



# Mass tourism and water efficiency in the hotel industry: A case study



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## ABSTRACT

Mass tourism, which has traditionally been associated with an unsustainable use of natural resources and intensive land use, is frequently identified as a major environmental stressor in coastal regions. Nonetheless, mass tourism resorts typically have a compact and vertical urban configuration and have been shown to make more efficient use of water resources than other low-density tourist destinations. This article investigates how the main variables identified by the literature as determinants of water consumption by hotels influences water efficiency in hotels in Lloret de Mar, a well-known mass tourism destination on the Costa Brava in Spain. The results of a generalized linear mixed model show that large, high-rise hotels that attract thousands of tourists annually also benefit from economies of scale in terms of water efficiency.

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## 1. Introduction

The mass tourism model has largely dominated the tourism sector since the beginnings of the international tourism boom (Khan, 1997) and it has been instrumental in shaping urban landscapes and land use patterns. Coastal resorts, which fit into what has been described as a static “Fordist-like” production framework (Vainikka, 2014), tend to form dense urban blocks dotted with high-rise hotels (Gössling and Peeters, 2015; Herold, et al., 2003). The purpose behind these Fordist-like models is to provide as much seaside accommodation as possible for the millions of tourists in search of sun and sand (Claver-Cortés, et al., 2007; Rico-Amorós, et al., 2009). This mass sun-and-sand model is often accused of being one of the main contributors to the environmental stresses experienced by coastal regions. Numerous factors have been found to contribute to the degradation of coastal environments, including the construction of large tourist resorts, increasing carbon emissions due to air, rail, and road transportation, intensive use of local, natural resources, and generation of waste and wastewater (Davenport and Davenport, 2006; Erdogan and Baris, 2007). Nevertheless, mass tourism resorts have frequently been found to be more energy- and water-efficient than other tourist destina-

tions and in particular low-density second home residential areas (Gabarda et al., 2015; Hof and Schmitt, 2011).

Water is essential for tourism. Not only is it necessary for basic human needs and leisure activities, such as golf and skiing (Gössling et al., 2012; Stonich, 1998) but it is also a social resource that can draw tourists (Chan and Wong, 2006). Hotel gardens, lakes, beaches, and ponds are well-known points of interest for tourist activities (Stonich, 1998). In the Mediterranean basin, the world’s leading tourist destination, water availability is a key element to ensure the viability of the tourist sector (Hall and Murphy, 2010). However, climate projections in this region suggest that water availability patterns will change with growing water demand (Gössling, 2001). Philandras et al. (2011), for example, estimated a 20% reduction in rainfall from 2071 to 2100, compared with the reference period 1961 to 1990. To deal with this changing scenario, more efficient use of water resources and adaptation to new climate conditions are essential to strengthen the resilience of the tourist industry (Fraguell et al., 2016).

Numerous studies have investigated water consumption patterns in tourist regions to explore the tourist sector’s capacity to cope with future reductions in water availability. Studies analyzing factors that influence water use by hotels in different parts of the world have primarily employed two distinctive research strategies. In the first case, they have analyzed the relationship between hotel characteristics and overall water consumption analyzed annually (Bohdanowicz and Martinac, 2007; Deng, 2003; Deyà and Tirado, 2011; Dinarès and Saurí, 2015; Gopalakrishnan and Cox, 2003) or monthly (Deng and Burnett, 2002), without consideration of water use per guest night. In the second case, they have focused on water

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**Table 1**  
Summary of variables that influence water consumption in hotels in different tourist settings.

Variables	Water use indicator	Location	Correlation	Reference
<b>Physical characteristics</b>				
Hotel capacity	Annual water consumption	Mallorca, Spain	++ <sup>a</sup>	Deyà and Tirado (2011)
	Liters per guest per night	Barbados	++ <sup>a</sup>	Charara et al. (2011)
	Liters per guestroom per night	USA	++ <sup>a</sup>	Redlin and DeRoos (1990) quoted in Barberán et al. (2013)
Floor area	Liters per guest per night	Zanzibar, Tanzania	+++ <sup>b</sup>	Gössling (2001)
	Annual water consumption	Hawaii, USA	+++ <sup>a</sup>	Gopalakrishnan and Cox (2003)
	Water consumption per occupied guestroom	Hong Kong, China	+++	Chan and Lam (2001)
	Annual water consumption	Hong Kong, China	+++ <sup>c</sup>	Deng (2003)
	Annual water consumption	Hong Kong, China	+ <sup>d</sup>	Deng (2003)
	Annual water consumption	Europe (Scandic hotels)	+++	Bohdanowicz and Martinac (2007)
	Annual water consumption	Europe (Hilton hotels in warm regions)	+++ <sup>e</sup>	Bohdanowicz and Martinac (2007)
Category	Annual water consumption	Europe (Hilton hotels in cold regions)	+ <sup>e</sup>	Bohdanowicz and Martinac (2007)
	Liters per guest per night	Barbados	++ <sup>e</sup>	Charara et al. (2011)
	Annual water consumption	Europe wide	++	Hamele and Eckardt (2006)
	Total annual water consumption/total floor area	Hong Kong, China	++	Deng and Burnett (2002)
	Annual water consumption	Barcelona, Spain	++	Dinarés and Saurí (2015)
	Liters per guestroom per night	Morocco	++	Hadjidakou et al. (2013)
	Liters per guest per night	Barbados	++	Charara et al. (2011)
	Liters per guest per night	Europe (Accor, NH, Rezidor Group and Scandic hotels)	++	Styles et al. (2015)
	Liters per guest per night	Benidorm, Spain	++	Rico-Amorós et al. (2009)
<b>Facilities and leisure structures that require water</b>				
Swimming pools	Annual water consumption	Mallorca, Spain	+	Deyà and Tirado (2011)
	Liters per guest per night	Zanzibar, Tanzania	++	Gössling (2001)
	Annual water consumption	Europe (Hilton hotels)	–	Bohdanowicz and Martinac (2007)
Extensive gardens	Annual water consumption	Hawaii, USA	+++	Gopalakrishnan and Cox (2003)
	Liters per guest per night	Zanzibar, Tanzania	+++	Gössling (2001)
Golf courses	Annual water consumption	Mallorca, Spain	+++	Deyà and Tirado (2011)
	Annual water consumption	Hawaii, USA	+++	Gopalakrishnan and Cox (2003)
Spa facilities	Annual water consumption	Mallorca, Spain	–	Deyà and Tirado (2011)
	Annual water consumption	Europe (Scandic and Hilton hotels)	–	Bohdanowicz and Martinac (2007)
Laundry service	Annual water consumption	Hong Kong, China	+++ <sup>c</sup>	Deng (2003)
	Total annual water consumption/total floor area	Hong Kong, China	++	Deng and Burnett (2002)
Kitchens	Liters per guestroom	Hong Kong, China	+++	Chan et al. (2009)
	Annual water consumption	Hong Kong, China	+++ <sup>c</sup>	Deng (2003)
	Monthly water consumption	Hong Kong, China	++	Deng and Burnett (2002)
	Annual water consumption	Hong Kong, China	++ <sup>d</sup>	Deng (2003)
	Annual water consumption	Europe (Scandic hotels)	++	Bohdanowicz and Martinac (2007)
	Annual water consumption	Europe (Hilton hotels)	+	Bohdanowicz and Martinac (2007)
	Annual water consumption	Mallorca, Spain	++	Deyà and Tirado (2011)
Liters per guestroom	Hong Kong, China	+++	Chan et al. (2009)	
<b>Business and environmental management model</b>				
Hotel chain affiliation	Annual water consumption	Mallorca, Spain	++ <sup>f</sup>	Deyà and Tirado (2011)
Number of employees	Liters per guest per night	Barbados	++	Charara et al. (2011)
Daily rate (price per room)	Liters per guest per night	Barbados	++	Charara et al. (2011)
Water-saving measures	Liters per guest per night	Barbados	– <sup>g</sup>	Charara et al. (2011)
	Annual water consumption	Mallorca, Spain	++	Deyà and Tirado (2011)
	Liters per guest per night	Europe (Accor, NH, Rezidor Group and Scandic hotels)	++	Styles et al. (2015)

Source: Compiled by authors from references consulted.

\*Correlation between variables and water consumption: –, no correlation; + weak correlation; ++ moderate correlation; +++, strong correlation.

Note: (a) Number of guestrooms, (b) number of beds, (c) hotels without in-house laundry, (d) hotels with in-house laundry, (e) floor area of hotel and landscaped grounds, (f) hotels affiliated to small chains, (g) hotels with green certification.

consumption by guest night according to the hotel's classification, i.e., number of stars (Hadjidakou et al., 2013; Rico-Amorós et al., 2009; Styles et al., 2015). Very few studies, however, have analyzed water efficiency according to the influence exerted by multiple

factors on water usage per guest per night (Charara et al., 2011; Gössling, 2001). The aim of this study was to determine which factors best explain daily per capita water usage in a mass sun-and-sand tourist destination where the vast majority of tourist beds are

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