



University of  
Massachusetts  
Amherst

## **An Investigation of Water Usage in Casual Dining Restaurants in Kansas**

Item Type	Poster
Authors	VanSchenk Hof, Matthew; Barrett, Elizabeth
Download date	2025-09-10 18:14:37
Link to Item	<a href="https://hdl.handle.net/20.500.14394/30049">https://hdl.handle.net/20.500.14394/30049</a>

# AN INVESTIGATION OF WATER USAGE IN CASUAL DINING RESTAURANTS IN KANSAS

Matthew Edward VanSchenkof  
Hospitality Management and Dietetics  
Kansas State University

and

Elizabeth B. Barrett  
Hospitality Management and Dietetics  
Kansas State University

## ABSTRACT

*Hospitality operations are considered the heaviest consumers of energy and water per square foot of building space among all commercial industries. Water processing may be more than 80% of hospitality operations' utility costs, and water expenditures are increasing due to infrastructure, demand, and climate change. The objectives of this study are to (1) identify water usage per-customer in casual dining restaurants (CDR's) and (2) determine if employee behavioral intent to reduce water use is possible through interventions. The research questions ask if a significant decrease in water can be obtained using three interventions and, when using the Theory of Planned Behavior (TpB), whether employee's behavioral intent toward water use will change. This study includes a historical review of previous six months water and customer data then a three month intervention with analysis of water use and employee behavioral intent.*

**Keywords:** *water usage, casual dining restaurant, water intervention*

## INTRODUCTION

Water usage in restaurants is an area which has not been studied academically in the past (Revell & Blackburn, 2005; Alonso & Ogle, 2010). Restaurants typically make up a small segment of the population of water users in the commercial and industrial segment (Gleick, Srinivasan, Henges-Jeck, Wolff, 2004). One study by Dziegielewski, Kiefer, Opitz, Porter, Lantz, DeOreo, Mayer, and Olaf (2000) discusses a thorough analysis of the amount of water used in restaurants analyzing 87 operations from California, Colorado, and Florida. Dziegielewski, et al. (2000) found, on average, each restaurant used more than 2.8 million gallons of water annually.

Energy Star (2010), WaterSense (2010), and the American Hotel and Lodging Association (AH&LA) (2001) discuss a correlation between water used in an operation and utility costs. A decrease in water usage will affect the utility costs via less water, lower sewer charges, and less electrical or gas energy required to heat water for use (Energy Star, 2010; WaterSense, 2010).

This paper introduces a study focusing on decreasing water usage in restaurant operations via three interventions: 1) education of back-of-house staff; 2) installation of water reducing equipment; and 3) the combination of both intervention one and two. After benchmarks for water usage for 24 restaurants are created from six months of historical water use and customer data, the interventions will be applied and water use studied versus customer counts will be studied for three months. A determination of whether reducing water use is most effective via education, equipment, or the combination of both will be determined.

## **LITERATURE REVIEW**

Water is necessary for all aspects of human life according to the U.S. Centers for Disease Control and Prevention (2010) (CDC) and naturally comprises more than 70% of the human body. Approximately 2.5% of the water found on Earth is considered fresh water, of which 66% is frozen in arctic poles and glaciers throughout the world (National Geographic, 2010). Water is not only essential for human life; it directly affects a population's health in terms of different environments. Bjorklund, Connor, Goujon, Hellmuth, Moriarty, Rast, Warner, & Winpenny, (2009) directly correlates access to clean water with the ability of a population to sustain itself in a healthful manner.

### **Infrastructure**

The United States used 410 billion gallons of water each day in 2005 (Kenny, Barber, Hutson, Linsey, Lovelace, & Maupin, 2009). Each American accounts for more than 1,362 gallon of water used for each day (U.S. Census Bureau, 2010). The infrastructure required to supply clean water and to process the returned grey and black water stretches for more than 1 million miles throughout North America (Brzozowski, 2010).

According to Brzozowski (2010) the American Society of Civil Engineers expects America's water infrastructure to require more than 2.2 trillion dollars in new and replaced infrastructure. Additionally, a New York Times article suggests there may be an increased costs associated with borrowing money for water infrastructure projects (Barringer & Henriques, 2010).

The question of a capability to replace infrastructure needs is not in doubt. Capital improvements in aged equipment and the expansion of current operations will require an increased burden on the people and operations which use the water. According to the National Restaurant Association's Conserve website (2010) water rates have been increasing faster than inflation in the last five years. Furthermore the strategy, actual cost pricing for water, is slowly occurring. Currently, in most municipalities, water is subsidized by government (Bjorklund, Burchi, Connor, Cosgrove, Hendry, Moriarty, Rast, Salamé & Winpenny, 2009).

### **Water Conservation**

The Environmental Protection Agency continues to be at the forefront of the federal government's response toward conservation. The EPA is the primary sponsor of WaterSense (2010), a partnership between the EPA and water equipment manufacturers, users, and providers.

The EPA certifies equipment or services and allows for the label to be used as a marketing instrument.

Energy Star, a joint program offered by both the EPA and the US Department of Energy, is an educational and marketing tool focusing on the electrical and water usage of equipment, buildings, and homes (EPA, 2010). According to the *Energy Management and Conservation Guide* (2001) from the American Hotel and Lodging Association (AH&LA), as much as 90% of fossil fuel use in a hotel may be from heating water.

LEED certification, offered by the United States Green Building Council (USGBC) (2010), is construction meeting requirements for target areas including energy and water efficiency. The 2009 standards have a minimum specification of 20% less water usage over building to codes and one can expect to use an average of 26% less energy (USGBC, 2010).

### **Water in Restaurants**

In a segmented analysis of water use throughout California it was found that 6% of total water usage in the commercial and industrial sectors took place in kitchens with restaurants being the largest user in this sector (Gleick, et al., 2004). This is water designated only for preparation, cooking, and sanitation of which more than half was used for sanitation (Dziegielewski, et al., 2000). Restaurants in California used 201 mcm (million cubic meters) of water in 2000 and implementing water efficiency techniques could save 37% or more than 74 mcm each year (Gleick, et al., 2004).

Restaurant managers and owners think of sustainability in monetary terms (Chan, 2005). Case studies available via the NRA's Conserve website discuss savings using both ecological and financial methods (NRA, 2010). The website estimates that energy is 30% of a building's yearly operating costs and that restaurants kitchens use 25 times as much energy as a normal building. Decreasing the amount of water used, either through training or new equipment, is directly correlated with decreasing utility costs (AH&LA, 2001; Conserve, 2010; Energy Star, 2010).

## **METHODOLOGY**

Objectives of (1) determining the gallons per meal used in casual dining restaurants (CDR's) and (2) understanding whether employee behavioral intent to reduce water use is possible through interventions are the focus of this study. The decision to use gallons of water per meal served is based on research done by Dziegielewski, et al. (2000) for the American

- |   |
|---|
| <p>R<sub>1</sub>: Does water usage by BOH staff decrease when an educational intervention is applied?<br/>R<sub>2</sub>: Does water usage by BOH staff decrease when an equipment intervention is applied?<br/>R<sub>3</sub>: Does water usage by BOH staff decrease when educational and equipment interventions are applied?<br/>R<sub>4</sub>: Does behavioral intent by BOH staff change after an educational intervention is applied?<br/>R<sub>5</sub>: Does behavioral intent by BOH staff change after an equipment intervention is applied?<br/>R<sub>6</sub>: Does behavioral intent by BOH staff change after educational and equipment interventions are applied?<br/>R<sub>7</sub>: Are back-of-house employee's perceptions of control over water use not influenced when equipment is included as part of an intervention?</p> |
|---|

**Figure 3.1: Research Questions**

Water Works Association. No other studies, academic or others, were located discussing the per-customer water used in the restaurant industry.

There are 2053 CDR's in Kansas according to the United States Census Bureau (2009) including chain and independent operators. A convenience sample of 24 CDR's will be elicited and randomly assigned one of four possible interventions. It is from this sample that water usage compared with the number of meals served will be employed. The research questions for the study are in figure 3.1.

A second phase of the study uses the Theory of Planned Behavior (TpB) (Ajzen, 1986) to determine whether the interventions of education, equipment, or equipment and education influence the intentions of back-of-house employees to act by conserving water. Most CDR's have more than 15 BOH staff. A convenience sample from the more than 360 participants (n>90 for each intervention) will be utilized for the TpB questionnaire. The hypotheses for this aspect of the study are in figure 3.2.

H<sub>1</sub>: Attitudes influence back-of-house employee's intent to decrease water usage in casual dining restaurants.

H<sub>2</sub>: Subjective Norms influence back-of-house employee's intent to decrease water usage in casual dining restaurants.

H<sub>3</sub>: Perception of control influences intent to decrease water usage in casual dining restaurants.

**Figure 3.2: Hypotheses for Behavioral Intent to Decrease Water Usage**

Water usage in CDR's is accessible using historical secondary data from the municipal water statements and the operation's data. This data will be collected for six months establishing benchmarks for each operation. Interventions including: 1) Education the BOH staff using specifically designed brochures and posters focusing on methods of decreasing water use while completing their assigned job duties; 2) Modification of equipment throughout the back of house by installing .4 gallon per minute aerators on every BOH faucet and .65 gallon per minute spray valves at the prep sink faucet and at the dishwashing station; 3) All aspects of both intervention one and two; and 4) A control group with no interventions will be instituted for three months.

Water usage per meal will be tabulated using SPSS to analyze data at the completion of the interventions. Descriptive statistics, factor analysis, analysis of variance and multiple regression will be run to determine the validity of the hypotheses and to better understand the answers to the research questions.

## REFERENCES

- Ajzen, I. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, 22(5), 453-474.
- Alonso, A. D., & Ogle, A. (2010). Tourism and hospitality small and medium enterprises and environmental sustainability. *Management Research Review*, 33(8), 818-826.  
doi:10.1108/01409171011065626
- American Hotel and Lodging Association. (2001). *Energy management and conservation guide* American Hotel and lodging Association.

- Barringer, F., & Henriques, D. B. (2010). *Water scarcity a bond risk, study warns*. Retrieved October 22, 2010, from <http://www.nytimes.com/2010/10/21/business/21water.html?scp=1&sq=water%20scarcity&st=cse>
- Bjorklund, G., Burchi, S., Connor, R., Cosgrove, W., Hendry, S., Moriarty, P., Rast, W., Salame, L., & Winpenny, J. (2009). Policies laws and finance. In UNESCO (Ed.), *The united nations world water development report 3: Water in a changing world* (pp. 49 - 67). Paris & London: UNESCO Publishing, Earthscan.
- Bjorklund, G., Connor, R., Goujon, A., Hellmuth, M., Moriarty, P., Rast, W., Warner, K., & Winpenny, J. (2009). Demographic, economic and social drivers. In *The United Nations world water development report 3: Water in a changing world* (pp. 29-40). Paris; London: UNESCO; Earthscan.
- Brzozowski, C. (2010, November/December 2010). Conveyance catch 22. *Water Efficiency: The Journal of Water Resource Management*, 5(6), 14-23.
- Centers for Disease Control and Prevention. (2010). *National drinking water week 2010: "only tap water delivers"*. Retrieved 9/27, 2010, from <http://www.cdc.gov/DrinkingWater/>
- Chan, W. W. (2005). Partial analysis of the environmental costs generated by hotels in hong kong. *International Journal of Hospitality Management*, 24, 517-531. doi:10.1016/j.ijhm.2004.10.008
- Dziegielewski, B., Kiefer, J. C., Opitz, E. M., Porter, G. A., Lantz, G. L., DeOreo, W. B., Mayer, P. W., & Olaf, J. N. (2000). *Commercial and institutional end uses of water* Denver, CO: American Water Works Association (AWWA) Research Foundation and the American Water Works Association.
- Gleick, P. H., Srinivasan, V., Henges-Jeck, C., & Wolff, G. (2004). Urban water conservation: A case study of commercial and industrial water use in california. In P. H. Gleick (Ed.), *The world's water 2004-2005* (1st ed., pp. 131-156). Baltimore, MD: Island Press.
- Kenny, J. F., Barber, N. L., Hutson, S. S., Linsey, K. S., Lovelace, J. K., & Maupin, M. A. (2009). *Estimated use of water in the united states in 2005* No. U.S. Geological Survey Circular 1344).
- National Geographic. (2010, April). Get the salt out. *National Geographic*, 217(4), 32.
- National Restaurant Association. (2010). *Conserve solutions for sustainability*. Retrieved August 29, 2010, from <http://conserve.restaurant.org/>
- Revell, A., & Blackburn, R. (2007). The business case for sustainability? an examination of small firms in the UK's construction and restaurant sectors. *Business Strategy and the Environment*, 16, 404-420. doi:10.1002/bse.499
- United States Census Bureau. (2010). *State and county quick facts*. Retrieved 8/11, 2010, from <http://quickfacts.census.gov/qfd/states/00000.html>
- U.S. Environmental Protection Agency. (2010). *Energy star*. Retrieved June 20, 2010, from <http://www.energystar.gov/>
- U.S. Environmental Protection Agency. (2010). *WaterSense: An EPA partnership program*. Retrieved 2/17, 2010, from <http://www.epa.gov/WaterSense/>
- United States Green Building Council. (2010). *An introduction to LEED*. Retrieved September 28, 2010, from <http://www.usgbc.org/>