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Environmental Implications of Hotel Growth in China: Integrating Sustainability with Hotel Development

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Abstract

China has embarked on the largest program of new hotel construction the world has ever seen. Even though the nation's growth rate has eased somewhat in the past year, China's hotel development continues at a pace that would see at least three new 150+ room hotels open every day for the next 25 years.[1] Even if the industry does not continue to expand at this rate, China's hotel growth carries substantial consequences in terms of increases in energy and water consumption, and an expanding carbon footprint. In this paper, we outline the dimensions of this issue, and we urge hotel developers to heed the national government's push for greater sustainability.

Keywords

sustainability, China travel and tourism, international travel, energy use, emissions

Disciplines

Environmental Studies | Hospitality Administration and Management | International Business

Comments

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EXECUTIVE SUMMARY

According to a recent count, China has 2.7 million hotel rooms. Although the nation's economic growth has cooled somewhat in recent months, there is no reason to believe that this number will not continue to increase. Moreover, some areas of China (such as Shanghai) have continued their expansion. By one estimate the number of hotel rooms in China is expected to grow to 9.1 million by 2039. In addition to outlining the scope of China's hotel industry this white paper points to the potential for and the importance of the industry improving the sustainability of its operations, particularly regarding carbon emissions, energy, and water consumption. Because the key is to include sustainability in hotel planning and design from a project's outset, we discuss both the barriers and opportunities for China's hotel industry to improve its sustainability.

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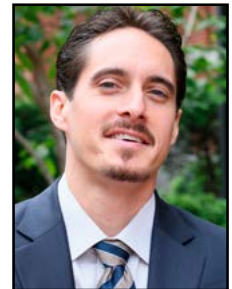
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Meng Wu is an international hotelier and strategic sourcing expert. Meng was born and raised in Shanghai, and then lived and studied in Canada for ten years. She holds a master's degree in sustainable development and organization from Paris-Dauphine University. Meng has over twenty-five years of professional experience in Greater China and became actively involved in corporate sustainability in 2010.

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China has embarked on the largest program of new hotel construction the world has ever seen. Even though the nation's growth rate has eased somewhat in the past year, China's hotel development continues at a pace that would see at least three new 150+ room hotels open every day for the next 25 years.[1] Even if the industry does not continue to expand at this rate, China's hotel growth carries substantial consequences in terms of increases in energy and water consumption, and an expanding carbon footprint. In this paper, we outline the dimensions of this issue, and we urge hotel developers to heed the national government's push for greater sustainability.

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[1] Yang, Y. (2011). Number of hotel rooms set to soar. China Daily www.chinadaily.com.cn/cndy/2011-11/08/content_14053498.htm. Lodging Econometrics. (2014). Asia-Pacific Lodging Real Estate Trends – Executive Summary. www.lodgingeconometrics.com/2q14-asia-pacific-executive-summary/

Hotel room growth projections—USA versus China
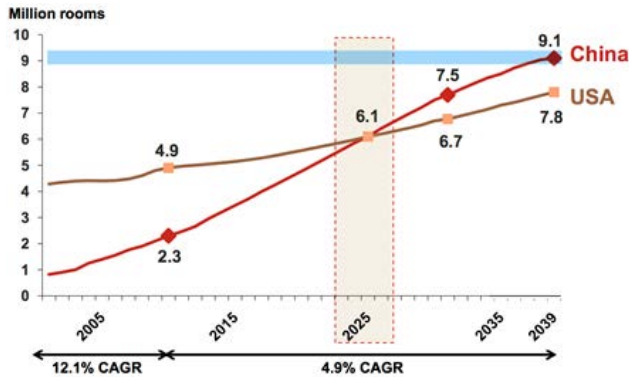
Sources: Morgan Stanley, (2011). "China High-Speed Rail on the Economic Fast Track," Morgan Stanley Blue Paper (www.morganstanley.com/views/perspectives/China_HighSpeed_Rail.pdf); United Nations World Travel Organization; and IHG, 2009.

As a starting point, our analysis of sustainability in China's hotel industry finds challenges in the development process. The major gains in efficient resource use in hotels occur in the conceptual planning and financing stages, but it appears that sustainability considerations are not included in these early development phases. One veteran energy management expert has said that "new hotel projects are rarely if ever conceptualized with sustainability factored into these phases of the new hotel project life cycle."[2] By the time the architect, consultants, and technical services companies get involved, property developers most often have already obtained approvals and secured financing. This makes it extremely challenging and impractical for hotel operators to convince hotel owners to put a project on hold and redesign the project to improve its sustainability. Changes to the project baseline inevitably result in delays, not only due to redesign, but also to reapplying for required government building permits and construction and gaining approval of additional funding.[3] At the same time, the approach taken by hotel companies when negotiating new management and franchise agreements with hotel owners focuses on branding and system contribution. Unfortunately, the value proposition does not always include sustainability, although most international hotel chains do have a strong focus on environmental programs.

Rather than treat sustainability as an afterthought, we strongly recommend that hotel developers and hotel companies strengthen their emphasis on sustainability so that these concepts are embedded in the early in development planning. The

benefits of this approach not only include increased operational efficiency and reduced costs, but collectively help to mitigate the risks associated with the scale of resource consumption needed to fuel hotel growth in China.

China's Travel Market

The Chinese State Council recognizes the importance of travel and tourism and has included it as a pillar industry in its Twelfth Five-year Plan of the Central Government. The China Tourism Academy estimated the number of domestic travelers in 2014 at 3.63 billion, and the number international visitors at 130 million.[4]

According to the World Travel & Tourism Council, the total contribution of travel and tourism to China's GDP reached ¥5.366 billion in 2015 (or 7.9% of GDP). Receipts were expected to rise by 6.3 percent in 2016, and by 7.0 percent per annum to ¥11.225 billion in 2026. Again, even with the world's recent economic slowdown, travelers will still be visiting China in substantial numbers.

China's domestic travel generated about 90.3 percent of the direct travel and tourism GDP in 2014. It is expected to generate ¥3.740 billion in 2015, and rise by 6.1 percent per annum to ¥6.742 billion in 2025. According to the Global Business Travel Association, China's domestic business travel spending grew by 15.9 percent in 2014 and was expected to grow another 18 percent in 2015. China spent a total of US$262 billion on business travel in 2014.[5] Forty-two percent of this domestic business travel is for meeting, incentive, convention, and exhibition travel, according to the Global Business Travel Association.[6]

One reason for the growth in travel and tourism in China is that the country has focused its economic agenda on domestic consumption, including hospitality businesses and service industries relating to travel and tourism.[7] Hotel investment not only supports this transition but also becomes attractive for domestic capital allocation as part of the trend toward investment in real estate.

In that regard, investment in travel and tourism in China attracted ¥832.5 billion, or 2.8 percent of total national investment in 2015, ranking second globally. In terms of employment, the industry supported close to 65 million direct and indirect

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[2] Robert Allender, Energy Resources Management. (2015).http://energy-rm.com.hk/. Noordzij, G. (2014). *Project Management of Hotel Opening Processes*, First Edition. CreateSpace

[3] Project Management Institute (PMI). (2013). *A guide to the Project Management Body of Knowledge* (PMBOK), Fifth Edition. Library of PMI Global Standards—Foundational Standards.

[4] TOPHotelProjects. (2015). Hainan: The tourism of China's island paradise is booming. www.tophotelprojects.com/en/hainan-tourism-china-s-island-paradise-booming.

[5] Global Business Travel Association. (2014). GBTA Foundation Forecasts China Business Travel Spend to see Double Digit Increases in 2014, 2015. www.itb-asia.com/gbta-foundation-forecasts-china-business-travel-spend/.

[6] Chinese Business Travelers Spend $110 Billion USD on Meetings & Events in China; www.gbta.org/PressReleases/Pages/RLS_110215.aspx.

[7] Keqiang, Li (2012), "China deepens strategy of domestic demand expansion in the course of reform and opening-up," China.org.cn (online), available at: www.china.org.cn (04-05-2015).

EXHIBIT 2

Top 10 worldwide hotel groups as of January 2015

Top 10 of worldwide hotel groups as of 01 January 2015					
Rank Groups		**Global**		**China**	
		Hotels	**Rooms**	**Hotels**	**Pipeline**
1	InterContinental Hotels Group	4,840	710,295	241	189
2	Hilton Worldwide	4,278	708,268	54	169
3	Marriott International	4,117	701,899	76	139
4	Wyndham Hotel Group	7,654	660,826	874	500
5	Choice Hotels International	6,376	504,808	2	5*
6	Accor Hotels	3,717	482,296	156	141
7	Starwood Hotels & Resorts	1,207	346,599	146	148
8	Best Western International	3,931	302,144	35	18
9	Home Inns & Hotel Management Inc.	2,609	296,075	2,609	201
10	Jin Jiang	2,208	241,910	2,208	35*

Source: MKG Hospitality Database, corporate annual reports

jobs, or 8.4 percent of total employment in 2015. This number is expected to rise by 3.5 percent per annum to 94 million jobs in 2026. [8]

China's Hotel Outlook

Anticipated increases in domestic and international travel are fueling demand for more lodging facilities. Currently there are approximately 2.7 million hotel rooms in China. [9] As summarized in Exhibit 1, China's National Bureau of Statistics predicts that the number of hotel rooms in China will more than double to 6.1 million by 2025, equaling the expected U.S. number by that time. Then by 2039 China is expected to reach 9.1 million hotel rooms, more than three times the current number. Needless to say, most of these will be newly constructed. [10]

According to Lodging Econometrics' China Construction Pipeline Trend report, there were 2,513 new hotel projects in the pipeline in mainland China at the end of 2015, comprising 548,550 rooms.[11] This marks a 5-percent year-on-year decline in terms of projects and a 2-percent drop in rooms.

The pace of hotel construction in China also appears to be decelerating in most parts of the country. According to the Lodging Econometrics report, there are now 1,884 hotel

projects under construction in China, with 384,000 rooms, representing approximately 70 percent of the country's total pipeline. But this represents a 13-percent decline in terms of projects compared to the previous year, and an 8-percent drop in terms of rooms. *Travel Daily Asia* observes that this is the first drop in planned hotel projects since 2007.[12] At the same time, STR Global estimates that Shanghai alone has 35 hotels comprising more than 9,000 rooms in the pipeline for the near future.[13] China has an estimated two thirds of all construction projects in Asia.

Senior executives of major international hotel chains expect that the outlook for the hotel sector in China will remain strong, as the tourism industry will continue to grow over the next few years.[14] Almost all of the major international hotel companies have indicated that development in China is a pertinent strategic objective as part of their ambitious global growth strategies, as shown in Exhibit 2. The global development pipeline of the top ten international hotel companies alone is estimated at US$86 billion worth of fixed asset projects. In China this represents US$26 billion.[15]

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[8] World Travel & Tourism Council (WTTC). (2016). Travel & Tourism Economic Impact 2016 China. www.wttc.org/-/media/files/reports/economic%20impact%20research/countries%202016/china2016.pdf.

[9] AT Kearney. (2013). "China's Hospitality Industry—Room for Growth." www.hotelnewsnow.com/Article/10266/Chinas-growth-drives-hoteliers-optimism.

[10] "Number of hotel rooms set to soar," China Watch. *The Washington Post*. (2011). http://chinawatch.washingtonpost.com/2011/11/number-of-hotel-rooms-set-to-soar.php.

[11] The report itself is behind a paywall. See: www.lodgingeconometrics.com/shop/construction-pipeline-trend-report/.

[12] "Chinese hotel pipeline contracts for first time since 2007," Travel Daily Asia, February 15, 2016, p. 2.

[13] Mark Elliott, "9,000 New Hotel Rooms Coming to Shanghai," *Travel Daily Asia*, February 15, 2016 (www.traveldailymedia.com/232706/9000-new-hotel-rooms-coming-to-shanghai/).

[14] Hotel News Now. (2013). China's growth drives hoteliers' optimism. www.hotelnewsnow.com/Article/10266/Chinas-growth-drives-hoteliers-optimism.

[15] Noordzy, G. and Whitfield, R. (2014). "Root Causes of Hotel Opening Delays in Greater China," *Cornell Hospitality Report*. Cornell University Center for , School of Hotel Administration. www.hotelschool.cornell.edu/research/chr/pubs/reports/abstract-17923.html.

EXHIBIT 3

Average energy and water use per occupied room in selected countries

Country	Mean Energy Per Occupied Room (kWh)	Mean Water Per Occupied Room (L)
Canada	163	589
China	208	1555
France	85	522
Germany	86	459
India	212	1547
Mexico	227	911
United Arab Emirates	217	1118
United Kingdom	98	622
United States	127	627

Adapted from: Howard Chong and Eric Ricaurte, "Hotel Sustainability Tool 2015: Energy, Water and Carbon. Cornell University," *Cornell Hospitality Report* (School of Hotel Administration; www.hotelschool. cornell.edu/research/chr/pubs/tools/tooldetails-18779.html).

Even given the volume of development planned by the top hotel groups, the majority of projects remains under control of smaller chains and independents. We suspect that these industry players would not have as strong a sustainability commitment as the international chains and may not incorporate the most efficient fixtures, furniture, or equipment standards in their hotel design.

Energy, Water, and Carbon Emissions from Hotel Operations in China

With so many entities involved in China's hotel pipeline, we anticipate that the writers of many development and feasibility studies are not taking into account the collective effects of their development plans, especially with regard to energy use, water consumption, and carbon emissions. We also don't see a chance for so many developers to take advantage of economies of scale through group purchasing power.

Studies have shown that in general, China's hotels consume more water and energy per square meter and per occupied room than those in other large countries (see Exhibit 3).[16] A comparative study of business hotels in Asia Pacific illustrating

[16] Chong, H. and Ricaurte, E. (2015). "Hotel Sustainability Tool 2015: Energy, Water and Carbon," *Cornell Hospitality Report*. Cornell University Center for Hospitality Research, School of Hotel Administration. www.hotelschool. cornell.edu/research/chr/pubs/tools/tooldetails-18779.html.

EXHIBIT 4

Sample GHG emission output rates by country

Country	CO2 per kWh
China (Mainland)	0.7645
France	0.0612
United Kingdom	0.4407
Brazil	0.0679
India	0.8558
Russian Federation	0.4374
Spain	0.2910
Japan	0.4973
Thailand	0.5219
United States	0.5031

Compiled from; International Energy Agency Data Services. 2014. "CO_2 Emissions from Fuel Combustion," 2013 Edition.

water use disparities reveals the scale of the problem.[17] Hotel rooms in the United States consume on average 627 liters per occupied room, compared to 1,555 liters per occupied room in China.

We see two cultural reasons for the disparity. First, for personal reasons, owners favor lavish displays in public areas and lobbies that use high amounts of energy and water.[18]

Even without the public displays, energy and water conservation measures are not common practice in China, except in international and Asian-branded properties. That, however covers only 22 percent of the hotel supply in Asia. The remaining independent operators or smaller local chains tend not to apply conservation measures, because sustainability is not always a priority and because these firms have less access to capital for equipment upgrades and retrofits that would aid in energy and water conservation efforts. Nevertheless, we expect China will follow the international trend of decreasing percentages of independent hotels.[19]

The discrepancy is exaggerated further when comparing carbon emissions and water stress, because coal is the major fuel

[17] EarthCheck Research Institute. (2013). White Paper on Tourism and Water. http://earthcheck.org/media/4087/2013-earthcheck_white-paper-on-water_2013.pdf; and EarthCheck Research Institute. (2014). Second White Paper on Tourism and Water: From Challenges to Solutions—Providing the business case. http://earthcheck.org/media/4088/2014-white-paper-on-water_from-challenges-to-solutions.pdf.

[18] P. Slattery, *The Economic Ascent of the Hotel Business*, Second Edition (Oxford, UK: Goodfellow Publishers Limited, 2012).

[19] HVS. (2015) "Decisions, Decisions... Which Hotel Operating Model is Right for You?" www.hvs.com/article/7303/decisions-decisions-which-hotel-operating-model-is-right/

EXHIBIT 5

CO_2 comparison of output per square meter and occupied room

Country	Mean CO_2 Emissions Per Occupied Room (CO_2)	Mean CO_2 Emissions Per Square Meter (CO_2)
Canada	32	76
China	106	194
France	10	42
Germany	29	113
India	121	247
Mexico	59	147
United Arab Emirates	105	227
United Kingdom	28	119.4
United States	38	118.6

Adapted from: Chong and Ricaurte, *op.cit.*

EXHIBIT 6

Sample baseline water stress of cities in China

City	Baseline Water Stress
Beijing	Extremely High
Shanghai	High
Chengdu	Medium to High
Guangzhou	Low
Xiamen	High
Xi'an	Extremely High
Sanya	Low
Shenzhen	High

Source: WRI Aqueduct 2014. Baseline water stress is calculated as the ratio of local water withdrawal to available water supply

EXHIBIT 7

Extrapolation of utility consumption and carbon footprint

	Hotel Rooms	Annual CO2 Emissions using CO2 per Room in China 25th Percentile (Metric Tons)	Annual CO2 Emissions using CO2 per Room in China 75th Percentile (Metric Tons)	Variance (Metric Tons)
Top 10 Brands (Current + Pipeline)	961,804	16,090,716	29,352,247	13,261,531
China 2025 Forecast	6,100,000	102,051,284	186,159,180	84,107,896
China 2039 Forecast	9,100,000	152,240,441	277,712,876	125,472,435

Adapted from: Chong and Ricaurte, *op.cit.*

for electrical generation, responsible for about two-thirds of the nation's power. Because of this reliance on coal, China's countrywide average output of CO_2 emissions per kWh of electricity generated in the grid is over 50-percent greater than that of the United States, Thailand, and the U.K., and over ten times greater than in France or Brazil (see Exhibit 4). As a result, the energy comparison of output per square meter or occupied room demonstrates a greater footprint of CO_2 (Exhibit 5).

Water consumption impacts are also exacerbated when considering issues of water stress and water quality. China's major urban areas are under more significant water stress than other counterpart cities of top tourism arrivals (see Exhibit 6). [20] Therefore, the collective increase in water use in stressed areas of China may result in increased costs and issues of water access.

China is one of several nations that have begun to address these sustainability issues, by applying international regulation

and standards that help increase efficiencies in new buildings. The Green Building Evaluation Standard came into effect in January 2015, and the new Hotel Building Design Regulations, including efficiency measures, were released in March 2015.[21] However, the regulations do not address some of the key drivers of energy and water efficiency which take place at the initial stages of planning. Moreover, a lack of enforcement remains a major impediment to implementing these regulations.

To demonstrate the value of including the new standards in prospective hotels, we extrapolated the high and low quartiles of Chinese benchmarks from the Cornell Hotel Sustainability Benchmarking 2015 data and applied them to hotels in the development pipelines, as shown in Exhibit 7. This exercise shows the improvements possible if hotels are developed with efficient energy and water attributes.

As depicted in Exhibit 7, the potential savings in carbon emissions are substantial. If the hotels forecasted to be open in China in 2025 increased their efficiency they would save the equivalent of 84 million tons of CO_2, which is greater than

[20] International Tourism Partnership. (2013). Green Hotelier in: World Water Week ITP publishes its global Water Risk Assessment report—ITP Water Risk Assessment. www.greenhotelier.org/wp-content/uploads/2013/09/ITP-Water-Risk-Assesement-Final.pdf.

[21] JGJ62-2014,

the annual carbon footprint of such countries as South Korea or the Philippines.[22]

We want to emphasize that the efficiency measures that would prevent or counter the drivers of hotel energy consumption are relatively simple and inexpensive to implement. Given that climate and occupancy are the greatest consumption drivers, the following are just five examples of low-hanging fruit that can easily be embedded into the development process with proven returns and higher asset value:

- Energy efficient HVAC;
- Efficient appliances, windows, fixtures, and lighting;
- Digital thermostats in guestrooms, with staff trained on efficient temperature settings;
- Insulating exposed pipes and covering swimming pools; and
- Landscaping with native or drought-tolerant plants.

The range of water and energy measures is wide and the implications are immense given the size of the hotel pipeline. Indeed, the savings may help maintain the pipeline, as there arises a question of whether most cities' municipal water supply will be able to meet this demand in the worst case scenario. To absorb 84 million tons of CO_2, a total of 2.1 billion trees would have to be planted. [23]

Industry Challenges

Despite the inherent value of sustainability as a strategic competency, we have identified several major challenges in adopting methodologies for resource efficiencies for new hotel openings. These challenges are a silo mentality, lack of understanding, a knowing-doing gap, misperception of the cost of sustainability, personal biases, and a disconnect between builders and users.

Silo approach. First, we observe that the hotel industry does not look at sustainability in a holistic manner. Instead, industry decision makers consider the components of sustainability in silos and do not necessarily fit the pieces together. To move forward, the industry needs to break down the silos and examine the big picture. The trend of holistically addressing sustainability components is on the rise due to the gain in prominence of (corporate) sustainability professionals. The main challenge that remains is for hotel owners and operators to include holistic sustainability solutions in the overall development budget.

Lack of understanding. Second, hotel managers and owners do not yet view sustainability as a strategic competency, even though studies have shown its strategic value. In that

regard, hotels with green programs command higher average room rates, higher profits, and higher numbers of return customers, when compared to their less-green peers.[24]

Knowing-doing gap. Third, hotel companies need to address the problem that has been identified as the knowing-doing gap in the implementation of project management.[25] Simply put, the knowing-doing gap expresses the problem of knowing what to do but not knowing how to actually implement the resulting strategic plans. To close this gap, executive management needs to embed sustainability into all phases of new hotel development, and seek to embed sustainability into company culture from the top down.

Misperception of sustainability costs. Fourth, the previous two challenges are aggravated by a cultural bias which causes hotel developers to focus only on the cost of sustainability, rather than to balance out the costs against the potential benefits, including the expected incremental profits and cost savings.

Bias of Chinese hotel owners. Fifth, although the Chinese government is committed to sustainability, there is still inertia slowing this government policy. While it's generally the case in China that when a program has been endorsed by the government or has become legislation, that program will happen, it's also the case that the main focus of hotel owners is to develop lavish hotels, without considering energy-efficient assets. We observe that hotel owners in China are willing to invest in energy saving, but they do not see this as a long-term strategy. Thus, the key question becomes whether the infrastructure is ready to support hotel owners who are willing to invest in sustainability.

Builder versus end-user dilemma. Finally, we see little incentive for project developers to invest in sustainability, due to a short-term focus. Hotel projects are managed by on-site construction managers, whose involvement generally does not exceed three years. In this limited time, the project managers are focused on controlling their construction budgets, and their performance is partly or fully measured on how tightly they control their costs. This approach frequently results in (excessive) compromises on critical sustainability features. Ironically, these decisions end up costing an owner more money in the long run than could be saved by cutting corners during the development process.

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[22] Comparing country annual CO_2 output in 2011 obtained from the World Development Indicators CO_2 Emissions
http://data.worldbank.org/indicator/EN.ATM.CO2E.KT/countries.

[23] The World Bank. (2015) Data—CO_2 emissions..
http://data.worldbank.org/indicator/EN.ATM.CO2E.KT/countries.

[24] Verma, R., Walsman, W. & Muthulingam, S. (2014). "The impact of LEED certification on hotel performance," *Cornell Hospitality Report*. Cornell University, School of Hotel Administration. www.hotelschool.cornell.edu/chr/pdf/showpdf/4013/chr/research/leedcert.pdf.

[25] Janice Thomas, Connie Delisle, and Kam Jugdev, "Exploring the 'Knowing-Doing Gap' in Project Management," presented at International Research Network on Organization by Projects (IRNOP V), at Hotel de Zeeuwse Stromen, Renesse, NL, December 2001

The Way Forward

As we stated at the outset, our purpose here is not to be critical of China's hotel industry, but to outline both challenges and opportunities for improved sustainability by expanding the awareness of the aggregate risks, implications, and opportunities for increasing energy and water use efficiency of hotels in China (or failing to do so). Next, we suggest four actions that hotel management companies can take to help hotel owners embrace sustainability as a strategic competence and take advantage of the virtuous cycle of efficiency.

Specific case studies. Hotel companies can provide owners with case studies of actual cost savings from specific projects relating to energy and water efficiency for new hotel projects, with proven returns.

Project life cycle. From a project management perspective, the companies can map out all necessary steps of sustainability measures to reduce energy and water consumption throughout each phase of the hotel project life cycle, thereby preventing a short-term approach. [26]

Prepare for future legislation. Operating firms can demonstrate how embedding resource-efficient strategies will help hotel owners and developers align with current and future legislation and trends toward efficient buildings.

Consumer trends. Finally, the management firms can highlight the growing trend of consumers seeking green hotels, along with the increased involvement of travel, tourism, and industry participants, including the focus from travel websites, such as TripAdvisor's GreenLeaders program. [27]

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[26] Noordzy, G. and Whitfield, R. (2015). "A Project Life Cycle for New Hotels." www.4hoteliers.com/features/article/9026.

[27] TripAdvisor. (2015). GreenLeaders. www.tripadvisor.cn/GreenLeaders.

Final Thoughts

With the rise of China's middle class and the growing appetite for international travel, China's travel and tourism industry will continue to expand for many years in the foreseeable future. To provide sufficient accommodations for the growing number of visitors, China's hotel industry is growing nationwide. We believe, however, that the nation's planners are aware that the increased number of hotels can have a detrimental impact on China's already stressed environmental resources.

By changing the trajectory away from further environmental damage on the part of the hotel industry, China has an opportunity to curtail the negative impacts of energy and water resource overuse and proactively plan for their sustainable use. China's hotel development professionals also have the opportunity to become the industry's leaders in hotel growth and environmental sustainability. By adopting the sustainability standards already promulgated by the government, the hotel industry can help China position itself to be a role model for future growth economies. By implementing best practices in environmental sustainability measures in each stage of the hotel planning and development process, China's hotels can become benchmarks—the industry gold standard.

To that end, in this paper we sought to increase awareness of the rise of energy and water resource use due to the tremendous growth in China's hotel development; inform industry leaders regarding practical solutions to mitigate the environmental impact of resource overuse; highlight the long term savings and financial benefit of adopting resource efficient measures both in existing hotels and those still in the planning and development stages; and contribute to the already existing dialogue regarding energy and water resource efficiency measures and their effect on environmental sustainability. We hope that the information provided in this paper can help hotel developers, owners, and other industry professionals make informed decisions on sustainable resource savings options and realize the benefit of early stage planning and implementation of these sustainable measures in every phase of the hotel development process. ■

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