CHAPTER 12

Energy Consumption in the Services Sector

CHAPTER OBJECTIVES

A. Introduction: Service Sector Contributors to Carbon Emissions

KIMPTON HOTELS

A woman walks into a hotel bar in San Francisco and asks whether any of the featured wines are organic. At the same time, a vacationer checking into a room in New York asks whether the hotel uses recycled paper and nontoxic cleaning supplies. In both cases, the hotel and restaurant staff at Kimpton Hotels are able to provide a satisfying answer to the patrons. Founded in 1981, the Kimpton Hotel chain now includes more than 50 properties in the United States. Kimpton hotels boast the highest customer satisfaction and emotional attachment scores of any hotel company operating in America.[1]

Although many things contribute to the customer evaluations of a hotel, Kimpton has made a notable investment in sustainability for several years, and it has actively promoted this investment with its customers, vendors, and other stakeholders. One of the more noticeable features of these hotels is the practice of remodeling and refurbishing existing buildings in urban settings.[2] For example, Kimpton has transformed a Seattle building constructed in 1901 into the Alexis Hotel. These preservation activities nurture urban traditions while fostering increased sustainability.

In 2005, Kimpton initiated a campaign called EarthCare that examined more than 40 eco-friendly practices performed daily at each hotel.[3] The program involved such practices as placing recycling bins in guest rooms for the disposal of organic mini-bar items.[4] This program was developed with a particular interest in guest experience and financial performance. Kimpton recognized early on that this sustainability initiative would only be successful if it did not compromise the quality of the hotel experience or detract from the bottom line for shareholders.

As a complement to the EarthCare program, Kimpton also developed EarthCare Champions in every restaurant and hotel. Any associate can be a champion—from general managers to housekeepers. These champions meet twice a month to ensure compliance with standards, develop tools to train new employees, and keep the sustainability focus on the minds of all employees. These champions have also generated many of the new ideas for products and services that enable Kimpton to remain at the forefront of sustainability in the hotel

industry. For example, an employee suggestion to recycle wire coat hangers for guest laundry saved approximately to two tons of steel per year.[5]

The sustainability efforts of the firm are also incorporated into the product offerings in the restaurants. One of the means for pursuing sustainability in the food service industry is to buy food products grown locally. This practice increases food freshness while decreasing the restaurant's carbon footprint. In addition, this practice provides the opportunity for chefs to offer unique menu options not available in other parts of the country. Implementation of this strategy enables Kimpton chefs to serve unique menu choices made from fresh and organic ingredients.[6] Where healthy local alternatives are not available, the firm emphasizes sourcing of eco-friendly products produced in a sustainable, organic, or biodynamic fashion. For example, currently 30% of all wines sold in Kimpton restaurants bear an eco-friendly label. This criterion is enforced regardless of the size of the cellar (from 50 to 1,400 selections) or the price of the wine (ranging from $5 to $500).[7]

Kimpton has been able to incorporate sustainability into operations while simultaneously achieving milestones in financial, relational, and environmental performance. In the first year of EarthCare, Kimpton attributed more than $500,000 in new revenue to the program. It also saved considerably from EarthCare directives to upgrade lighting—San Francisco's Galleria Park Hotel alone saved $4,000 from changing exit lighting to LEDs. The company has fostered closer relationships with employees via the EarthCare Champions program, and the eco-friendly requirement for food service products has nurtured relationships with local producers. Among the environmental benefits are reduced water usage and reduced use of toxins. In the first year of EarthCare operations, the company saved more than 103,000 gallons of water at the Hotel Allegro in Chicago.[8]

The Kimpton Hotels example underscores the work being done in the services sector to enhance sustainability. In order to contribute to these efforts, it is meaningful to take stock of current sustainability programs in this sector of the economy. Therefore, the purpose of this chapter is to provide an overview of the role of the services economy in energy consumption. We begin by providing an overview of this sector and its use of energy. We subsequently describe the use of energy in retailing, administration, education, health care, and lodging.

Despite the fact that services account for more than 50% of the GDP in most mature economies, few countries collect detailed information concerning energy consumption in this sector.[9] Japan, the United States, and Canada provide the greatest level of information concerning services and energy consumption. Given the lack of global information and the size of the American economy, our development of energy use focuses on this country. Consider first the overall influence of this sector.

Services are product offerings that possess several traits that distinguish them from goods and other product offerings. The delivery of most services is contingent of the action of people, and the personnel-based facet distinguishes these products from goods. Services are products that are essentially intangible and vary based on the provider. Because services are associated with the time the services provider has available to render the service, the amount of available service is perishable.[10]

The service sector includes service businesses (e.g., retail stores, hotels), educational institutions, correctional facilities, religious groups, and fraternal organizations. The

service sector of an economy is an important source of employment and GDP. In the United States, for example, the services sector accounts for more than 80% of the jobs in the economy as well as 80% of the GDP.[11]

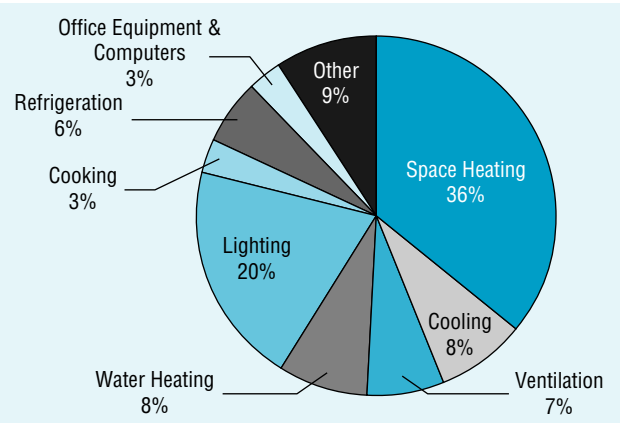
On a global level, the service sector accounts for 9% of total final energy consumption and 12% of carbon emissions.[12] In 2003, total *on-site* energy consumption in the U.S. services sector surpassed 6.5 quadrillion British Thermal Units (BTUs).[13] This estimate of U.S. energy consumption refers to energy deployed at a location and does not include energy consumed in generating and transmitting electricity. The costs incurred to generate and transport electricity are nearly equivalent to the on-site costs. Because the reporting facilitates efforts to raise efficiency at the point of service, our discussion addresses *on-site* energy consumption.

The three primary sources of energy for services are electricity, natural gas, and fuel oil. Electricity usage represents more than 50% of all energy use, and the largest uses of electricity are in air cooling, lighting, office equipment operations, refrigeration, and ventilation. Natural gas represents nearly 40% of energy use, and it is the primary source of energy for space heating, water heating, and cooking. Electricity is also used for these purposes, but gas is generally a more efficient and more popular energy source for these applications. Fuel oil is predominantly used for space heating.[14]

Figure 12-1 illustrates the primary uses of energy in the service sector. Space heating (36%) and lighting (20%) account for the majority of energy consumption within the services sector. Water heating, cooling, ventilation, and refrigeration each represent 6 to 8% of energy usage. Cooking and office equipment each account for 3% of energy consumption in this sector.

It is noteworthy that the number of commercial buildings and the amount of floor space has steadily increased, yet total energy consumption in this sector has not risen at comparable levels. In virtually every application—from computers to space heating—there have been significant enhancements to energy efficiency. Space heating is primarily achieved via boilers and furnaces. Furnaces heat air and distribute it through ducts; boilers heat water, providing either hot water or steam for heating. Steam is distributed via pipes to steam radiators, and hot water can be distributed through baseboard radiators or radiant floor systems.[15] Boilers are more likely in larger buildings, whereas furnaces are more prevalent in smaller facilities.

FIG. 12-1 Major Fuel Consumption by End Use—2003



Source: *U.S. Department of Energy*

The energy efficiency of a furnace or boiler is measured by **annual fuel utilization efficiency** (AFUE). The U.S. Federal Trade Commission requires new furnaces or boilers to display each unit's AFUE for consumer comparison purposes. AFUE is the ratio of heat output of the furnace or boiler compared to the total energy consumed by a furnace or boiler. For example, a furnace with an AFUE of 95% uses 95% of the energy as heat whereas the remaining 5% escapes through the chimney or elsewhere. The U.S. Department of Energy has established federal minimums of 80% efficiency for gas-fired furnaces, 82% for oil-fired furnaces, 84% gas fired–boilers, and 83% for oil fired–boilers. These minimums are below Energy Star requirements that are currently set at 90% for furnaces and 85% for boilers.[16]

The fuel efficiency of furnaces and boilers has improved markedly over the years. As a result of this enhanced efficiency, there are substantial savings and, simultaneously, reduced carbon emissions realized from upgrading space heating systems. For example, many furnaces installed in the 1970s had AFUEs of 60%.[17] The replacement of one of these systems with a highly fuel-efficient system with an AFUE of 95% lowers fuel consumption costs by $37.80 for every $100 spent on energy.[18] Consequently, carbon emissions and fuel cost are both reduced via the upgrade to more efficient space-heating technology.

One area of energy consumption that has changed markedly over the past 10 years is in the form of lighting used within this sector. In contrast to the household sector, the services sector has substantially more locations that rely on fluorescent lighting rather than incandescent lighting. Although there are some energy savings to be realized from replacing the incandescent lighting, the energy savings from upgrading fluorescent lighting are more appreciable.[19] The enhancements to commercial lighting include electronic ballasts and lighting control systems. Ballasts are devices designed to stabilize the flow of electricity in an electric circuit. The ballasts used in fluorescent lighting before the 1980s were magnetic, but increasingly these devices are being replaced with electronic ones. These newer devices increase the efficiency of fluorescent lighting by 25%.[20] For example, a study of a 440,000-square-foot office building in Washington, DC, revealed a potential for annual savings of about $27,000 (290,000 kWh) per year to the building owner. These savings are realized when fluorescent lamps and magnetic ballasts are replaced with smaller-diameter lamps and electronic ballasts. Together, these lighting changes reduced power per fixture by 20% from 110 watts to 88 watts.[21] Estimates from the U.S. National Academy of Sciences study suggest that electronic ballasts sold through 2005 provide $15 billion in energy savings. Moreover, the heightened efficiency results in electronic ballasts currently accounting for more than 80% of the ballast market.

Improvements in electronic control technology complement advances in the efficiency of lighting and space heating equipment. The development of digital thermostats enables one to control the temperature in a home by the day, week, and hour. Thus, facilities operated in climates that demand air-conditioning and heating in the same day can be managed effectively. Moreover, the electronic programming of the heaters enables one to raise or lower the temperature in a location. For example, the U.S. Department of Energy claims that one realizes a savings of as much as 1% for each degree change in temperature if the setback period is eight hours long.[22] Digital thermometers that are properly programmed to reduce the temperature by 10° to 15° for 8 hours yield about 5% to 15% a year on heating costs and limit the amount of carbon emissions associated with the location. Similarly, digital control devices for lighting also lower fuel costs and emissions. The lighting control devices include dimmers, sensors, and timers. Dimmers used with fluorescent lighting

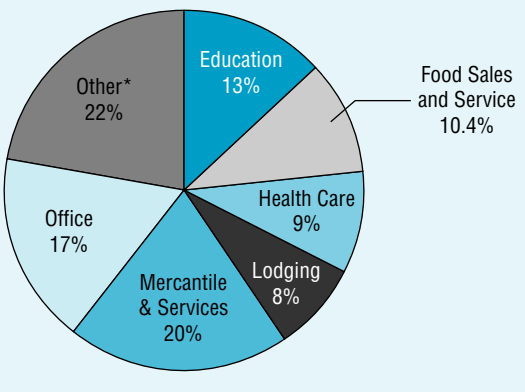
are dedicated fixtures and bulbs that provide even greater energy savings than a regular fluorescent lamp. By contrast, dimmers used with incandescent lighting do not increase energy efficiency. Sensors are devices that sense motion, light (photo sensors), and occupancy. These devices enhance fuel efficiency by reducing the use of power when conditions do not warrant energy consumption. For example, photo sensors are used in outdoor applications to turn appliances off during daylight hours.[23] Similarly, timers attempt to limit energy use via programs that allow energy to flow to lighting appliances on predetermined schedules.

Figure 12-2 illustrates the various facets of the services sector, as elsewhere as well as their respective energy consumption in the United States. At 20% of total energy consumption, the mercantile section represents the largest user of energy in the services sector of the economy. Mercantile services include the malls and strip centers that house nonfood, nonlodging components of retailing. At 17% of total energy usage, offices are the second largest consumers in the services sector. Education facilities account for 13% of energy consumption, whereas food service, health care, and lodging are each associated with at least 8% of total energy consumption. Consider first the role of the mercantile sector.

B. Nonfood Retailing

The mercantile component of the services sector includes all buildings used for the sale and display of goods other than food. This category includes enclosed malls, strip shopping centers, car dealerships, liquor stores, video rental stores, and every type of retail building other than food retailing.[24] In order to assess the potential to enhance sustainability in the nonfood retail sector, it is valuable to look at the *inputs, processes*, and *outputs*. Two inputs associated with carbon emissions are packaging and energy sourcing. Manufacturers and distributors are increasingly examining ways to enhance sustainability while simultaneously shoring up logistics costs associated with marketing to retailers. For example, Georgia-Pacific worked in conjunction with A. O. Smith Water Products to reconfigure the packaging of the company's water heaters.[25] The new package

FIG. 12-2
Commercial Buildings' Consumption by Energy Source, 2003 (6,523 Trillion BTUs)
* "Other" includes public assembly, public order and safety, religious worship, warehouse and storage, and vacant properties.



Source: *U.S. Department of Energy*

design reduced material usage by one third, decreased storage and logistical costs, and simultaneously resulted in a 1,423-ton decrease in greenhouse emissions. This example underscores the merits of the green marketing strategy to participants throughout the value chain. The manufacturing and transportation efficiencies result in lower costs to the retailers and consumers while the overall carbon emissions are reduced.

The efforts by Georgia-Pacific represent action taken by manufacturers to limit the packaging and floor space associated with products. Retailers also are initiating procedures to limit the emissions associated with products sold in their establishments. For example, Target has eliminated harmful perfluorooctanoic (PFOA) chemicals from products used in fabric and garment processing. Target also actively looks to reduce polyvinyl chloride (PVC) plastic in products and packaging.[26] Approximately 66% of the paper used at Target's in-house printing facility is recycled.[27] The company further uses 100% recycled-content paper bags, 80% recycled shoe boxes, and plastic bags with 5 to 25% recycled content.[28]

A second input that is being aggressively modified is the form of energy employed at the retail location. For example, Walmart has a long-term goal to use 100% renewable forms of energy in its retail stores. Walmart has entered into a four-year power purchase agreement with Duke Energy whereby it will purchase wind power at competitive rates from Duke's Notrees, Texas, facility. By purchasing clean, renewable energy, Walmart will avoid producing more than 139,000 metric tons of carbon dioxide (CO_2) emissions per year. The energy purchase is equivalent to taking approximately 25,000 cars off the road.[29]

The process component of nonfood retailing concerns the management of energy usage at a retail location. Walmart and Target have implemented programs designed to reduce energy consumption without affecting the consumer shopping experience. At Walmart, the average savings per store from daylight harvesting is approximately 800,000 kWh per year, enough energy to power 73 homes. The company also uses dimmable fluorescent lighting systems and LED technologies that are more efficient than older fluorescent lights. Since about 80% of the energy consumed in a retail location is associated with heating and cooling, Target has made substantial strides to enhance the energy efficiency of these systems. Heating and air-conditioning systems within Walmart stores are well above retailing requirements, and humidification systems are energy-efficient systems that make the trip to the market more enjoyable. Walmart has also implemented a plan to reduce store water consumption by 17%. This goal is achieved by installation of new faucets and other plumbing that limits the flow of water. In addition, Walmart is replacing some percentage of cement with fly ash and slag. The company also uses recycled materials in its cabinetry and counters, and it uses 100% recycled plastics (most from unused diaper scraps) in its baseboards.

The third aspect of nonfood retailing concerns the waste derived from a retail location. Retailers have collected paper waste for recycling for many decades, but the attention to waste reduction has increased dramatically in the last few years. Target, for instance, now recycles or reuses more than 70% of waste that would have been thrown into landfills a few years ago. Municipalities are mandating that retailers recycle plastic bags. For example, New York City passed a law in 2008 that requires retailers to establish in-store recycling programs for plastic bags.[30] In response to the increasing criticism of plastic bags, retailers are actively switching to other bags. Walmart has set a goal to reduce its shopping bag waste by 33%

by 2013.[31] It will achieve this goal by training associates to bag products more efficiently, introducing reusable bags, and accepting worn-out bags for recycling. In October 2008, Walmart U.S. introduced a reusable bag that cost consumers 50 cents. Similar initiatives have already yielded plastic reductions for the company in Canada, Europe, Argentina, and Brazil. In Japan, 46% of Walmart customers now use their own bags.[32]

C. Food Retailing

Food retailing represents 10.4% of consumption in the services sector.[33] The **food service** component refers to buildings used for preparation and sale of food and beverages. These buildings include restaurants, cafeterias, and fast food restaurants. **Food sales** refers to buildings used to sell food at the retail or wholesale level and includes grocery stores, food markets, and convenience stores. Food service accounts for 6.8% of total energy consumption, whereas food sales represent 3.8% of total energy consumption.

Although food retailing represents slightly more than 10% of consumption in the services sector, the energy intensity for food marketing is more than twice the average among all commercial buildings. In the food service subsector, electricity represents slightly more than 50% of energy usage with the remainder primarily associated with natural gas. Companies operating in this market are addressing ways to reduce fuel input costs, operating costs, and waste removal. Food retailers of varying size have taken measures to conserve energy and use sustainable sources of fuel. McDonald's, for instance, has implemented TEEM (The Energy-Efficient McDonald's) strategies that save each restaurant more than $2,000 annually. The design elements include skylights that allow fluorescent lights to be dimmed during the day, as well as windows with specially treated glass that filter out the sun's infrared and ultraviolet light. Infrared rays raise the temperature in dining areas, whereas ultraviolet light fades colorful fabrics inside restaurants.[34]

Many other restaurateurs are recognizing financial and brand advantages. The Austin Grill, for example, made the switch to wind power in 2003 and was the first multiunit restaurant in the United States powered exclusively via wind power. The switch to wind power cost the restaurant chain about 2% more per kilowatt hour versus fuels generated from traditional sources.[35] Similarly, Holland Inc. began using wind power for all of its electrical needs at Burgerville and Noodlin' restaurants in 2005. By converting 40 restaurants to wind power, Holland Inc. avoids adding 17.4 million pounds of carbon dioxide to the air each year.[36]

A second facet of sustainability associated with inputs to the restaurant and food service industry concerns food sourcing. Restaurateurs can lower their carbon footprints by purchasing sustainably grown products and products sourced locally. Sustainably grown products are generally associated with lower carbon emissions, but they currently cost more than their counterparts.[37] Local purchasing offers many benefits to the restaurateur and the community. The purchase of locally produced products lowers the carbon emissions costs associated with delivery and results in generally lower shipping costs. In addition, the firm can support its claims associated with freshness by buying locally grown products. The purchase of these products also supports the local community that is vital to the success of the restaurants.[38]

Retailers are also recognizing the multiple benefits associated with limiting fuel consumption. Since heating/air conditioning, lighting, cooking, and refrigeration account for about 75% of fuel costs in the sector, companies are looking for

efficiencies realized through equipment purchases and operations. Commercial restaurant equipment that bears the Energy Star label offers significant fuel savings and carbon reductions. Energy Star fryers are more than 50% more efficient than other fryers. Similarly, Energy Star steamers are 25 to 60% more efficient, and food warming/heating equipment is up to 137% more efficient than products that do not carry the Energy Star label.[39] In addition, restaurateurs can invest in tankless water heaters that reduce water consumption and are up to 70% more efficient than conventional water heaters.

Energy management for refrigeration equipment requires retailers to examine ozone depletion and global warming.[40] Retailers can reduce energy expenses by investing in refrigeration equipment that offers the highest possible evaporation temperature and the lowest possible condensing temperature while maintaining optimal storage temperature.[41] Newer-model commercial refrigerators meet these specifications and are 30% more efficient than older models. In addition, these units may use coolants that are more environmentally friendly than CFC- or HFC-based refrigerators. For example, Danish producer Vestfrost has developed refrigerators that use R-134A as the refrigerant.[42] The need to maintain adequate temperature, however, must also include consideration of the humidity conditions. Since moisture removal is more energy intensive than lowering air temperature, it is essential to regulate humidity.[43] Proper dehumidification makes the shopping experience more enjoyable and can make supermarket refrigeration cases up to 20% more efficient. Furthermore, moisture elimination is a main factor in the control of biological contamination, particularly for meat and poultry. Retailers must simultaneously consider the energy efficient rating (EER) and the moisture removal efficiency (MRE). Whereas the former measures the kilowatt cost per hour to maintain temperature, the latter addresses the amount of condensate per kilowatt hour.[44]

Importantly, refrigerators and cooking equipment only realize energy savings when installations are maintained properly. Store-level operations must, for example, regularly clean evaporator coils and condensers to ensure fuel efficiencies and avoid wear on compressors. Refrigerators should also be maintained and properly loaded to ensure quick access to products without affecting the flow of air throughout the units. When proper maintenance is part of the energy assessment, the life cycle savings of commercial products can be realized.[45]

The final aspect of energy conservation for food retailing concerns the amount of waste produced. In the United States alone, the Environmental Protection Agency (EPA) estimates that the processing of wasted food costs the country more than $1 billion annually. These costs are curtailed by recycling, reusing, donating, and composting materials.[46] Recycling centers, for example, will pay retailers for noncontaminated paper, glass, and aluminum. By contrast, retailers lower their costs by reusing cardboard, paper, and plastic. They can also lower overall costs by donating food, used uniforms, furniture, and appliances to the needy. Finally, retailers recognize the financial rewards associated with composting. Since 1997, San Francisco restaurateurs have been composting more than 300 tons of materials every day. The compost ferments for 60 days before it is sold to local vineyards.[47]

D. Offices and Administrative Buildings

Office buildings include locations used for general office space, professional offices, and administrative offices.[48] Twenty-nine percent of the energy used in these locations is associated with electricity for lighting, and another 16% is associated with

office equipment. They also rely on natural gas and electricity for space heating; together, space heating fuels account for 25% of energy use in office buildings.

Efforts to control energy expenditures for commercial offices include **green design** and office equipment operations. *Green design* refers to the development and maintenance of buildings that are sensitive to the environment, resource and energy consumption, the quality of the work setting, cost effectiveness, and the world at large.[49] In the United States, the nonprofit Green Building Council (USGBC) has established the **Leadership in Energy and Environmental Design (LEED)** rating system. LEED includes 34 performance criteria associated with sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design processes. Four levels of certification (certified, silver, gold, and platinum) correspond to increasingly higher levels of sustainability of a building.

The decision whether to incorporate LEED criteria into buildings is contingent on the cost effectiveness of the sustainability-based enhancements. Regrettably, there is limited research on the costs incurred with green design. The **green premium** refers to the additional expenditures associated with green design. Green design decisions are often not priced out in comparison to nongreen ones, and the relative newness of green technologies results in conservative cost estimates by designers, architects, and their clients. The benefits of green design include cost savings from reduced energy, water, and waste as well as lower operating and maintenance costs. In addition, green design yields enhanced occupant productivity and health. Furthermore, green buildings are 25 to 30% more energy efficient and lower peak energy consumption. They are also more likely to generate renewable power on site and purchase power from renewable energy sources.[50]

Although survey and census data are not available to characterize the trade-offs associated with using a green design, available evidence suggests strong financial benefits over a 20-year horizon. In a 2003 study of 33 LEED projects, the state of California used net present value calculations to estimate the benefits and costs of using a sustainable design. The green premium was estimated at $4 per square foot, but the net present value of energy (NPV) savings was estimated at $5.79. When the benefits of lowered emissions, enhanced water quality, and occupant productivity are added to the energy savings, the net present value of a certified or silver location was estimated at $52.47 per square foot. Consequently, the benefit of a green building was approximately $48.87 per square foot. These figures should not be used to assume that green building is necessarily more cost effective. These preliminary data underscore the need to consider the inherent costs and benefits of employing a sustainable design. When the costs are assessed over the life of the property, the merits of green building strategies are likely to be pronounced.

The second facet of energy savings most associated with office buildings is office equipment. This equipment includes personal computers, facsimile (fax) machines, photocopiers, telephones, and other instruments designed to facilitate office operations. In 2006, the International Sustainable Development Foundation established the Green Electronics Council (GEC) to support the effective design, manufacture, use, and recovery of electronic products. GEC works in conjunction with the electronics industry to recognize and reward environmentally sensitive products. GEC has established the Electronics Products Environmental Assessment Tool (EPEAT) to identify electronics that are environmentally preferable. The EPEAT sourcing criteria call for the reduction or elimination of environmentally sensitive materials (e.g., cadmium and mercury), the use of recycled content, and the implementation of design features that enable recycling at the end of a product's life. Operational criteria include energy conservation concerns

(e.g., Energy Star), packaging, and upgradeability of products. Products are also evaluated based on corporate environmental performance and whether the corporation has implemented a return policy for obsolete products.[51]

Products that meet EPEAT standards use less energy and use more recycled materials while producing less greenhouse gas, air and water pollution, and solid and hazardous waste. In 2006, less than 10% of desktop, laptop, and computer monitors met the EPEAT standards. These products saved 13.7 billion kWh of electricity and 24.4 million metric tons of materials. In addition, these EPEAT-certified products prevented 56.5 million metric tons of air pollution, 1.07 million metric tons of global warming gases, 118,000 metric tons of water pollution, and avoided disposal of 41,100 metric tons of hazardous waste.[52] Given the benefits of these products, however, it is not surprising to see manufacturers such as Apple and Dell marketing EPEAT products. Apple markets the 13-inch MacBook as the greenest MacBook ever. This computer is arsenic, mercury, and PVC free and is enclosed in recyclable aluminum and glass.[53] Dell is also striving to achieve higher levels of sustainability and currently offers 28 products that are EPEAT registered.[54]

E. Educational Institutions

Educational institutions are buildings used for academic or classroom instruction. These buildings include elementary, middle, or high schools and classrooms on college or university campuses.[55] Educational institutions account for 13% of energy consumption in the services sector. Space heating (41%), water heating (22%), and lighting (20%) represent more than 80% of the power expenditures in education. Most educational facilities are part of multibuilding campuses, and schools in the Northeast and Midwest are generally larger than schools in the South and West. Almost two-thirds of the schools are government owned, and three-fourths of the government-owned buildings are owned by local government.

Although there are notable efforts to raise the sustainability of operations at the elementary and high school levels, the action undertaken at the collegiate level provides the opportunity to compare green marketing action across campuses. In 2005, the Rockefeller Philanthropy Advisors established the **Sustainable Endowments Institute** (**SEI**). SEI is a nonprofit organization engaged in research and education to advance sustainability in campus operations and endowment practices. Since 2007, SEI has been publishing the **College Sustainability Report Card**. This assessment of sustainability evaluates the policies and programs of 100 leading colleges and universities. These schools hold more than $258 billion in endowments and represent about 75% of all higher education endowment investments. Collegiate institutions are evaluated on the following criteria:[56]

Administration. This category addresses action regarding sustainability by colleges and universities at the administrative or trustee level. This action includes commitments to sustainability in the institution's mission statement or master plan and commitments to local, national, or international sustainability agreements.

Climate change and energy. Climate change initiatives seek to improve energy efficiency and to obtain energy from renewable resources. Conservation campaigns may encourage college community members to monitor their energy consumption, retrofit appliances or power plants with energy-efficient technology, conduct a carbon emissions inventory, and commit to emissions reductions.

Food and recycling. This category examines the sustainability practices of dining services. Schools earn higher evaluations based on the quantity and availability

of locally grown food, as well as organic and sustainably produced food. The use of reusable dishware and eco-friendly to-go containers is also taken into consideration. In addition, this category also examines campus-wide and dining-specific programs for recycling and composting food and landscape waste.

Green building. The green building category assesses the degree to which schools adopt high-performance green building design. This category includes the adoption of campus-wide green building policies and the integration of green building practices into new and existing buildings, construction projects, and the incorporation of green building design features into retrofits of existing buildings. Colleges earn better evaluations when they use the LEED rating system.

Student Involvement. This category considers the degree to which students participate in sustainability initiatives as well as the support for these activities by school administrators.

Transportation. The transportation category examines the extent to which a school promotes alternative transportation choices through the policies and practices of facilities management and the administration.

Endowment transparency. This factor addresses the control information about endowment investment holdings and shareholder proxy voting records. Access to endowment information fosters constructive dialogue about opportunities for clean-energy investments and shareholder voting priorities.

Investment priorities. Investment priorities focus on prioritizing return on investment, investing in renewable energy funds, and investing in community-development loan funds.

Shareholder engagement. Colleges illustrate shareholder engagement by establishing committees of students, faculty, and alumni to advise the trustees regarding sustainability.

The College Sustainability Report Card offers a number of benefits to institutions of higher education. The specific criteria in the report card provide opportunities to make significant advances in aspects of a university's sustainability evaluation that fall below desired levels. By charting this activity over time, universities can illustrate to stakeholders the amount of progress achieved over time. For example, Table 12-1 identifies the best-performing institutions in 2009. The relative rankings indicate how the efforts of one college fare in comparison to all other higher educational institutions.

The scorecard provides insight to colleges, but it also provides insight to marketers that seek to make product offerings available to institutions of higher learning. By analyzing these criteria, firms can develop campaigns that illustrate how their product offerings help schools achieve sustainability goals. For example, Leviton markets a line of dimmer switches that accommodate fluorescent lighting.[58] Sales representatives marketing these products to colleges and universities can illustrate how retrofitting of these devices to existing fixtures can enable the institution to achieve sustainability goals while simultaneously lowering operating costs.

F. Health Care

Health care buildings are those used as diagnostic and treatment facilities for both inpatient and outpatient care.[59] Doctors' and dentists' offices are considered health care buildings if they use any type of diagnostic medical equipment and offices if they do not. Skilled nursing or other residential care buildings are categorized as lodging.

TABLE 12-1 BEST SUSTAINABILITY PERFORMERS AMONG COLLEGES AND UNIVERSITIES—2009[57]

	Overall Grade	Administration	Climate Change and Energy	Food and Recycling	Green Building	Student Involvement	Transportation	Endowment Transparency	Investment Priorities	Shareholder Engagement
Oberlin College	A-	A	A	A	A	A	B	B	A	A
University of New Hampshire	A-	A	A	A	B	A	A	A	B	–
University of British Columbia	A-	A	B	A	A	A	A	A	B	B
Columbia University	A-	A	B	A	A	A	B	B	A	A
Dickinson College	A-	A	A	A	B	B	A	B	A	A
Harvard University	A-	A	A	A	A	A	B	C	A	A
Middlebury College	A-	A	A	A	A	A	A	D	A	A
University of Washington	A-	A	A	A	A	B	A	B	A	B
Brown University	A-	B	B	A	A	A	A	C	A	A
Carleton College	A-	A	B	A	B	A	B	B	A	A
University of Colorado	A-	A	A	A	A	A	A	A	A	F
Dartmouth College	A-	C	B	A	A	A	B	A	A	A
University of Pennsylvania	A-	A	A	A	A	B	B	C	A	A
Stanford University	A-	A	B	A	A	A	B	C	A	A
University of Vermont	A-	A	A	A	A	B	B	B	B	A

Source: *www.GreenReportCard.org*

Health care accounts for 9% of the energy consumption in the services sector. The health care sector has a set of unique conditions that influence the measures taken to conserve energy. Similar to food retailing, health care buildings have energy intensities that are more than twice the average of all buildings in the sector. Health care facilities must cope with 24/7 operations accompanied by chemical use, infectious disease control requirements, and substantial regulatory requirements that challenge efforts to achieve higher levels of sustainability.

The health care industry has been working toward developing sustainability standards since the 2002 release of the Green Healthcare Construction Guidance statement by the American Society for Healthcare Engineering. In the following year, the Green Guide for Health Care initiative began when a team of geographically and professionally diverse industry leaders established a steering committee to guide development of the document. Importantly, the members of this committee include a wide range of stakeholders who do not have direct financial interests in certification processes or products addressed in the document. The guide has evolved from a pilot project to become a full-fledged registration and certification program. In its current form, the **Green Guide for Health Care** (version 2.2) is

intended to serve as a reference for best practices in the industry. The Guide provides the health care sector with a voluntary, self-certifying metric toolkit that designers, owners, and operators can use to guide and evaluate their progress toward high-performance healing environments. The detailed guide provides insight into the manner by which health care facilities can enhance the extent of sustainability in building construction and operations.

The guidelines for health care sustainability examine issues associated with new construction and current operations. When a hospital elects to add new construction or analyzes current operations, it is increasingly basing decisions on the Green Guide for Health Care. The construction and operations-related issues for health care facilities include:[60]

Integrated design. The health care facility must implement a collaborative multistakeholder goal-setting and design process and establish human health as a criterion for design, construction, and operations.

Sustainable sites. Site development must limit the environmental impact from the location of a building on a site. Developments in urban areas should protect greenfields and preserve natural resources, and developments in rural areas should focus on previously developed sites. Facilities should also rehabilitate sites where development is complicated by environmental contamination. Sites should be regulated to limit pollution from automobiles as well as pollution from storm water runoff.

Water efficiency. Health care facilities must eliminate the use of potable water for cooling of medical equipment or for landscape irrigation. At the same time, the health care facility should maximize drinkable water efficiency within facilities and monitor water consumption practices over time.

Energy and atmosphere. The health care facility should establish minimum energy efficiency standards, encourage performance above these standards, and monitor this performance over time. The facility should also encourage use of renewable and self-supplied energy while simultaneously reducing energy consumption. In addition, the facility should be in compliance with the Montreal Protocol for ozone depletion.

Materials and resources. Eliminate the use of mercury-containing building products and reduce the release of bio-accumulative toxic chemicals associated with building materials. Redirect recyclable resources into manufacturing, redirect reusable materials to appropriate sites, and direct hazardous waste in compliance with governmental regulations.

Environmental quality. Provide natural ventilation to enhance occupant comfort and minimize indoor air contaminants that are potentially harmful. Minimize the use of furnishings that release air contaminants and limit the amount of disruptive sound near the facility.

Innovation and design process. Establish programs that reward design teams and projects that achieve performance above the goals established by the Green Guide for Health Care.

Chemical management. Minimize airborne effluents and hazardous spills while also reducing the potential for building occupant exposure to PCBs and PCB combustion by-products. Limit the amount of pharmaceutical waste in sanitary sewer discharge.

Waste management. Establish minimum reduction and recycling programs. Reduce solid waste in landfills and incinerators through reuse, reduction,

recycling, and composting. Reduce medical waste through improved segregation and modified work practices.

Environmental services. Develop grounds management practices that enhance the ecological integrity of the property. Reduce exposure to physical and chemical hazards. Limit land development and pollution effects by limiting the amount of vehicle transportation.

The merits of the Green Guide for Health Care are similar to those enjoyed by universities that use the College Sustainability Report Card. The guidelines provide clear objectives for the hospitals, and they enable health care institutions to track their level of progress over time. Moreover, the Green Guide provides significant help to marketers seeking to make their product offerings available to hospitals. Marketers that can illustrate how their products augment construction and operations guidelines are well positioned to increase market shares in the health care industry.

G. Hotels and Lodging

The hotel and lodging industry accounts for 8% of energy consumption in the services sector. The hotel industry is one of the world's largest employers and represents more than 195 million jobs and 10.2% of the world's GDP. In addition, the industry reports annual capital investments of $685 billion.[61]

The tourism industry is forecast to reach more than 1.56 billion people by the year 2020, and the hotel industry will need to accommodate the demand by providing more properties. Industry participants recognize that new hotel construction must occur in a manner that incorporates sustainability issues.[62] The industry recognizes the need to enhance sustainability, but many of the efforts in operations have occurred independently by various hoteliers.[63] The International Business Leaders Forum (IBLF) and Green Globe certification represent two attempts to draw consensus about sustainability efforts. In 2005, the IBLF and Conservation International developed a plan for implementing sustainability into hotel planning and development to help guide planners, investors, hotel owners, and developers.[64] This plan was developed in conjunction with nine of the world's leading hotel companies: Accor, Carlson, Four Seasons, Hilton, InterContinental, Marriott, Rezidor SAS, Starwood Hotels & Resorts Worldwide Inc., and Taj Hotels Resorts and Palace. This plan focuses on site selection, building design, and construction. Key facets of the plan include:[65]

Sustainable building site and design. Design concerns examine architectural features such as site location, passive solar design, day lighting, renewable energy, water conservation, and landscaping. In addition, the plan examines environmental considerations associated with windows, insulation, and other building materials. The design also calls for resource-efficient technologies and appliances.

Reuse of existing buildings. The plan recognizes that, when feasible, retrofitting and repairing of existing properties is preferred to new construction. When buildings must be leveled, existing materials should be evaluated for reuse.

Sustainable construction. Sustainability in construction involves ensuring that modifications to initial plans do not impair the sustainability features of the design, nor do they reduce energy efficiency. The environmental integrity of the site is to be preserved at all costs. Additionally, the site must be a clean and safe workplace.

Although the IBLF plan provides guidelines for property development, it does not represent a form of accreditation that hotel properties can obtain. Green Hotel Certification, however, is a third-party certification that integrates IBLF logic and other industry documentation. The Green Globe seal is an independent recognition of sustainability efforts that benchmarks properties against the highest worldwide principles. Its object is to introduce and strengthen sustainability and social practices at all levels of management in the hospitality industry. Green Globe certification reviews energy efficiency, greenhouse gas emissions, water conservation, indoor and outdoor air quality, waste management, facility management, policy and governance, purchasing, community, destination protection, conservation and management, and cultural and social issues.

Summary

A. Introduction: Service Sector Contributors to Carbon Emissions

This chapter provides an overview of energy consumption in the services sector. This economic sector includes service businesses (e.g., retail stores, hotels), educational institutions, correctional facilities, religious groups, and fraternal organizations. On a global level, the service sector accounts for 9% of total final energy consumption and 12% of carbon emissions. The three primary sources of energy for services are electricity, natural gas, and fuel oil.

B. Nonfood Retailing

The mercantile component of the services sector includes enclosed malls, strip shopping centers, car dealerships, liquor stores, video rental stores, and every type of retail building other than food retailing. Manufacturers and distributors that provide inputs are increasingly examining ways to enhance sustainability while simultaneously shoring up logistics costs associated with marketing to retailers. The process component of nonfood retailing concerns the management of energy usage at a retail location. Large and small retailers have implemented programs designed to reduce energy consumption without affecting the consumer shopping experience.

C. Food Retailing

The food service component refers to buildings used for preparation and sale of food and beverages. These buildings include restaurants, cafeterias, and fast food restaurants. Given that the energy intensity for food marketing is substantial, companies operating in this market are addressing ways to reduce fuel input costs, operating costs, and waste removal. *Food sales* refers to buildings used to sell food at the retail or wholesale level and include grocery stores, food markets, and convenience stores. Firms in this industry can lower their carbon footprints by purchasing sustainably grown products and products sourced locally. They further can lower their energy emissions by upgrading to fuel-efficient equipment.

D. Offices and Administrative Buildings

Efforts to control energy expenditures for commercial offices include green design and office equipment operations. *Green design* refers to the development and maintenance of buildings that are sensitive to the environment, resource and energy consumption, the quality of the work setting, cost effectiveness, and the world at large. The second facet of energy savings most associated with office buildings is office equipment. The International Sustainable Development Foundation established the Green Electronics Council to support the effective design, manufacture, use, and recovery of electronic products.

E. Educational Institutions

Educational institutions are buildings used for academic or classroom instruction. Sustainable Endowments Institute publishes the College Sustainability Report Card that evaluates universities' and colleges' efforts to attain sustainability in administration, climate change and energy, food and recycling, buildings and construction, endowment transparency, investment priorities, and shareholder engagement.

F. Health Care

The Green Guide for Health Care provides health care facilities with guidelines about construction issues

that include integrated design, sustainable sites, water efficiency, energy and atmosphere, materials, environmental quality, innovation, and design. The ongoing operations of the facility are also addressed with respect to energy efficiency, water conservation, chemical management, waste management, and environmental services.

G. Hotels and Lodging

Firms operating in the lodging industry can increase the level of sustainability via proper building site and design, refurbishing and reusing existing buildings, and sustainable construction.

Key Terms

annual fuel utilization efficiency, 242
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green premium, 247
Leadership in Energy and Environmental Design (LEED), 247
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Questions

1. What is the merit of examining the state of progress on sustainability issues for each sector of the services economy?
2. What is the relative influence of the services economy on energy consumption, and what are the primary sources of energy used in the sector?
3. Describe the primary energy-intensive inputs, processes, and outputs in nonfood retailing, and describe recent efforts to use energy more efficiently.
4. How does local food sourcing enhance sustainability?
5. Why would an organization seek to have LEED certification for its new facility?
6. Is the green premium increasing or decreasing? What evidence supports your answer?
7. What are the components of the College Sustainability Report Card?
8. How does your college or institution rate on the Collegiate Sustainability Report Card, and what can it do to enhance its performance?
9. What can your college or institution do to enhance the sustainability of the classroom in which your class is held?
10. What types of firms marketing to hospitals would benefit from knowing that the health care facility is using GGHC logic to direct its purchasing?
11. To what extent is the hotel and lodging industry engaging in sustainability efforts?

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