Sustainable Hotel
Siting, Design and Construction

Conservation International

International Tourism Partnership

The industry guide to good practice

9 MONITORING PERFORMANCE

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MONITORING PERFORMANCE

9.1 Measurement

There is a well-known phrase that says '*You cannot manage what you cannot measure*' and it is particularly true for managing resource efficiency in hotels. The hotel operator should use the appropriate measuring devices that will permit monitoring, assessment and adjustment of all major energy and water-consuming equipment and systems, and of the waste output of the establishment.

Once the hotel is operational and its environmental performance is being tracked and benchmarked on an ongoing basis, internal competition between departments and incentive programmes will help the operator to improve environmental performance on a continuous basis.

A Energy and water consumption should be **sub-metered by major department** and by energy type. Suitable areas for sub-meters are:

- **Guest rooms**.
- **Restaurants**.
- **Function rooms**.
- **Public areas**.
- **Kitchens**.
- **Laundry**.
- **Gardens**.
- Staff **changing rooms**.
- **Air-conditioning, ventilation and heating** systems.
- **Pools** (indoor and outdoor) and **spa facilities**.
- **Gym** and **sports facilities**.
- **Garages** and parking areas.
- **Leased areas**.
- Any other areas of major resource consumption.

This will allow each department to take responsibility for its usage and enable feedback on deviations and implemented improvements, depending on size and complexity of the hotel. It will also be useful for benchmarking performance. Much of the monitoring work can be carried out by the BMS.

B **Benchmarks** should be set for water and energy consumption and the architect's, designer's and contractor's **final payments** should be tied to the building's overall energy and water performance.

C The architect and engineers and any specialist consultants for lighting, kitchens and gardens, etc. will all have a **major influence** on resource demand and consumption. This needs to be factored into the commissioning process to ensure that design capacities and functionality are being achieved.

D For **large, energy-consuming equipment** such as boilers and chillers, efficiency should be monitored continuously. This will enable corrective action to be taken as soon as any deviation from optimum performance is detected.

9.2 Setting benchmarks

Benchmarking is a standard by which something can be **measured or judged**. It is an ongoing process in order to determine what needs to be improved. Benchmarks provide a quantitative assessment of the current situation against which **targets** can be set for future improvement and progress measured. Benchmarks for hotels can include indicators such as the number of covers served by waiters or profit per square metre (m^2), etc.

Environmental benchmarks specifically measure environmental performance such as:

- **Energy** use (typically expressed as kWh per m^2, kWh per guest night or CO_2 in tonnes per year).
- **Water** use (litres per m^2, litres or m^3 per guest night).
- **Waste production** (kg per guest night or tonnes per year).
- Amount of **waste recycled**.
- Use of **cleaning chemicals**.
- Use of **hazardous products**.

Most hotels can benchmark their own performance. Some hotel groups not only measure the performance of individual buildings but also compare this across the group, referencing their results against industry performance benchmarks.

The following tables provide a guide to help establish performance targets for electricity, energy, water and waste production. The benchmarks have been established on the basis of data available from approximately 1,000 hotels of differing standards from around the world.

It should be borne in mind that there are many variables when it comes to benchmarking and that hotels vary greatly in type, facilities, types of equipment, weather conditions, occupancy and age, and not every hotel will fit the simple examples given here. The following benchmarks should therefore only be used as a guide. Individual hotels or chains may wish to develop their own specific benchmarks.

9.2.1 Electricity and energy use

Table 11: Benchmark values for electricity and other energy (fuel, gas, district heating) consumption in typical hotels

Energy consumption (kWh/m² of serviced space)	EXCELLENT	SATISFACTORY	HIGH	EXCESSIVE
luxury* serviced hotels				***temperate***
Electricity	<135	135 – 145	145 – 170	>170
Other energy	<150	150 – 200	200 – 240	>240
TOTAL	<285	285 – 345	345 – 410	>410
				mediterranean
Electricity	<140	140 – 150	150 – 175	>175
Other energy	<120	120 – 140	140 – 170	>170
TOTAL	<260	260 – 290	290 – 345	>345
				tropical
Electricity	<190	190 – 220	220 – 250	>250
Other energy	<80	80 – 100	100 – 120	>120
TOTAL	<270	270 – 320	320 – 370	>370
mid-range serviced hotels				***all climate zones***
Electricity	Insufficient data	70 – 80	80 – 90	>90
Other energy	Insufficient data	190 – 200	200 – 230	>230
TOTAL	Insufficient data	260 – 280	280 – 320	>320
small and budget serviced hotels				***all climate zones***
Electricity	Insufficient data	60 - 70	70 – 80	>80
Other energy	Insufficient data	180 – 200	200 – 210	>210
TOTAL	Insufficient data	240 – 270	270 – 290	>290

Source: benchmarkhotel.com

NOTE: Benchmark values may adjust over time.

* Luxury in this context is a large luxury hotel (approx 400 rooms) with ventilation and air-conditioning (electrical chillers), and a laundry.

For the different CO_2 emission values of various fuels see **Section 5.1.2** *Energy Sourcing*.

MONITORING PERFORMANCE

Worked example: calculating maximum demands

In this example, the above benchmarks can be used as follows to determine the maximum energy and electricity demand that a planned hotel should not exceed.

1 Specification

- A large luxury **400–room** hotel with full air-conditioning is planned in a temperate climate zone.
- The total enclosed area is **30,000 m²** (75 m²/room).

2 Typical full **operating hours** for hotels in temperate climate zones are:

- ELECTRICITY: **5,000 hours**
- ENERGY: **2,000 hours**

3 From the above tables the **benchmarks** for large hotels in temperate climate zones are:

- ELECTRICITY: **145 KWh/m²**
- ENERGY: **200 KWh/m²**

4 Equations:

ANNUAL CONSUMPTION (KWh) = CONSUMPTION BENCHMARK (KWh / m²) × AREA (m²)

ANTICIPATED MAXIMUM DEMAND (KW) = ANNUAL CONSUMPTION (KWh) ÷ # HOURS (h)

5 Annual consumption results:

- ELECTRICITY: 145 KWh/m² × 30,000 m² = **4,350,000 KWh**
- ENERGY: 200 KWh/m² × 30,000 m² = **6,000,000 KWh**

6 Anticipated maximum demand results:

- ELECTRICITY: 4,350,000 KWh ÷ 5,000 hrs = 870 KW = **0.87 MW**
- ENERGY: 6,000,000 KWh ÷ 2,000 hrs = 3,000 KW = **3.00 MW**

The results can be used to compare the planning engineers' calculated total demand at the end of the design stage. Transformers and boilers are sized accordingly. The anticipated peak demands are the basis for concluding utility contracts.

Should the planning engineers' figures turn out to exceed the above figures, the hotel would then be less efficient and exceed annual consumption figures. The design should therefore be re-evaluated in order to maximise the building's energy efficiency.

9.2.2 Water use

Most water utility companies express their bills in cubic metres so water consumption is expressed here in m^3. $1m^3 = 1000$ litres.

Table 12: Benchmarks for total daily consumption (excluding any water use in gardens)

TYPE OF HOTEL	DAILY CONSUMPTION
Large hotel with HVAC, laundry, kitchens, pool	< 0.60 m^3/guest night
Mid-range class hotel	< 0.40 m^3/guest night
Small hotel	< 0.33 m^3/guest night

Source: International Tourism Partnership working group

Table 13: Benchmarks for water consumption (m^3/guest night)

Water consumption (m^3 per guest night)	EXCELLENT	SATISFACTORY	HIGH	EXCESSIVE
luxury fully serviced hotels				
temperate	<0.50	0.50 – 0.56	0.56 – 0.90	> 0.90
mediterranean	< 0.60	0.60 – 0.75	0.75 – 1.10	> 1.10
tropical	< 0.90	0.90 – 1.00	1.00 – 1.40	> 1.40
mid-range fully serviced hotels				
temperate	< 0.35	0.35 – 0.41	0.41 – 0.75	> 0.75
mediterranean	< 0.45	0.45 – 0.60	0.60 – 0.95	> 0.95
tropical	< 0.70	0.70 – 0.80	0.80 – 1.20	> 1.20
small and budget fully serviced hotels				
temperate	< 0.20	0.20 – 0.21	0.21 – 0.31	> 0.31
mediterranean	< 0.22	0.22 – 0.25	0.25 – 0.38	> 0.38
tropical	< 0.29	0.29 – 0.30	0.30 – 0.46	> 0.46

Source: benchmarkhotel.com

Table 14: Benchmarks for daily individual consumption

DEPARTMENT	DAILY CONSUMPTION
Guest rooms	< 0.22 m^3/guest
Kitchens	< 35 litres/cover
Laundry	< 20 litres/kg

Source: International Tourism Partnership working group

9.2.3 Waste production

Total annual waste is usually measured in terms of kg per week/month or tonnes per year sent to landfill, total waste recovered for recycling or percentage of total waste recycled. A benchmark that is often used by the hotel industry is kg of waste produced per guest night.

Table 15: Benchmark values for waste production in typical hotels

Waste production (kg/guest night)	EXCELLENT	SATISFACTORY	HIGH	EXCESSIVE
luxury fully serviced hotels				
all climate zones	< 0.60	0.60 – 1.20	1.20 – 2.00	> 2.00
mid-range fully serviced hotels				
all climate zones	< 0.40	0.40 – 1.00	1.00 – 1.50	> 1.50
small and budget fully serviced hotels				
all climate zones	<0.60	0.60 – 0.80	0.80 – 1.50	> 1.50

Source: benchmarkhotel.com

More information

Measuring Eco-Efficiency: A Guide to Reporting Company Performance
World Business Council for Sustainable Development, 2000
www.wbcsd.org

Sustainable Measures: Evaluation and Reporting of Environmental and Social Performance
Greenleaf Publishing, 1999
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The Green Bottom Line: Environmental Accounting for Management: Current Practice and Future Trends
Greenleaf Publishing, 1998
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