsible for installing and maintaining new bulbs. Management is responsible for monitoring cost savings.

Feasibility Assessment – Compact florescent bulbs are available in Phnom Penh. The initial capital expenses involved in replacing bulbs is balanced by the following (Bleeker 1992):

- Compact fluorescent bulbs last an average of nine times longer than incandescent bulbs.
- Each 13 W compact fluorescent bulb saves 47 W of electricity.
- Each 11 W compact fluorescent bulb saves 29 W of electricity.

Audit Finding - The split air conditioning units are in direct sunlight which reduces their efficiency.

Improvement Opportunity - Protect split air conditioning units from direct sunlight. Install a simple, low cost-shading device that will prevent direct sunlight from hitting

the compressor but allow for maximum airflow for hot air dissemination. This will improve the efficiency and life cycle of the individual units. Variables such as aesthetics and noise should be kept in mind when choosing an option. For example, a metal shade may become extremely noisy in the rain.

Responsible Department(s) - Management is responsible for contracting the project out.

Feasibility Assessment - Installation is relatively low cost and the energy savings due to increased efficiency range from 5%-8% (TRANS ENERG 1999). Thai and Vietnamese benchmarks suggest an approximate payback period of 6-7 months.

Audit Finding - The upper floor has a glass ceiling that adds to the heat load in the daytime.

Improvement Opportunity - Install airflow vents or wind catchers in the ceiling of the glassed in top stairwell. Currently, the hot air that collects near the top of the hotel has no place to go and is re-circulated, not allowing the top floor to cool.

Responsible Department(s) - Management is responsible for contracting the project out.

Feasibility Assessment - Cooling the guestrooms on the top floor consumes a lot of energy. As they are deluxe suits, they may not be used as often as the other rooms and

being located on the top floor, they receive the bulk of the warm air in the building. The air conditioning units take a long time to cool the physical structure of the rooms themselves. Installing the vents would lower the amount of energy required. However, the opportunity will be cost intensive initially.

Audit Finding - The roof of the hotel is flat and exposed to the sun. The tiles are matte clay. As a result, a significant amount of heat is transferred to the upper guest floor.

Improvement Opportunity - Reduce heat load in top floor by shielding the roof. Possibilities include:

- Glazing roof top tiles with a light, reflective surface.
- Constructing a simple A-shaped cover.

Responsible Department(s) - Maintenance is responsible for applying the glaze.

Feasibility Assessment - Glazing the tiles would reflect much of the light and heat that is absorbed through the roof and transferred to the top guest floor. A cover would serve the same function and could double as a shaded, rooftop resting space for guests. Glazing the rooftop would be an easy, low cost opportunity. The roof cover would require a higher capital investment.

Audit Finding - Water could be saved in the guestrooms and public wash rooms.

Improvement Opportunities

- Install flow restrictors on guestroom water pipes.
- Install water saving showerheads in guestrooms.
- Install aerators on guestroom and public taps.

Responsible Department(s) - Maintenance is responsible for installation. Management is responsible for monitoring the water savings.

Feasibility Assessment - Flow restrictors are cost intensive initially. However, water flow will be reduced from 20.5 L/min. to 9.1 L/min (Habitat Suites Hotel no date) in the guestrooms, a water savings of >50% that translates directly into energy savings from decreased pump operation.

Water flow in the showers will be reduced from 22.8 L/min. to 9.5 L/min (Habitat Suites Hotel no date), a water savings of >50% that translates directly into energy savings from decreased pump operation.

As the water leaves the nozzle it is split up and mixed with air, giving it the appearance of normal water flow but only using 60% of the water that would normally be used. This translates into a 40% savings in pump energy for guestroom taps.

5.2.4 Improvement Opportunities Through Wastewater Management

Wastewater is poorly managed in many hotels in Siem Reap. The Auberge Mont-Royal d'Angkor does have a septic tank but it is not regularly maintained. Wastewater generation and treatment are a serious concern in Siem Reap. There are no municipal treatment systems and most hotels rely on small, ill maintained septic systems to treat wastewater before it is discharged into the Siem Reap River. Data gathered throughout this project indicates that most hotel operators do not understand how to maintain their septic systems and have no way of being certain of the quality of the discharge water. This document does not provide technical details regarding septic system operation or maintenance but does make a very strong recommendation for the development of a septic tank maintenance workshop for hotel operators in Siem Reap.

Other improvement opportunities include:

- Installing a grease trap or screen in pipe leaving the kitchen.
- Refraining from dumping any chemicals, oils or other toxins into the drains. Store them in marked containers and dispose of them with hazardous waste.
- Using wastewater from washing vegetables to water flowers and plants in the dining room.
- Reusing rinse water in the laundry area.