DETERMINANTS OF WATER CONSUMPTION IN TOURISM LODGING SECTOR. THE CASE OF KAZAKHSTAN

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Abstract
Purpose – The main purpose of the paper is to identify, define and analyze the main variables that determine water consumption in the lodging industry, which usually accounts, on average, between the 6% and 10% of total operational costs.
Design/Methodology/Approach – The research is based on a survey questionnaire distributed among lodging managers in summer 2016 in the Shchuchinsk-Burabay resort area (Kazakhstan). The regression model methodology has been used to determine the main drivers of water consumption in the tourism lodging facilities.
Findings – The estimations obtained in the regression model reveal that the main determinants of water consumption are the total area of the lodging facility, the pool sizes, the type of accommodation (with a special attention to the sanatoriums sector) and the type of board offered. Our study also concludes that the implementation of water saving initiatives significantly reduces water consumption levels and constitutes an effective tool to minimize lodging water consumption. These results can be useful both for policy makers and accommodation managers to develop water management policies to guarantee water, both in quantity and quality, both for the resident population and for the tourism sector.
Originality of research – The study extends the geographical scope of research in tourism-water nexus by focusing on the case of emerging tourist destination, such as Kazakhstan.
Keywords water, water consumption, tourism, lodging facilities, sustainability, Kazakhstan

1. INTRODUCTION

Tourism is one of the world's largest industries, with an exponential growing evolution during the last decades (UNWTO 2018). In this sense, several studies demonstrate that water is crucial for the development of the tourism sector in any tourist destination (Essex et al. 2004; Eurostat 2009). At the same time tourism is an intensive water consumption sector, both directly (to satisfy the first needs of tourists such as drinking, showering and flushing the toilets), and indirectly (i.e., for irrigation of gardens, filling the pools, laundry facilities, etc.) (Gössling 2015; Sulnu 2003; Tortella and Tirado 2011). And, within the tourism sector, lodging industry accounts for a significant part of total water consumption (Bohdanowicz and Martinac 2007; Charara et al. 2011; Deng and Burnett 2002; Gössling et al. 2012; Hamele and Eckardt 2006; Tortella and Tirado 2011; White and Fane 2002). The reason of this high levels of water consumption is due to several factors like the existence of water intensive facilities (swimming pools, spa, gardens,

kitchens, etc.), and the guest's behavior (tourists water consumption at room facilities is usually higher comparing with their consumption levels at home). In this sense, we can find several evidences in the literature that prove this fact. For example, Charara et al. (2011), basing on a sample of hotels in Barbados, compute that the average water consumption of the hotel industry is 863 liters per person and day. Other studies conclude that average hotel water consumption ups to 394 liters per overnight stay (hereinafter l/os), while in five-star hotels the consumption reaches the 594 l/os (Ecologic 2007; Hamele and Eckardt, 2006). In the same line, Bohdanowicz and Martinic (2007) obtained that water consumption at European Hilton International hotels (upscale brand) accounts for 515 liters per person and day, while at European Scandic hotels (mid-market brand) accounts for 215 liters per person and day.

This situation concludes in the fact that tourism sector tends to present high levels of water consumption, usually significantly superiors to residents' levels (Becken 2014; Gössling 2015). For example, the study of Gössling (2001) conclude that the average water consumption by tourist in the accommodation business of Zanzibar (Tanzania), accounts for 685 liters per person and day that is 15 times higher than local resident's consumption. The study of Mangion (2013) pointed out that in Malta island, the average water consumption by tourists at hotels was 296 liters per person and day, whereas average water consumption by local residents was 150 per person and day. These studies demonstrate that water consumed by tourists when they stay on holiday tends to be higher comparing with their consumption at home (Charalambous et al. 2012; Essex et al. 2004; Gössling et al. 2012; Kasim et al. 2014). Other studies obtain similar conclusions (Eurostat 2009; Gössling et al. 2012; Kasim et al. 2014).

This high intensity in water consumption at lodging facilities usually conclude in environmental negative consequences (Sulnu 2003), usually related with the overexploitation of water resources, water quality degradation, and water scarcity, among others. For instance, water scarcity has been a national problem in tourist regions like Alicante, Barbados, Cyprus, Mallorca and Malta for many decades, and had usually concluded in negative effects (i.e., water cuts, poor water quality standards, high water prices, etc.), that directly affects the welfare of residents and tourist and, thus, the sustainability and competitiveness of the destination (Essex et al. 2004; Eurostat 2009; Gabarda-Mallorquí et al. 2017; Gössling et al., 2012; UNWTO 2013). Therefore, efficient use and conservation, sustainability of water resources is of high concern for many countries.

These environmental problems usually push policymakers to develop and implement water management policies to reduce the negative impacts generated by the tourism activity. During many years, these policies were oriented on the offer side, and usually consist in increase the availability of fresh water. Nevertheless, during the last years, and following international recommendations (such as European Union Water Directive, European Union 2000), policymakers have reoriented water policies to the demand side. The main objective is, rather than increase the water offer, try to reduce and optimize water demand levels. These policies usually consist in the implementation of awareness campaigns, the increase of water prices, and the design of new water pricing structures that favor low level consumptions, and penalize non efficient consumption levels (i.e., rising block price systems) (Deyà-Tortella et al., 2016; Deyà-Tortella et al., 2017).

In this framework, it will be useful to develop a model that attempts to identify the main explanatory variables of water consumption in the tourism lodging sector. Thus, our research develop a regression model that, basing on the evidence obtained by previous literature, includes a wide set of explanatory variables related with the physical and managerial characteristics of the lodging business. The explanatory variables identified and included in the model try to analyze the effects of size, the existence of water intensive facilities (i.e., pools), category, occupation, the food and beverage regime on lodging water consumption levels. In order to analyze the effectiveness of the introduction of water saving measures in the lodging facilities, our model also incorporate a dummy variable. The model is empirically tested on a representative sample of lodging facilities from the Shchuchinsk-Burabay resort area, located in Kazakhstan, the ninth biggest country in the world. In our opinion, the region of Shchuchinsk-Burabay constitutes a perfect study area, for several reasons. First, tourist activity has been growing up exponentially during the last decades and constitutes one of the key economic drivers of the region (Erzhanova 2014; Zhansagimova 2013). Secondly, during the last decades the region has revealed significant water and wastewater problems directly related with different economic activities, including the tourism sector (Meiramkulova et al. 2020; Ramazanova et al. 2019).

The paper is organized as follows. The next section exposes the materials and methods applied in our research. Concretely, the study area is defined, and sample methodology is analyzed, including the selection process and exposition of detailed model, basing on a deep literature review, following by the summary statistics. The next section includes the analysis and discussion of the results obtained in our estimations, comparing with the evidence obtained by previous similar studies. In the last section the main conclusion of the research is exposed, with a special attention to the recommendations for accommodation managers and policy makers.

2. MATERIALS AND METHODS

2.1. Study area

Akmola is the most dynamic region of Kazakhstan in terms of the evolution of the tourism accommodation capacity and interest in investigating tourism sector of the region is increasing (Ramazanova et al. 2019). Within Akmola region, Shchuchinsk-Burabay resort area has been selected as a priority region for tourism development. This area is part of the national heritage of the Republic of Kazakhstan, where natural therapeutic resources and attractive landscapes, lakes have been decisive in acquiring its status. This area also includes an important set of hydrological resources with therapeutic and wellness properties, that made it the most important balneological area of the country, similar to other mountain balneological resorts located in other European countries like Karlovy Vary (Czech Republic), Baden-Baden (Germany), Bad Ischl (Austria), Montecatini Terme (Itay), Vichy (France) (UNESCO 2016). These favorable natural, geographical, hydrological, and therapeutic conditions, joint to a favorable climatology make Shchuchinsk-Burabay one of the most important resort areas for medical and wellness tourism in the country and their water resources are of high value.

Undoubtedly, tourism development generates considerable economic benefits, however at the same time, tourism can create additional pressure and a demand for natural resources, especially for water (Garcia and Servera 2003). Thus, a careful attention should be paid to the limited natural resources, such water during planning and development of tourism.

2.2. Sample and data collection

Quantitative data related on water consumption in the tourism lodging industry is usually scarce and incomplete in many countries (Eurostat 2009; Gössling et al. 2012), as usually tourism-related water consumption statistics are combined with 'urban' water consumption statistics (Tortella and Tirado 2011). Thus, the data used in this study has been obtained basing on a survey questionnaire distributed among lodging facilities sample of the Shchuchinsk-Burabay resort area in 2016. The sampling technique has been the stratified random procedure, stratified by lodging type, to obtain a representative sample. Data were collected through professional interviews with lodging managers. The questionnaire requested information related to water consumption, size and type of accommodation, size of swimming pools, strategy, occupation level, board type and water saving measures introduced. Data related with water consumption has been contrasted and completed with the information provided by the local water authorities of Akmola region, such as the State Communal Enterprise on the right of economic management 'Burabay Tazalyk' and 'Burabay Su Arnasy'.

According to the data provided by the Department of Tourism in Akmola (2016), the Shchuchinsk-Burabay resort area includes around 150 lodging facilities, with 8,734 beds. This population includes multiple types of lodging facilities, such as hotels, sanatoriums, guesthouses, and camping camps, but also other small accommodation providers (such as cottages, hostels, recreation centers, apartments, and small houses etc.). A detailed information of lodging types and number of beds is exposed in Table 1.

Our sample includes the most relevant categories, that are, hotels, sanatoriums, and guesthouses. These lodging categories represent the most important part of the Akmola lodging sector (accounting for 6,566 beds, the 75.18% of total), and constitute the most popular in the area and the unique that operate during all year. Only the 17.64% of our sample lodging facilities use the star category system, confirming that the use of the star category classification is not widely spread in Kazakhstan.

While the water consumption at hotels and guesthouses has been investigated in previous studies (Plan Bleu 2004; Bohdanowicz and Martinic 2007; Charara et al. 2011; Gössling 2001; Gabarda-Mallorquí et al. 2017), the concept of the sanatorium is less often examined in international studies. This type of accommodation, mainly oriented to health and wellness, is typical in Kazakhstan, and most of them developed during the Soviet period (Vetitnev and Dzubina, 2013). During the Soviet period, sanatoriums were even a part of public health-care services funded by the government. These facilities are usually located in resort areas, and are intended to provide health improvement measures and promote wellness for guests.

The stratified sample methodology has been conducted according to lodging category, to obtain a representative sample. The sample database was obtained from a survey distributed among all lodging facilities selected, including sanatoriums, hotels and guesthouses. Finally, a total of 51 questionnaires were successfully fully completed, that represents the 49.03% of our population (table 1).

Table 1: **Population and sample**

Type of lodging	**Population**	%	**Number of beds**	%	**Sample**	%
Hotels	58	38.67%	2,236	25.60%	30	58.82%
Sanatoriums	21	14.00%	3,850	44.08%	11	21.57%
Guesthouses	25	16.67%	480	5.50%	10	19.61%
Recreation centers	10	6.67%	215	2.46%		
Cottages	9	6.00%	126	1.44%		
Hostels	9	6.00%	140	1.60%		
Children´s camps	7	4.67%	1,320	15.11%		
Others	11	7.33%	367	4.20%		
Total	150	100.00%	8,734	100.00%	51	100.00%

Sources: Elaborated from data of Department of Tourism in Akmola region (2016)

2.3. The model

The objective of the study is to develop and estimate a model to identity the main drivers of water consumption at tourism lodging sector. The dependent variable of our model is the log transformation of annual water consumption per meter cubic. We apply the log transformation of water consumption to ensure a normal distribution of the dependent variable.

The independent variables included in the model are related with the physical and management characteristics of the lodging businesses. Within the first group, several previous studies conclude that size of the accommodation facilities is one of the main determinants of water consumption (Bohdanowicz and Martinic 2007; Charara et al., 2011; Gabarda-Mallorquí et al. 2017; Tortella and Tirado 2011). Within these studies, we can find two different possibilities to measure the size of the lodging business. Some studies use the proxy ‘number of rooms’ (Charara et al., 2011; Tortella and Tirado 2011), while others use the proxy ‘area of the hotel’ (usually measured in square meters) (Bohdanowicz and Martinic 2007; Gabarda-Mallorquí et al. 2017). In any case, previous research demonstrates that both variables are good proxies of the size of the hotel, and present similar effects, that is, as bigger is the size of the lodging facilities, higher is the level of water consumption. Our model includes the variable ‘total area of the lodging facility’ like a proxy of the accommodation size. In order to prevent scale effects, and also to simplify the interpretation of estimated coefficients, we use the log transformation of the total area of the lodging facility.

Another variable related to physical characteristics is the existence of swimming pools facilities. According to previous studies (Gössling 2001, 2012; Mclennan et al. 2017), swimming pools are considered one of the most intensive water consumers in hotels.

In previous studies this factor was usually incorporated in the regression models through the introduction of dummy variables, that takes value one in the case that the business presents this facility, and zero otherwise. However, in our opinion, the size of pools constitutes a key point to explain their influence on water consumption, since as bigger is this facility, greater will be the water consumption (i.e., higher evaporation levels). Thus, the variable included in our model is the 'area of pools' (measured in square meters). With the same aim to prevent scale effects, and also to simplify the interpretation of estimated coefficients, we apply the log transformation of pool's area.

The type of the accommodation also plays an important role to determine the water consumption at the lodging facilities.

If we analyze previous literature, which is mainly focused exclusively on the hotel sector, we can find several studies that introduce the category of the hotel using the variable 'number of stars'. However, in the case of Kazakhstan, and more especially, in our study area, the variable 'number of stars' is not a good choice, for several reasons. First, because the lodging sector of the area includes not only hotels, but also other popular accommodation options of the region like sanatoriums and guesthouses. Second, because the 86% of hotels and other accommodations in Kazakhstan are not categorized with the traditional star ratings (Syzdykbayeva et al., 2015). Thus, basing on the idysioncracy of the lodging sector of the region (for a detailed analysis, see table 1), we identify the three most popular types of lodging facilities: hotels, sanatoriums, and guesthouses. Basing on previous evidence obtained by literature (Eurostat 2009; Hadjikakou et al. 2013; Hamele and Eckardt 2006, Gössling et al. 2012 among others), we can expect that the levels of water consumption will be different depending on the type of accommodation. Concretely, we expect that sanatoriums will be the type of accommodation with higher levels of water consumption, while guesthouses, usually oriented in the budget accommodation segment, will present the lower levels of water consumption. This hypothesis is supported by previous evidence (Hadjikakou et al., 2013). Thus, in order to introduce the effect of accommodation type on water consumption, our regression model includes two dummy variables for hotels and sanatoriums. The dummy variable 'Sanatorium' takes value one if the type of accommodation is sanatorium and zero otherwise. The variable 'Hotel' takes value one if the type of accommodation is hotel, and zero otherwise. Guesthouses, the ones that we expect with lower levels of water consumption, will remain like the reference group.

Our model also includes a set of variables related with the lodging management system, that can have a potential effect on water consumption. Those variables are occupation, number of meals served, and the introduction of water saving initiatives. With respect of occupancy level, previous literature obtained evidence that higher levels of occupation increases lodging water consumption, since higher will be the water consumed in rooms (i.e., number of showers, water spend in room cleaning, etc.) and in the common areas of the lodging business (i.e., refilling of swimming pools, etc.) (Bohdanowicz and Martinic 2007; Deng and Burnett 2002; Tortella and Tirado 2011).

The model also incorporates a variable to control the effects of the number of meals served. Several previous studies conclude that the number of meals served increase directly the levels of water consumed due to higher consumptions at kitchens facilities (Bohdanowicz and Martinic 2007; Deng and Burnett 2002). The typical boards offered at the accommodation business in Kazakhstan are usually only bed (no meals included), bed and breakfast (only breakfast included), half board (breakfast, lunch, or dinner included), and full board (breakfast, lunch, and dinner included). Thus, in order to analyze the effect of the number of meals on water consumption in the accommodation business of Kazakhstan we include the variable 'type of board'. This variable is calculated multiplying the percentage that each type of board represents in each accommodation facility by the coefficient factor that introduce the typical number of meals included in each type of board: zero in the case of accommodation only, one for bed and breakfast, two for half board, and three for full board.

Finally, our model also includes a variable to control for the effect of the introduction of water-saving measures (i.e., installing water efficient fittings, installation of flow restrictors for the tubs and showers, low/dual flush toilets, the use of grey water systems, etc.). The introduction of these measures constitutes an increasing trend during the last decades in the accommodation sector (Chan et al. 2009; Mangion 2013; Mclennan et al. 2017). Several theoretical and empirical studies revealed encouraging results of introducing water saving measure in tourism accommodation sector (Barberán et al. 2013; EPA 2012; Gössling et al. 2012; Tortella and Tirado 2011). In this line, Gössling et al. (2012) provided several examples on effectiveness and economical profitability of installing water saving devices in accommodation's rooms, toilets (dual flush), bathrooms (low flow showerhead), kitchens (efficient dishwashers, flow control regulators) as well as in pools (reducing size, drainage barriers to collect overflows) and efficient irrigation systems. The reasons that usually push lodging business to introduce these measures are heterogeneous and diverse, and go from environmental firm awareness, cost reduction strategies, and marketing reasons. In order to control the effects of the introduction of water saving measures, our model includes a dummy variable that takes the value of one when the lodging facility has introduced these measures, and zero otherwise.

Thus, the final model proposed in our study in order to determine the key drivers of water consumption in the lodging sector, includes the following variables:

$$Ln\,(Water\ Consumption)_i = \beta 1 + \beta 2 \cdot Ln(Area)_i + \beta 3 \cdot Ln(Pool)_i + \beta 4 \cdot (Sanatorium)_i + \beta 5 \cdot (Hotel)_i + \beta 6 \cdot (Occupation)i + \beta 7 \cdot (Board)_i + B8 \cdot (Measures)_i + e_i$$

Where the dependent variable is the log of water consumption (measured in cubic meters); Ln(Area) is the logarithm transformation of total area; Ln (Pool) is the logarithm transformation of the area of swimming pools; the variable Sanatorium is a dummy variable for the type of accommodation; Hotel is also a dummy variable representing the accommodation type; Occupation is the annual average occupancy level; Board is the type of board offered by the lodging business; and finally the variable Measures, is a dummy variable controlling the introduction of water saving measures.

2.4. Summary statistics

Data related with sample water consumption is exposed on Table 2. As we can observe, our sample presents an average consumption of 242 liters per guest and night (l/g/n) in 2014 and 269 l/g/n in 2015, with a minimum level of 3 and 16 l/g/n, and a maximum level of 1,383 and 1,302 l/g/n respectively. In the line of the evidence in other countries, these levels represent approximately three times the consumption levels of Kazakhstan's local population (82.70 liters per day; Water Resources Committee of Kazakhstan, 2016). These figures are comparable with those observed in hotels of the Mediterranean region (250 liters per tourist per day), guesthouses in Zanzibar (248 liters), hotels in the Normandy Coastal of France (259 liters) and Germany (275 liters) (Gössling et al., 2015).

Table 2: **Water consumption in the Shchuchinsk-Burabay resort area**

Water consumption/Years	**Min.**	**Max.**	**Mean.**	**SD.**
Water consumption in 2014 (m^3)	12.00	35,052	4,468.29	7,963.91
Log of water consumption (2014)	2.48	10.46	7.17	1.67
Water consumption in 2015 (m^3)	100.00	33,000	4,951.27	8,096.15
Log of water consumption (2015)	4.61	10.40	7.40	1.53
Consumption per guest per night in 2014 (liters)	3.25	1,383.05	242.49	262.57
Consumption per guest per night in 2015 (liters)	16.03	1,302.08	269.20	256.03

The descriptive statistics for the explanatory variables are exposed in Table 3. The area of the lodging facilities included in the sample presents, on average, around 3,016 square meters, with a swimming pool size of 128.61 m^2. The annual average occupation level ranges from the 35% to 52%, with and average value of 42%. The type of board offered by accommodation facilities ranges from zero (facilities that only offers accommodation) to three (facilities that provides the full board option), with average value of one-half. Thus, the type of board usually offered in the area generally includes breakfast, and in a less extent a second meal (usually dinner). Finally, we can observe that only the 17.65% of the sample facilities have introduced some water saving measures.

Table 3: **Sample descriptive statistics**

Variables	**Min.**	**Max.**	**Mean**	**SD.**
Total area of lodging business	150	16,500	3,016.73	2,859.19
Pool area	12	540	128.61	128.88
Sanatorium	0	1	21.57%	
Hotel	0	1	58.82%	
Average occupation in 2015 (annual)	0.35	0.52	0.42	0.04
Type of board	0	3	1.5	1.2
Water saving measures	0	1	17.65%	

Notes: 1US$=330.75365KZT, source: Inforeuro, May 2016.
High season is considered May-August, low season is considered September – April.

3. RESULTS AND DISCUSSION

The proposed model is estimated with Ordinary Lease Squares Methodology, using the Statistical Package for Social Sciences SPSS 23.0. Regression results are exposed on Table 4. The adjusted square R square of the model is 0.712, and demonstrates that our model is able to explain a significant part of the variability of water consumption in the lodging sector of the Shchuchinsk-Burabay resort area. The values of Variance Inflation Factor (VIF) proof that the explanatory variables introduced in our model do not present multicollinearity problems.

With respect to the coefficient estimations, our research also concludes, in the line with previous research, a positive significant relation between the size of the lodging facility (i.e., the total area of the lodging facility) and water consumption levels. Concretely, our model estimates that an increase of 1% in the total area of the accommodation, results in an increase of 0.301% on the water consumption of lodging business. Rico et al. (2020) argue that hotel size influences the decrease of water consumption in the mass tourism resort of Benidorm, Spain.

Our research concludes that the existence of swimming pools generates a significant effect on total lodging water consumption. Concretely, our model estimated that an increase in one square meter of the area of pools tends to increase 0.218% of total water consumption, in the line of results obtained by previous studies, such as Gössling (2001), and Tortella and Tirado (2011). The operation of swimming pools facilities typically demands substantial quantities of water for renewal and evaporation reasons. In this context, Hof et al. (2018) state that swimming pools are major contributor to increasing water consumption levels in both urban and tourism sectors. The researchers empirically revealed that evaporation and refilling of the swimming pools account for 4.9% of the total urban water consumption in the Balearic Islands, and lead to additional 9.6 L of water consumption per guest night and person night. Additionally, in the case of our study area, this effect could be also attributed to the weather conditions of the region. The average temperatures of the region during the high season are usually between 20º and 23º Celsius degrees. This temperature usually tends to generate unfavorable conditions for swimming in the lakes and rivers, leading many tourists to primarily use the pool facilities at their accommodation facilities. Additionally, renewal of water in pools and high evaporation rates are two other factors that influence the water demand of hotels (Gössling, 2001).

Regression results also confirm our hypothesis related with lodging type. Guesthouses are the lodging category with lower levels of water consumption, while sanatoriums are the highest water consumers comparing with hotels and guesthouses. Specifically, the results indicate that sanatoriums consume 38% more water than guesthouses, while hotels consume 8.2% more water than guesthouses.

Table 4: **Regression results**

Dependent variable	**Log of water consumption(2015)**		
Model and Variables	Coefficients	Standard errors	VIF
Constant	4.296**	1.830	
Ln (total area)	0.301***	0.171	1.837
Ln (area of pools)	0.218**	0.064	1.466
Sanatorium	0.380***	0.494	3.136
Hotel	0.082	0.333	2.032
Annual average occupancy level	-0.111	3.441	1.085
Board type	0.278**	0.182	2.456
Measures	-0.157*	0.371	1.516
R2	0.752		
Adj. R2	0.712		
F-test	18.643***		

Note*:* * significant at 10%, **significant at 5%, *** significant at 1%,
VIF – Variance Inflation Factors.

These results are in the line of previous study. For example, the study of Hamele and Eckardt (2006) conclude that type of accommodation plays a key role in water consumption. This study obtains that water consumption is different depending on the type of accommodation: 394 liters per person and day at hotels, 281 liters at bed and breakfast, and 174 liters at campsites. As reported in Eurostat (2009), water consumption levels vary considerably in accommodation businesses of Morocco. The figures indicate that water consumption in luxury 5 star hotels accounts for 600 liters per night, while in the apartments the amount of water consumed by the individuals is 180 liters. Similarly, Hadjikakou et al. (2013) conclude that budget accommodations tend to present the lower footprints, while luxury lodging places tend to present the highest footprints. In the same line, Gössling (2001), analyzing water consumption in Zanzibar, found out that daily water consumption per tourist in hotels is higher than in guesthouses.

More concretely, the high level of consumption observed in sanatoriums can be explained by several facts. First, sanatoriums not only offer lodging services, but also a set of health and well-being services and activities, that usually include the use of water intensive facilities. Thus, sanatoriums facilities usually include a wide range of health, medical and therapeutic services and activities, usually related with water intensive facilities (i.e., hot and cold-water baths, mineral water, radon water, healing water, etc.). Additionally, sanatoriums are usually managed by the government authorities without a market-oriented basis, mostly with a social orientation. Historically, these facilities were developed by the government to provide medical and wellness services and activities for workers of the public companies and factories (usually from the mining and energy sectors). To our knowledge, during the last years these sanatoriums have been reoriented to offer their services to all public but continuing with a public management system. Thus, the management of these facilities are not usually market driven. Contrary, these facilities attempt to offer a social service, and thus, this can explain the higher levels of water consumption. Finally, another reason explaining the high levels of water consumption observed in these facilities can be related with the number of workers. The nature of these facilities, that combine accommodation with health improvement

services, usually makes that the number of employees of these facilities is significantly higher comparing with hotels and guesthouses. In this sense, the study of Charara et al. (2011) revealed that the number of employers working at hotels affects in a positive way to the levels of water consumption.

In the case of the effect of annual average occupancy level, regression results revealed not significant effect of the mentioned variable on total water consumption. This result can be explained by the fact that this variable presents a very reduced variability in the lodging facilities of the Shchuchinsk-Burabay resort area. As we expose previously in table 3, the value of annual occupancy ratio presents a mean value of 42%, and moves between a range of 35% (minimum level) and 52% (maximum level). Thus, this reduced variability in the occupation variable can explain the fact, that it is not statistically significant.

Regression results also indicate that the number of meals offered plays an important role to explain water consumption in accommodation facilities. The results conclude that an increase in one unit in number of meals included in the type of board offered leads to a significant increase of 27.8% in total annual water consumption. These results are consistent with data obtained in studies of Deng and Burnett (2002), Bohdanowicz and Martinic (2007), and Tortella and Tirado (2011), who concluded that hotels consume more water when they serve more meals. Undoubtedly, this positive relation is because as higher are the meals included in the type of board, higher will be the water consumed in kitchens and restaurants (74.51% of accommodation establishments in our sample have restaurant kitchens). But it is also due the fact that as more meals included in the type of board, higher will be the time spent by guests at the accommodation facilities, and this will lead to an increase in consumption and costs of water (i.e., more showers, use of swimming pools, etc.).

Finally, our estimations conclude that the introduction of water saving measures reduce in a significant way the level of water consumption. Concretely, our results confirm their effectiveness, since the introduction of these measures reduce the levels of water consumption of the lodging facility in 15.7%, in the line of previous findings. For example, Barberán et al. (2013) empirically revealed effectiveness of installing water saving devices in taps in hotel rooms, kitchens and public areas, which resulted in 21.5% reduction in total water consumption. The study of Chan et al. (2009), basing on a sample of Hong Kong hotels, conclude that the introduction water saving initiatives plays a relevant role in the reduction of water consumption levels. The study consider that the significant reduction in consumption observed between the periods 1994-1996 and 2001-2002 (from 572.5 l/os up to 452 l/os), is mainly due to the introduction of water-saving technologies and a greater water-saving awareness among staff and guests. The study of Hamele and Eckardt (2006) obtained similar results in a hotel case study in Spain, where introducing water saving devices in taps and dual flush toilets led to 33% water reduction. Obviously, such reductions in water use also help to reduce sewage and protect from pollution of groundwater. Kelly and Williams (2007) discussed the strategies proposed by Whistler (North America) to reduce water consumption in tourist destinations. First strategy is based on implementation of water conservation practices on new and redeveloped building, which is expected to be better for 25% in water conservation. The second strategy is based on installing greywater recycling systems in new and retrofitted

buildings, which have a potential to provide about 95% of water to be used for toilets and irrigation. The third strategy is related to implementing rainwater capture systems which estimates for 25% of water, that can be used for laundry and dishwashing purposes. Following this discussion, we believe that similar-sized reductions in water consumption can be possible in our case study area.

However, analyzing in a more deeply way sample database, we detect that only nine of the 51 sample observations (17.65%) reveals the introduction of water saving measures in their facilities. The reasons usually exposed by managers to justify this situation are related with the high pay back periods of these investments motivated, on the one hand, by the high cost of the investments and, on the other, by the low price of water. Thus, the cost of the measures are perceived like higher than the cost savings generated, probably influenced by the reduced price of the water in Kazakhstan. These results are in the line of Kasim et al. (2014), who point out that the adoption of environmental management systems is an intensive process and will face high costs. Thus, increase of water prices and the implementation of new pricing methodologies (that usually tries to penalize intensive water consumers), can constitute an effective instrument to push hotel managers to introduce efficient water saving measures.

4. CONCLUSIONS

Water resources in the Shchuchinsk-Burabay resort area have been experimented significant stress situations during the last years, among other reasons, due to the important development of the tourism activity, and mainly, to the increase in the lodging sector, one of the main water consumers within the tourism sector. Thus, efficiency in the water consumption at the accommodation facilities is considered as a key environmentally issue for the next decades (Krstinić Nižić and Matoš, 2018), and the analysis of consumption patterns in the lodging sector becomes crucial to ensure the sustainability of the region, from environmental, economic, and social points of view.

In this context, this study attempts to contribute to a better understanding of the main driving factors of lodging water consumption. Basing on a representative sample of lodging facilities of the region, a regression model has been estimated, with the objective to identify the main key explanatory variables that influence the level of water consumption. As we expect, regression results confirm that the total area of the lodging business and the area of pools increase the levels of water consumption. Thus, the development of large hotels with large swimming pools, rather than small guesthouses, will tend to increase the water stress problems of the region.

Comparing the different types of accommodations, the results also revealed that sanatoriums business present the higher levels of water consumption, probably due to the presence of water intensive facilities. The type of board offered to guests also constitute a significant explanatory variable, in the same line of previous results. Thus, the proliferation of full board formulas will increase water consumption levels, not only at kitchens and restaurants, but also in the rooms and hotel facilities, since the time that guests spend at accommodation facilities will increase. Finally, our findings also conclude that the introduction of water saving initiatives significantly reduces

accommodation's water consumption levels. But our database also reveals that very few accommodation facilities have introduced this kind of initiatives, usually arguing that this investments present long pay back periods.

Thus, the sustainability of water resources of the region requires the collaboration between public and private sector to develop strategies in three complementary directions. First, it is important to design a tourism development plan that encourages the growth of the sector based on management models that generate lower levels of consumption, such as smaller and more efficient accommodations options (i.e., bed and breakfast formulas). Second, policy makers must design water pricing mechanisms that penalize intensive water consumers, and incentive efficient water management processes and water saving attitude's at lodging facilities.

Finally, we encourage policymakers to develop mechanisms to enhance environmental responsibility and incentive the implementation of water saving techniques in the accommodation facilities, that leads to a more efficient use of water scarce resources. Those mechanisms can consist in fiscal incentives to the introduction of water saving measures, and the design of effective and efficient water pricing structures that incorporates the real cost of the water. The interaction of both mechanisms will push lodging managers to introduce water saving measures in their facilities, since the pay back periods of the investment will be reduced.

In any case, this work also presents limitations that will require future research. First, the scarcity, limited depth, and low quality of public data available reduce considerably the possibilities of research in this field, and not allow for conclusions of greater scope and dimension. This problem, very common in the area of water consumption, is even more serious in the case of studies related to the tourism sector, since tourism water consumption is usually included in the statistics within the so-called "urban consumption", thus preventing an specific analysis of the sector. Second, our study has been carried out in a specific tourist region, so it would be necessary to carry out similar studies in other tourist areas that would allow us to obtain more robust conclusions.

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