

Resource use and waste management in Vietnam hotel industry

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Abstract

The hotel industry of Vietnam is expanding rapidly with increasing international arrivals and domestic tourists. At the same time, mounting costs of resources and impacts of waste could affect the income, environmental performance and public image of the hotel sector. The hotel industry's resource management (energy and water) would contribute to the long-term sustainability of the tourism sector. This paper reports the results of a study conducted to assess the resource use and management in the hotel industry in Vietnam. This was obtained by carrying out a survey in 50 hotels on energy and water consumption, and waste generation. The energy and water use, as well as the waste generated in the various hotel categories have been estimated and compared with those in other countries. The current practices in the hotels to address these issues are highlighted, and benchmarks for efficient use of resources in Vietnamese hotels are presented.

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Keywords: Hotel energy consumption; Hotel water use; Hotel waste; Hotel industry's environmental performance

1. Introduction

Vietnam has a significant potential for tourism development with about 2000 national historic sites, 125 beaches and parks featuring precious fauna and flora. The tourist arrivals have increased from 250,000 in 1990 to 1.4 million in 1994, and to 2.5 million in 2001. The number of visitors is expected to grow by 30–40% up to the year 2010. To meet the growth of inbound foreign and local tourists, various hotels and resorts, rated from 2-star to 5-star, have been built in recent years with a total of about 63,500 rooms in 1999 [8]. Though the occupancy rate has not shown much increase during 1996–1999, the number of rooms during this period increased by about 15%.

With increasing demands for hotel services, the Vietnamese hotel industry has become a great consumer of energy, water and other resources. However, at present, there are no existing guidelines for the efficient

use and management of these resources. A study was undertaken to initiate the development of such a guideline [7] by carrying out a survey of 50 hotels in Vietnam. This paper summarizes the results of this study and focuses on:

- The current status of resource use in the hotel industry in Vietnam, namely the electricity consumption, water use, LPG and other fuel use; and the waste generated, namely solid waste and wastewater; and
- The current practices of energy, water and waste (solid and wastewater) management.

Benchmarks for electricity and water consumption, and solid waste and wastewater discharge have been estimated, and issues for improving resource management in hotels highlighted.

2. Resource use of and waste from Vietnam hotel industry

To the knowledge of the authors, there has been no systematic study on resource use and its analysis in Vietnam. Therefore, there is a need for conducting a

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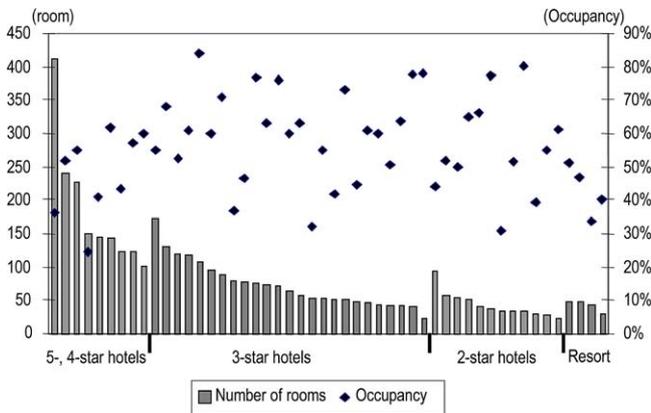


Fig. 1. Distribution of the surveyed hotels by category.

survey, to gather and analyze information from some sample hotels, which can be considered as representatives for the hotel industry in Vietnam.

The survey was conducted through the distribution of a questionnaire to hotels and resorts and altogether 50 responses were received (Fig. 1). Almost one-half of the surveyed hotels are in South Vietnam and are of 3-star category. Due to the time and budget constraints, 37 hotels in nine major tourist provinces/cities around the country were considered for on-site surveys. The survey questionnaire requested data regarding the resource use (electricity, fuel and water) and wastes, and qualitative data regarding current resource use and practices, classified by hotel departments (Engineering, Housekeeping and Laundry, Kitchen and Restaurant, Front Office, and other departments).

Resource use performance of each hotel was evaluated by using resource indices, such as specific electricity consumption, specific water use and specific waste discharge. Table 1 shows some resource indices calculated from raw data (of 2000) according to hotel categories. In general, as the occupancy rate increases, the specific consumption decreases and vice versa.

2.1. Energy consumption

A wide variation in resource use in each hotel category could be observed. The specific electricity consumption of resorts is the lowest, followed by the 2-star and 3- and 4-star hotels. The average specific electricity consumption of 3- and 4-star hotels is nearly the same. As some of the built areas in the resorts are not air conditioned, their specific electricity consumption is the lowest.

The main sources of energy used in hotels are electricity (for air conditioning, lighting, appliances, water heating and water pumping), LPG (for cooking), diesel oil (for diesel generator), and coal (for heating and as boiler fuel). Electricity dominates the total hotel energy consumption, while fuel (gasoline) for transport is very small as compared to others and could be neglected. Fig. 2 shows the breakdown of energy use in Vietnamese hotels. The energy use patterns of 2- and 3-star hotels, where electricity is used for around 90% of energy consuming activities, are nearly the same, while LPG is the main fuel for cooking in 4-star hotels and resorts. Generally, the 4-star hotels and resort consume much fuel (fuel oil, diesel and LPG for boiler, diesel generator and cooking, respectively); some charcoal is also used for outdoor parties in resorts. Some 3-star

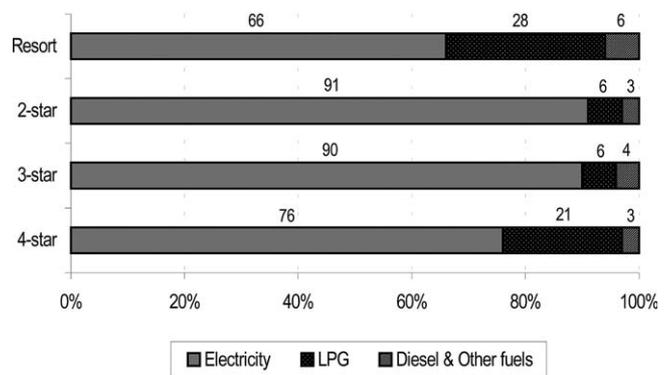


Fig. 2. Energy use share in Vietnamese hotels by category.

Table 1
Specific resource use, waste discharged and recycled in Vietnamese hotels

Resource/waste	4-star hotel			3-star hotel			2-star hotel			Resort		
	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min
Electricity consumption (kW h/m ² year)	237	141	80	426	143	41	271	101	26	165	78	9
Water consumption (m ³ /m ² year)	9	4	1	17	5	1	8	4	2	22	9	0.4
Solid waste discharge (ton/m ² year)	23	17	12	52	18	2	78	20	3	20	11	3.7
Percent of solid waste recycled ² (%)	10%			10%			30%			10%		
Wastewater discharge (m ³ /m ² year)	5	3	2	13	4	0.3	9	5	3	22	10	3
Average occupancy	45%			62%			58%			49%		

Estimated by hotel staff.

Table 2
Electricity use in Vietnamese hotels

Electricity consumption for	Hotel categories			
	4-star	3-star	2-star	Resort
Lighting (%)	26	13	17	23
Air conditioning and ventilation (%)	53	47	46	48
Water heating (%)	17	27	25	12
Others (lifts, pumps, refrigerators, etc.) (%)	4	13	12	17

and 2-star hotels use electricity for almost all activities (such as water heating, cooking and washing) and very little fuel is used.

Table 2 summarizes the share of electricity use in hotel, and air conditioning always accounts for the highest share of electricity use (from 46% to 53% of the total, depending on the category of the hotel). The rest is shared by lighting, electric water heating and other equipment (such as elevators, refrigerators, and mini-bars in guest rooms).

2.2. Water consumption

Resorts have large green areas and therefore consume much water for gardening and produces large amount of garden waste (Table 1). The major water users in Vietnamese hotels are guestrooms, laundry, kitchen and outdoor activities depending on hotel categories. Water consumption in guestrooms always dominates the total consumption in hotels, except in resorts, whereas outdoor activities (such as gardening, maintaining the fountain and green areas) take the biggest share of water consumption (Fig. 3). Most 2-star hotels and resorts in Vietnam are not equipped with laundries; this work is contracted to outside laundries to minimize operating costs. Outdoor temperature and occupancy rates also influence the water consumption in hotels. Water consumption varies with the outdoor temperature in northern region (which is hot in summer (average temperature of

29 °C) but cold in winter (average temperature of 18 °C)), but not in the South.

2.3. Wastewater and other wastes

Four-star hotels and resorts consume much water and discharge more waste as compared to the others. Wastewater treatment in hotels is not yet a common practice in Vietnam. Very few surveyed hotels and resorts have installed wastewater treatment or/and recycling systems; most of them discharge their wastewater directly into municipal drainage system, rivers and sea, causing bad odor and pollution. Many hotel managers, who are aware of the need for wastewater management, are still reluctant to make decisions on investment in wastewater treatment due to its high cost. However, hotels and resorts in coastal region have started showing concern for wastewater management due to the new environmental laws, tourist heritage and sustainable tourism goals.

Depending on the hotel categories, the sources of solid waste in the surveyed hotels are mainly from food and beverage (kitchen, restaurant), guestrooms, offices, laundry and garden. The composition of the solid waste ranges from food waste, plastic, paper, garden waste to chemical wastes (such as, cleaning agents, spent oil, paints and solvents, used Ni-Cd batteries, CFCs and halons).

No data on the quantity of solid waste generated are measured and documented by the hotels, and all collected data regarding solid waste are based on interview and approximations made by hotel staff. About 60% of the surveyed hotels indicate that their wet waste (food) is sold to local collector as animal feed, while about 10–30% of solid waste is classified and sold to local collectors for recycling (Fig. 4). The reusable or recyclable dry solid wastes (plastic bottles, paper, carton boxes, and cans), which account for 10–30% of total waste are sold to local scrap collectors for recycling. The rest are disposed directly at the municipal

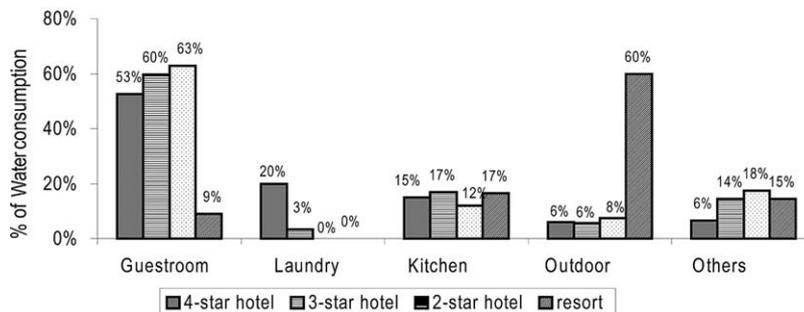


Fig. 3. Water consumption in Vietnamese hotels.

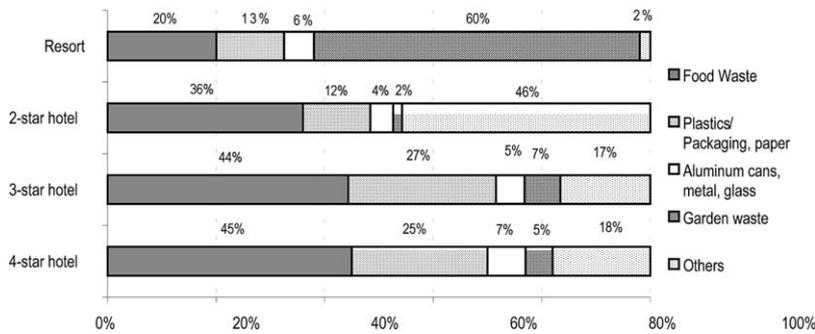


Fig. 4. Solid waste in hotels and resorts of Vietnam.

Table 3
Common good practices observed in the surveyed hotels

Items	Practices
<i>Energy management</i>	<ul style="list-style-type: none"> • Temperatures in guestrooms are kept between 24–26 °C, and equipment is turned off when not in use. • In the coastal region, air conditioners are usually turned off and entrance doors opened to take natural fresh air for indoor ventilation. • Electricity use for drying cloth is reduced by making use of solar energy in laundry; hot water temperature is limited to a maximum of 60 °C in guestrooms. • Day-lighting is best made use of, while energy-saving lighting is installed in entrance/lobby, stair case/corridor, restaurant and guestroom. • In kitchens, LPG instead of electricity is mainly used for cooking. For laundry work, LPG has also replaced electricity in drying machines. • Boilers (oil- or coal-fired) are used in some hotels in the North to supply steam for sauna services and hot water for public toilets and laundry. • Energy management work is assigned to a competent staff (chief of engineering or vice director). Readings of energy consumption are monitored periodically (monthly or weekly). • The room key-card/tag is generally used for controlling energy use in guestrooms, while priority is given to the purchase of energy-saving office equipment (“Energy Star” computer, monitor, etc.). • The 3-part electricity tariff is applied to most hotels in the central and northern regions. Since most energy intensive activities of the hotel are during the utility peak period, this becomes a main driving force for energy saving activities in hotels.
<i>Water management</i>	<ul style="list-style-type: none"> • Any leaks/faults in the water system are notified to the Engineering Department, while pipes, taps, showers and water cisterns are checked for leaks on a monthly basis. • Housekeepers pay attention to check and close running tap/faucet when guests leave the room, while staff in kitchen only turn the tap on when needed. • To avoid excessive water evaporation, garden is watered during early mornings or late afternoons; less water consuming plants and pots are used for decoration instead of fresh flowers. • Water saving sanitary devices (tap/faucet, toilet, showerhead) are considered for installation; float level in the toilet water tank is retrofitted/adjusted to save water. • Water-flow restricting valves are used on guest-floors to reduce water pressure which results in water saving.
<i>Waste management</i>	<ul style="list-style-type: none"> • Staff pays attention to avoid unnecessary photocopying, uses double-sided copying and reuse carton boxes in good condition for storage purpose; reuse of remaining toilet paper rolls and soaps from guestrooms for internal use. • Used laser printers cartridges and shampoo bottles are refilled; products (e.g. shampoo, soft-drink) are purchased in bulk; 10–30% of waste (paper/cardboard, aluminum cans, plastic, food residuals) are separated and sold to local collectors for reusing or recycling. • In the kitchen, before issuing a purchase requisition, staffs check the quantity of products still available and handles all food carefully to avoid wastage. • In some 4- and 3-star hotels and resorts, announcements have been put up in the bathrooms, requesting guests to save water, chemical and protect the environment. This draws the attention of guests, especially the well aware foreign tourists. • When replacing old minibars in guestrooms, some hotels have decided to purchase the “Non-CFC” refrigerators, which are more environment-friendly.

Table 4
Common inefficient practices observed in the surveyed hotels

Items	Problems
<i>Energy</i>	<ul style="list-style-type: none"> • In most hotels, no energy audit was conducted during the last 3 years. However, hotels have tried to implement some energy measures saving on their own. The results are not shared with other hotels. As a result, hotels do not know the level of their energy performance as compared to the others. • For lighting, most hotels use incandescent lamps, though, gradually, incandescent lamps are being replaced by compact fluorescent lamps (CFL). However, in some hotels, these selected CFL are cheap and are of low quality; they have low power factor and short lifetime. Up to now, CFL installation is mostly limited to the lobby, restaurants and corridors. • For air conditioning in guestrooms, hotels have installed split-type and window-type air conditioners with low efficiency. The location of their installation is sometimes not proper; either guests feel sick or there is infiltration of hot air into the conditioned space. • For water heating in guestrooms, 95% of the surveyed hotels use individual electric water heaters. This leads to high electricity consumption, especially during the utility peak period. Central water heating is adopted in a few hotels in the north for other purposes, but not for guestrooms.
<i>Water</i>	<ul style="list-style-type: none"> • Not many hotels have water-meters installed in the major water consuming departments/sections (guest-floor, kitchen, laundry, etc.) for monitoring. • Resorts generally use large amount of water for gardening which accounts for about 60% of total water consumption. • In kitchens, some hotels waste a lot of water when defrosting food under running tap or let the water tap running when it is not in use. • Leakages in sanitary devices are quite common; this leads to wastage of water, and energy when there is leakage of hot water.
<i>Waste</i>	<ul style="list-style-type: none"> • Most of the wastewater is discharged to public sewage system, river or sea. The wastewater treatment system does not handle all the wastewater. Some hotels and resorts do not have the capital, technical support or access to suitable small-scale water treatment system. • Recycling wastewater for other purposes (watering, gardening, etc) is not common. • In some hotels, solid waste is separated for recycling, but mainly for paper, plastic, and aluminum cans. • In some resorts, efforts are not made to compost organic waste and produce fertilizer. • Official letters are still used for internal communication in 4- and 3-star hotels.

landfill by contractors at a fixed waste disposal cost (varying from 0.6 to 1 million VND/month²).

3. Status of resource use and management in Vietnamese hotels

The resource management status of the Vietnamese hotel industry was assessed by means of questionnaire and on-site surveys. To identify good and bad practices in hotel, a set of “Yes–No” questions was prepared related to energy, water, waste and management practices, and was specified for main departments in hotel (Engineering, Housekeeping, Front Office, and Management).

Some common good practices observed in the hotels during the survey are listed in Table 3. Many hotels practice these measures for minimizing resource use and waste discharge. Some solid waste management measures are also being practiced. It was noted that the 4- and 3-star hotels in coastal and inland regions have conducted many good practices as compared to the others. However, all observed good practices are

mostly limited to housekeeping and low-cost measures. For resource saving, dissemination and promotion should be more widespread to involve both hotel staff and guests. Hotels are interested in the no- or low-cost measures with payback periods of less than 1 year (for smaller hotels) or less than 3 years (for bigger hotels). However, these measures should only be considered as initial initiatives, which need to be done as the first step of resource management program. This will provide hotels with short-term benefits, experience and more confidence before considering the adoption of medium- and long-term measures.

Some inefficient practices of resource use and waste management observed in many hotels are described in Table 4. Through staff education and guest involvement by hotels and related organisations, dissemination, promotion, green labeling, pilot projects and training courses could be initiated for efficient resource use and management of hotels.

To overcome these inefficiencies, some possible measures of improvement, with no and/or low cost approach, are proposed (Table 5). These suggestions are based on the current state of operation and management in the surveyed hotels, and based on information from case studies in other countries and considering their feasibility for hotels in Vietnam.

² 1 US\$ = VND 14,500 (approximately January 2002).

Table 5
Some proposed measures for resource use improvement

Issues	Solutions
<i>Energy</i>	<ul style="list-style-type: none"> The incandescent lamps should be gradually replaced with high quality CFLs. Initially, CFLs should be installed in areas with high daily operating hours of lighting (more than 8 hours per day). 40 W linear fluorescent lamps ($\phi 32$) should be replaced with 36 W ones ($\phi 28$). The thermostats of electric water heaters should be set at 50–60 °C as recommended by <i>IHA</i>—International Hotel Association—to save energy, water and prevent hazard of scalding and Legionella bacteria [3]. The thermostats of air conditioners should be set depending on the season and region; natural cooling can be adopted for air conditioning in summer by opening of windows; on the other hand, only ventilation may be adequate to provide comfort in winter. Water pumping should be done mostly during the utility off-peak period (when electricity price is the lowest).
<i>Water</i>	<ul style="list-style-type: none"> The level of the float in toilet water tank should be adjusted to save water. Energy and water saving announcements/notices with more pictures and less text should be put up in bathrooms and toilets. Water use in various departments should be monitored.
<i>Solid waste</i>	<ul style="list-style-type: none"> The amount of food waste discharged/100 food covers (meal) should be managed to optimize the amount of food prepared and to minimize the waste discharged from the Food and Beverage Department. Garbage buckets with capsizing cover should be employed in the kitchen. Laser printer cartridges and shampoo bottles should be refilled. To optimize the amount of food prepared and raw material purchased, it is necessary to monitor the daily weight of waste discharged from Food and Beverage Department. Unfortunately, none of the hotels have focused on this issue.
<i>Wastewater</i>	<ul style="list-style-type: none"> Grease traps should be installed in the kitchen drainage system.

According to IHA/IHEI/UNEP (1995) [3], comfortable indoor air temperature should be 25–26 °C in summer and 22–24 °C in winter, and humidity of 50%.

4. Benchmarks for efficient resource use

For hotels, benchmarks can be useful for reviewing progress towards targets. They can eventually lead to establishment of “best practices” within a hotel or across hotels in the industry. “Best practices” are means by which the desirable benchmark results could be achieved. For example, although 4-star hotels have adopted many good practices, many of them still have their specific energy consumption higher than the average indicating that they still have considerable scope and many opportunities for improvement (Fig. 5). Therefore, based on the surveyed data, a set of benchmarks could be proposed for hotels, which would assist hotels to understand their current resource use with reference to the average values in the country.

Two sets of benchmarks (climatic-based and overall) are proposed (Table 6). The overall (general) benchmarks could be used for comparison with other hotels in the region and elsewhere. The climatic-based benchmarks may help a hotel located in a specific region to compare its performance with the hotels located nearby. Though the number of samples for each hotel category (geographic and climatic regions) is small, this is the first available estimate based on data from Vietnamese hotels.

Table 7 compares the benchmarks of Vietnamese hotels for energy, water, solid waste and wastewater with those of Asian and European hotels. In terms of electricity use, resorts and 2-star hotels compare well with hotels from other countries. The water consumption in Vietnamese hotels is much higher than hotels of Europe.

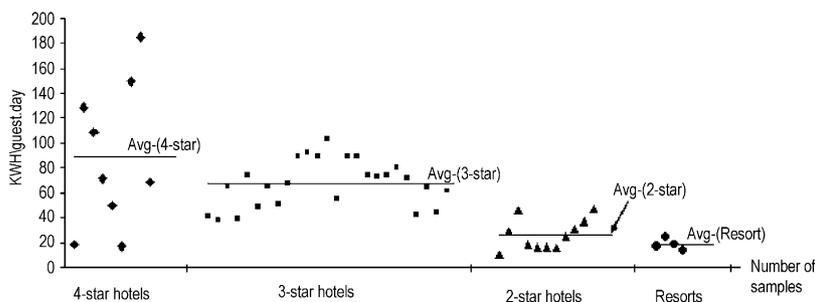


Fig. 5. Specific energy consumption of the surveyed hotels, classified by categories.

Table 6
Benchmarks for efficient use of resources in Vietnamese hotels

Climate category	Climate-based benchmarks							Overall benchmarks			
	Coastland			Highland	Inland			4-star	3-star	2-star	resort
Hotel category	4-star	3-star	2-star	2-star	4-star	3-star	2-star				
kW h/room/day (Elec.)	44–77	30–37	25–47	14–17	88–112	38–46	27–37	75–97	37–43	26–37	30–41
kW h/guest/day (Elec.)	24–43	42–62	15–27	15–17	129–178	37–45	26–44	81–127	40–50	27–41	18–24
m ³ water/room/day	2.3–2.6	1.2–1.6	0.9–1.3	1.8–2.6	1.9–2.3	1.2–1.4	1.1–1.5	5.4–20.3	2.6–8.1	0.7–11.5	4.1–16.4
m ³ water/guest/day	1.2–1.5	1.8–2.7	0.5–0.8	2.1–2.6	2.4–3.2	1.3–1.5	1.3–1.8	4.4–38.9	2.2–11	0.6–10.8	6.3–19.6
kg solid waste/guest/day	2.5–7.2	0.4–0.5	n/a	2.2–3.8	9.7–17.5	5.2–9	8.3–13.9	13.5–32.3	8.2–17.9	0.7–5.6	5.7–18.7
m ³ wastewater/guest/day	1–1.3	n/a	n/a	n/a	1.8–3.5	1.2–1.6	1.4–1.7	n/a	2.3–12	1.4–1.9	n/a

n/a: Not estimated due to lack of data.

5. Discussions and conclusion

The status of resource use and management in Vietnamese hotels was studied through on-site surveys and assessment by questionnaire in terms of energy, water and waste. The resource usage and management practices, both good and inefficient practices, have been identified. Based on the analysis of the survey data, benchmarks for efficient rating in terms of specific energy/water consumption and waste discharge have been proposed for different hotel categories.

- Hotels should focus on and analyze the resource use and management in each domain/department. Benchmarking should be carried out inside hotels for efficient use of resources in each department. Studies focusing on other aspects of resource management, such as environment-friendly product purchasing, indoor air control, air emission

management, noise pollution and community concerns need to be carried out.

- With the implementation of national environmental regulations, wastewater management is now one of the most important concerns for the hotels, especially the resorts. However, hotels and resorts face difficulties due to high investment cost of wastewater management system. Therefore, there is need to develop low cost wastewater treatment/recycling system suitable for Vietnamese hotels.
- Hotel staff education and guest involvement will greatly enhance efficient resource management. To increase the awareness/knowledge of hotel managers, assistance in terms of dissemination, promotion, green labeling, pilot projects and training courses as well as regular meetings of hotel managers for sharing their experiences of good environmental performance should be extended by the concerned government agency.

Table 7
Comparison of benchmarks for hotels in Vietnam and other countries

Hotel category	4-star			3-star			2-star			Resort		
	VN*	Ref (1)	Ref (2)	VN*	Ref (1)	Ref (2)	VN*	Ref (1)	Ref (2)	VN*	Ref (1)	Ref (2)
<i>Energy performance</i>												
kW h electricity/guest day	81–127	n/a	25 ^a	40–50	<21.4 ^b	25 ^a	27–41	<21.4 ^b	25 ^a	18–24	<21.4 ^b	25 ^a
<i>Water performance</i>												
m ³ water/guest day	4.4–38.9	n/a	<0.6 ^c 0.2–0.3 ^d	2.2–11	n/a	<0.44 ^c 0.2–0.3 ^d	0.6–10.8	n/a	<0.33 ^c 0.2–0.3 ^d	6.3–19.6	n/a	<0.33 ^c
<i>Solid waste performance</i>												
kg solid waste/guest day	13.5–32.3	n/a	0.5–1.5 ^d	8.2–17.9	–	0.5–1.5 ^d	0.7–5.6	–	0.5–1.5 ^d	5.7–18.7	n/a	n/a
<i>Wastewater performance</i>												
m ³ wastewater/guest day	n/a	0.26 ^c	n/a	2.3–12	0.26 ^c	n/a	1.4–1.9	0.26 ^c	n/a	n/a	n/a	n/a

Note: Ref, available benchmarks from other countries in [1]: Asia; [2]: Europe. VN*, benchmarks estimated from data of hotel survey in Vietnam. n/a, not available.

^a ADEME (1999) [2].

^b Meade and Monaco (1999) [5].

^c THERMIE (1998) [6].

^d ADEME (2001) [1].

^e Juntrasook (1998) [4].

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