University of Hawai‘i Sea Grant College Program

Economic Impact Analysis of the Potential Erosion of Waikīkī Beach

A 2016 Update

Nori Tarui
Department of Economics, University of Hawai‘i at Mānoa and
University of Hawai‘i Economic Research Organization (UHERO), nori@hawaii.edu

Marcus Peng
Department of Economics, University of Hawai‘i at Mānoa, marcuspe@hawaii.edu

Dolan Eversole
University of Hawai‘i Sea Grant College Program, eversole@hawaii.edu

Final Draft
April 6, 2018

Abstract

This report provides an update to a 2008 report on the value of Waikīkī Beach using 2016 economic and visitor arrival data. Hospitality Advisor's 2008[1] report concludes that just under $2 billion (2007 U.S. dollars) in overall visitor expenditures could be lost annually due to a complete erosion of Waikīkī Beach. The 2008 report investigated the economic impact of the erosion of Waikīkī Beach through visitor surveys and analysis of data provided by the Hawai'i Department of Business, Economic Development and Tourism, Hawai'i Tourism Authority, and Smith Travel Research. This report updates the economic impact estimates with the most recent set of complete tourism data available for 2016. The estimated potential loss in spending and revenue increased slightly to $2.22 billion in 2016 (about a 1.4% decrease from 2007 after adjustment for inflation). While the total number of O'ahu visitors increased by 18.5% between 2007 and 2016, the rate of change differs among visitors from different parts of the world, whose spending patterns and likelihood to revisit Waikīkī after complete beach erosion varies. The average daily rate for hotel accommodation increased by 15.0%, but the average daily expenditure per visitor decreased by 6.2% between 2007 and 2016 (daily expenditures outside hotels decreased by more than 16%). O'ahu, in particular, has many new visitors, but on average these visitors spend less than the visitors to the neighbor islands do. These factors together explain the 1.4% reduction in the estimated economic impact of the erosion of Waikīkī Beach between 2007 and 2016 when adjusted for inflation.

Publication of this update report was funded by the Waikīkī Beach Special Improvement District Association. The content and updated information was produced by the University of Hawai'i Department of Economics in conjunction with the University of Hawai'i Sea Grant College Program, School of Ocean and Earth Science and Technology (SOEST), under Institutional Grant Number NA09OAR4170060 from the NOAA Office of Sea Grant, Department of Commerce. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

Hawai'i Sea Grant publication reference number: UNIHI-SEAGRANT-GG-16-04.

Suggested reference:
Tarui, N., Peng, M., Eversole, D. *Economic Impact Analysis of the Potential Erosion of Waikiki Beach*. April, 2018. University of Hawai'i Sea Grant College Program.

[1] Hospitality Advisors, LLC. (2008). Economic Impact Analysis of the Potential Erosion of Waikīkī Beach. Final Report prepared for Waikīkī Improvement Association.

1. Introduction

How much visitor spending would be lost if all of Waikīkī Beach is eroded? Though the value of the beach is considered to be substantial, few studies have addressed the question with quantitative assessments. A report by Hospitality Advisors in 2008 (henceforth HA, 2008) is an exception, providing an oft-cited value estimate. By investigating the economic impact of beach erosion through visitor surveys and analysis of data provided by the Department of Business, Economic Development and Tourism (DBEDT), Hawai'i Tourism Authority (HTA) and Smith Travel Research (STR), HA (2008) concludes that nearly $2.0 billion (2007 U.S. dollars) in overall visitor expenditures could be lost annually due to a complete erosion of Waikīkī Beach.[2] This figure reflects estimated drops in visitor expenditures on hotel rooms, local retail, entertainment, food, transportation and the subsequent local tax impacts.

Figure 1. Waikīkī and the Coastal Urban Corridor including Kaka'ako and Ala Moana.

Given the changes in Hawai'i's tourism and the surrounding economic environment since 2007, there is a clear need for updating these numbers. Despite the financial crisis of 2007-8 and the associated economic recession, visitor days on O'ahu have increased by almost 15%[3] while the real visitor expenditures decreased by about 6% (17% excluding accommodation) between 2007 and 2016.[4] The demographic composition of visitors also changed in the past decade (e.g., more eastbound visitors from Asia, whose spending behavior differs from other visitors).

This report's main objective is to update the estimated economic impacts of Waikīkī Beach erosion in HA (2008) to reflect the subsequent changes in the economic environment to date by applying publicly available data on Hawai'i's tourism and economy. HA (2008) based its estimates on the 2007 tourism statistics including the number of visitors, visitor days, and visitor expenditures by visitor demographics, combined with a visitor incept survey by MTP and a survey on hotel room rates by STR. This update applies the 2016 tourism data, made available from DBEDT and HTA, to compute an updated estimated value of Waikīkī Beach based on the survey findings by MTP and STR.

[2] The study is based on a visitor intercept survey conducted by Hospitality Advisors' subcontractor, Market Trends Pacific (MTP), and Smith Travel Research (STR) hotel lodging and financial survey.

[3] The visitor day data are from Hawai'i Tourism Authority's Annual Visitor Research Report (Table 4 from the 2007 and 2016 reports).

[4] The expenditure data are from DBEDT "Historical Visitor Statistics" available at http://dbedt.Hawaii.gov/visitor/. The consumer price index for Honolulu, used to deflate expenditure, is from the U.S. Bureau of Labor Statistics.

In order to compare the updated figures with the original 2008 estimates in a legitimate manner, the scope and methodology of this report are consistent with the original study by HA (2008). The conclusion section lists some of the meaningful ways in which the scope of the valuation study can be expanded in order to arrive at a more comprehensive estimate on the value of Waikīkī Beach.

Figure 2. Waikīkī Beach and the nearshore waters are a major attraction for Hawai'i.

SUMMARY FINDINGS:

1. The total estimated impact of complete beach erosion on visitor expenditures changed from $1.948 billion in 2007 to $2.223 billion in 2016.

2. After adjustment for inflation, the change from 2007-2016 is a 1.4% decrease in the economic impact.

3. While the number of O'ahu visitors increased by 18.5% and the average daily rate for hotel accommodation increased by 15.0%, the average daily expenditure per visitor decreased by 6% (17% excluding accommodation) between 2007 and 2016 (after inflation adjustment).

4. These factors, along with changes in the demographic distribution of O'ahu and Waikīkī visitors, together explain the 1.4% decrease in the estimated impact of beach erosion.

2. Methodology

2.1 Project Scope

The scope of HA (2008) included estimates of the market and economic impact assuming complete erosion of Waikīkī Beach, including visitor spending, beach activities, and taxes. To assess the economic impact of a complete beach erosion, HA (2008) relied on primary and secondary research statistics for analysis, including State of Hawai'i DBEDT visitor statistics, a visitor intercept survey conducted by HA's subcontractor, Market Trends Pacific (MTP), and Smith Travel Research (STR) hotel lodging and financial survey. Specifically, HA (2008) analyzed the following areas of impact based on U.S. and Japan visitor expenditures:

- Total hotel revenue: including rooms, food and beverage, and other operations;
- Visitor Activity Spending;
- General Excise Tax;
- Transient Accommodations Tax.

HA (2008)'s study utilizes tourism data from three sources:

- State of Hawai'i DBEDT public data;
- STR subscription data on hotel room rates; and
- A visitor incept survey conducted by MTP that asked visitors in person if they would continue to visit Waikīkī in the event of complete erosion of Waikīkī Beaches.

For westbound visitors and visitors from Japan separately, the visitor expenditures lost annually due to a complete erosion of Waikīkī Beach are computed according to the following formula from HA, (2008):

Lost expenditures = (Share of visitors lost due to beach erosion)*(Total number of Waikīkī visitors) * (Average spending per visitor and associated taxes paid).

The sum of the lost expenditures associated with all visitor types yields an economic impact estimate on the value of Waikīkī Beach. In this 2016 update, we make use of the most recent and complete set of DBEDT and STR data while relying on the same MTP survey data.

Figure 3. Waikīkī Beach in 2010 under extreme high tides illustrating beach conditions under the complete erosion scenario.

2.1.1 THE NUMBER OF VISITORS LOST DUE TO BEACH EROSION

Following the formula from HA (2008), we estimate the number of visitors to Waikīkī Beach accordingly:
Total of lost visitors to Waikīkī Beach = *A X B X C*

(A) Estimated number of visitors to O'ahu
(B) the share of visitors who stay in Waikīkī
(*C*) the share of visitors who would not visit Waikīkī upon beach erosion.

While (*A*) is updated based on DBEDT data and (*B*) on STR data, we apply the same estimates for (*C*) as in HA (2008) based on MTP's Visitor Preference Survey conducted in 2006. According to the survey, 58 percent of westbound respondents indicated that they would not stay in Waikīkī if the beach is completely eroded. In the same manner, 14 percent of the Japan visitors responded that they would not stay in Waikīkī if the beach is no longer available (Table 1, Figure 3).

MTP sampled 428 visitors located between the Honolulu Zoo and the Hilton Hawaiian Village with 105 from Japan, 323 Westbound visitors defined as 274 US and the remainder 49 from "Canada and other countries". Of all intercepts, 80% were on beach and 20% off beach (HA 2008).

	Visitor Hotel Location:			Visitor Hotel Location:		
	Westbound Total	On-Beach	Off-Beach	Japan Total	On-Beach	Off-Beach
Definitely Consider Staying in Waikīkī	18.0%	16.0%	20.0%	56.0%	58.0%	58.0%
Possibly Consider Staying in Waikīkī	24.0%	23.0%	26.0%	27.0%	29.0%	18.0%
Not Consider Staying in Waikīkī	58.0%	60.0%	53.0%	14.0%	9.0%	21.0%
Don't Know	1.0%	1.0%	1.0%	3.0%	4.0%	3.0%

Table 1. Consideration for staying in Waikīkī if beach is eroded. Source: Market Trends Pacific.

2.1.2 VISITORS' EXPENDITURES ON HOTEL ACCOMMODATIONS

The quantity of hotel rooms demanded in Waikīkī (Q) is estimated as the following.
Q= (D X E)/F
Where: (D) Share of O'ahu visitors staying in hotels (as opposed to non-hotel accommodations)
(E) Waikīkī visitor nights
(F) Occupancy factor.

The share (D) is updated based on a DBEDT survey. Multiplying the number of Waikīkī visitors by the average length of visitors' stay on O'ahu (updated with DBEDT data) yields (E). Following HA, (2008), this study assumes the occupancy factor (the average number of persons per room) to be 2.3. Average daily hotel rates (STR) are applied to estimate the total visitor expenditures on hotel accommodations in Waikīkī.

2.1.3 VISITORS' EXPENDITURES

An MTP survey estimates visitors' expenditures on beach recreation including: surfing, swimming, stand up paddling, umbrella rental for sunbathing, canoe paddling, and snorkeling (Figure 3). Average expenditures on food and beverage; entertainment and recreation; transportation; and shopping are updated to the 2016 figures based on DBEDT data. We multiply these average estimates by the number of Waikīkī visitors to compute Waikīkī visitors' expenditures in these categories.

Figure 4. Waikīkī Beach offers a wide variety of recreational opportunities that would be directly impacted by total erosion of the beach.

2.2 Assumptions for the 2016 update

The 2016 update depends on the original MTP survey mentioned above for the estimated share of visitors who would not stay in Waikīkī if the beach were no longer available. Clarification is needed regarding the original MTP survey. The survey asked visitors regarding their hypothetical choice in the event of beach erosion, where the entire Waikīkī Beach erodes away. While this is one way to address how many visitors (and how much associated expenses) will be lost due to beach erosion, it is not the only way. On one hand, survey respondents might find it simple to answer whether they would be willing to visit Waikīkī were it not for its beach. On the other hand, they may find it challenging to imagine what they might do if the beach were completely gone, i.e., under a fairly drastic (and arguably a low-likelihood) scenario. In order to solicit the respondents' willingness to visit under more likely scenarios (i.e., less than complete beach erosion), we would need to conduct a survey with different questions.

Other tourism data are updated from State of Hawai'i DBEDT and STR. STR has redacted data for the lowest hotel category (budget) in this update because there are very few "budget" hotels left in Waikīkī and most of those that do remain share common ownership and/or operations as part of a chain. Using STR O'ahu island-wide data, we estimated averages for the lowest hotel category, as well as determine on-beach and off-beach sets of hotels.

The visitor categories are somewhat coarse: the 2007 data breaks down the visitor groups to those from the U.S., Japan, and others. While the share of the U.S. and Japanese visitors combined exceeded 84% in 2007, the share is 76% as of 2016. The increasing number of visitors from other parts of the world would influence the economic impact estimate to the extent that these visitors spend differently from U.S. and Japanese visitors. A notable trend is the increased number of visitors from China with Chinese visitors to O'ahu up 31% and spending up 35%, whose spending per person exceeds that of visitors from the U.S. and Japan. Counted individually starting in 2009, Chinese visitors accounted for 38,733 visitors with $285.63 per person per day spending (PPPD). In 2016, the Chinese presence was significantly larger with 156,799 visitors and $384.68 PPPD. There are no available PPPD estimates specifically for Waikīkī: this report applies the PPPD estimated for O'ahu.

Figure 5. Waikīkī Beach has a reputation as a high-density urban beach supporting many local businesses.

3. Results

3.1 Main results

For comparison purposes, we repeat the HA (2008) results using restated 2007 DBEDT visitor data, as the original 2008 study used partial data made available partway through the year (when the finalized 2007 data were not available). The total estimated impact of complete beach erosion on visitor expenditures changed from $1.948 billion in 2007 to $2,223 billion in 2016. After adjustment for inflation, this represents a decrease by 1.4% (Table 2).

Table 2. Summary of Estimated Visitor Expenditure by Category.

	2007 (restated)	2007 (inflation adjusted)	2016
Total Estimated Impact on Waikīkī Visitor Expenditures:	$1,947,686,271	$2,254,532,669	$2,222,604,617
Estimated Hotel Room Expenditure	$503,826,446	$583,201,308	$674,215,601
Estimated Retail Expenditure	$549,669,871	$636,267,092	$488,139,309
Estimated Entertainment & Recreation	$220,224,254	$254,919,276	$259,158,498
Estimated Food & Beverage Expenditure	$447,300,538	$517,770,080	$580,766,382
Estimated Transportation Expenditure	$226,665,162	$262,374,912	$220,324,827
(Lost Visitor Days)	37,545	37,545	41,639

Source: State of Hawai‘i DEDT, Hospitality Advisors LLC, and the author’s computation.

HA (2008) also reported potential tax impacts due to beach erosion. Table 3 shows that the tax impact increased from $162 million in 2007 by 8% to $134 million in 2016.

Table 3. Estimated Tax Impact.

Tax rate	Tax impact	
	2007	2016
TAT (2007, 7.25%)	$42,282,095	
TAT (2016, 9.25%)		$62,364,943
GET (4.50%)	$101,453,970	$100,017,208

Source: State of Hawai'i DBEDT, Hospitality Advisors LLC, and the authors' computation.
Note: TAT refers to the transient accommodations tax and GET the general excise tax. All dollar amounts are in 2016 dollars, inflation adjusted.

Note that the estimated tax impacts in 2007 and 2016 are not directly comparable (even after adjustment for inflation) because the transient accommodation tax rate changed between these years. While the TAT rate was 7.25% from 1999 to 2009, it increased to 8.25% in 2009 and to 9.25% in 2010 (State of Hawaii, 2016). Another increase to 10.25% is scheduled beginning 2018 (Hawaii Tourism Authority, 2017a). On one hand, the tax impact might have been similar even if the TAT rate had stayed the same because of how Hawai'i's visitor arrivals would respond to a change in the price of hotel room rates.[5] If TAT stayed at 7.25%, the tourism arrival has been higher to at least offset the lower tax revenue per dollar, and hence the tax impact would have been no less. On the other hand, TAT is not included in the room rates displayed on many travel websites. This implies that the visitors may not be aware of changes in the TAT rates when booking hotel rooms.[6] Hence, if the visitor arrivals had stayed the same, the tax impact would have been smaller. Taking these possibilities together, our study estimates that the increase in the tax impact between 2007 and 2016 would lie between 3.6% and 14.7%.

While this study uses the most recent data available (i.e., for 2016), the number of visitors to O'ahu has been increasing since the end of 2016. According to Hawai'i Tourism Authority, visitor spending was up 5.9% to $5.73 billion in the first three quarters of 2017, compared to the same time frame in 2016 (Hawaii Tourism Authority, 2017b). Likewise, visitor arrivals are up 4.2% to 4.3 million for the first three quarters of 2017 compared to 2016. Therefore, the economic impact of beach erosion would correspondingly change further with more recent updates on Hawai'i's tourism data.

[5] Using Hawai'i's tourism data, Fuleky et al. (2014) find that a 1% increase in room rates results in a 1.2% reduction in tourist arrivals. This indicates that, if the TAT had stayed at 7.25% instead of 9.25%, the tax impact would have been higher by 0.4%.

[6] Chetty et al. (2009) indicate that consumers may be less sensitive to changes in prices when the taxes are not salient to them.

3.2 Factors behind changes in 2007-2016

What explains the change in the estimated value of the Beach between 2007 and 2016? Figure 6 indicates the factors behind the change. All spending impacts are adjusted for inflation in the figure. Most indicators demonstrate an increase during the period. In particular, the number of visitors to O'ahu increased by 18.5%. A slightly smaller proportion (2.8% less) of O'ahu visitors stay in Waikīkī while their average length of stay did not change much (with a 0.2% increase). However, the average daily rate (ADR, hotels' room revenue divided by rooms sold) increased significantly (by 15%). Despite these increases, the total estimated lost spending exhibits a small decrease (1.4%) as indicated in Table 2. This is in part because of the decline in the visitor daily expenditure (by 6%; 17% excluding accommodation). While the visitors spend more on rooms, they spend less on other items.

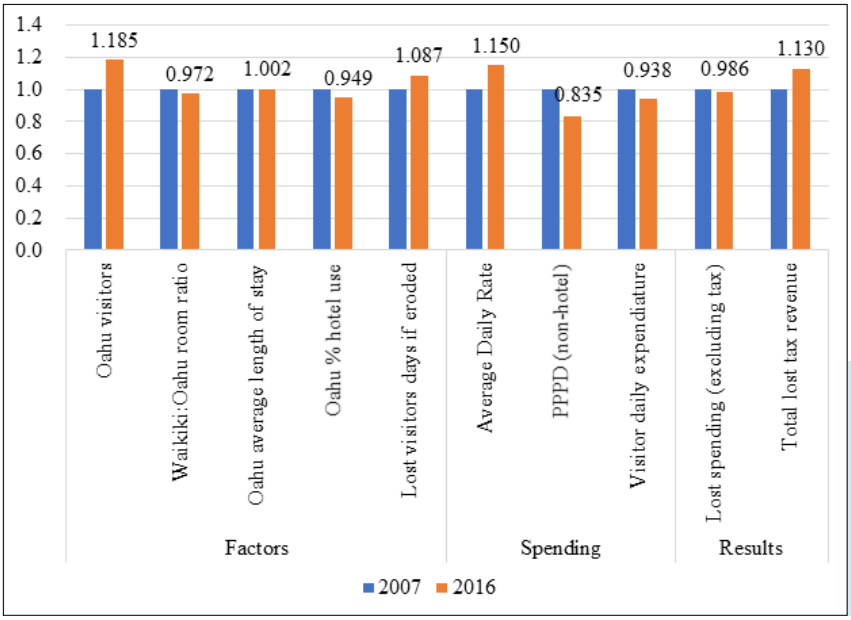

Figure 6. Changes in tourism indicators, 2007-2016 (2007 values = 1). Visitor daily expenditure, average daily rate, net lost tax revenue, and total lost spending are adjusted for inflation.

Another factor behind the 1.4% reduction in the lost spending estimate is the change in the composition of visitors, i.e., there is growth in the "other" visitor category (mainly Australian and Chinese). Following the methodology set out in HA (2008), we assume that "other" eastbound visitors (such as those from China) behave like Japanese visitors, who, according to the MTP survey, tend to continue to want to visit Waikīkī even after beach erosion occurs (as Table 1 indicates, only 14% of Japanese visitors would no longer visit Waikīkī in the event the beach is eroded). As a consequence, the number of visitors lost due to beach erosion will not increase when the share of the eastbound visitors rises while there is a decline in the share of the U.S. and other westbound visitors drop, who are more sensitive to beach erosion (58% of U.S. visitors would no longer visit Waikīkī in the event the beach is eroded).

Visitors from different countries exhibit differences not only in terms of attitudes toward beach erosion but also in spending. Thus, it is useful to examine the makeup of statewide, O'ahu, and Waikīkī visitors by country of origin. While the number of U.S. West visitors has grown a great deal over the past two decades, most of this growth has occurred on the neighbor islands while the number of O'ahu visitors stayed mostly flat (Figures 7 and 8). Compared to 2007, the number of Japanese visitors has not changed, the number of total U.S. visitors is down, and the "other" category comprising mostly of "other" (Australian and Chinese) visitors is up (Figure 6). These changes in visitor arrival demographics tend to reduce the average share of visitors lost associated with beach erosion due to the reason explained in the previous paragraph.

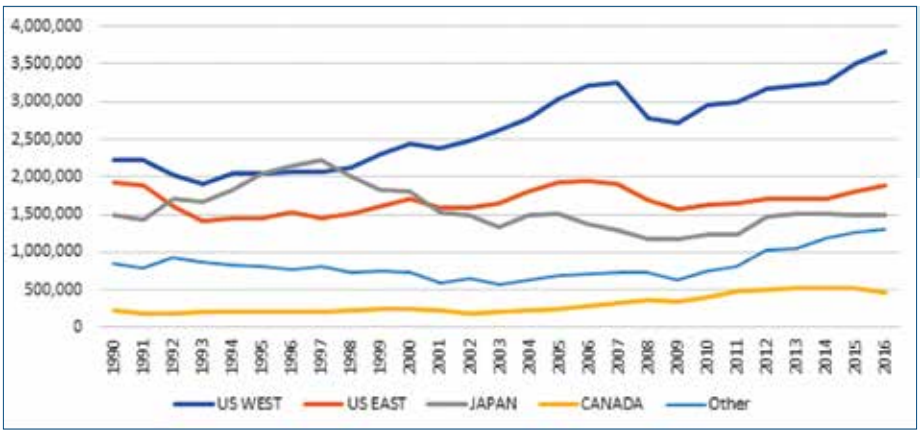

Figure 7. The number of Hawai‘i visitors by major market area (MMA) (DBEDT, 2016).

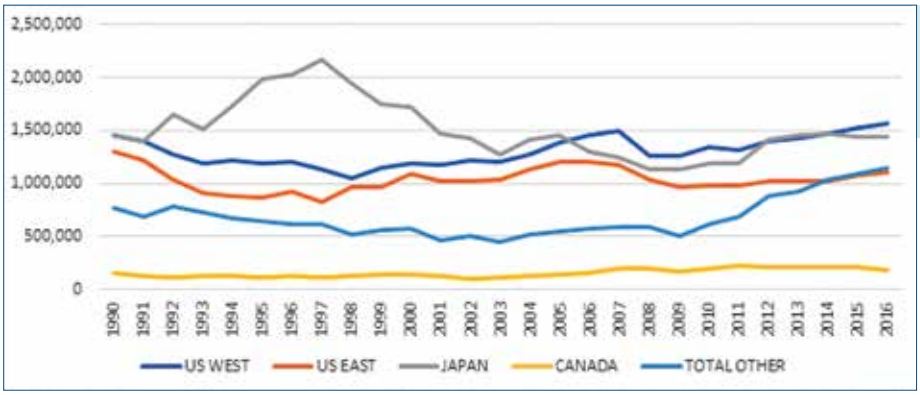

Figure 8. The number of O‘ahu visitors by MMA (DBEDT, 2016).

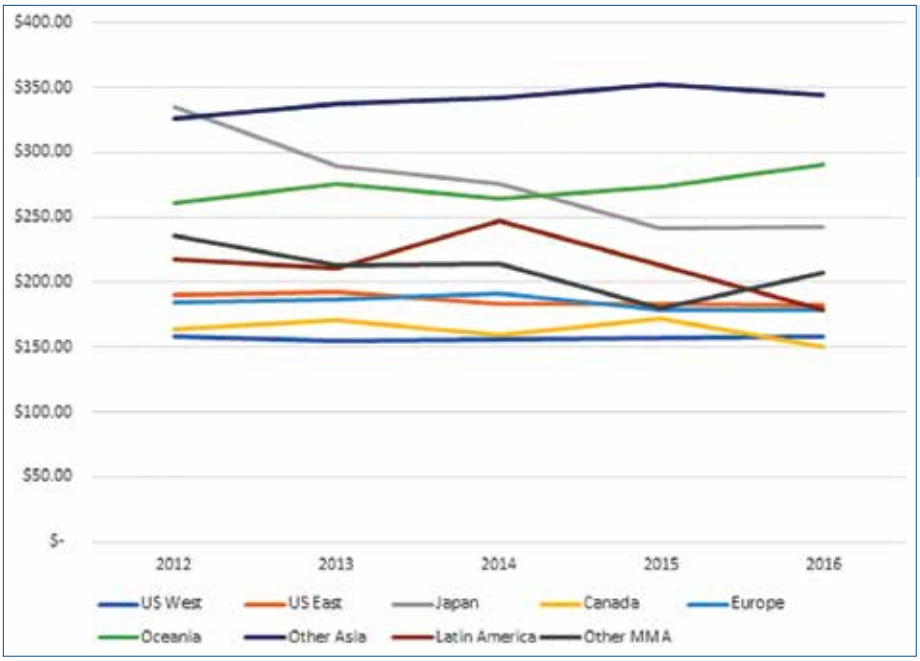

Figure 9. O‘ahu visitor per person per day spending by MMA (in 2016 U.S. dollars).

As for the visitor expenditure, a typical visitor from “Other Asia” (including China and Korea), Oceania (including Australia), and Japan spend more per day than those from the U.S., Canada, Latin America, and Europe (Figure 9).

A notable trend is that Japanese visitors' spending has declined sharply over the past 5 years while the spending by visitors from Other Asia is growing and stays high. When combined with the number of visitor days, Japanese visitors are still by far the largest contributor in visitor spending (Figure 10). Despite the high expenditure per person, the total spending by the visitors from Other Asia remains small in magnitude because the visitor arrival is still limited compared to the visitors from other countries of origin.

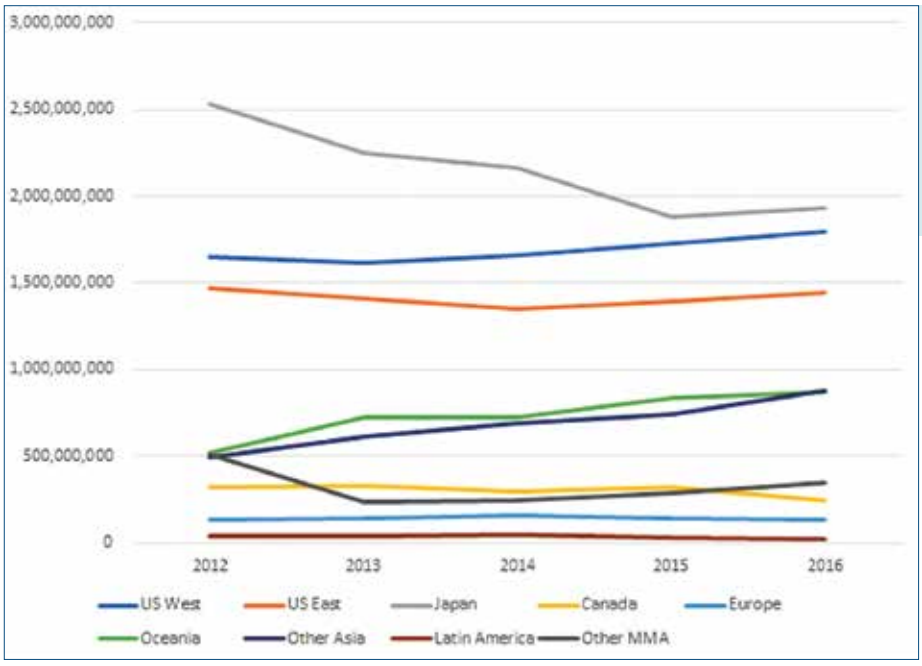

Figure 10. O'ahu visitor total spending (visitor days x per person per day spending, in 2016 U.S. dollars).

4. Discussion

4.1 Conclusions

Following HA's (2008) methodology, this study estimated the economic value of Waikīkī Beach as the tourism-related revenues that would be lost if complete beach erosion occurred. The lost revenue depends on several factors, many of which have changed significantly since the original HA's study was conducted in 2008. Notably, the number of Waikīkī visitors likely increased by more than 18%, corresponding with the statewide increase and the hotel room rates increased by 15% while what a typical visitor spends daily outside hotels decreased by more than 16%. **Together with the change in the share of visitors from different countries of origin, whose attitudes toward beach erosion and spending differ among each other, these changes indicate that the estimated economic value of Waikīkī Beach has not changed much between 2007 and 2016 with a nominal 1.4% decrease.**

Tourist arrivals to Hawai'i depend on visitors' real personal income and travel costs.[7] A major component of the travel costs is the airfares, which depend on oil prices. Therefore, the above valuation estimates are dependent on the oil price fluctuation as well as the extent of income growth in the regions and countries where the visitors come from. An increased presence of non-hotel accommodations indicates that capturing tourists' expenditures on such new types of accommodation may improve the estimates (JLL 2016).

[7] Fuleky et al. (2014) find that a 1% increase in the real personal income leads to about a 1.2% increase in tourist arrivals while a 1% increase in the airfares results in a quarter of a percent reduction in tourist arrivals.

Some concern has been raised over increasing visitor arrivals (Mak, 2017a), especially as real visitor spending continues to decline on a per person per day (PPPD) basis (Figure 11). The state's overall tourism revenue has increased, but in effect declining PPPD is being compensated by increasing visitor arrivals. O'ahu, in particular, has many new visitors, but on average these visitors spend less than the visitors to the neighbor islands do. If we assume that tourism has no impacts on local communities (crowding, traffic congestion, etc.), then one may not be concerned about the number of visitors or how much they spend as along as the net benefit is higher. However, some studies indicate that increased tourism activity imposes real environmental and social costs (Neuts, et al. 2012) on local communities. It is not clear if increased costs from tourism are outpacing the decreasing marginal benefits per additional visitor. Additional work must be undertaken to better assess the costs of congestion and crowding and to better understand the impact on both residents and visitors.

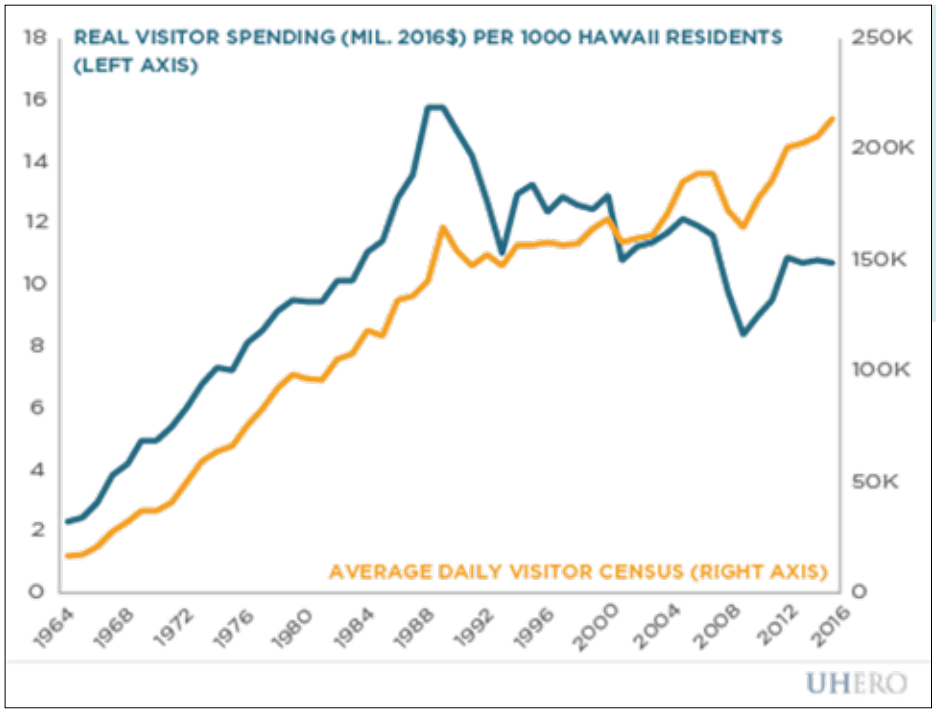

Figure 11. Visitor arrivals vs. real visitor spending. While visitor arrivals have continued to increase, visitor spending has stagnated and in recent years declined. Source: Mak (2017a).

4.2 Accounting for the value of Waikīkī Beach: Research needs and opportunities

Several factors explain that the value of Waikīkī Beach, as estimated in the current study, may be an underestimate or an overestimate of the true value. To the extent that the actual beach erosion of practical relevance is not a complete but a partial beach erosion and presumably quickly restored, the tourism losses due to beach erosion may be lower than what this study indicates. A decrease in the accommodation demand in Waikīkī due to beach erosion may lead to lower room rates, thereby requiring a downward adjustment of the impacts on hotel revenues. However, there are a few other factors that indicate why this study may underestimate the true economic impacts of beach erosion. These factors are summarized below.

4.2.1 REFINING THE TOURISM-RELATED BENEFITS OF WAIKĪKĪ BEACH

Besides the spending at the destination, tourists would incur costs of traveling to Honolulu. While it is not clear how much of each tourist's total travel expenditure could be attributed toward the economic value of Waikīkī Beach, as a willingness to pay factor, taking into account these types of expenses will increase the Waikīkī Beach value estimate. Besides the tourists' benefits from recreational activities on the beach, they might simply enjoy staying in a hotel with an ocean view. Though the benefits of ocean views are incorporated in hotel room rates, further investigations would clarify just how much visitors are willing to pay to have close

access to the beach or to have an ocean view in addition to the inherent natural resource value of the beach and nearshore ecosystem including the coral reefs. Visitors to beaches on O'ahu value water quality (Peng and Oleson 2017). Some studies suggest that the amenity and natural resource benefits that beaches and reefs provide to recreational surfers may be significantly larger than what the beach concession revenues indicate (Lazarow et al. 2008).


Image courtesy of Hawaii Tourism Authority

Figure 12. Waikīkī Beach is a highly-desired destination requiring willingness to pay to get to due to the remote location.

4.2.2 BENEFITS TO HONOLULU RESIDENTS

Waikīkī Beach benefits not only the visitors from outside O'ahu but the Island's residents in many interconnected ways. Though arguably Waikīkī Beach is frequented by more tourists than residents, no accurate estimates on the number of the residents visiting Waikīkī exists. Accounting for the beach's benefits to the residents is also important because a substantial number of residents live, work and play in the Waikīkī district.

4.2.3 CONSIDERING THE VALUE OF WAIKĪKĪ BEACH BEYOND THE TOURISM ECONOMY

Beaches mitigate storm damage by working as a buffer to coastal assets property and infrastructure. Such benefits may be significant for Waikīkī Beach where the beachfront accommodates a large tourism capital stock (hotels, restaurants, and condominiums).[8] Besides those values (called "use value," i.e., the benefits that consumers gain by using the resource), beaches provide various "non-use value," which represents values that consumers place on the resource even when they do not use it. One might be willing to pay something to preserve the option of visiting the beach or reef in the future (option value); some may find it valuable if the resource can be used by consumers in the future generations (bequest value); and others may value resources out of moral concerns about resource degradation or about the livelihood of creatures other than human (existence value).

A comprehensive assessment of the beach's value requires estimations of various types of benefits, other than direct expenditures for accommodation and recreational activities, as described above. Such an assessment requires analysis of data collected from surveys to beachgoers, as well as the general population, in a manner that is scientifically valid.

[8] Cesar and van Beukering (2004) discuss various types of value that coral reefs provide. A large portion of reefs in the Great Barrier Reef are experiencing damages due to sea temperature rise (Hughes et al. 2017), indicating a significant impact on the health of the reef as well as the reef tourism.

Figure 13. Waikīkī Beach and the iconic views of Diamond Head Crater.

Reliable estimates of the value of the beach and nearshore ecosystem value, along with estimates of changes in the values under alternative beach management scenarios, are crucial for justifying the type and the scale of investment necessary for maintaining or improving beaches and nearshore environment. In fact, a major component of a beach management plan or technical engineering study for any beach requires an understanding and detailed analysis of the costs and the benefits of alternative strategies relative to status quo. A robust methodology for valuing beach and coastal ecosystems will greatly enhance resource management and coastal management efforts regionally. Extending the scope of this report in these directions will yield critical inputs for an effective beach management.

Figure 14. Waikīkī Beach and the iconic views of Diamond Head (Leahi) Crater.

References

Cesar, H. S., & Van Beukering, P. (2004). Economic valuation of the coral reefs of Hawai'i. *Pacific Science*, 58(2), 231-242.

Chetty, R., Looney, A., & Kroft, K. (2009). Salience and Taxation: Theory and Evidence. *American Economic Review*, *99*(4), 1145-1177.

Fuleky, P., Zhao, Q., & Bonham, C. S. (2014). Estimating demand elasticities in non-stationary panels: The case of Hawai'i tourism. *Annals of Tourism Research*, *44*, 131-142.

Hospitality Advisors, LLC. (2008). Economic Impact Analysis of the Potential Erosion of Waikīkī Beach. Final Report prepared for Waikīkī Improvement Association.

Hawaii Tourism Authority (2017a). Travel Industry Notification from the Hawai'i Tourism Authority RE: 1% Transient Accommodations Tax Increase Takes Effect January 1, 2018. HTA Release (17-41) http://www.hawaiitourismauthority.org/default/assets/File/news/HTA%20Statement-1Percent%20TAT%20Increase%201-1-18%20(002).pdf.

Hawaii Tourism Authority (2017b). Visitor Spending Rose 7.1 Percent to $12.56 Billion in First Three Quarters of 2017, Arrivals Increased 4.9 Percent to 7 Million Visitors. HTA Release (17-42). http://www.hawaiitourismauthority.org/default/assets/File/news/September%202017%20Visitor%20Stats%20Press%20Release%20(FINAL).pdf.

Hughes, T. P., Kerry, J. T., Álvarez-Noriega, M., Álvarez-Romero, J. G., Anderson, K. D., Baird, A. H., ... & Bridge, T.C. (2017). Global warming and recurrent mass bleaching of corals. *Nature*, *543*(7645), 373-377.

JLL (2016). Hawai'i's Home and Vacation Rental Market: Impact and Outlook. A report prepared for Hawai'i Tourism Authority, retrieved from http://www.Hawai'itourismauthority.org/research/research/infrastructure-research/ on November 29, 2017.

Lazarow, N., Miller, M. L., & Blackwell, B. (2008). The value of recreational surfing to society. *Tourism in marine Environments*, 5(2-1), 145-158.

Mak, James (2017a) How Many Tourists is Too Many? Economic Currents, University of Hawai'i Economic Research Organization, retrieved from http://uhero.Hawai'i.edu/news/view/317 on February 20, 2017.

Mak, James (2017b) Sustainable Tourism Development and Overtourism. University of Hawai'i Economic Research Organization, retrieved from http://www.uhero.hawaii.edu/assets/SustainableTourismDevelopmentOvertourism.pdf on November 15, 2017.

Neuts, B., Nijkamp, P., & Van Leeuwen, E. (2012) Crowding Externalities from Tourist Use of Urban Space. *Tourism Economics* 18(3), 649-670

Peng, M. and Oleson, K.L.L. (2017) Beach Recreationalists' Willingness to Pay and Economic Implications of Coastal Water Quality Problems in Hawai'i. *Ecological Economics* 136, 41-52.

State of Hawaii (2016). Chapter 237D Transient Accommodations Tax. Transient Accommodations Tax Law. http://files.hawaii.gov/tax/legal/hrs/hrs_237d.pdf.

Acknowledgement

The authors acknowledge the financial support from the Waikīkī Beach Special Improvement District Association. They also thank Joseph Toy at Hospitality Advisors LLC for suggestions on the details of tourism data about Waikīkī; Jennifer Chun at Hawai'i Tourism Authority for facilitating the access to their tourism data; and Kwanglim Seo for facilitating the use of STR data. We also thank Rick Egged, Dr. Denise Konan, Dr. James Mak and Jennifer Chun for their technical review. The authors are responsible for any errors on this report.

Appendix: Details of the Analysis

METHODOLOGY

For westbound visitors and visitors from Japan separately, the visitor expenditures lost annually due to a complete erosion of Waikīkī Beach is computed according to the following formula:

Lost expenditures = (share of visitors lost due to beach erosion)*(total number of Waikīkī visitors) * (Average spending per visitor).

Formally, let s_c, V_c, and Exp_c be the share of visitors of type c that would not visit Waikīkī upon beach erosion; the total number of visitors of type c; and the average expenditure per visitor of type c. The sum of the lost expenditures associated with all visitor types yields an economic impact estimate on the value of Waikīkī Beach:

$\sum_{c=1}^{C} \Delta Exp_c$, where $\Delta Exp_c = s_c * V_c * Exp_c$.

THE NUMBER OF VISITORS TO WAIKĪKĪ

Waikīkī's hotel inventory represents approximately 85.2 percent of total hotel supply on O'ahu. Similarly, Waikīkī's hotel demand captures an estimated 85.4 percent of total room nights sold on O'ahu according to STR market research. For the purposes of our analysis, Waikīkī's visitor demand is assumed to be 85.3 percent of O'ahu's total demand.

2016 total Waikiki visitors	4,646,487
X 2016 Oahu average length of stay (nights)	5.79
= 2016 Waikiki visitor nights	26,887,272
2016 % Oahu hotel use	73.6%
2016 % Oahu hotel-only use	64.7%
Occupancy factor (average # of persons per room)	2.3
2016 est. Waikiki hotel room demand (DBEDT) – High	8,600,075
2016 est. Waikiki hotel room demand (DBEDT) – Low	8,078,959
2016 est. Waikiki hotel room demand (DBEDT) – Midpoint	7,557,843

To determine room demand, we start with the number of O'ahu visitors for 2016 (DBEDT), scale it down to the Waikīkī level using the ratio of Waikīkī rooms to O'ahu rooms (STR), then multiplied by the average length of stay (DBEDT) less 1 for nights, resulting in 2016 Waikīkī visitor nights. Using two occupancy rates, percentage O'ahu hotel use (DBEDT) and percentage hotel-only use (DBEDT), along with the occupancy factor defined as the average number of persons in a room (STR), we multiply 2016 Waikīkī visitor nights by occupancy factor (STR) and percentage O'ahu hotel use (DBEDT) or percentage hotel-only use (DBEDT) to determine a "high" or "low" estimate of 2016 Waikīkī room demand, respectively. We take the midpoint of these two estimates as the result.

	Room demand		ADR		Room revenue
2016 Waikiki hotel room demand estimate (high)	8,600,075	X	$230.84	=	$1,985,253,424
2016 Waikiki hotel room demand estimate (midpoint)	**8,078,959**	**X**	**$230.84**	**=**	**$1,864,958,273**
2016 Waikiki hotel room demand estimate (low)	7,557,843	X	$230.84	=	$1,744,663,123

Multiplying the 2016 Waikīkī room demand by the average daily rate (STR) for hotels, we determine room revenue. We can now multiply room revenue by the Transient Accommodation and General Excise Tax rates to determine the associated tax revenues. These results from DBEDT statistics are just for comparison purposes. We make use of STR data to derive a more detailed estimate for our analysis.

	Full Service/ On-Beach	Ltd. Service/ Off-Beach	Total Waikīkī
2016 STR Waikiki room demand	2,261,057	5,169,795	7,430,852
2016 STR Waikiki room revenue	$639,707,755	$1,075,664,071	$1,715,371,826
Oahu average % room revenue to total revenue	69.8%	95.3%	77.0%
Total hotel revenue	$916,486,754	$1,128,713,611	$2,045,200,365

From the STR hotel dataset, we identified two groups of hotel properties, an on-beach set and an off-beach set. The on-beach set is comprised of more expensive hotels that are typically full-service properties, while the off-beach set is comprised of cheaper hotels that are typically limited service properties. Using the same methodology as the DBEDT dataset, we can also determine room demand and revenue for the STR dataset. We assume room revenue as a share of total hotel revenue (STR) ratios for both on-beach and off-beach properties remain the same as they did in 2007. This ratio allows us to estimate hotel revenue other than room revenue, that is, restaurants, spas, and other associated services typically offered at a full-service hotel.

	Full Service/ On-Beach	Ltd. Service/ Off-Beach	Total Waikīkī
2016 TAT generated from room revenue	$59,172,967	$99,498,927	$158,671,894
2016 GET generated from room revenue	$28,786,849	$48,404,883	$77,191,732
2016 GET generated from other hotel revenue	$12,455,055	$2,387,229	$14,842,284
2016 TAT & GET generated from Waikiki hotels	$100,414,871	$150,291,039	$250,705,910

As with the estimate based on the DBEDT dataset, we can multiply room revenue by the Transient Accommodation and General Excise Tax rates to estimate the associated tax revenues. We can now compare the results from the STR dataset with those from the DBEDT dataset and see the difference between the two is negligible.

	DBEDT	STR	% variance
2016 Waikiki room demand	8,078,959	7,430,852	9
2016 Waikiki room revenue	$1,864,958,273	$1,715,371,826	9
2016 TAT from Waikiki room revenue	$153,859,058	$141,518,176	9
2016 GET from Waikiki room revenue	$83,923,122	$77,191,732	9

VISITOR MARKET SHARE, ORIGIN, AND EXPENDITURES

	US	Japan	Other	Total Oahu	% share
2016 Total Oahu visitors	2,677,608	1,442,192	1,327,430	5,447,229	100.0%
2016 Est. Waikiki visitors	2,284,000	1,230,189	1,132,297	4,646,487	85.3%
% market share	49.2%	26.5%	24.4%	100.0%	--

DBEDT visitor statistics track the origin of visitor arrivals. Just under half of visitors to Hawai‘i are from the mainland, over a quarter are from Japan, and the remaining quarter are from elsewhere.

	Westbound	%
US	2,677,608	83.8%
Other	517,754	16.2%
Total	3,195,362	100.0%

	Eastbound	%
Japan	1,442,192	64.0%
Other	809,676	36.0%
Total	2,251,868	100.0%

Mainland visitors comprise of the vast majority of “westbound” visitors, while Japanese visitors make up a similarly large portion of “eastbound” visitors. We make use of this distinction later on to determine visitor responses to beach erosion.

	US	Japan	Canada	Other	Total
2016 Oahu visitors	2,677,608	1,442,192	185,680	1,141,750	5,447,229
% Waikiki visitors	85.3%	85.3%	85.3%	85.3%	85.3%
Total Waikiki visitors	2,284,000	1,230,189	158,385	973,913	4,646,487
Oahu average length of stay	7.19	5.51	8.92	7.10	6.79
2016 Waikiki visitor days	16,420,759	6,783,010	1,413,306	6,916,684	31,533,759
Oahu PPPD expenditure	$181.90	$240.30	$161.14	$280.61	$198.56
Waikiki visitor expenditure	$2,986,863,417	$1,629,938,208	$227,736,974	$1,940,897,070	$6,261,253,798

By downscaling O‘ahu visitor data, we can determine the amount of Waikīkī visitor expenditures by country of origin of interest.

	On-beach	Off-beach	Waikiki total
Room demand	2,261,057	5,169,795	7,430,852
US market share (48.7%)	1,111,432	2,541,234	3,652,666
Japan market share (26.9%)	598,630	1,368,739	1,967,369
Other market share (24.4%)	550,995	1,259,822	1,810,816
X ADR	$282.92	$208.07	$230.84
US room revenue	$314,450,997	$528,747,131	$843,198,128
Japan room revenue	$169,367,043	$284,789,487	$454,156,531
Other revenue	$155,889,714	$262,127,453	$418,017,167
Total revenue	$639,707,755	$1,075,664,071	$1,715,371,826

Applying DBEDT visitor origin data to on-beach and off-beach hotel revenue from above, we can now determine room revenue and other hotel revenue by country of origin.

	Impact on room demand	Impact on room revenue
US	2,013,713	($468,906,578)
Japan	341,312	($75,048,826)
Other	564,284	($130,260,197)
Total	2,919,309	($674,215,601)

Applying the preferences in Table 1 (MTP) to room demand and room revenue by country origin, we can estimate the potential losses to on-beach and off-beach properties as the U.S., Japanese, and other visitors no longer stay in Waikīkī if Waikīkī beach were to completely erode away. “Other” visitors are assumed to behave like U.S. visitors if they are travelling westbound (for example, Canadian visitors) while eastbound visitors are assumed to behave like Japanese visitors.

	On-beach	Off-beach	Waikiki Total (US)
US room demand	1,111,432	2,541,234	3,652,666
% US visitors definitely not staying in Waikiki due to beach erosion	-60.0%	-53.0%	-58.0%
Impact on US room demand	(666,859)	(1,346,854)	(2,013,713)
X ADR	$282.92	$208.07	
Impact on US visitor room revenue due to beach erosion	($188,670,598)	($280,235,979)	($468,906,578)
Oahu average % room revenue to total revenue	69.8%	95.3%	
Impact on US visitor hotel revenue due to beach erosion	($270,301,717)	($294,056,642)	($564,358,358)

The calculation for the U.S. visitors is shown above.

	On-beach	Off-beach	Waikiki Total (Japan)
Japan room demand	598,630	1,368,739	1,967,369
% Japan visitors definitely not staying in Waikiki due to beach erosion	-9.0%	-21.0%	-14.0%
Impact on Japan room demand	(53,877)	(287,435)	(341,312)
X ADR	$282.92	$208.07	
Impact on Japan visitor room revenue due to beach erosion	($15,243,034)	($59,805,792)	($75,048,826)
Oahu average % room revenue to total revenue	69.8%	95.3%	
Impact on Japan visitor hotel revenue due to beach erosion	($21,838,157)	($62,755,291)	($84,593,448)

The calculation for Japan visitors is shown above.

	Westbound	Eastbound	Waikiki total (Other)
% visitor arrivals	39.0%	61.0%	100.0%
Other MMA room demand	706,296	1,104,521	1,810,816
% visitors definitely not staying in Waikiki due to beach erosion	-58.0%	-14.0%	-36.5%
Impact on Other MMA room demand	(409,651)	(154,633)	(564,284)
X overall Waikiki ADR	$230.84	$230.84	
Impact on Other MMA visitor room revenue due to beach erosion	($94,564,512)	($35,695,684)	($130,260,197)
Oahu average % room revenue to total revenue	71.8%	71.8%	71.8%
Impact in Other MMA visitor hotel revenue due to beach erosion	($131,705,449)	($49,715,438)	($181,420,887)

The calculation for “other” visitors is shown above.

	Total room revenue impact	Total hotel revenue impact
US	($468,906,578)	($564,358,358)
Japan	($75,048,826)	($84,593,448)
Other	($130,260,197)	($181,420,887)
Total	($674,215,601)	($830,372,694)

Similarly, applying the preferences in Table 1 (MTP) to room revenue and other (or total) hotel revenue by country origin, we can estimate the potential losses to on-beach and off-beach properties as the U.S., Japan, and other visitors no longer stay in Waikīkī if Waikīkī beach were to completely erode away.

TAX REVENUES LOST

Transient Accommodations Tax:	
Potential room revenue loss:	($674,215,601)
X Transient Accommodation Tax (TAT) @	9.25%
= Potential TAT impact from hotel revenue	($62,364,943)
General Excise Tax:	
Potential hotel revenue loss:	($830,372,694)
X General Excise Tax (GET) @	4.50%
= Potential GET impact from hotel revenue	($37,366,771)

By applying the Transient Accommodations and General Excise tax rates, we can now determine the tax revenue loss from lost hotel revenues.

BEACH CONCESSION REVENUE

% paid activity participation	US	Japan
Surfing	9.6%	8.6%
Sunbathing	15.8%	1.6%
Canoe paddling	0.2%	0.0%
Snorkeling	20.2%	1.4%

To account for lost spending at beach concessions for activities such as surfboard and beach chair & umbrella rentals in the event Waikīkī beach is completely eroded away, we first examine participation (MTP) in each of these paid activities for the U.S. and Japanese visitors.

	US	Japan	Other	Total
# Waikiki visitor arrivals	2,284,000	1,230,189	1,132,297	4,646,487
% not returning due to beach erosion	58.0%	14.0%	36.5%	
= # of potential visitors not returning	1,324,720	172,227	413,289	1,910,235

Next, combine paid activity participation rates (MTP) with the number of visitors not returning due to beach erosion (MTP, DBEDT), and the result is the loss in paid activity spending by visitor country of origin.

	U.S. Spending Impact	Japan Spending Impact	Other Spending Impact	Total Spending Impact
Surfing @ $12/Board Rental	$1,472,085	$171,449	$430,083	$2,073,618
Sunbathing @ $12/Umbrella & Chair Rental	$2,422,806	$31,898	$341,511	$2,796,214
Canoe Paddling @ $17/Rental	$46,003	$0	$5,598	$51,601
Snorkeling @ $17/Gear Rental	$4,646,267	$41,866	$626,665	$5,314,798
Total Impact on Beach/Water Activity Spending	$8,587,161	$245,213	$1,403,857	$10,236,231

Potential Activity Revenue Loss:	($10,236,231)
X General Excise Tax (GET) @	4.50%
= Potential GET impact from activity revenue	($460,630)
Potential GET impact from hotel revenue	($37,366,771)
Potential GET impact from Activity Revenue	($460,630)
= Potential GET impact from activity revenue	($37,827,402)

ENTERTAINMENT & RECREATION SPENDING

Category	2016 PPPD $	% share
Food and beverage	$38.21	37.5%
Entertainment & recreation	$17.05	16.7%
Transportation	$14.50	14.2%
Shopping/retail	$32.12	31.5%
Grand total PPPD	$101.88	100%

Using per person per day spending categories (DBEDT) shown above, we can examine its effects on other areas of visitor spending, including different categories of entertainment and recreation spending.

Category	2016 PPPD	Estimated loss of visitors per day	# days	Impact allocation
Food and beverage	$38.21	41,639	365	$580,766,382
Entertainment & recreation	$17.05	41,639	365	$259,158,498
Transportation	$14.50	41,639	365	$220,324,827
Shopping	$32.12	41,639	365	$488,139,309
Total expenditure excluding lodging				$1,548,389,016
Room revenue				$674,215,601
Total potential economic impact				$2,222,604,617

Combined with the reduction in visitation due to beach erosion, we determine lost visitor expenditures in each category.

Total estimated impact on total Waikiki visitor expenditures	($2,222,604,617)
Including:	
Estimated hotel room expenditure	($674,215,601)
Estimated retail expenditure	($488,139,309)
Estimated entertainment & recreation	($259,158,498)
Estimated food & beverage expenditure	($580,766,382)
Estimated transportation expenditure	($220,324,827)

NET HOTEL SPENDING AND TAX REVENUE LOSS

	$ revenue impact	Tax rate	$ tax impact
Estimated TAT impact	($674,215,601)	9.25%	($62,364,943)
Estimated GET impact	($2,222,604,617)	4.50%	($100,017,208)
Total tax impact			($162,382,151)

Finally, with hotel spending, paid activity spending, and entertainment & recreation spending loss estimates and their associated tax implications account for, we arrive at the net hotel revenue loss and net tax revenue loss.

Potential hotel revenue loss	($830,372,694)
Estimated TAT impact	($62,364,943)
Estimated GET impact	($37,366,771)
Estimated total hotel impact	($930,104,408)

A remark is in order regarding the average spending computation. This study produced different estimates using both Waikīkī-based and O`ahu-based data for per person per day spending as HA (2008) appeared to apply both in its computation.


Sea Grant


WBSIDA
Waikiki Beach
SPECIAL IMPROVEMENT
DISTRICT ASSOCIATION