OXFORD JOURNAL
OF STUDENT
SCHOLARSHIP

The Environmental Impact of the Rise in Single-Household Products

Jayden Hyunjin Yoo
hjyoo2027@daltonschool.kr

ABSTRACT

Single-person households have become a global phenomenon, especially in industrialized and developed countries, driven primarily by social changes such as decreasing birth rates and rising living costs. As a result, the increase in single-person households has led to a higher demand for single-serving products worldwide. This study examines the environmental impact of the growing number of single-person households, with a specific focus on the increasing amount of plastic packaging used in single-serving products in South Korea. The survey findings highlight the significant environmental burden of these products, both in terms of landfill waste and carbon footprint.

INTRODUCTION

The rise in single-person households is a global trend. In a study by Cohen,[1] which surveyed 75 countries representing approximately 73 percent of the world's population, 53 countries reported an increase in the number of one-person households from 1960 to 2019. This rise is particularly prevalent in developed countries, with all European nations showing an increase in single-person households since 1960. Switzerland, in particular, has the highest percentage of single-person households, accounting for 38 percent of its population. A notable observation is that younger generations make up the majority of these households. According to the United States Census Bureau,[2] over a quarter of U.S. households were one-person households in 2020, marking a steady increase each decade since 1940. Approximately 28 percent of these single-person households are headed by individuals under the age of 45.[3] Moreover, the number of single-person households may be underreported due to students and young professionals sharing homes in cities with high rent costs.[4,5] These trends reflect several societal changes, such as delayed marriage and childbearing, rising costs of homeownership, and evolving views on family types and structures.[1,5,6]

The growing number of one-person households has both social and economic effects, which are often cyclical. The increasing trend of living alone contributes to rising living costs, driven by services and products tailored to single-person lifestyles.[7] However, the environmental impact of this lifestyle change is often overlooked. As mentioned earlier, the large proportion of one-person households has made them a target consumer group for many companies, especially in the food industry. South Korea, where 34.5

percent of households are one-person households,[8] has seen a rise in products marketed to this demographic, such as ready-made meals and produce packaged in small portions.[9] The popularity of these products is reflected in the increasing sales figures at convenience stores, where "one-person products" (hereinafter referred to as OPP) are more widely available. In 2022, convenience stores in South Korea saw a 10.8% increase in sales, significantly outpacing the 6.0% growth in large supermarkets; much of the sales growth came from ready-made meals designed for single-person households.[10,11] The demand for one-person products is also evident in the refrigerated section of stores, where product sizes for liquids have steadily decreased in recent years, aimed at short-term consumption or specific tasks (e.g., sports drinks or protein shakes), often for use in work environments.

The sustainability of the growth in OPPs, however, must be challenged. A major concern is that these products contribute to an increase in plastic use, as most of the packaging is made from plastic, with single-use plastics being one of the world's most pressing environmental issues.[12,13,14] Despite global efforts to reduce plastic pollution through regulations, we have seen a steady increase in the use of single-use plastics in recent years.[15] Food packaging, with an annual consumption growth rate of 5%,[16] accounts for 50% of fossil fuel-derived plastic worldwide.[17] Given the observed increase in OPPs, the production of plastic for food packaging is expected to continue to rise. The detrimental impact of plastic on the environment is clear. According to data published by the United States Environmental Protection Agency,[18] less than 15% of plastic containers and packaging have been recycled annually from 1980 to 2018, while over 10 million tons of plastic packaging end up in U.S. landfills each year since 2015.[18] Moreover, plastic production contributes to 3.4% of global greenhouse gas emissions, which in turn contribute to climate change.

The adverse impacts of plastic use on human health have garnered significant attention recently. A prominent example is the ingestion of microplastics—plastic particles between 1 nm and 5 mm in size[19]—mostly formed from the degradation of plastic items. The routes of human exposure to microplastics are so diverse that it is almost impossible to avoid them. Humans can ingest, inhale, or come into skin contact with microplastics through drinking from plastic bottles, eating animals that have been exposed to microplastics, or even from rain and wind that carry particles of nano- and microplastics.[20] The most significant adverse effects of microplastic exposure include cancer and reproductive issues, caused by plastic particles small enough (on the nanometer scale) to infiltrate cells, leading to DNA damage and changes in gene activity.[21]

The use of plastic is becoming increasingly common in our daily lives. This study focuses on the rise in plastic use due to the packaging of single-person products. Specifically, I report the amounts of single-use plastic used in products marketed primarily toward single-person households and discuss the environmental impact of these products. I conducted a survey across three categories of products in South Korea: 1) individually packaged market produce and products that are often sold without packaging, such as fruits and vegetables; 2) plastic containers used for delivery foods; and 3) everyday items sold for single use, such as toothbrushes. The first two categories represent the growing plastic use due to the increasing number of single-person households. The amounts of plastic in these products were measured using a precision scale to determine the plastic consumption in our daily lives.

METHODOLOGY

For the OPPs, I surveyed eight products, ranging from market produce to disposable items. These products were chosen because they appeal to the single-person household markets specifically. They are available and commonly purchased in bulk with packaging that is generally compostable, such as cardboard, or even without any packaging at all. However, these products are becoming increasingly more and more available in single-packaged forms to target single-person households due to their perishable nature when bought in bulk. While this study has focused on perishable produce, the plastic use in packaging can be more broadly surveyed by including non-perishable products that are individually packaged.

Additionally, I measured the amount of plastic used in delivery packaging. The plastic usage was measured by weight using a precision scale (CAS CWA-35B). The scale is capable of accurately measuring up to 3 kg, with a minimum displayed increment of 0.1 g. Weight measurements were taken three times, and the average and standard deviation of these measurements are reported. The scale was tared before each measurement.

Table 1 summarizes the names of the distributors and products surveyed in this study. The items were selected to represent products typically consumed by a household on a daily basis. The products marketed toward single-person households are predominantly sold in convenience stores. As shown in Table 1, the items surveyed are all individually packaged and intended for single-person, single-meal use. While convenience stores also carry other OPPs, such as salads, bento boxes, sandwiches, and cup noodles, these items were excluded from this survey because they do not have alternatives that are not individually packaged.

Table 1. List of single-household products surveyed

Manufacturer	**Product name**	**Product type**	**Vendor**	**Item quantity (per packaging)**
Dole	Dole banana	Fruit	GS25	1
Sanjiae	Sanjiae apple	Fruit	GS25	1
Sunsu	Sunsu sweet potato	Fruit	GS25	1
Shin-sun	Shin-sun cucumber	Vegetable	GS25	1
Shin-sun	Shin-sun perilla leaves	Vegetable	GS25	1
Fresh	Fresh corn	Vegetable	CU	1

KC	KC corn	Vegetable	CU	1
Dole	Dole lemon	Fruit	CU	1

The delivery was ordered for a two-person meal, as shown in Figure 1, which is typical for food delivery. The order was placed using the BaeMin delivery app. The food shown in Figure 1 represents a typical amount of plastic and other packaging used for food delivery in South Korea.

Figure 1. Packaging used in delivery food for a two-person meal

RESULTS AND DISCUSSION

In this section, I discuss the survey results for single-person household products and their environmental impact from multiple perspectives, including the carbon footprint of packaging production and the amount of landfill waste generated throughout their lifecycle. Furthermore, I examine the plastic packaging used in delivery foods, which have become common both in Korea and globally. The estimates used in the analysis are based on the best available data.

One-person product packaging

Table 2 shows the weight of the OPPs surveyed. The measurement error has been estimated using the standard deviation of the three weight measurements. The amount of packaging is not proportional to the weight of the products. This observed lack of proportionality between the weights of product and packaging is largely driven by two factors: logistics and preservation. Logistically, certain products tend to have a high packaging-to-content ratio. For example, perilla leaves lack natural protective layers, unlike bananas or lemons, and require more protective plastic packaging. From a preservation standpoint, certain perishables goods, such as bananas or sweet potatoes are more prone to bruises and damage, often requiring thicker barrier packaging to maintain freshness. In contrast, these items in bulk may only require a single protective cardboard packaging that is compostable. The products surveyed generally represent

the daily consumption of single-person households, with most being perishable items. An alternative to purchasing these products individually packaged is buying them in bulk at supermarkets, where they are typically packaged in cardboard boxes. However, bulk packaging does not appeal to single-person households, as perishable produce does not have a long enough shelf life to be consumed by one person. While these products are sometimes packaged in plastic bags, they use significantly less plastic per item than the OPPs surveyed here.

Table 2. Weight measurements of the surveyed products and packaging

Product name	**Product type**	**Product (g)**	**Packaging (g)**	**Packaging SD* (g)**
Dole banana	Produce, fruit	281.5	4.4	0.1
Sanjiae apple	Produce, fruit	214.4	1.9	0.1
Sunsu sweet potato	Produce, fruit	150.2	8.3	0.2
Shin-sun cucumber	Produce, vegetable	490.0	4.7	0.1
Shin-sun perilla leaves	Produce, vegetable	37.8	2.1	0.2
Fresh Corn	Produce, Vegetable	304.5	9.1	0.3
KC Corn	Produce, Vegetable	326.6	9.1	0.3
Dole Lemon	Produce, Fruit	104.8	0.9	0.1

*Standard deviation of three weight measurements

The total weight of the products surveyed is 40.5 g, with a standard deviation of 1.4 g. Single-person households in South Korea account for nearly 40% of all households,[8,21] totaling approximately 10 million people, or roughly a quarter of South Korea's population. The estimated amount of plastic used annually due to OPPs is 150,000 metric tons. The greenhouse gas emissions associated with plastic production are approximately 5 kg of CO2 equivalent per kg of plastic produced.[23,24,25] Therefore, the estimated amount of greenhouse gas emissions is 750,000 metric tons of CO2 equivalent. This amount of carbon emission is equivalent to the emissions produced by 163,000 passenger vehicles on the road (4.6 metric tons of CO2 per vehicle[26]).

Packaging used in delivery

Delivery food has also increased in number with the rise of single-person households. South Korea is often described as a delivery haven, with the earliest recorded history of food delivery dating back to the 18th century.[27] While delivery has always been a part of Korean life, it has become easier and faster since the introduction of smartphones and the rise in small households.[28] Online food sales in South Korea, including on-demand delivery, have steadily increased over the years, with its share of total online commerce rising as well,[29] reaching 67 trillion KRW (equivalent to 46 billion USD) in 2023.

Table 3 shows the amount of plastic used in the delivery of a two-person meal. The majority of the packaging material is plastic, with the paper case also coated with a thin layer of plastic. The total packaging weight is much higher than that of the OPPs surveyed in Table 2. This is due to the thicker packaging material and the inclusion of additional items, such as soup and sauces. The total weight of plastic used in a single delivery for a two-person meal is 127.1 g. To estimate the number of deliveries per year, I use the revenue of major delivery apps. The transaction amount for delivery apps in 2024 hit a record high of around 30 trillion KRW, with 8 million monthly active users.[27] Since data on the exact number of deliveries is not available, I assume that the amount of plastic used is proportional to the cost of delivery. This is a rough and conservative estimate, as the delivery food ordered in this survey (28,000 KRW) exceeds the average cost of delivery foods. Based on 2024 transaction data, the estimated number of deliveries in South Korea is 1.1 billion annually, which translates to 140,000 metric tons of plastic. This amount is comparable to the plastic generated from OPPs and results in 700,000 metric tons of greenhouse gas emissions. This assumption is based on the delivery items being similarly priced across different venues and every additional delivery item being individually packaged in plastic containers. While this study believes that these assumptions are within reason, it should be noted that they each pose limitations. First, delivery has become so common in South Korea that food services across a wide price range are available for delivery. Second, the packaging-to-content ratio can also vary depending on item size and structural integrity required to hold food items.

Table 3. Weight measurements of packaging used in delivery

Type	**Amount of supplies**	**Packaging (g)**	**Total (g)**	**Packaging SD* (g)**
Black plastic bottom plate	3	9.5	28.5	0.2
Transparent plastic lid	3	8.3	24.9	0.3
Small white plastic case	3	2.1	6.3	0.1
Small white plastic lid	3	1.5	4.5	0.1
Medium-size white plastic case	4	4	16.0	0.2
Medium-size white plastic lid	4	1.7	6.8	0.1
Soysauce case	3	1.5	4.4	0.1

Plastic wrapper	1	19.2	19.2	0.2
Paper case	1	16.5	16.5	0.4

*standard deviation of three weight measurements

The amount of plastic estimated from this survey is a conservative estimate, as it does not account for other OPPs that are frequently consumed, such as drink products, which use significant amounts of plastic packaging. Carbon emissions are not the only environmental burden associated with plastic consumption. A large portion of plastic ends up in landfills or the ocean, creating waste that will take centuries to decompose. These estimates demonstrate the potential for reducing both carbon emissions and landfill waste. For example, fruits do not need to be packaged in plastic because they are often naturally protected by external shells or peels, such as apples and bananas, which were surveyed in this study. By simply removing plastic packaging from these products, a significant reduction in landfill waste and carbon emissions can be expected. In the next section, we discuss a successful implementation of a government regulation that resulted in a large reduction in plastic consumption.

Regulations for waste reduction

In 2023, South Korea's National Assembly passed a bill banning hotels from providing single-use toiletries to guests.[30] The single-use toiletries defined in the bill include toothbrushes, toothpaste, and single-use shampoo and body cleansers; these items are typically individually wrapped in plastic packaging and provided to guests daily. The following table summarizes the weight of plastic used in single-use toothpaste and toothbrushes commonly found in hotels.

Table 4. Weight measurements of plastic used in major hotel amenities

Items	**Brands**	**Plastic used**	**Plastic weight (g)**
Toothpaste	Besto	Outer case	0.2
Toothbrush	Besto	Brush handle, Bristle	9.8
Travel-size shampoo	N/A	Bottle	15.2
Travel-size body wash	N/A	Bottle	14.1

Data on the exact number of hotel guests in South Korea during the post-pandemic period is not readily available; therefore, we use the number of visitors to the country to estimate the amount of plastic reduction due to the regulation. The total number of arrivals into South Korea was approximately equal to the number of hotel guests in 2018.[31] This is likely because the number of local guests staying at hotels during domestic trips is not reflected in inbound arrival statistics. Consequently, we estimate the number of hotel guests to be equal to the number of arrivals in the same year. In 2024, approximately 16 million visitors traveled to South Korea[32] and stayed for an average of 7.5 days.[33] The amount of plastic reduction per year is estimated to be 4,700 metric tons, equivalent to a carbon emission reduction of 23,500 kg. This

amount of carbon emission is comparable to the reduction from removing approximately 5,000 vehicles from the road. Such a reduction is significant and demonstrates the potential for substantial environmental benefits if implemented globally. However, the reduction due to this regulation may be less than expected, as not all travelers pack their daily toiletries when traveling and may purchase them instead. Additionally, while the regulation applies to single-use toiletries, the bill does not ban the provision of minor personal hygiene products. As shown in Figure 2, these products are also packaged in plastic.

Figure 2. Personal hygiene products (JW Marriott, Seoul, South Korea).

The regulations targeting the hotel industry are a step in the right direction from an environmental perspective. Toiletries are just one example of single-use items in the hotel industry. Towels and soaps are often washed or discarded after a single use, particularly in high-end hotels, to maintain the appearance of luxury. The hotel industry is responsible for approximately 15% of total water consumption by commercial buildings in the United States, with 17% of that consumption coming from laundry.[34] This water usage could be avoided, as towels and bed linens are not typically washed after each use in private homes. Therefore, hotels have recently begun promoting towel reuse to reduce the wasteful water usage associated with laundering single-use towels and linens, and are working to create effective messages encouraging guests to participate in this movement.[35,36] An organization called Clean the World is also partnering with hotel chains to recycle soap bars that are discarded after being used just a few times, having produced 80 million recycled soap bars since its founding.[37] Regulations for the hotel industry are not the only examples of efforts to reduce environmental impact. Coffee shops in South Korea have started offering discounts to customers who use their own cups, incentivizing the use of personal cups and reducing plastic cup usage.

While this study has showcased the amount of plastic usage that arises from single-use items targeted for user convenience, the amount of data collected for this study can be expanded to create a large dataset of plastic use in our daily lives to better understand the environmental impact. Such a dataset could help us understand the areas that show the most use of plastic and therefore give the most effective targets for reducing plastic consumption from a regulatory level.

CONCLUSION

The rise of single-person households has led to significant shifts in consumer behaviors, particularly in the demand for products tailored to this demographic, such as "one-person products" (OPPs). While these products provide convenience, they also contribute to the increasing environmental burden, primarily due to excessive plastic packaging. This study has highlighted the growing consumption of plastic in South Korea, driven by the packaging of fruits, vegetables, and delivery food. The analysis of the plastic used in these products shows a substantial amount of waste generated by the growing popularity of individually packaged goods.

While this study highlights a growing environmental concern, I acknowledge several limitations. First, the primary data is based on a small sample size of eight representative products and delivery items from a selected venue. These items provide a useful representation of common consumption patterns; however, they do not encompass the full range of the OPP and food delivery market. Second, the study is geographically limited to Seoul, South Korea. Consumer packaging practices may vary by region, potentially limiting the generalization of this study's findings to a particular location. Lastly, the large-scale estimates for national plastic waste rely on the assumption that plastic usage scales linearly with delivery frequency and cost. Future research should utilize a larger sample size to more accurately estimate the national-level plastic waste, including products in different categories, such as beverages and household cleaners, which were excluded from the current analysis.

The findings of this study underline the urgency of addressing the sustainability of packaging in products marketed to single-person households. The estimated annual plastic use and greenhouse gas emissions associated with OPPs are significant, indicating a need for alternative packaging solutions. Efforts to mitigate these impacts, such as the ban on single-use toiletries in South Korea's hotel industry, demonstrate the potential for significant reductions in plastic consumption.

To effectively combat the environmental challenges posed by the growth of single-person households and their consumption patterns, it is crucial to foster consumer awareness, develop eco-friendly packaging alternatives, and encourage policy changes that prioritize sustainability. Through collective action at both the consumer and regulatory levels, we are able to reduce the environmental footprint associated with the packaging of one-person products and make significant strides toward a more sustainable future.

REFERENCES

1. P. N. Cohen. The rise of one-person households. *SAGE Journals*. https://doi.org/10.1177/23780231211062315 (2021).
2. U.S. Census Bureau. More than a quarter of all households have one person. *U.S. Census Bureau.* https://www.census.gov/library/stories/2023/06/more-than-a-quarter-all-households-have-one-person.html (2023).
3. G. Masnick. The rise of the single-person household. *Joint Center for Housing Studies of Harvard University.* https://www.jchs.harvard.edu/blog/the-rise-of-the-single-person-household (2015).

4. S. Kale. No Scorpios, no meat-eaters: The rise of extreme flatsharing ads. *The Guardian.* https://www.theguardian.com/money/2019/jun/26/no-scorpios-no-meat-eaters-rise-of-extreme-flatsharing-ads (2019).
5. A. VanOrman & L. A. Jacobsen. U.S. household composition shifts as the population grows older, more young adults live with parents. *Population Reference Bureau.* https://www.prb.org/resources/u-s-household-composition-shifts-as-the-population-grows-older-more-young-adults-live-with-parents/ (2020).
6. R. Ronald. The remarkable rise and particular context of younger one-person households in Seoul and Tokyo. *City & Community*, **16**(1), 25–46. https://doi.org/10.1111/cico.12221 (2017).
7. K. Kojima & T. Ozawa. Toward a theory of industrial restructuring and dynamic comparative advantage. *Hitotsubashi Journal of Economics*, **26**(2), 135–145 (1985).
8. S. Kim. Era of 10 million single-person households… Convenience food is on the rise. *Good News 1*. https://www.goodnews1.com/news/articleView.html?idxno=432244 (2024).
9. J. Yang. A bold transformation and 'big hit'… What food has single-person households excited? *Hankyung.* https://www.hankyung.com/article/202301153493i (2023).
10. J. Kim. Rising alone... Why only convenience store sales are growing these days. *Chosun.* https://www.chosun.com/economy/economy_general/2024/02/12/CZN5UPX7UBCWFMNGD346LSF3IA/ (2024).
11. A. Kim. Sales increase at convenience stores for seniors in their 50s and 60s: Absorbing demand from one- to two-person households. *Yonhap News.* https://www.yna.co.kr/view (2024).
12. W. Leal Filho, P. H. Havea, A.-L. Balogun, J. Boenecke, A. A. Maharaj, M. Ha'apio, & S. L. Hemstock. Plastic debris on Pacific Islands: Ecological and health implications. *Science of the Total Environment*, **679**, 181–187. https://doi.org/10.1016/j.scitotenv.2019.03.181 (2019).
13. W. Leal Filho, A. L. Salvia, A. Minhas, A. Paço, & C. Dias-Ferreira. The COVID-19 pandemic and single-use plastic waste in households: A preliminary study. *Science of the Total Environment*, **793**, 148571 (2021). https://doi.org/10.1016/j.scitotenv.2021.148571
14. A. L. P. Silva, J. C. Prata, T. R. Walker, A. C. Duarte, W. Ouyang, D. Barcelò, & T. Rocha-Santos. Increased plastic pollution due to COVID-19 pandemic: Challenges and recommendations. *Chemical Engineering Journal*, **405**, 126683 https://doi.org/10.1016/j.cej.2020.126683 (2020).
15. D. Stanway. Single-use plastic waste rises from 2019 to 2021 despite pledges. *Reuters.* https://www.reuters.com/business/environment/single-use-plastic-waste-rises-2019-2021-despite-pledges-2023-02-06/ (2023).
16. M. Kan & S. A. Miller. Environmental impacts of plastic packaging of food products. *Resources, Conservation and Recycling*, **180**, 106156. https://doi.org/10.1016/j.resconrec.2022.106156 (2022).
17. J. Jacob, U. Lawal, S. Thomas, & R. B. Valapa. Biobased polymer composite from poly(lactic acid): Processing, fabrication, and characterization for food packaging. In *Processing and development of polysaccharide-based biopolymers for packaging*

applications (pp. 97–115). Elsevier. https://doi.org/10.1016/B978-0-12-818795-1.00004-6 (2020).
18. U.S. EPA. Containers and packaging: Product-specific data. *U.S. Environmental Protection Agency.* https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/containers-and-packaging-product-specific (2025).
19. Illinois EPA. Microplastics. *Illinois Environmental Protection Agency.* https://epa.illinois.gov/topics/water-quality/microplastics.html (2025).
20. U.S. Geological Survey. Microplastics: Sources, pathways, and fate conceptual diagram. *U.S. Geological Survey.* https://www.usgs.gov/index.php/media/images/microplastics-sources-pathways-and-fate-conceptual-diagram (2023).
21. S. Dutchen. Microplastics everywhere. *Harvard Medical School.* https://magazine.hms.harvard.edu/articles/microplastics-everywhere (2020).
22. M.-s. Yoon. Nearly half of S. Koreans live alone: Report. *The Korea Herald.* https://www.koreaherald.com/article/3295607#:~:text=Jan.,or%20above%20were%20living%20alone (2024).
23. K. Nihan, N. Khanna, & N. Shah. Climate impact of primary plastic production. *Lawrence Berkeley National Laboratory.* https://energyanalysis.lbl.gov/publications/climate-impact-primary-plastic#:~:text=Our%20estimates%20show%20that%20global,Use%20Change%20and%20Forestry (2024).
24. H. Ritchie, V. Samborska, & M. Roser. Plastic pollution. *Our World in Data.* https://ourworldindata.org/plastic-pollution (2024).
25. K. Vasarhelyi. The impact of plastic on climate change. *University of Colorado Boulder.* https://www.colorado.edu/ecenter/2023/12/15/impact-plastic-climate-change (2023).
26. U.S. EPA. Greenhouse gas emissions from a typical passenger vehicle. *U.S. Environmental Protection Agency.* https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle (2025).
27. S.-y. Jeon. Food delivery paradise: Transforming the landscape of food delivery services. *Korea Culture and Information Service.* https://www.kocis.go.kr/eng/webzine/201811/sub03.html (2018).
28. S. A. Lee. S. Korea's food delivery apps relish fresh boom in demand. *Korea Economic Daily.* https://www.kedglobal.com/retail/newsView/ked202411140002 (2024).
29. S. Yoo. South Korea food ecommerce market (Report No. KS2024-0033). *U.S. Department of Agriculture, Foreign Agricultural Service.* https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=South%20Korea%20Food%20Ecommerce%20Market_Seoul%20ATO_Korea%20-%20Republic%20of_KS2024-0033 (2025).
30. D.-h. Ko. Single-use toiletries ban poses challenge for hotels. *The Korea Times.* https://www.koreatimes.co.kr/www/nation/2025/03/113_346332.html (2023).

31. UN World Tourism Organization. Key tourism statistics. *United Nations World Tourism Organization.* https://www.unwto.org/tourism-statistics/key-tourism-statistics (2024).
32. J.-h. Moon. South Korea tourism surges in 2024 with record spending and arrivals. *The Korea Herald.* https://www.koreaherald.com/article/10412971#:~:text=In%202024%2C%20South%20Korea%20welcomed,to%20just%20970%2C000%20in%202021 (2025).
33. Road Genius. South Korea tourism statistics. *Road Genius.* https://roadgenius.com/statistics/tourism/south-korea/#5f36db3c-eef0-4119-b5a3-fb8e373e6068 (2024).
34. U.S. EPA. Saving water in hotels: Fact sheet. *U.S. Environmental Protection Agency.* https://19january2017snapshot.epa.gov/www3/watersense/docs/saving-water-in-hotels_fact%20sheet_508_Mar2016.pdf (2016).
35. S. Gössling, J. E. Araña, & J. T. Aguiar-Quintana. Towel reuse in hotels: Importance of normative appeal designs. *Tourism Management*, **70**, 273–283 https://doi.org/10.1016/j.tourman.2018.08.027 (2019).
36. G. Bohner & L. E. Schlüter. A room with a viewpoint revisited: Descriptive norms and hotel guests' towel reuse behavior. *PLOS ONE*, **9**(8), e104086 https://doi.org/10.1371/journal.pone.0104086 (2014).
37. Clean the World. Recycling. Clean the World. https://cleantheworld.org/recycling/ (n.d.).