

# The economic value of America's beaches

By

James R. Houston

U.S. Army Engineer Research and Development Center  
3909 Halls Ferry Road, Vicksburg, MS 39180  
james.r.houston@usace.army.mil

---

## ABSTRACT

Travel and Tourism (T&T) is among America's largest industries, its largest employer, and its largest producer of a trade surplus. It is also one of America's healthiest industries and is projected to grow at twice the rate of the U.S. economy over the next 10 years. The U.S. is the world's most competitive country in tourism, attracting more than three times the number of international tourists as any other country. Surveys have repeatedly shown that beaches are by far the most popular U.S. tourist destination. There are about 3.4 billion visits to U.S. beaches annually. This is an enormous number of visits — more than 225% times greater than the combined annual attendance at all National Park properties from the Washington Monument to the Grand Canyon; state parks; all amusement-park attractions such as Disney World; all professional and collegiate football, basketball, and baseball games; cruises; and events of the National Association for Stock Car Auto Racing. Beach tourists spend \$240 billion annually, more than the value of all crops grown in America or oil exported by Saudi Arabia. They generate an economic output of \$520 billion. U.S. tourism was hit hard during the coronavirus pandemic. However, unlike other tourism, beach tourism boomed during the pandemic, showing remarkable resilience as tourists flocked to beaches

that they thought were safe because they were in the open air with plenty of sunshine. Since then, science confirmed the safety of beaches during the pandemic. Beach nourishment provides unprecedented economic return, sustainable employment, and storm-damage protection. It has an extremely high return-on-investment, with U.S. beach tourists generating annually about \$3,000 in economic output, \$1,400 in direct spending, and \$200 in taxes for every \$1 spent on nourishment. The \$36 billion in taxes that U.S. beach tourists generate each year is over four times the total spent on all beach nourishment during the 100 years from the first beach nourishment in 1923 through 2022. Tourism jobs have boomed, providing one of every four new jobs in 2022. Moreover, tourism jobs in America cannot be outsourced and will not be impacted much by artificial intelligence. In addition to producing a booming economy by being a magnet for tourists, wide beaches and high dunes have been documented to provide billions of dollars in protection to land infrastructure during storms. However, beaches are threatened by erosion caused primarily by dams and navigation projects that greatly impact sand flowing to the coast and remaining in the littoral system. Beach nourishment is needed to mitigate this environmental impact and restore the balance.

Houston (2018a) highlighted the economic value of America's beaches, noting that the travel and tourism (T&T) industry is becoming increasingly dominant in economies throughout the world. T&T is among America's largest industries, its largest employer, and its largest producer of a trade surplus. Moreover, beaches are by far America's leading tourist destination. Beach tourism boomed during the pandemic from 2020-2022 in contrast with other tourism that was hit hard by the coronavirus (COVID) (Houston 2023).

Beaches also provide significant economic benefits protecting infrastructure. It has long been known that wide beaches with high dunes provide significant protection of infrastructure from storms. The National Research Council (1995) noted that: "A wide beach is effective in dissipating wave energy... The destructive force of storm waves thus falls on the beach rather than on upland structures."

**ADDITIONAL KEYWORDS:** Tourism, beach nourishment, pandemic, COVID, debris cleanup, jobs, trade balance, infrastructure protection, Blue Flag, Gross Domestic Product.

*Manuscript submitted 18 August 2023,  
revised and accepted 21 October 2023.*

## T&T AND THE ECONOMY

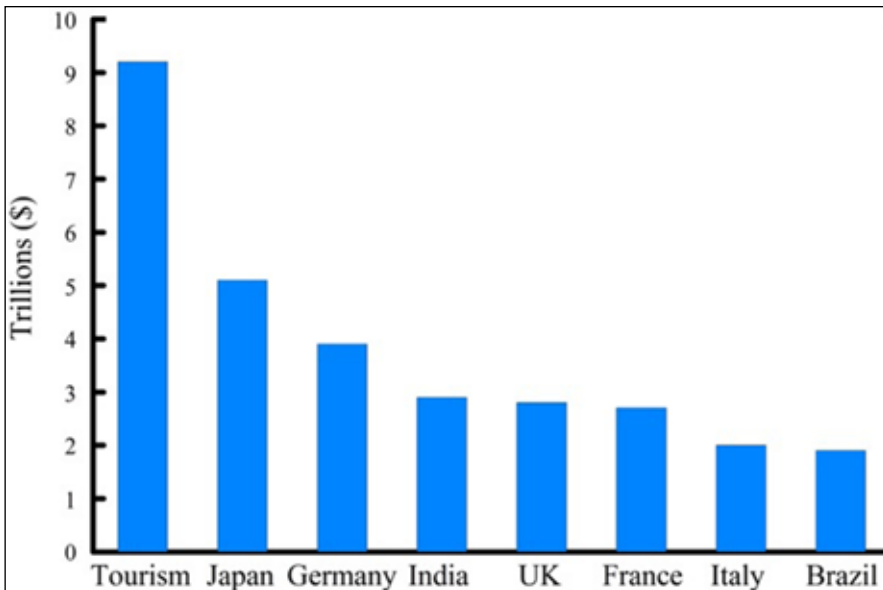
### World economy

T&T is one the world's largest industries, contributing \$9.2 trillion to the world's Gross Domestic Product (GDP) in the pre-pandemic year of 2019. This exceeds the GDP of all countries other than the U.S. and China, which have GDPs of \$27 trillion and \$18 trillion, respectively (Figure 1; World T&T Council 2022a; International Monetary Fund 2023).

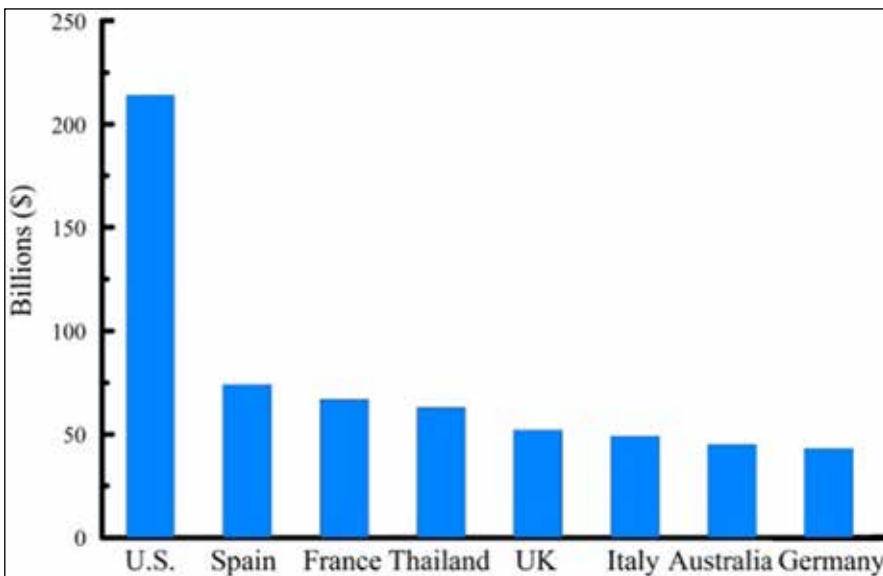
### U.S. economy

About two thirds of U.S. consumer expenditures are for services rather than goods, and T&T is a major service indus-

try (Economic Research 2023). U.S. T&T generated \$2.6 trillion in total (direct, indirect, and induced) economic output in 2022 (U.S. Travel Organization 2023). This is greater than the \$2.5 trillion total output of the entire U.S. manufacturing sector in 2021 (MacroTrends 2023). Leisure tourists generate \$1.8 trillion in economic output, which is over 70% of total T&T economic output (U.S. Travel Organization 2023). In addition, T&T in the U.S. has been one of the fastest growing sectors of the economy, and is projected to grow at an annual rate from 2022-2032 that will be almost double the overall growth of the U.S. economy, making it one of the economy's healthiest sectors (World T&T Council 2022b). T&T produced \$179.6 billion in annual tax revenue to federal, state, and local governments in 2019, and without this revenue each American household would pay \$1,398 more in taxes (U.S. Travel Organization 2020a).



**Figure 1. The contribution T&T makes to the worldwide GDP compared with countries having the highest GDPs (other than the U.S. and China). UK is the United Kingdom (International Monetary Fund 2023).**



**Figure 2. Eight countries with the greatest international tourism receipts in 2018 (Gohosh 2019).**

### T&T MEANS JOBS IN AMERICA

T&T is the largest employer in both the world and America, providing 334 million jobs throughout the world in pre-pandemic 2019 (9.7% of jobs) and 15.8 million jobs (10% of jobs) in the U.S. (U.S. Bureau of Labor Statistics 2021; U.S. Travel Organization 2020b; Hotelmize 2021; Statista 2023a). T&T is the leading U.S. small-business employer and has grown jobs faster than average job growth, including accounting for one out of every four new jobs in 2022 (U.S. Travel Organization 2020c; 2023). In contrast, all U.S. manufacturing industries from Ford to Boeing to Intel employed only 12.8 million people in 2019, having steadily lost

almost seven million jobs in the past 40 years due to outsourcing and automation (U.S. Bureau of Labor Statistics, 2019). Automation and artificial intelligence (AI) have already reduced the number of jobs in the European Common Market (EU) (Bordot 2022), and the U.S. and EU have studied the significant AI threat to jobs in the future (Whitehouse.gov 2022). In a decade, AI is expected to eliminate 25% of all American jobs (Technology.org 2022). AI will undoubtedly eliminate some routine jobs in the T&T industry, but most T&T jobs cannot be offshored or automated using AI. There can be intense competition among countries for tourists, but if a tourist wants to experience Venice

Beach in Los Angeles or South Beach in Miami Beach, that tourist will travel to Los Angeles or Miami Beach, stay in a hotel, eat at restaurants, and pay for entertainment.

### T&T IS KEY TO INTERNATIONAL COMPETITIVENESS

U.S. is the world's largest T&T market and is highly competitive with international travelers to the U.S. spending \$239 billion in 2019 pre-pandemic, by far the largest international tourist spending in the world (Figure 2; World T&T Council 2022a; U.S. Travel Organization 2023). U.S. T&T generated a trade surplus of \$55 billion in 2019 as international tourists spent more in the U.S. than U.S. tourists spent abroad (U.S. Department of Commerce 2020). The U.S. ran deficits in all goods trade categories in pre-pandemic 2019 including a \$9.3 billion deficit in agriculture, despite the U.S. being the world's largest agricultural-products exporter, but also its largest importer after China (U.S. International Trade Commission 2020; Wunsch 2022; Ross 2023). In 2019 the U.S. ran a merchandise trade deficit with China of \$345 billion but a T&T trade surplus of \$28.3 billion (U.S. Department of Commerce 2021). Similarly, the U.S. ran T&T trade surpluses with most major countries for which it has large trade deficits, including surpluses of \$11.4 billion with India, \$9.2 billion with Brazil, \$6.3 billion with South Korea, and \$6.0 billion with Japan (U.S. Department of Commerce 2021).

### BEACHES ARE KEY TO U.S. T&T

Surveys consistently find that beaches are the leading tourist attraction in the U.S., with about 50% of Americans saying it is their favorite vacation destination despite many interior tourist attractions from the Grand Canyon to Las Vegas to Disney World (Gavin 2017; Kunst 2019; Turner 2020; Kiesnoski 2021; Reddish 2021; DestinationAnalysts 2023; Diaz 2023).

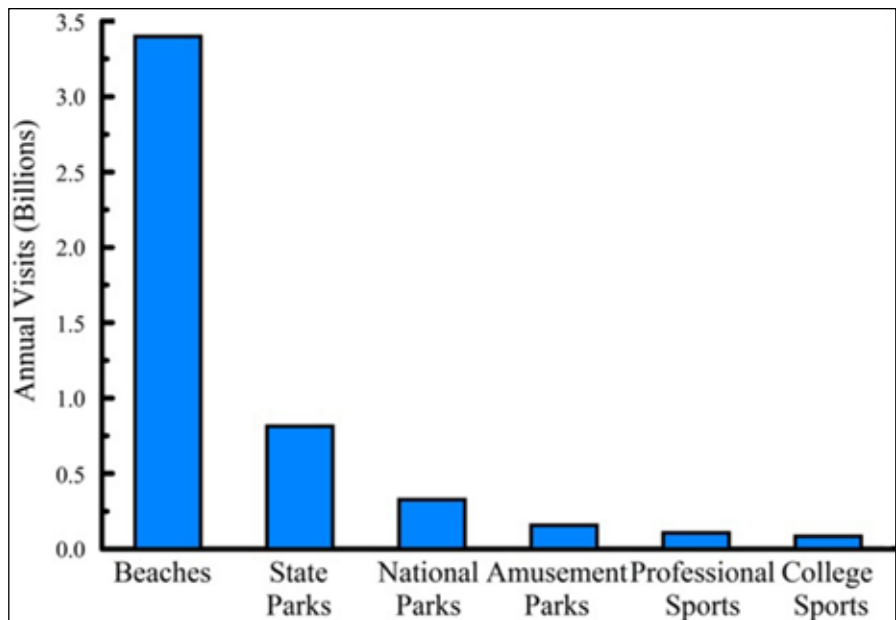
An estimated 180 million Americans made 2 billion visits to beaches in 2001 (FindLaw.com 2002). Based on this, Houston (2018a) used U.S. population growth to estimate the increase in visits from 2001 to 2017. However, tourism growth has increased much more rapidly than population growth. A more appropriate estimate of tourist-visit growth is real-tourism output in constant dollars, which factors out inflation in 2001 versus

the pre-pandemic output in 2019. The ratio of these two outputs from 2001 to 2019 is about 1.45 (U.S. Department of Commerce 2022a,b). Comparisons will be for pre-pandemic 2019 because it will be shown later that non-beach tourism was hit hard by the pandemic in 2020-2022.

The 2 billion beach visits are visits by Americans. About 13.7% of tourists in the U.S. are international tourists (U.S. Travel Organization 2020c). International tourists are attracted to beaches at least as readily as domestic tourists; for example, 44% of tourists at Miami Beach are international tourists (MiamiBeach411 2022). Increasing the number of visitors in 2001 by 13.7% and then projecting from 2001 to 2019 using the 1.45 growth factor yields about 3.3 billion tourist visits to beaches in pre-pandemic 2019.

The 3.3 billion tourist visits to beaches in 2019 can be compared with data from a recent survey asking Americans how often they visited beaches (Windfm.com 2023). Two percent said they visited beaches daily, and with a U.S. population of 328 million in 2019, this is about 2.4 billion beach visits (U.S. Census Bureau 2020). But these visits are by people living at or near the beach and are typically not considered “tourist” visits. Therefore, they are not included in the tourist beach-visit estimate. Forty-seven percent said they visited the beach once a year, 15% once a month, 10% once a week, 19% every few years, and 7% never. “Few” is often meant to be three but selecting “five” for “few” instead of “three” changes the number of visits by less than 2% (Dictionary.com 2023). With a U.S. population of 328 million in 2019 and the average trip of 6.9 days for those going once a year or every few years and an average trip of a day for those going once a week or month, this is 3.5 billion beach visits (Statista Research Department 2014). Therefore, the estimated number of beach visits based on a 2023 survey is similar to an estimate based on an estimate in 2001 that is extrapolated to the present.

Another national estimate uses lifeguard counts. The U.S. Lifesaving Association (2023) counted about 1.1 billion people at beaches it protects. However, only 30%-35% of beaches are protected by the Association, giving an estimate of 3.1 billion to 3.7 billion for all beaches (U.S. Lifesaving Association 2023). This may be an undercount, because during



**Figure 3. Comparison of the number of annual visits to beaches with other major recreational attractions. Cruise line passengers and NASCAR attendances are too small to be displayed on the plot.**

the summer lifeguards are typically on duty for 8-10 hours, but there are about 14 hours of sunlight. Moreover, in other seasons there typically are not lifeguards because fewer people enter the ocean. For example, in Southern California, temperatures are moderate but in the winter only 26% of those at beaches enter the water, and lifeguarding is reduced or eliminated (Dwight *et al.* 2007). However, some people visiting beaches once a day may be in the lifeguard counts, although they live near the beach and typically use it before or after work and seasons when lifeguards are not on duty. Taking the lifeguard count as 3.4 billion (average of the range 3.1-3.7 billion) and averaging with the other two counts of 3.3 and 3.5 billion yields an estimate of about 3.4 billion annual beach visits. The three very different methods to estimate annual beach visits yield remarkably similar results.

The reasonableness of the average national beach visit estimate can be seen by comparing it to state estimates. The California Department of Boating and Waterways and Coastal Conservancy (2002) estimated that California beaches had 659 million day visits in 2001. Again, using the 1.45 factor for the growth of tourism from 2001 to 2019, this would be 956 million day visits in 2019. Similarly, the Florida Department of Environmental Protection estimated “conservatively” that Florida residents made at least 500 million visits to the beach (Kavanagh

*et al.* 2011). The real tourism output in 2009 versus 2019 in constant dollars for Florida produces a multiplicative factor of 1.48, yielding 740 million beach visits by Florida residents in 2019 (U.S. Department of Commerce 2022b,c). Florida had 112 million out-of-state tourists in 2017 with estimates of 370 million beach visits (Houston 2018a). Florida’s 131 million out-of-state tourists in 2019 results in a proportional estimate of about 430 million beach visits by out-of-state tourists in 2019 (VisitFlorida.org 2020). Therefore, Florida had a total of about 1.17 billion beach visits in 2019.

Combining these estimates, the two states had about 2.1 billion beach visits in 2019. This implies that there are 4.5 billion beach visits nationally due to California and Florida having just 47% of the shoreline length of states with significant beach tourism (Beaver 2006). Therefore, the estimate of 3.4 billion visits may be an underestimate.

The magnitude of the number of beach visits can be appreciated by comparing these visits to other recreational attractions in 2019 before the pandemic. There were 327 million day visits in 2019 to the 424 National Park Service properties (National Park Service 2020; National Park Foundation 2023). The 2,474 state parks had 813 million visits (Stateparks.org 2020; America’s State Parks 2023). In 2019, all U.S. amusement parks such as Disney World, Disneyland, Universal

Studios, SeaWorld, and Six Flags attracted 159 million day visits (Themed Entertainment Association 2019). In 2019 the combined attendance at National Football League, Major League Baseball, and the National Basketball Association games was 107 million (Baseball America 2023; ESPN 2023; and Pro-football-reference.com 2023). Men's college football, basketball, and baseball had 84 million in attendance in 2019 (National Football Foundation 2023; NCAA 2019; WSN 2023). There were 13.8 million U.S. cruise line passengers (Statista 2022a). Races of the National Association for Stock Car Auto Racing (NASCAR) had 2.3 million attendees (Motorracingsports.com 2023). The number of beach visits annually is over 225% greater than the combined 1.5 billion visits of all of these attractions combined (Figure 3).

Beaches make a large contribution to the U.S. economy. Houston (2018a) estimated that beach tourists were responsible for 28.8% of leisure-tourist spending and contributions to the U.S. GDP in 2017 based on the number of beach visits in California versus national visits and a detailed economic study by the California Department of Boating and Waterway and Coastal Conservancy (2002). Americans took 1.9 billion person-trips in 2019 (U.S. Travel Organization 2020c). With the average leisure vacation trip being 6.9 days (Statista Research Department 2014), there were 13.1 billion person-trip-days in 2019. Beach visits of 3.4 billion persons are about 26% of the total. This is similar to the 28.8% that is based more directly on tourist spending.

Assuming the 28.8% share of the direct leisure-tourist spending in 2022 of \$837 billion, beach tourists spent \$240 billion in 2022 (U.S. Travel Organization 2023). This is greater than the \$192 billion value in pre-pandemic 2019 of every U.S. crop (e.g., corn, wheat, soybeans, fruits, and vegetables) or the \$171 billion in oil exports in 2022 of Saudi Arabia, the world's largest oil producer (U.S. Department of Agriculture 2022; Statista 2023b). Leisure tourists produce a total economic output of \$1.8 billion annually, and the 28.8% contribution yields an economic output of about \$520 billion by beach tourists (U.S. Travel Organization 2023). Leisure tourism generated about \$125 billion in taxes to local/state/federal governments in 2019 with beach tourism's share being \$36 billion (U.S. Travel Organization 2023).

Beach tourists spend \$240 billion annually to pay for far more than beach chair and umbrella rentals. Those on vacations at the beach stay in hotels and condos at or near the beach, eat at restaurants, and pay for other local entertainment. Again, the magnitude of the spending can be appreciated by comparing it to other recreational attractions. Visitors to National Parks spent \$20.5 billion in 2021 within 60 miles of parks they were visiting (U.S. Department of the Interior 2022). State park visitors spend \$51 billion annually, assuming they spend the same per capita as visitors to National Parks. In 2019 pre-pandemic, visitors to all U.S. amusement parks spent \$20.1 billion (Federal Reserve Economic Data 2022). In 2021-2022, \$31.8 billion was spent to attend all games in the National Football League, Major League Baseball, and the National Basketball Association (Sportico.com 2022; Sportsvalue.com 2022; Forbes 2023). All Division I sports including college football, basketball, and baseball had revenues of \$15.8 billion in pre-pandemic 2019 (Crawford 2023). U.S. cruise line passengers spent \$13.3 billion in pre-pandemic 2019 (Statista Research Department 2023). Those attending NASCAR races spend \$190 million annually (Rookieroad 2023). Combining this spending yields annual spending of about \$150 billion. Beach tourists spend about 160% more annually than is spent on all of these attractions combined.

#### **BEACH TOURISM WAS VERY RESILIENT DURING COVID**

Overall tourism was hit hard during the COVID pandemic, but as soon as beaches began to be reopened to the public in about May 2020, people flocked to them, seemingly recognizing that beaches were one of the safest places to be because of fresh air and sunshine (Forbes 2020). Houston (2023) showed that beach tourists in the 20 coastal states with sandy beaches shattered attendance records. In contrast, overall tourism spending in these 20 coastal states dropped 44% and 24% in 2020 and 2021, respectively, relative to pre-pandemic 2019 (U.S. Travel Organization 2022).

This boom in beach tourism contrasted with the near-collapse of attendance at inland tourist attractions. For example, attendance at Disneyland in Orange County, California, was down more than 80% in 2020 compared to 2019, but attendance at beaches in Orange County

was up, with Newport Beach having 7.7 million beach visitors in 2019 and a record 8.3 million in 2020 during the height of the pandemic (Orange County Register 2021; Statista 2022b). Similarly, tourists flocked to Miami Beach, with the number of U.S. tourists increasing a remarkable 63% to record levels in 2021 compared to 2019 (Greater Miami and Beaches 2022). In contrast, the number of visitors at Disney World in Orlando fell 68% in 2020 and 40% in 2021 relative to 2019 and was still below 2019 levels in 2022 (Themed Entertainment Association 2022; Travelweekly.com 2022).

People's perceptions of the relative safety of open environments proved correct. Experts have shown that sunlight causes the COVID virus to be inactivated on surfaces and in the air within minutes (Spencer 2020). Other experts have noted that beaches were some of the safest places to be during COVID and that there has never been a COVID outbreak linked to a beach anywhere in the world (Washington Post 2021; Yahoo News United Kingdom 2021).

Houston (2023) noted that the popularity of beaches during the pandemic continued after COVID cases decreased significantly and the pandemic was no longer a news item. In 2017-2019 before the pandemic, surveys at Daytona Beach, Florida, showed that a constant 60% of tourists listed beaches as their reason for going to Daytona Beach (Daytonabeach.com 2023). Because of the pandemic, there were no surveys in 2020. In 2021 and 2022, conventions and tourist attractions such as the Daytona International Speedway were fully operating, but the percentage of those listing beaches as their reason for going to Daytona Beach rose to over 80% with the percentage in 2022 being even greater than 2021 (Daytonabeach.com 2023). In 2017-2019, about 80% of Daytona Beach tourists said they went to the beach regardless of their reasons for vacationing at Daytona Beach, but in 2021-2022 the percentage rose to 90% (Daytonabeach.com 2023). This indicates that some tourists who may have taken few beach vacations in the past found a new liking for beaches after vacationing there during the pandemic.

#### **BEACHES PROTECT INFRASTRUCTURE**

Dean (2001), noted that: "A wide beach during storm-induced elevated

**Table 1.****Estimated change in visitor days and spending by reducing beach debris to near zero or doubling it (based on Tables 7 and 10, NOAA 2023).**

	Orange County, CA	Delaware & Maryland	Alabama	Ohio
Number of visitor days	27.1 million	24.0 million	4.6 million	8.2 million
Visitor spending	\$2.4 billion	\$2.2 billion	\$630 million	\$790 million
<b>Debris reduced to zero</b>				
Change in visitor days	2.1 million	480,000	310,000	2.8 million
Change visitor spending	\$187 million	\$44 million	\$43 million	\$273 million
<b>Debris doubled</b>				
Change in visitor days	- 4.6 million	- 3.5 million	- 1 million	-2.8 million
Change visitor spending	- \$414 million	- \$254 million	- \$113 million	- \$274 million

water levels and high waves provides a very effective energy absorber. Basically, the wave energy is dissipated on and absorbed by the wide beach rather than on upland structures.” He cited Shows (1978), who quantified the benefit of wide beaches by analyzing the damage to 540 upland structures as a result of Hurricane Eloise in Florida in 1975.

Beach nourishment produces a wider protective beach, with the National Research Council (1995) noting that: “Beach nourishment creates a ‘soft’ (i.e., nonpermanent) structure by adding sand to make a larger sand reservoir, which pushes the shoreline seaward.” The National Research Council (2014) considered beach nourishment to be a “... nature based coastal risk reduction” strategy that is “designed and engineered to mimic natural features for the purpose of attenuating storm surge.”

In general, there has been little funding to document storm-damage reduction produced by wide beaches, although some documentation is available for beaches widened by beach nourishment projects. For example, Florida Atlantic University studied damage in Florida during the 2004 and 2005 hurricane seasons and showed that nourished beaches prevented a loss of \$1.8 billion in property values (Welch and Brockbank 2016). The U.S. Army Corps of Engineers (USACE) showed that beach nourishment projects in New Jersey and New York prevented \$1.3 billion in damages during Hurricane Sandy (USACE 2016). Beach nourishment projects at Ocean City, Maryland, which were started in the early 1990s, have prevented \$927 million in damages (Delmarvanow.com 2017). An analysis of damage in North Carolina during Hurricanes Bertha and Fran showed “far less damage to structures in locations protected by USACE beach nourishment

projects than in adjacent unprotected locations” (National Research Council 2014).

The damage reduction provided by beach nourishment is recognized at the federal level with nourishment accounting for 80% of the expenditures of the USACE’s Shore Protection and Restoration Program (National Research Council 2014). Storm-damage reduction rather than recreation benefits must be the main justification for beach nourishment in this program.

Houston (2022a) showed that beach nourishment provides resilient protection. He noted that nourishment is partially self-healing, because during a storm some of the sand moves to offshore bars where it causes waves to break and reduces infrastructure damage, and then much of that sand returns to shore after the storm passes. For example, within days to weeks of the passage of Hurricane Sandy, sand began moving back onshore along the New Jersey shoreline, and it was noted that this happens after all storms on the New Jersey shoreline (Coastal Research Center 2012). Some of the sand also moves through longshore transport to adjacent shorelines, increasing their protection against storms (Houston 2019). Beach nourishment also facilitates rapid recovery from storms. For example, Hurricane Sandy made landfall in 2012 near Atlantic City, New Jersey, which had a beach nourishment project in 2011. The beach lost width and elevation during Sandy, but the city’s casinos were back up and running in five days (*USA Today* 2013). In contrast, the municipalities of Margate and Longport, which are on the same barrier island as Atlantic City but were further from Sandy’s landfall, had declined to participate in a beach nourishment project in 2003 and suffered “substantial storm wave inundation” in

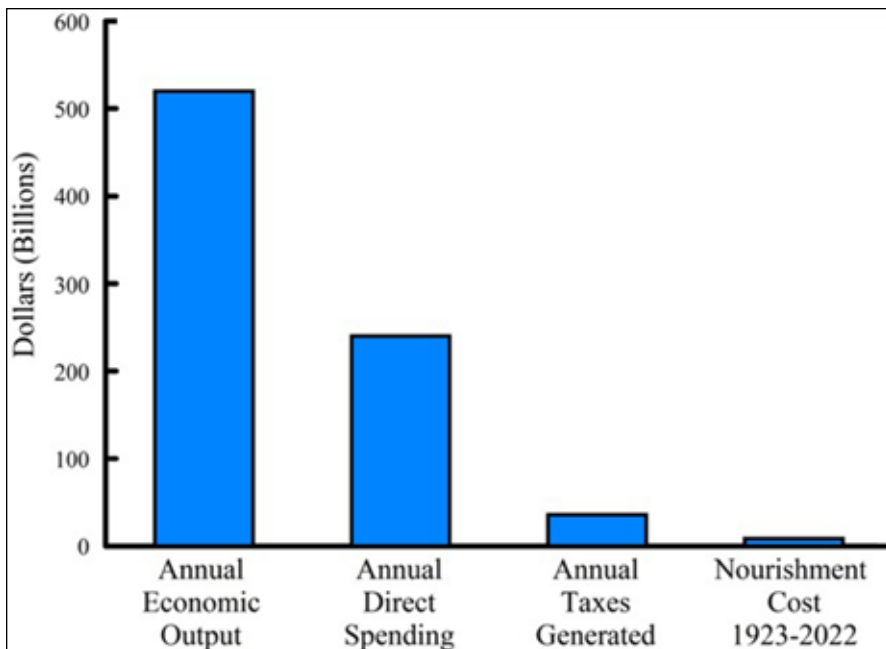
2012 (Barone *et al.* 2014). Margate’s mayor said 1,000 houses were damaged, and he estimated it would take two years to recover (*The Press of Atlantic City* 2012).

Beach nourishment also is an adaptable approach to climate change because the rate of sand placement can be easily varied over time to mitigate the wide range of projected future sea level rises. For example, Houston (2020) used projections of the Intergovernmental Panel on Climate Change (IPCC) and showed that if beach nourishment placement in Florida continued at its 30-year rate from 1988-2017, Florida shorelines would advance seaward for all IPCC scenarios except for Gulf of Mexico shorelines for IPCC’s upper-confidence-level projection of its worst scenario (IPCC 2019). The rate could be increased on Florida’s Gulf of Mexico shoreline if the likelihood increased of the worst scenario occurring. Similarly, Toimil *et al.* (2023) used IPCC projections and not only found that beach width could be maintained until 2100 on its Narrabeen-Collaroy beaches north of Sydney, Australia, but concluded that by maintaining the width to 2100 Australia would avoid the loss of 785 million Australian dollars in asset losses from flood damage (Toimil *et al.* 2023).

#### THE VALUE AND RETURN-ON-INVESTMENT OF MAINTAINING BEACHES

##### *Clean beaches*

The Marine Debris Program of the National Oceanic and Atmospheric Administration (NOAA) funded a study on how human-produced debris on beaches (e.g., plastics, cigarette butts, food wrappers, and derelict fishing gear) affects the behaviors of beachgoers, and as a result the economies of coastal communities where beach tourism is important (NOAA 2023). Beaches were studied in Orange County, California; Delaware and



**Figure 4. Annual economic output, direct spending, and taxes generated by beach tourists compared with spending on beach nourishment estimated by ASBPA (2023b) for the 100 years from 1923 to 2022.**

Maryland; Alabama; and on Lake Erie in Ohio. The study looked at the gain and loss in tourist-visitor days and spending if the debris were reduced to near zero or doubled. Table 1 presents results.

According to Table 1, eliminating beach debris to almost zero would increase tourist beach spending by 2%-35%. With national beach tourists spending of \$240 billion annually as found in the previous section entitled “BEACHES ARE KEY TO U.S. T&T,” eliminating debris nationwide would increase beach tourist spending by about \$5-84 billion. Conversely, beach visitor spending would drop about 12%-35% if the quantity of debris were doubled, causing a national decrease in beach tourist spending of about \$29-84 billion annually.

Beach communities have been increasingly aware of the importance of clean beaches. The return-on-investment (ROI) of cleaning beaches is huge because coastal communities often use volunteers to clean beach debris. The Ocean Conservancy started International Coastal Cleanup Day over 35 years ago and cleanup takes place in 150 countries (Ocean Conservancy 2022a). In 2021 more than 220,000 people worldwide participated in the Day, cleaning debris from almost 50,000 miles of shoreline (Ocean Conservancy 2022b). The Surfrider Foundation and the Reef shoe company formed the Better Beach Alliance in 2018; in 2021,

the Alliance engaged 30,000 volunteers to clean beaches at 1,000 locations (REEF 2021; Surfrider Foundation 2023). There are also many local organizations that sponsor beach debris cleanup. For example, the Clean Ocean Action organization has had a “Beach Sweeps” program since 1985 with 8000 volunteers cleaning 75 miles of beaches in 2022 along the New Jersey shore (Clean Ocean Action 2023). Similarly, an average of 350 volunteers join monthly to clean Seal Beach in California (Kelly 2019).

Beach communities are increasingly becoming involved in the Blue Flag designation program. The Blue Flag is the world’s most recognized voluntary award for clean marine areas including beaches. In order to qualify for the Blue Flag designation, a series of stringent environmental, educational, safety, and accessibility criteria must be met and maintained. There are 5,000 Blue Flag beaches around the world. Spain and Greece have the most — 621 and 581, respectively (Guinnessworldrecords.com 2023). Several studies have shown there are economic advantages for a beach to have a Blue Flag designation (Boevers 2008; McKenna *et al.* 2011; and Rigall-i-Torrent *et al.* 2011; Halkos and Matsiori 2012).

Amazingly, Blue Flag beach designations were not awarded in the U.S. until 2023 when Westward Beach in Malibu, California, and Delray Beach, Florida, re-

ceived the recognition from the Blue Flag International Jury (ASBPA 2023a). It is anticipated that many more U.S. beaches will receive the coveted designation in the future and this will aid in keeping U.S. beaches clean.

#### **Beach nourishment**

Maintaining beaches through beach nourishment has a tremendous ROI. Beach tourists annually generate \$520 billion in economic output, \$240 billion in direct spending, and \$36 billion in taxes to federal, state, and local governments as was shown at the end of the section on “BEACHES ARE KEY TO U.S. T&T.” The ASBPA (2023b) estimates that \$8.7 billion has been spent by federal, state, and local governments and local communities on beach nourishment during the 100 years from the first beach nourishment in 1923 through 2022 (Figure 4). Beach tourists annually generate taxes that are more than 4 times greater than ever spent on beach nourishment in 100 years. Most nourishment spending has been the past 50 years since the early 1970s, resulting in average expenditures per year of about \$175 million. Therefore, for every \$1 spent on beach nourishment annually, beach tourists generate about \$3,000 in economic output, \$1,400 in direct spending, and \$200 in taxes annually. In comparison, the National Park Service had a 2019 federal budget of \$3.2 billion, and most Americans think it is woefully underfunded (Powell 2019; Congressional Research Service 2019). Visitors to national parks generate an estimated \$42.5 billion in economic output and \$20.5 billion in direct spending within 60 miles of a national park (National Park Service 2022). This is \$12.50 and \$6.40 annually in visitor-generated economic output and spending, respectively, per \$1 invested in the parks. This is a good ROI, but only about 4% of the ROI of beach nourishment.

With 3.4 billion beach visits annually and annual expenditures of \$175 million for beach nourishment, about \$0.05 is spent on beach nourishment for every beach visit, with about half (\$0.025) funded by the federal government and the other half by state/local governments (Houston 2018a). There are 327 million visits to national parks and a budget of \$3.2 billion, and the federal government spends \$9.79 for every visit to a national park compared to \$0.025 for every beach visitor. Similarly, states spent \$39.9 billion

on state parks in 2013 (Semow 2021). With 813 million annual visits, state governments spend \$49.08 for every visit to a state park in contrast to \$0.025 for every visit to a beach.

The beach nourishment project at Miami Beach is notable for its large ROI. In the mid-1970s Miami Beach had almost no beach; as a result, tourism dropped and hotels became run down. By 1977, *Time* magazine (1977) reported of Miami Beach: “So rapidly has the seven-mile-long island degenerated that it can be fairly described as a seedy backwater of debt-ridden hotels.” Newly-elected Miami Beach Mayor Neisen Kasdin said in 1977: “Business was so bad in Miami Beach I was happy just to see prostitutes.” (*New York Times* 2009). Beach nourishment from 1978-1983 rejuvenated Miami Beach, with tourism spending increasing \$290 million in just the first year after nourishment (Klein and Osleeb 2010). This increase was more than five times the \$51 million cost of the beach nourishment (Wiegel 1992). The total cost of beach nourishment from 1978 through 2017 was about \$168 million (Houston 2018b). It was \$212 million from 1978 through 2022 to include the effects of inflation and \$16 million spent on a nourishment project in 2020 (*Tampa Bay Times* 2020; U.S. Inflation Calculator 2023). This cost is spread over 45 years, giving an average annual cost of \$4.7 million in 2022 dollars. Tourists generated \$5.8 billion in taxes in Miami-Dade County in 2021 with Miami Beach accounting for about 45% of taxes, or \$2.6 billion (Greater Miami and Beach 2022; Rockport Analytics 2022). Therefore, for every \$1 spent annually on nourishment, Miami Beach tourists generate over \$550 in taxes annually, which is a remarkable ROI.

Beach nourishment provides significant ROI in other states. For example, Houston (2021) showed that South Carolina spends an average of \$20.2 million annually on beach nourishment in 2019 dollars. South Carolina beach tourists generate \$16.8 billion in economic development and \$1.77 billion in taxes (Willis and Straka 2017; U.S. Travel Association 2020; Houston 2021). Therefore, South Carolina beach tourists generate \$830 in South Carolina economic development and \$88 in taxes for each dollar spent on beach nourishment.



**Figure 5. Signs closing off the beach to the public at Sandestin in Walton County, Florida.**

Similarly, a significant ROI from beach nourishment has been found internationally. In their study of Narrabeen-Collaroy beach, Toimil *et al.* (2023) show that maintaining the present beach width by beach nourishment until 2050 would produce flood protection and recreational benefits more than 150 times the cost of the nourishment.

#### ***Beach maintenance is challenged by ownership issues***

Who is responsible for maintaining America's beaches? Many Americans may believe it is the responsibility of local/state/federal governments because Americans typically believe that beaches are “owned” by the public from the vegetation-line/dunes to the ocean (Houston and Angus 2022). However, 70% of land abutting the U.S. shoreline is privately owned (On The Commons 2005). This private land extends down to the mean-low-water line in Virginia, Delaware, Massachusetts, Rhode Island, and Maine, and it extends down to the mean-high-water line in the other coastal states (Houston and Gordon 2022).

Americans are famous for bringing many items to the beach such as umbrellas, tents, coolers, beach wagons, and food (Johnson 2023). Typically, most of these items are placed on what is actually private property on the dry beach between the vegetation-line/dunes and the mean-high-water line. This has not caused problems in most of the country because of

“an implicit agreement between property owners and beach goers to not press” the issue (Eagle 2018). However, this implicit agreement has started to unravel in parts of the country. For example, private resorts in Walton County, Florida, have called local sheriffs to evict local residents and tourists from beaches (Surfrider Foundation 2022). “Private beach” signs are becoming increasingly common and readily available for purchase on the internet (Figure 5; Houston 2022b).

Beach maintenance depends largely on beaches having public access. Most beach debris cleanup is performed by volunteers, who understandably volunteer to work on beaches that are publicly accessible. Similarly, most beach nourishment is funded by local/state/federal governments that require public access. USACE is the leading federal agency for beach nourishment, and it has cost-shared with local and state governments the placement of nourishment sand on about 350 miles of beach in several states (USACE 2022). Typically, USACE places the sand seaward from the vegetation-line/dunes, so property owners must agree to perpetual easements for the public to use their properties seaward of the vegetation-line/dunes. USACE projects also require access points so the public can reach beaches. Opening beaches to the public increases the public's support for maintaining beaches through debris clean-up or beach nourishment.

The success of beach nourishment in stimulating the economy, as exemplified by Miami Beach, has increased support for opening beaches to the public. In addition to the remarkable economic success of beach nourishment, Miami Beach has been listed as both the most visited and “top rated” beach in the U.S. (Grant 2017; McMurray 2022). Before nourishment it was necessary to stay at a beach hotel or condo at Miami Beach to access the beach. Now Miami Beach has more than 50 beach access points (Saltchef.com 2022).

#### ***Restoring and maintaining beaches to offset impacts of engineering projects***

The economic value of restoring and maintaining America's beaches is evident. But there also is a need to compensate for past and current human impacts that are the leading cause of beach erosion. Humans have built dams on rivers that have reduced the natural sand flow to

beaches, and built navigation projects that have taken sand out of the littoral system and moved it to ebb and flood shoals, or disposed of dredged sand beyond the littoral system. The sand loss from these activities is much greater than the total quantity of beach nourishment sand that has ever been placed. There is little quantitative data, but relative magnitudes can be used to appreciate the impacts.

Dams built on rivers have impounded vast volumes of sediment including sand, thereby substantially reducing sand flowing to coasts. For example, 500 California dams have impounded at least 2.7 billion yd<sup>3</sup> of sediment (Jacob 2017). There are over 91,720 dams in the U. S. (Dempsey 2022). If these dams trap sediment as efficiently as California dams, almost 500 billion yd<sup>3</sup> of sediment is impounded behind U.S. dams. The percentage of the sediments that are sand is typically unknown. However, when the largest dams to ever be removed from a river, the Elwha and Glines Canyon Dams on the Elwha River, Washington, were removed starting in 2011, 63% of the sediment was sand, gravel, or cobble and the shoreline began moving seaward dramatically (Warwick *et al.* 2019). Dams have brought great economic value to agriculture, urban development, and hydropower, but they have damaged distant beaches by depriving them of the natural flow of sand to the coast.

Beaches also have been significantly impacted by navigation projects. For example, Florida has 66 inlets, with 12 of them not natural but cut and 41 that have been modified for navigation by being jetted and dredged (Houston 2022c). These modified inlets caused sand to build up in ebb and flood shoals, with about 225 million yd<sup>3</sup> being taken out of the littoral system on the Florida east coast alone (Houston 2022c). Similarly, almost 60 million yd<sup>3</sup> of sand was dredged on the Florida east coast and disposed offshore beyond the littoral zone (Houston 2022c). The State of Florida has recognized these impacts, and most Florida inlets now have inlet management plans to bypass sand around inlets to restore the natural

flow of sand (Florida Department of Environmental Protection 2022). But the damage has been done and is still occurring at inlets and navigation entrances throughout the U.S.

Dams are stopping sand from naturally flowing to beaches, and navigation projects are taking naturally flowing sand out of the littoral system. The sand deficit they cause is the main cause of beach erosion. States and the federal government have spent huge sums of money to build dams and navigation projects, and presently spend large sums to operate them for the benefit of many. It is the responsibility of states and the federal government to add sand back into the littoral system by beach nourishment to address the environmental impacts produced by their projects stopping the natural flow of sand. They should lead the effort to restore the balance.

### CONCLUSIONS

T&T is very important to America's economy, being among America's largest industries, its largest employer, and its largest producer of a trade surplus. Moreover, it has been among the fastest growing sectors of the U.S. economy and is projected to grow at an annual rate over the next 10 years that is double the overall growth rate of the U.S. economy. The 3.4 billion beach visits annually is greater than the combined total of almost all recreation activities outside the home. The ROI of beach debris cleanup and nourishment is very large. In particular, taxes generated by beach tourists each year are over four times greater than what has ever been spent on beach nourishment for the past 100 years. Unlike the significant downturn in other tourism during the COVID pandemic, beach tourism demonstrated its resilience by booming. Beaches are not only magnets for tourism, but they also perform a double duty of protecting land infrastructure during storms. Engineering projects have greatly impacted the natural flow of sand to the coast or diverted sand out of the littoral system and beach nourishment is needed to mitigate these impacts and restore the balance.

### REFERENCES

- ASBPA, 2023a. "Breaking News: First Blue Flags Awarded in Continental US." <https://asbpa.org/2023/04/26/breaking-news-first-blue-flags-awarded-in-continental-us/#:~:text=Blue%20Flag%20USA%20is%20proud,beaches%20in%20California%20and%20Florida>.
- ASBPA, 2023b. "National Beach Nourishment Database." <https://gim2.aptim.com/ASBPA-NationwideRenourishment/>.
- America's State Parks, 2023. "How Many State Parks Are There In The U.S.?" <https://www.americasstateparks.org/how-many-state-parks/>.
- Barone, D.A., McKenna, K.K., and S.C. Farrell, 2014. "Hurricane Sandy: Beach-dune performance at New Jersey Beach Profile Network sites." *Shore & Beach*, 82(4), 13-23.
- Baseball America, 2023. "MLB Attendance Dipped Significantly From Pre-Pandemic Numbers." <https://www.baseballamerica.com/stories/mlb-attendance-dipped-significantly-from-pre-pandemic-numbers/#:~:text=In%202019%2C%20MLB%20drew%2068%2C494%2C895,two%20years%20before%20in%202017>.
- Beaver, 2006. "U.S. International Borders: Brief Facts." CRS Report for Congress, Order Code RS21729. <https://sgp.fas.org/crs/misc/RS21729.pdf>.
- Boevers, J., 2008. "Assessing the utility of beach eco-labels for use by local management." *Coastal Management*, 36(5), 524-531.
- Bordot, F., 2022. "Artificial Intelligence, Robots and Unemployment: Evidence from OECD Countries." *J. of Innovation Economics & Management*, 37 (1), 117-138.
- California Department of Boating and Waterways and Coastal Conservancy, 2002. "California Beach Restoration Study." [https://dbw.parks.ca.gov/?page\\_id=29041](https://dbw.parks.ca.gov/?page_id=29041).
- Clean Ocean Action, 2023. "The 2023 Beach Sweep dates are April 15th and October 21st." <https://cleanoceanaction.org/beach-sweeps>.
- Coastal Research Center, 2012. "Beach-dune performance assessment of New Jersey Beach Profile Network (NJBPN) sites at Long Beach Island, New Jersey, after Hurricane Sandy." Stockton College. [https://stockton.edu/coastal-research-center/project-archive/documents/lbi\\_report.pdf](https://stockton.edu/coastal-research-center/project-archive/documents/lbi_report.pdf).
- Congressional Research Service, 2019. "National Park Service: FY2019 Appropriations." <https://crsreports.congress.gov/product/pdf/IF/IF10900/5#:~:text=The%20largest%20single%20program%20funded,w%20for%20national%20heritage%20areas>.
- Crawford, B., 2023. "College athletics' 25 powerhouses who produced the most revenue for 2022." <https://247sports.com/longformarticle/college-athletics-25-powerhouses-who-produced-the-most-revenue-for-2022-211772377/>.
- Daytonabeach.com, 2023. "Market and Investor Research." <https://www.daytonabeach.com/about/market-research/>.
- Dean, R.G., 2001. "Storm Damage Reduction Potential via Beach Nourishment." *Proc. 27<sup>th</sup> International Conf on Coastal Engineering*, American Society of Civil Engineers, 16-21 July 2000, Sydney, Australia.
- Delmarvanow.com, 2017. "Hogan: 'We must safeguard the town of Ocean City and our coastal shoreline.'" <https://www.delmarvanow.com>.



- com/story/news/local/maryland/2017/11/20/hogan-we-must-safeguard-town-ocean-city-and-our-coastal-shoreline/872039001/.
- Dempsey, C., 2022. "Dams in the United States." <https://www.geographyrealm.com/dams-united-states/#:~:text=Which%20states%20have%20the%20most,36%20dams%20for%20Puerto%20Rico>.
- DestinationAnalysts, 2023. "The State of the American Traveler in May 2023 – Risk of Travel's Declining Value Perception." <https://www.destinationanalysts.com/insights-updates/>.
- Diaz, A., 2023. "International Travel, Multigenerational Trips Popular This Spring Break." <https://newsroom.aaa.com/2023/02/more-americans-heading-abroad-for-spring-break/>.
- Dictionary.com, 2023. "How many is a few?" <https://www.dictionary.com/e/few-vs-couple-vs-several/>.
- Dwight, R.H., Brinks, M.V., Kumar, G.S., and J. Semenza, 2007. "Beach attendance and bathing rates for southern California beaches." *Ocean & Coastal Management*, 50(10), 847-858.
- Eagle, J., 2018. "Are Beach Boundaries Enforceable?" *Washington Law Review*, 93, 1181-1224. [https://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=2340&context=law\\_facpub](https://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=2340&context=law_facpub).
- Economic Research, 2023. "Federal Reserve Economic Data." <https://fred.stlouisfed.org/release/tables?rid=53&eid=5125&snid=5106>.
- ESPN, 2023. "NBA Attendance Report – 2019." [https://www.espn.com/nba/attendance/\\_/year/2019](https://www.espn.com/nba/attendance/_/year/2019).
- Federal Reserve Economic Data, 2022. "Total Revenue for Amusement and Theme Parks, All Establishments, Employer Firms." <https://fred.stlouisfed.org/series/REVEF71311ALLEST>.
- FindLaw.com., 2002. "Brief Amicus Curiae of Save Our Shoreline in support of petitioners." Supreme Court No. 01-1243. <https://www.findlawimages.com/efile/supreme/briefs/01-1243/01-1243.mer.amis.sos.pdf>.
- Florida Department of Environmental Protection, 2022. "Annual Inlet Report." [https://floridadep.gov/sites/default/files/Annual%20Inlet%20Report\\_FINAL\\_08-2022.pdf](https://floridadep.gov/sites/default/files/Annual%20Inlet%20Report_FINAL_08-2022.pdf).
- Forbes, 2020. "Photos: Crowds Flock To Beaches And Bars For Labor Day Weekend." <https://www.forbes.com/sites/suzannerowankeller/2020/09/07/photos-crowds-flock-to-beaches-and-bars-for-labor-day-weekend/?sh=6323d7723551>.
- Forbes, 2023. "MLB Sets New Revenue Record, Exceeding \$10.8 Billion For 2022." <https://www.forbes.com/sites/maurybrown/2023/01/10/mlb-sets-new-revenue-record-exceeding-108-billion-for-2022/?sh=2a72883177ee>.
- Gavin, S.W., 2017. "Expedia 2017 Flip Flop Report." <https://www.expedia.com/stories/expedia-2017-flip-flop-report/>.
- Gohosh, I., 2019. "Mapped: Top Countries by Tourist Spending." <https://www.visualcapitalist.com/map-countries-by-tourist-spending/>.
- Grant, L., 2017. "8 of the most crowded beaches and where to go instead." <https://www.oyster.com/articles/8-of-the-most-crowded-u-s-beachesand-where-to-go-instead/>.
- Greater Miami and Beaches, 2022. "Greater Miami & Miami Beach 2021 Visitor Industry Overview." [https://www.miamiandbeaches.com/getmedia/fcf55ce5-3058-4362-990b-e33cf85171d2/Visitor\\_Industry\\_Overview\\_2021\\_FINAL\\_1.pdf](https://www.miamiandbeaches.com/getmedia/fcf55ce5-3058-4362-990b-e33cf85171d2/Visitor_Industry_Overview_2021_FINAL_1.pdf).
- Guinnessworldrecords.com, 2023. "Most Blue Flag beaches (countries)." <https://www.guinness-worldrecords.com/world-records/383319-most-blue-flag-beaches-country>.
- Halkos, G., and S. Matsiori, 2012. "Determinants of willingness to pay for coastal zone quality improvement." *J. Socio-Economics*, 41(4), 391-399.
- Hotelmize, 2021. "5 Travel Industry Facts You Need to Know in 2020." <https://www.hotelimize.com/blog/5-travel-industry-facts-you-need-to-know-in-2020/#:~:text=According%20to%20IBISWorld%20experts%20analysis,in%20as%20the%20first%20one>.
- Houston, J.R., 2018a. "The economic value of America's beaches – a 2018 Update." *Shore & Beach*, 86(2), 3-13.
- Houston, J.R., 2018b. "The economic value of Florida's beaches." *Shore & Beach*, 86(3), 1-11.
- Houston, J.R., 2019. "The fate of beach nourishment sand placed on the Florida East Coast." *Shore & Beach*, 87(2), 3-14.
- Houston, J.R., 2020. "Beach nourishment versus sea level rise on Florida's coasts." *Shore & Beach*, 88(2), 3-13.
- Houston, J.R., 2021. "The economic value of beach nourishment in South Carolina." *Shore & Beach*, 89(3), 3-12.
- Houston, J.R., 2022a. "Beach nourishment provides resilient protection for critical coastal infrastructure." *Shore & Beach*, 90(2), 19-32.
- Houston, J.R., 2022b. "Who owns the beach?" ASBPA National Coastal Conference, 13-16 September 2022, Long Beach, California.
- Houston, J.R., 2022c. "How Well Have Florida Inlet Management Plans Worked to Continue Sand Flow?" National Conference on Beach Preservation Technology, Florida Shore and Beach Preservation Association, St Augustine Beach, FL, 2-4 February 2022.
- Houston, J.R., 2023. "The value and resilience of beach tourism during the COVID pandemic." *Shore & Beach*, 91(3), 1-13.
- Houston, J.R., and R.G. Dean, 2014. "Shoreline Change on the East Coast of Florida." *J. Coastal Res*, 30(4), 647-660.
- Houston, J.R., and Gordon, A.D., 2022. "Who owns the beach?" *Shore & Beach*, 90(3), 50-58.
- International Monetary Fund, 2023. "GDP, Current Prices." <https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD/>.
- IPCC, 2019. In: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, "Chapter 4, Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities, Supplementary Material." [https://report.ipcc.ch/srocc/pdf/SROCC\\_Final-Draft\\_Chapter4.pdf](https://report.ipcc.ch/srocc/pdf/SROCC_Final-Draft_Chapter4.pdf).
- Jacob, J.P., 2017. "How a useless dam nearly destroyed an iconic beach." <https://www.eenews.net/articles/how-a-useless-dam-nearly-destroyed-an-iconic-beach/>.
- Johnson, H., 2023. "Beach Packing List: 33 Essentials to Bring." *U.S. News and World Report*. <https://travel.usnews.com/features/beach-packing-list>.
- Kavanagh, C., Santamaria, M., Lazar, A., Adams, B., Dennis, J., Salinas, and L. Voges, 2011. "FACT 2010 Florida Assessment of Coastal Trends." [https://www.researchgate.net/publication/267630694\\_Florida\\_Assessment\\_of\\_Coastal\\_Trends\\_2010](https://www.researchgate.net/publication/267630694_Florida_Assessment_of_Coastal_Trends_2010).
- Kelly, C.M., 2019. "Community responds to beach trash crisis after storm." <https://www.sunnews.org/community-responds-to-beach-trash-crisis-after-storm/>.
- Kiesnoski, K., 2021. "Top dream vacation wish lists for Americans as travel takes off." <https://www.cnn.com/2021/04/04/post-covid-travel-beaches-top-vacation-wish-lists.html>.
- Klein, Y.L., and J. Osleeb, 2010. "Determinants of Coastal Tourism: A Case Study of Florida Beach Counties." *J. Coastal Res.*, 26(6), 1149-1156. <http://www.jcronline.org/doi/pdf/10.2112/2FJCOASTRES-09-00152.1>.
- Kunst, A., 2019. "Most popular types of vacation for U.S. adults 2017." <https://www.statista.com/statistics/667802/leading-vacation-types-us-adults/>.
- McMurray, S., 2022. "23 Top-Rated Beaches in the U.S." <https://www.planetware.com/florida/top-rated-beaches-in-the-us-us-fl-408.htm>.
- MacroTrends, 2023. "U.S. Manufacturing Output 1997-2023." <https://www.macrotrends.net/countries/USA/united-states/manufacturing-output#:~:text=U.S.%20manufacturing%20output%20for%202021,a%2011.55%25%20increase%20from%202020>.
- McKenna, J., Williams, A. T., J.A.G. Cooper, 2011. "Blue Flag or Red Herring: do beach awards encourage the public to visit beaches?" *Tourism Management*, 32(3), 576-588.
- MiamiBeach411, 2022. "Miami Beach Tourist Demographics." <http://miami411.com/conventions/stats.htm>.
- MotorracingSports.com, 2023. "What is the Average Attendance at NASCAR Race Tracks?" <https://motorracing.com/what-is-the-average-attendance-at-nascar-race-tracks/>.
- National Football Foundation, 2023. "College Football." [https://footballfoundation.org/news/2020/5/27/2019\\_Attendance\\_and\\_Ratings.aspx](https://footballfoundation.org/news/2020/5/27/2019_Attendance_and_Ratings.aspx).
- National Park Foundation, 2023. "How Many National Parks Are There?" <https://www.nationalparks.org/connect/blog/how-many-national-parks-are-there#:~:text=The%20National%20Park%20System%20encompasses,%2C%20American%20Samoa%2C%20and%20Guam>.
- National Park Service, 2020. "National Park Visitation Tops 327 million in 2019." <https://www.nps.gov/orgs/1207/2019-visitation-numbers.htm#:~:text=%20E2%80%93%20America's%20national%20parks%20continue,record%20keeping%20began%20in%201904>.
- National Park Service, 2022. "National Park Visitor Spending Contributed \$42.5 Billion to U.S. Economy in 2021." <https://www.doi.gov/pressreleases/national-park-visitor-spending-contributed-425-billion-us-economy-2021#:~:text=National%20Park%20Visitor%20Spending%20Contributed,U.S.%20>
- National Research Council, 1995. "Beach nourishment and protection." Washington D.C., The National Academies Press. <https://www.nap.edu/download/4984>.
- National Research Council, 2014. "Reducing Coastal Risks on the East and Gulf Coasts." Washington, DC, The National Academies Press. <https://www.nap.edu/catalog/18811/reducing-coastal-risk-on-the-east-and-gulf-coasts>.
- NCAA, 2019. "Baseball Attendance Records, 2019." [http://fs.ncaa.org/Docs/stats/baseball\\_RB/2019/Attend.pdf](http://fs.ncaa.org/Docs/stats/baseball_RB/2019/Attend.pdf).
- New York Times, 2009. "Miami Beach feels the

- heat.” <http://www.nytimes.com/2009/02/15/fashion/15Miami.html?pagewanted=all&r=0>.
- NOAA, 2023. “The Economic Impacts of Marine Debris on Tourism-Dependent Communities.” <https://marinedebris.noaa.gov/research/economic-impacts-marine-debris-tourism-dependent-communities>.
- Ocean Conservancy 2022a. “Fighting for Trash Free Seas.” <https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/>.
- Ocean Conservancy 2022b. “We Clean On. 2021 Report.” [https://oceanconservancy.org/wp-content/uploads/2021/09/2020-ICC-Report\\_Web\\_FINAL-0909.pdf](https://oceanconservancy.org/wp-content/uploads/2021/09/2020-ICC-Report_Web_FINAL-0909.pdf).
- On The Commons, 2005. “Who Owns the Beach?” <https://www.onthecommons.org/who-owns-beach/index.html#:~:text=Half%20the%20population%20of%20the,is%20increasing%20all%20the%20time>.
- Orange County Register, 2021. “Busy beaches: A look back a year after the coast was closed.” <https://www.ocregister.com/2021/05/28/busy-beaches-a-look-back-a-year-after-the-coast-was-closed/>.
- Powell, A., 2019. “National parks’ economic benefits put at over \$100B annually.” *The Harvard Gazette*, 23 September 2019. <https://news.harvard.edu/gazette/story/2019/09/report-looks-into-u-s-national-parks-budgeting-woes/>.
- Pro-football-reference.com, 2023. “2019 NFL attendance data 2023” <https://www.pro-football-reference.com/years/2019/attendance.htm>.
- Reddish, V., 2021. “Beach vs Mountains: Reigniting the Vacation Rivalry for 2021.” <https://florida-panhandle.com/blog/beach-vs-mountains/>.
- REEF, 2021. “2021 Better Beach Challenge Goals.” <https://www.reef.com/blogs/news/2021-betterbeachalliance-goals>.
- Rigall-i-Torrent, R., Fluvia, M., Ballester, R., Salo, A., Ariza, E., and J.M. Espinet, 2011. “The effects of beach characteristics and location with respect to hotel prices.” *Tourism Management*, 32(5), 1150-1158.
- Rockport Analytics, 2022. “The 2021 Economic & Fiscal Impact of Tourism in Florida.” <https://www.visitflorida.org/media/30679/florida-visitor-economic-impact-study.pdf>.
- Rookieroad, 2023. “NASCAR attendance by year.” <https://www.rookieroad.com/nascar/what-are-annual-ticket-sales/#:~:text=The%20average%20annual%20ticket%20sales,revenue%20of%20approximately%20%24190%20million>.
- Ross, S., 2023. “4 Countries That Produce the Most Food.” <https://www.investopedia.com/articles/investing/100615/4-countries-produce-most-food.asp#:~:text=Key%20Takeaways&text=China%20is%20the%20world's%20largest,yields%20and%20extensive%20agricultural%20infrastructure>.
- Saltchef.com, 2022. “Beach Accesses in Miami Beach, Florida.” [https://www.saltchef.com/catch\\_fish/FL/Dade/miami\\_beach\\_beach\\_accesses.html](https://www.saltchef.com/catch_fish/FL/Dade/miami_beach_beach_accesses.html).
- Semow, T., 2021. “States Spending the Most on Parks and Recreation. CLIQ.” <https://www.cliqproducts.com/blogs/news/states-spending-the-most-on-parks-and-recreation>.
- Shows, E.W., 1978. “Florida’s Setback Line – An Effort to Regulate Beachfront Development.” *Coastal Management J.*, 4(1-2), 151-164.
- Spencer, J., 2020. “Study: Coronavirus appears to die quickly in direct sunlight.” <https://www.kxan.com/news/local/study-coronavirus-appears-to-die-quickly-in-direct-sunlight/>.
- Sportico.com, 2022. “NFL National Revenue Totals a Record \$11 Billion For 2021.” <https://www.sportico.com/leagues/football/2022/nfl-national-revenue-2021-1234682461/>.
- Sportsvalue.com, 2022. “NBA Revenues.” <https://www.sportsvalue.com.br/en/nba-has-surpassed-us-10-billion-in-revenue-increasingly-disruptive-valuation-reached-us-86-billion/#:~:text=NBA%20Revenues,US%24%206.2%20billion%20in%202021>.
- Stateparks.org, 2020. “Get to Know America’s State Parks.” <https://www.stateparks.org/about-us/>.
- Statista.com, 2022a. “Number of cruise passenger embarkations in the United States from 2007 to 2019.” <https://www.statista.com/statistics/202208/number-of-cruise-line-passenger-embarkations-in-the-us/>.
- Statista.com, 2022b. “Disneyland theme park (California) attendance 2009-2021.” <https://www.statista.com/statistics/236154/attendance-at-the-disneyland-theme-park-california/#:~:text=In%202021%2C%20the%20Disneyland%20theme,8.5%20million%20visitors%20in%20total>.
- Statista.com, 2023a. “Number of travel and tourism jobs worldwide from 2019 to 2022, with a forecast for 2023.” <https://www.statista.com/statistics/1268465/number-of-travel-and-tourism-jobs-worldwide/>.
- Statista, 2023b. “OPEC net oil export revenue streams in 2022, by member country.” <https://www.statista.com/statistics/223231/opec-net-oil-export-revenue-streams-by-country/>.
- Statista Research Department, 2014. “Average trip length in the U.S. in Q1 2014.” <https://www.statista.com/statistics/316519/average-trip-length-us/>.
- Statista Research Department, 2023. “Revenue of the cruises industry in the U.S. 2018-2027.” <https://www.statista.com/forecasts/1250588/us-cruise-revenue>.
- Surfrider Foundation, 2022. “Lawsuit challenging customary use doctrine in Florida fails.” <https://www.surfrider.org/coastal-blog/entry/lawsuit-challenging-customary-usedoctrine-in-florida-fails>.
- Surfrider Foundation, 2023. “About beach cleanups.” <https://cleanups.surfrider.org/about-beach-cleanups/>.
- Tampa Bay Times*, 2020. “Miami Beach is dumping \$16 million in fresh sand to push back against erosion.” <https://www.tampabay.com/news/environment/2020/01/15/miami-beach-is-dumping-16-million-in-fresh-sand-to-push-back-against-erosion/?outputType=amp>.
- Technology.org, 2022. “The Impact of Artificial Intelligence on Unemployment.” <https://www.technology.org/2022/09/17/the-impact-of-artificial-intelligence-on-unemployment/#:~:text=The%20Impact%20of%20AI%20on,entire%20job%20industries%20could%20disappear>.
- Themed Entertainment Association, 2019. “Global Attractions Attendance Report.” <https://ae-com.com/wp-content/uploads/2020/07/2019-Theme-Index-web-1.pdf>.
- Themed Entertainment Association, 2022. “Global Attractions Attendance Report.” <https://ae-com.com/wp-content/uploads/documents/reports/AECOM-Theme-Index-2021.pdf>.
- The Press of Atlantic City*, 2012. “Margate Mayor Mike Becker has been pulling double duty to help his town recover from Hurricane Sandy.” [https://pressofatlanticcity.com/news/breaking/margate-mayor-mike-becker-has-been-pulling-double-duty-to-help-his-town-recover-from/article\\_2846b55c-47e0-11e2-971d-0019bb2963f4.html](https://pressofatlanticcity.com/news/breaking/margate-mayor-mike-becker-has-been-pulling-double-duty-to-help-his-town-recover-from/article_2846b55c-47e0-11e2-971d-0019bb2963f4.html).
- Time*, 1977. “Business: Ebb tide at Miami Beach.” <https://content.time.com/time/subscriber/article/0,33009,945864,00.html>.
- Toimil, A., Losada, I.J., Alvarez-Cuesta, M., and G. Le Cozannet, 2023. “Demonstrating the value of beaches for adaptation to future coastal flood risk.” *Nature Communications*, 14 (3474), 1-11.
- Travelweekly.com, 2022. “Disney says park attendance often exceeds 2019 levels.” <https://www.travelweekly.com/Travel-News/Hotel-News/Disney-earnings-Q3-2022>.
- Turner, M., 2020. “Stats: Americans Prefer Beach Vacations and Road Trips in 2020.” <https://www.travelagentcentral.com/your-business/stats-americans-prefer-beach-vacations-and-road-trips-2020>.
- UNWTO, 2003. “Tourism Highlights 2003 edition.” <https://www.e-unwto.org/doi/epdf/10.18111/9789284406647>.
- USACE, 2016. “Messages in the sand from Hurricane Sandy.” Defense Visual Information Distribution Service. <https://www.dvidshub.net/news/208990/messages-sand-hurricane-sandy>.
- USACE, 2022. “Beach Nourishment. Institute for Water Resources.” <https://www.iwr.usace.army.mil/Missions/Coasts/Tales-of-the-Coast/Corpsand-the-Coast/Shore-Protection/Beach-Nourishment/>.
- USA Today*, 2013. “Atlantic City boardwalk back in business after Sandy.” <http://www.usatoday.com/story/travel/destinations/2012/12/03/atlantic-city-boardwalk-business-sandy/1743903/>.
- U.S. Bureau of Labor Statistics, 2019. “Forty years of falling manufacturing employment.” <https://www.bls.gov/opub/btn/volume-9/forty-years-of-falling-manufacturing-employment.htm>.
- U.S. Bureau of Labor Statistics, 2021. “Employment by major industry sector.” <https://www.bls.gov/emp/tables/employment-by-major-industry-sector.htm>.
- U.S. Census Bureau, 2020. “2019 Population Estimates by Age, Sex, Race and Hispanic Origin.” <https://www.census.gov/newsroom/press-kits/2020/population-estimates-detailed.html>.
- U.S. Department of Agriculture, 2022. “Cash receipts by state — 2019.” <https://data.ers.usda.gov/reports.aspx?ID=17843>.
- U.S. Department of Commerce, 2020. “Fast Facts. U.S. T&T Industry, 2019. International Trade Administration.” <https://www.trade.gov/sites/default/files/2020-12/Fast%20Facts%202019.pdf>.
- U.S. Department of Commerce, 2021. “International Travel Trade Balance.” <https://www.trade.gov/sites/default/files/2021-03/Fact%20Sheet%20Balance%20of%20Trade%20FINAL.pdf>.
- U.S. Department of Commerce, 2022a. “Tourism Satellite Accounts Data Sheet, Bureau of Economic Analysis. Table 8, AU22, Real Tourism Output, 2001.” <https://www.bea.gov/data/special-topics/travel-and-tourism/tourism-satellite-accounts-data-sheets>.
- U.S. Department of Commerce, 2022b. “Tourism Satellite Accounts Data Sheet.” Bureau of

- Economic Analysis. Table 8, AU22, Real Tourism Output, 2019. <https://www.bea.gov/data/special-topics/travel-and-tourism/tourism-satellite-accounts-data-sheets>.
- U.S. Department of Commerce, 2022c. "Tourism Satellite Accounts Data Sheet." Bureau of Economic Analysis. Table 8, AU22, Real Tourism Output, 2009. <https://www.bea.gov/data/special-topics/travel-and-tourism/tourism-satellite-accounts-data-sheets>.
- U.S. Department of the Interior, 2022. "National Park Visitor Spending Contributed \$42.5 Billion to U.S. Economy in 2021." <https://www.doi.gov/pressreleases/national-park-visitor-spending-contributed-425-billion-us-economy-2021#:~:text=According%20to%20the%20National%20Park,were%20in%20park%20gateway%20communities>.
- U.S. Lifesaving Association, 2023. "American Lifeguard Rescue and Drowning Statistics for Beaches." <https://www.usla.org/page/Statistics>.
- U.S. Inflation Calculator, 2023. "Inflation Calculator." <https://www.usinflationcalculator.com/>.
- U.S. International Trade Commission, 2020. "U.S. Trade by Industry Sector and Selected Trading Partners." [https://www.usitc.gov/research\\_and\\_analysis/trade\\_shifts\\_2019/us.htm](https://www.usitc.gov/research_and_analysis/trade_shifts_2019/us.htm).
- U.S. Travel Association, 2020. "The Economic Contribution of Tourism in South Carolina." <https://embed.widencdn.net/pdf/plus/scprt/m69e4pbrmk/SC%20TSA%202018%>.
- U.S. Travel Organization, 2020a. "U.S. Travel and Tourism Overview (2019)" [https://www.ustravel.org/system/files/media\\_root/document/Research\\_Fact-Sheet\\_US-Travel-and-Tourism-Overview.pdf](https://www.ustravel.org/system/files/media_root/document/Research_Fact-Sheet_US-Travel-and-Tourism-Overview.pdf).
- U.S. Travel Organization, 2020b. "U.S. Travel Industry Impact." [https://www.ustravel.org/system/files/media\\_root/document/Research\\_Fact-Sheet\\_US-Travel-Answer-Sheet.pdf](https://www.ustravel.org/system/files/media_root/document/Research_Fact-Sheet_US-Travel-Answer-Sheet.pdf).
- U.S. Travel Organization, 2020c. "Travel: America's Unsung Hero of Job Creation." [https://www.ustravel.org/system/files/media\\_root/document/Research\\_Fact-Sheet\\_Travel-Jobs.pdf](https://www.ustravel.org/system/files/media_root/document/Research_Fact-Sheet_Travel-Jobs.pdf).
- U.S. Travel Organization, 2022. "Economic Impact Map." <https://industryimpact.ustravel.org/>.
- U.S. Travel Organization, 2023. "The State of the Travel Industry." [https://www.ustravel.org/sites/default/files/2023-04/answer-sheet\\_2023\\_final.pdf](https://www.ustravel.org/sites/default/files/2023-04/answer-sheet_2023_final.pdf).
- VisitFlorida.org, 2020. "2019 Contribution of Travel & Tourism to the Florida Economy." <https://www.visitflorida.org/media/30679/florida-visitor-economic-large-impact-study.pdf>.
- Warrick, J.A., Stevens, A.W., Miller, I.M., Harrison, S.R., Ritchie, A.C., and G. Gelfenbaum, 2019. "World's largest dam removal reverses coastal erosion." *Science Reports*, 9, Article number 13968.
- Washington Post*, 2021. "A year into the pandemic, it's even more clear that it's safer to be outside." 13 April 2021. <https://www.washingtonpost.com/health/2021/04/13/covid-outside-safety/>.
- Welch, L., and D. Brockbank, 2016. "What is President Trump's position on beach renourishment?" TCPalm, 18 November 2016. <https://www.tcpalm.com/story/opinion/contributors/2016/11/18/guest-column-what-president-trumps-position-beach-renourishment/94037176/>.
- Whitehouse.gov, 2022. "The Impact of Artificial Intelligence on the Future Workforce in the European Union and the United States of America." <https://www.whitehouse.gov/wp-content/uploads/2022/12/TTC-EC-CEA-AI-Report-12052022-1.pdf>.
- Wiegel, R.L., 1992. "Dade County, Florida, Beach Nourishment and Hurricane Surge Study." *Shore & Beach*, 60(4), 2-26.
- Willis, D.B., and T.J. Straka, 2017. "The economic contribution of natural resources to a state economy: A South Carolina case study." *Natural Resources*, 8, 115-129.
- Windfm.com 2023. "It's National Beach Day! How Many People Visit the Beach 365 Days a Year?." <https://windfm.com/on-air/its-national-beach-day-how-many-people-visit-the-beach-365-days-a-year/>.
- World T&T Council, 2022a. "Travel and Tourism Economic Impact 2021." <https://wtcc.org/Portals/0/Documents/Reports/2021/Global%20Economic%20Impact%20and%20Trends%202021.pdf>.
- World T&T Council, 2022b. "Travel & Tourism set to inject over \$2.6 billion into the U.S. economy over next decade." <https://wtcc.org/news-article/travel-and-tourism-set-to-inject-over-2-point-6-billion-usd-into-the-us-economy-over-next-decade>.
- WSN 2023. "NCAA Men's vs Women's Basketball: Viewership." <https://www.wsn.com/ncaam-basketball/ncaa-men-vs-women-basketball/#:~:text=Average%20attendance%20in%202019%20was%201625%20per%20game%2Fsession.,universities%20and%20the%20NCAA%20Tournament>.
- Wunsch, N-G, 2022. "Leading countries worldwide by value of agricultural products imported in 2020." <https://www.statista.com/statistics/1332314/leading-countries-worldwide-by-value-of-agricultureal-products-imported/#:~:text=In%202020%2C%20China%20was%20the,100%20billion%20U.S.%20dollars%2C%20respectively>.
- Yahoo News United Kingdom*, 2021. "COVID doesn't spread on crowded beaches, government adviser says." <https://uk.news.yahoo.com/not-single-covid-outbreak-linked-crowded-beaches-124027364.html>.