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The Effect of Second-Home Tourism on Sewage Treatment Practices

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ABSTRACT

Sanitation and waste management are major issues across developing and developed countries, influenced by factors such as local infrastructure, public policy, and tourism. This research aims to analyze the effect of second-home tourism on sewage treatment quality in an area, particularly in relation to seasonal population influxes and the resulting strain on local infrastructure. In this literature review, we first analyzed the levels of second-home tourism in 6 cities in the United States, 6 cities in Spain, and the municipality of Çeşme in Türkiye. We then evaluated sewage treatment quality in those areas to assess tourism's impact on sanitation practices. The results indicated significant seasonal pressure on local wastewater infrastructure, resulting in a negative correlation between second-home tourism and sewage treatment quality in the area. We used Pearson correlation for our data analysis of the United States and Spain. By calculating a correlation coefficient of -0.89 (U.S) and -0.94 (Spain), we highlighted a strong correlation.

INTRODUCTION

Sanitation and hygiene technologies have existed since circa 3200-1100 BCE, where sophisticated drainage and sewerage systems were utilized in the Hellenic world (Yannopoulos et al., 2017). Yet developing and developed countries still struggle with waste management. Sewage treatment challenges arise from high investment costs, policy constraints, and competing governmental interests (De Paula et al., 2025). Tourism exacerbates this problem: second-home expansion in rural areas can lead to seasonal population fluctuations and a failure to invest due to an imbalance between supply and demand across seasons (Mirani & Farahani, 2015).

The Declaration and Plan of Action of the 1990 World Summit for Children set a goal of universal access to safe drinking water and sanitation by 2000 (Bartram et al., 2014). However, many developing countries, including Türkiye, have not achieved this goal. Difficulties persist in developed countries as well. Areas with coastal tourism face greater risks from inadequate sewage treatment, as contaminated waterways threaten public health.

The effects of second-home tourism in cities in wealthier countries highlight the broad impacts that seasonal demand fluctuations can have on local waste management. This systematic review summarizes these studies and argues for expanding them in poorer nations.

Waste management challenges are evident in the municipality of Çeşme in Izmir, Türkiye. Second-home tourism is common in the area. Buried under oceanside estates and summer homes, inadequate wastewater infrastructure causes wastewater from many homes to be discharged into the ground, where it mixes with groundwater and flows into the ocean as runoff. Çeşme's rich cultural history, economic significance, and vibrant recreational opportunities underscore the need for a cleaner, more resilient future. In an area that generates such tourism, residents are still struggling to meet their basic sanitation needs.

Although waste management has been extensively researched, previous studies have limitations. Some studies model and evaluate solid waste transportation practices to improve recycling system efficiency (Hajatnia, 2022). However, the lack of focus on sewage treatment leaves critical deficiencies in a vision of sustainability. Others (*Türkiye Denizlerinde Kirlenme [Pollution in Turkish Seas]*, 2020) analyze the effects of inadequate sewage treatment but fail to connect the issue to tourism. The few case studies (Staunstrup et al., 2023) that connect second-home tourism to waste management tend to have a myopic focus on developed countries. Our study addresses these gaps by drawing direct connections between second-home tourism and sewage challenges, applying patterns observed in developed countries to a case study in Türkiye. The municipality of Çeşme was established as a focal point to bring the issues of developing countries to the forefront of the study. Results indicate a negative correlation between second-home tourism and sewage treatment quality.

LITERATURE REVIEW

Effect of Second Home Tourism on Sewage Quantity

Tourism in general contributes to a surge in sewage quantity. This pattern can be observed across several countries and regions. A study in Spain describes waste management practices in the Balearic Islands, where the Balearic Water and Environmental Quality Agency (ABAQUA) governs sanitation and purification practices. In the system, wastewater is moved to a collector network, transported to treatment plants, and processed. However, the seasonal nature of tourism jeopardizes this process. The study shows a substantial monthly variation in Human Population Index (HPI), where the population consistently surges from about 1.2 million to 2 million people during summer months (Rodríguez-Alcántara et al., 2024). These surges in population correspond to surges in wastewater production, making sewage treatment difficult. The study also notes the concentration of tourist settlements on the coast. Çeşme, with a Mediterranean environment similar to that of the Balearic Islands, also faces difficulties in population fluctuations for coastal areas, highlighting the connection between seasonal tourism and inadequate waste management.

Seasonal surges in population are largely a result of second-home tourism. The nature of waste management challenges shift when second-home tourism is involved, as the population of second-home residents is non-permanent, mobile, and "invisible". Second-home tourism specifically has become a crucial subset of the tourism industry. One study conducted in Denmark showed that in 2019, 36.9% of all tourism bednights were undertaken in second-homes. Danish planning authorities even have designated "summer cottage areas", or "second home zones", as a planning category. In fact, 78 out of 98 Danish municipalities have dedicated second home zones. Jutland's west coast is considered a major holiday area, where second homes are often rented out. It is crucial to note that Jutland's west coast also has the lowest percentage of houses connected to sewage utilities (Staunstrup et al., 2023).

Natural and coastal attractions draw parallels between Denmark's municipalities and Çeşme. Similar patterns are expected to be observed in both countries regarding second home tourism and sewage quantity. Rising levels of second home tourism exacerbate environmental pollution issues stemming from improper wastewater management or sewage overflow.

While the Spanish study explores monthly population fluctuations and the Danish study explores general trends of increasing second-home tourism over time, it is imperative to mention that the core argument of both is the substantial effect of seasonal tourism on waste management practices. A correlation emerges between higher demand and lower treatment quality: the more densely populated an area becomes, the more existing waste infrastructure is burdened, and the more likely it is for untreated wastewater to get discharged into the environment. Both papers call for increased government action in extending sewage infrastructure. This can be achieved through mobilization of second-home owners or through an expansion of taxpayers. Our research draws on these approaches when proposing solutions to infrastructure challenges in Çeşme.

Current Sewage Infrastructure Organization

Sewage infrastructure is a global issue, and challenges persist across a multitude of countries. Wear et al. (2021) found that at least 4.5 billion people live without or have inadequate sanitation. Challenges are less pronounced but still existent in developed countries. In the United States, overburdened treatment systems lead to improper waste management. Annually, 1.2 trillion gallons of untreated sewage, stormwater, and industrial waste flow into U.S rivers, with 27 billion gallons of untreated wastewater entering New York Harbor alone (Wear et al., 2021). Within countries, some areas are more prone to dangers than others. People in tropical or coastal communities are extremely susceptible to sewage pollution exposure. In the Caribbean, 85% of all sewage is discharged into coastal water untreated, potentially exposing people to rotavirus, cholera, and norovirus (Wear et al., 2021). Untreated discharge has historically occurred in Çeşme as well, placing residents at the center of concern.

Staunstrup et al. (2023) collected systematic property data for all second homes from the Danish Building Register (BBR). From the 185,238 second homes included in their study, they discovered that only 54.1% of all second home properties were located in areas connected to public wastewater utilities with underground piping. A large minority (43.3%) had underground septic tanks on their land sites, beneath

their properties. A small number of second-homes (3014) had no or rudimentary wastewater handling. Annual waterway inspections help keep this number small: owners of houses causing contamination are required to update their facilities, boosting the cleanliness of the environment (Staunstrup et al., 2023). However, not all countries with waste management issues have such regulations. Areas without regulations, such as the municipality of Çeşme, face increasing environmental and health concerns.

The study also found significant disparities in level of connection to public utilities. The study mentioned municipalities such as Nordfyn, Kolding, and Guldborgsund, where almost 100% of second-homes were connected to public sewage utilities. In other areas, such as Jutland's West Coast, these numbers dropped to 38.9%. We predict that inconsistencies in waste management practices of different geographical zones extend beyond Denmark. These disparities can be attributed to economic factors and public policy.

Effect of Public Policy on Expansion

The waste management system is a crucial part of public planning and management. Falling under the jurisdiction of a city or municipality's government, specific responsibilities differ depending on the country in question.

Nation-wide legislation and programs can support water quality protection projects. One study conducted in the United States, references the Clean Water State Revolving Fund. This program provides financial assistance to states to help with wastewater treatment, pollution control, and watershed and estuary management. Programs like these can boost the capacity of local governments to maintain and expand wastewater systems (Onifade et al., 2024).

Staunstrup et al. (2023) spotlight the role of municipalities as the primary authorities for planning, managing, and regulating sewage treatment. Drastic changes in government policy lead to shifts in waste management outcomes. The study describes the governance transition in Denmark (beginning in 2009 for water sector reform) that transformed planning for sewage infrastructure expansion. Before, strategic wastewater plans contained specific indications of the range of a project (the number of second-homes that were expected to be covered). However, new operational flexibility granted to municipalities reduced public transparency in plans and changed outcomes. Initially, the municipality of Odsherred essentially promised residents to ensure sewage piping for 800 second-homes annually. Recently, after the government transition, the "estimate" has been reduced to 400 houses annually, which will postpone final modernization of the sewage system to 2070.

When collecting information about strategies and planning for future investment, Staunstrup et al. (2023) examined wastewater strategic plans for municipalities. They also conducted interviews with officials in the water sector of municipalities and chief executives of the water utility cooperatives (semi-privatized companies responsible for wastewater operations within a municipality). Our study adopted this approach when analyzing the waste management operations in Çeşme. We conducted interviews with the business manager of Çeşme's wastewater treatment plant and the former mayor of Çeşme.

While the study by Onifade et al. (2024) explores legislation to aid municipalities' waste management efforts, and Staunstrup et al. (2023) examine issues with municipality organization, both studies underscore the crucial role of government in regulating sewage treatment and reducing pollution. A crucial responsibility emerges for the government to take an active role in management and expansion. Our study acknowledges this when choosing to interview key members of the legislature (such as the former mayor) to gain insight into current waste infrastructure and future plans for expansion.

Residents' Perspective on Waste Management

Residents in areas with a high-proportion of second-homes consistently express dissatisfaction with waste management services.

In Denmark, second-home owners and renters have concerns about the low level of connection to public utilities, and the resulting challenges posed in their daily lives. Additional problems occur when high groundwater levels combine with hard rain showers, causing foul waters to rise to the surface of lawns and even houses. Contaminated bathing water incidents in areas with second-homes have also been brought to the attention of the municipality (Staunstrup et al., 2023).

A study in Newfoundland, Canada underscores the importance of proper sewage treatment practices to public satisfaction in coastal communities. Constant exposure to and dependency on a marine environment makes residents vulnerable to the destructive effects of improper waste disposal. Results show that 59% of residents expressed a desire for more information relating to local waste management practices and services, and 61% of residents expressed concerns about water contamination (Saxena et al., 2025).

Both studies emphasize how residents of coastal communities understand the significance of proper waste management and often express discontent with current sewage infrastructure.

METHODOLOGY

Our study conducted three separate analyses to identify a correlation. One was centered in Çeşme in Izmir, Türkiye. The second examined cities in the United States, while the third studied cities in Spain. The second and third analyses aimed to establish a broader pattern to which the results of Çeşme could be applied.

For the analyses of the United States and Spain, correlation was assessed by comparing the proportion of seasonal residences with the proportion of wastewater treatment facilities in violation of regulatory standards across the selected municipalities. We calculated correlation coefficients using Pearson correlation to illustrate the strength of our correlation. Additionally, we graphed least squares regression lines on two scatterplots (one for each analysis) to provide a visual representation of the relationships in our datasets.

United States: Second-Home Tourism and Sewage Treatment

The dataset for our independent variable in the sewage treatment analysis was sourced from the American Community Survey conducted by the United States Census Bureau (U.S. Census Bureau, 2024). 6 cities within the United States were selected from the survey for evaluation of second-home tourism rates. Our study used a stratified sample, where the experimental units (cities) were divided into two treatment groups (coastal and non-coastal). We randomly selected 3 experimental units (coastal cities) for the coastal treatment group; these cities tended to have larger proportions of second-home tourism. We also randomly selected 3 experimental units (non-coastal cities) for the non-coastal treatment group; these cities tended to have lower proportions of second-home tourism. We chose municipalities based on data availability in the United States Environmental Protection Agency (EPA) database and the U.S Census Bureau database. Second-home tourism in an area was assessed based on the proportion of residences used for seasonal/recreational/occasional use. The dataset for our dependent variable was sourced from the Enforcement and Compliance History Online (ECHO) database (U.S. Environmental Protection Agency, 2025). Sewage treatment quality was assessed by the proportion of sewage treatment plants in the area that met EPA-established standards. Violations within the past three years were considered breaches of standards for the purposes of this analysis. The data were analyzed to evaluate the overall relationship between second-home tourism in a region and sewage system performance.

Europe: Second-Home Tourism and Sewage Treatment

A similar analysis was conducted in Spain, where 6 municipalities were selected for evaluation. Again, in our stratified sample, our two treatment groups were coastal and non-coastal municipalities. We selected 3 experimental units (coastal Spanish municipalities) for our coastal treatment group; these cities tended to have higher proportions of second-home tourism. We also selected 3 experimental units (non-coastal Spanish municipalities) for our non-coastal treatment group; these cities tended to have lower proportions of second-homes tourism. We chose municipalities based on data availability in the databases of the European Environment Agency (EEA) and the Instituto Nacional de Estadística (National Statistics Institute) of Spain. Data on second-home tourism were sourced from the Population and Housing Census conducted by the Instituto Nacional de Estadística (Instituto Nacional de Estadística, 2021). Second-home tourism in an area was assessed based on the proportion of secondary/seasonal dwellings. Data for sewage treatment quality were sourced from the Waterbase repository of the European Environment Agency (EEA) (European Environment Agency, 2020). Sewage treatment quality was assessed based on compliance with the Urban Waste Water Treatment Directive (UWWTD) standards. Again, data were analyzed to evaluate the general relationship between second-home tourism in a region and sewage system efficacy.

Application to Çeşme

Similar information was collected to apply these existing patterns to the municipality of Çeşme. Limited government data were available on this topic for Çeşme, especially at the level of specificity required by this study. Therefore, data collection was completed with a set of semi-structured interviews. Interviews

covered a range of topics as follows: (1) infrastructure and operational challenges; (2) governance and policy perspectives; (3) public awareness and behavior. Interviews were conducted with Ekrem Oran, former mayor of Çeşme; Yiğit Kara, business manager of the Çeşme Alacatı Wastewater Treatment Plant; local septic tank drivers; and residents of neighborhoods within the Çeşme municipality, including Yalı and Ardıç. All interviewees provided verbal consent to be interviewed, recorded, and featured in this study.

RESULTS

United States and Spain: Sewage Treatment in Relation to Second-Home Tourism

There is a negative correlation between the proportion of second homes in an area and sewage treatment quality. Cities where second homes make up most residences display substandard sewage treatment when compared to cities with a negligible proportion of second homes (highlighted in Fig. 1 and Fig. 2).

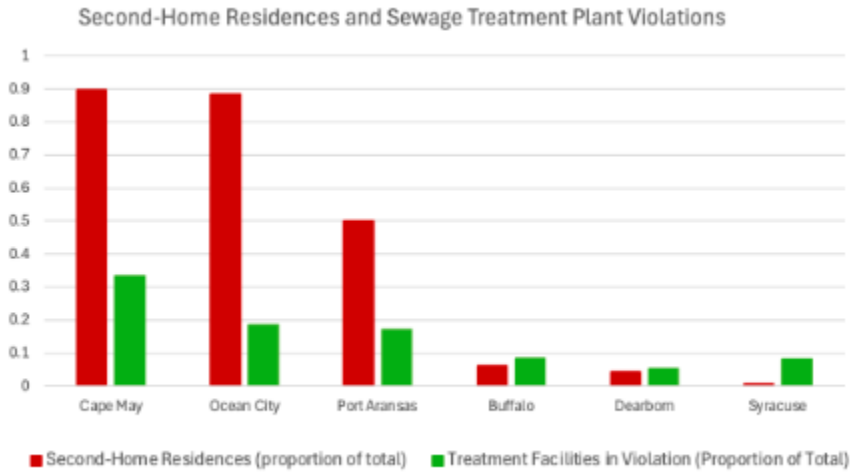

Figure 1. A general decrease in sewage treatment facilities' violations of EPA standards is observed as the proportion of second-home residences in a community decreases.

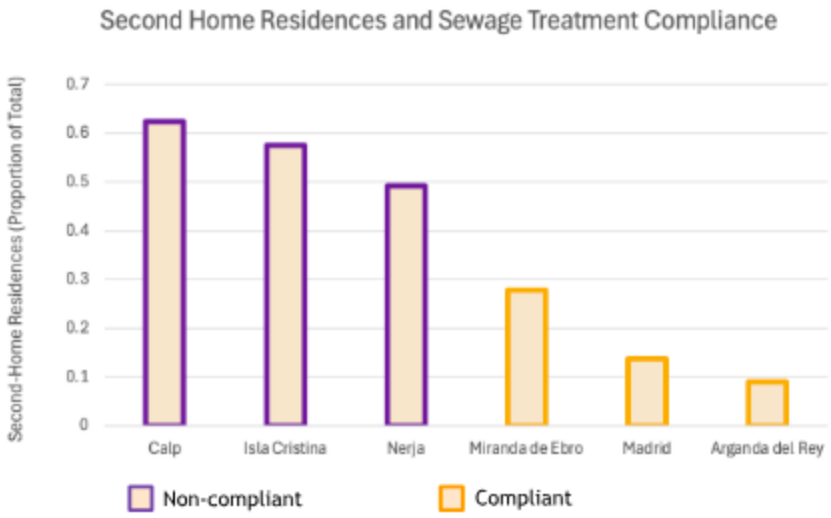

Figure 2. Sewage treatment facilities in communities with a smaller proportion of second-home residences are generally more compliant with UWWTD standards.

Fig. 1 models the proportion of second-home residences in a municipality compared to the proportion of treatment facilities in violation of established standards. In order to obtain the proportion of compliant treatment facilities, we can subtract our proportions for noncompliant treatment facilities from 1. Fig. 3 compares the proportion of second-home residences in a municipality to the proportion of treatment facilities in compliance with regulatory standards. We displayed a least squares regression line in our scatterplot to illustrate the relationship between variables. The dataset yielded a Pearson correlation coefficient of -0.89.

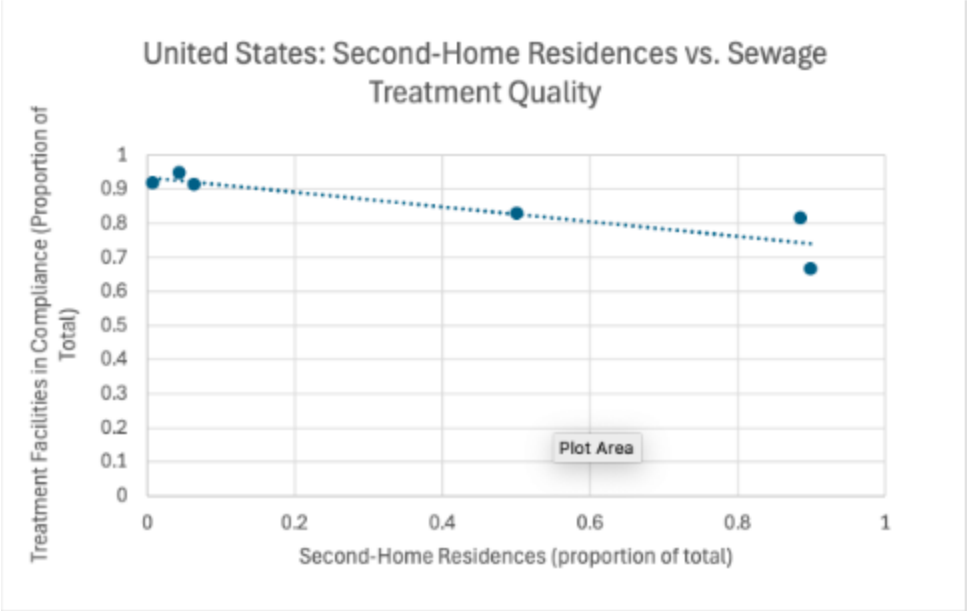

Figure 3. The slope of the least squares regression line is negative: as the proportion of second-home residences in a municipality increases, the proportion of sewage treatment plants compliant with EPA standards decreases. The coefficient of determination for this dataset is approximately 0.79.

Fig. 2 compares the proportion of second-home residences in Spanish municipalities to treatment facility compliance with regulatory standards in those municipalities.. Generally, the municipalities in this sample were small in size and had a single wastewater treatment facility (Madrid was the sole exception). Thus, our y-values were binary and not continuous. 1 represented 100% compliance and 0 represented 0% compliance. (Since all of Madrid's treatment facilities adhered to established regulations, it had a 100% compliance rate and could follow this pattern). The data yielded a Pearson correlation of -0.94. Fig. 4 displays a visual representation of the data in a scatterplot, with a least squares regression line illustrating the relationship between the variables.

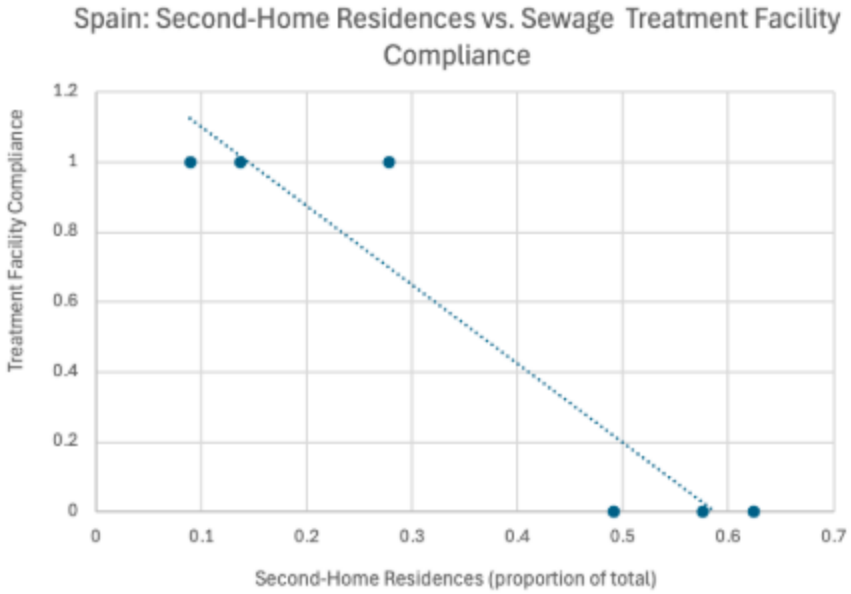

Figure 4. The slope of the least squares regression line is negative: as the proportion of second-home residences in a municipality rises, sewage treatment plants tend to violate EPA standards (not compliant). The coefficient of determination for this dataset is approximately 0.89.

Overall, in both the United States and Spain, cities where second homes constitute the majority of residences are coastal cities or resort towns and are subject to large fluctuations in population. This burdens existing sewage treatment systems, which are often not designed to handle intense demand. Consequently, they become overloaded during peak season.

Observations In Çeşme

The municipality of Çeşme follows a pattern similar to that of coastal resort towns in the U.S and Spain: seasonal fluctuations in population, a high level of second-home tourism, and inadequate sewage treatment. Former mayor Ekrem Oran describes how the municipality's infrastructure was built to accommodate the officially registered population (approximately 50,000). However, during the summer season, Çeşme is often host to about 1,000,000 people- permanent residents, seasonal occupants, and tourists. Only about 55-60% of the city is connected to wastewater infrastructure (excluding key neighborhoods such as Ardıç, Yalı, Ildır, and Germiyan). While some of the remaining homes utilize septic tanks, others do not. Enforcement of proper sewage treatment practices is nearly nonexistent: waste from houses without septic tanks is released into the ground, where it mixes with groundwater and flows into the sea as runoff. Fig. 5 shows the construction of a septic tank at a local residence in the Yalı neighborhood.

Figure 5. Residences that are not connected to existing wastewater infrastructure construct septic tanks beneath their houses; septic tanks are not regulated to ensure that proper sanitation practices are being followed. (Taken on July 2 at 6224 Sokak, No; 12, Yali Mahallesi, Izmir, Türkiye).

The Çeşme Atıksu Arıtma Tesisi, constructed in 2013, is currently the only advanced wastewater treatment facility in Çeşme. Using advanced biological processes, the plant extracts both organic (carbon, phosphorus, and nitrogen) and inorganic waste from wastewater before discharging treated water into the ocean. A pipe system used to discharge this treated water extends 1400 meters into the sea. Plant manager Yiğit Kara explains how the Çeşme Atıksu Arıtma Tesisi is designed to have a capacity of 21,900 cubic meters of wastewater per day. It can exceed this amount by 40%, and the plant can comfortably handle 30,000 cubic meters of wastewater per day. However, the stark dichotomy between the population in summer and winter poses a challenge. In the winter months, when the population drops, the plant functions at 50% capacity. This time is used for repairs and maintenance (for instance, emptying the septic pools). In the summer months, the plant is again operated at 100% capacity and must even operate overtime. Kara notes, “Treatment facilities in larger cities such as Izmir and Istanbul have more demand. However, since the fluctuations in population are not as drastic, the work is more monotone”. Fig. 6 displays wastewater treatment at the Çeşme Atıksu Arıtma Tesisi.

Figure 6. In August, the Çeşme Atıksu Arıtma Tesisi exceeded its capacity to keep up with the mass demand caused by tourism in the peak summer season. (Taken on August 18, 2025 at Sakarya Mahallesi, 1074. Sokak, No: 4, 35930 Çeşme/İzmir).

While there are currently no projects to expand the capacity of the Çeşme Atıksu Arıtma Tesisi, plans are underway to construct other facilities. Kara explains that the main problem in establishing new facilities is finding appropriate locations far enough away from settlements. He reports that these projects are planned far in advance due to the lengthy planning, funding, and construction processes: "The idea of constructing a new treatment facility was first being discussed when I started working here, in 2013". A location for a new treatment plant in Ovacık was identified in former mayor Oran's last term (2019-2024). Zoning permits are currently being issued, and the Metropolitan Municipality will soon build a biological treatment facility there to treat wastewater from Çiftlikköy, Çeşme Center, and Ovacık (a rapidly growing area).

However, these plans all depend on the available budget. The Çeşme Municipality does not have the authority to invest in infrastructure. This falls to the Izmir Metropolitan Municipality; services such as water, waste management, and cemetery maintenance are specifically under the jurisdiction of the Izmir Water and Sewage Administration (IZSU). Çeşme receives government funding only in proportion to its officially registered population, so its budget is strained when handling 800,000 people rather than 50,000. Property taxes in Çeşme are minimal, at 0.028%. However, a sewage tax is imposed, adding a startling 50% surcharge to all water bills, even for residents who aren't connected to sewage infrastructure.

Residents of Çeşme are dissatisfied with sewage treatment practices in the area. Resident Banu Bilhan of the Ardıç neighborhood (specifically the Venus complex) describes her experience with pollution in her local beach. A leak in the septic tank of a neighboring complex caused untreated waste to be discharged into the beach. “I didn’t feel safe going in,” she states. “We stayed out of the water for four days.”

Furthermore, most of the Venus complex were not alerted to the water’s unsafe condition; only residents of the complex in question were informed. Although Ms. Bilhan learned about the danger from a friend who lived in the neighboring complex, many residents of the Venus complex, unaware of the threat, went to their local beach as usual. Residents also conveyed their annoyance at the difficulty of obtaining waste collection services during the peak season. Residents who must call in septic trucks face delays and struggle to reach septic truck drivers. Many explain that the system has not drastically changed or improved over the years.

DISCUSSION

Our study found that a high level of second-home tourism in an area is associated with poorer sewage treatment quality. Communities characterized by second-home tourism face disproportionate sewage challenges. These patterns consistently manifest in cities in the United States and Spain as well as in Çeşme.

In Dearborn, Michigan, for instance, about 4.44% of residences are for seasonal/recreational/occasional use, and only 5.26% of sewage treatment plants violate EPA standards. Conversely, in Cape May, New Jersey (a popular resort town), 89.89% of residences are classified as second homes. A much larger 33.33% of sewage treatment plants violate EPA standards.

Strengthening this conclusion, in Calp, a municipality in Spain, 62.38% of homes are secondary/seasonal dwellings, and the local sewage treatment facility is not compliant with UWWTD standards. In Arganda del Rey, a municipality with a much smaller percentage of second homes (8.94%), the local treatment facility adheres to UWWTD standards. This general pattern emerges throughout the 6 municipalities in the Spanish sample.

Our correlation coefficients of -0.89 (for the United States) and -0.94 (for Spain) indicate a statistically strong negative correlation between second-home tourism and sewage treatment quality in an area.

Our study corroborates case studies conducted in countries such as Denmark (Staunstrup et al., 2023), which show a similar relationship.

In Çeşme, tourism places a tremendous strain on the existing wastewater management. Seasonal influxes of tourists lead to a population boom during the summer season, putting severe pressure on the existing infrastructure. The amount of human waste increases drastically, septic truck collection routes become burdened, and the system gets backlogged in many areas. People resort to discharging untreated waste into Çeşme's marine environment, highlighted in the pollution in the local beach of the Venus complex.

The single wastewater treatment facility (Çeşme Atıksu Arıtma Tesisi) serving the entire municipality was established in 2013. We can assume that before this time, a large portion of sewage was being discharged- untreated- into the bodies of water surrounding the municipality. Çeşme has historically discharged wastewater into the ocean, even before facilities were established to treat it properly. Since the sea is a self-renewing ecosystem, small amounts of sewage could be tolerated. However, the population of Çeşme has grown rapidly over the years, and this is no longer a sustainable strategy.

The lack of regulation of sewage treatment cannot continue in the municipality. This study highlights the association between high levels of second-home tourism and poorer sewage treatment quality. Thus, there is a need for more effective government and public policy practices to control funding for infrastructure expansion. The lack of a substantial property tax in Çeşme results in lower revenue for infrastructure expansion, especially compared to cities in the United States. While the high sewage tax largely offsets this deficit, it is not always used where it is collected. Therefore, more effective use of tax revenue is necessary to secure a budget for infrastructure expansion.

Limitations

The primary limitation of this study is the small sample size used to analyze cities in the United States and Spain. This could have caused our correlation coefficient values to misleadingly appear higher and robust, as there was more variability in our data. Additionally, the lack of available public data on the number of second homes in Çeşme made quantifiable data collection difficult for this region. The study sought to address this limitation by using interviews with trusted sources with in-depth experience in governance and waste management.

Next Steps

Our study used the proportion of sewage treatment plants in a region that adhered to regulations (EPA or UWWTD) to assess sewage treatment quality in the United States and areas of Europe. Future studies could judge sewage treatment quality differently, possibly investigating the number of septic tanks in a region to determine the percentage of houses that aren't connected to regulated waste infrastructure. Future studies could also employ more precise methods to survey large samples of houses in areas where government data are unavailable. This would yield more quantifiable data on the number of second homes in developing countries such as Türkiye.

CONCLUSION

Our study analyzed developed and developing countries to illustrate a negative correlation between second-home tourism and sewage treatment quality, showing that communities with second-home tourism face disproportionate sewage challenges. The municipality of Çeşme illustrates how communities with high levels of tourism still struggle to meet basic sanitation guidelines for residents. The results of this study underscore the need for increased investment in local waste infrastructure and more responsible use of tax revenue to foster a cleaner, environmentally sustainable future for Çeşme.

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