

The structure of food waste in Istanbul

— and why every city needs its own policy

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Abstract. Istanbul generates about 18,000 tonnes of household waste a day^[1]; the municipality's own characterisation finds about 48% of it organic^[5]. That is roughly **8,600 t of organic waste a day (estimate)**. In 2023 only about 45 t/day of separately collected organic waste was composted^[8] — **about 0.5% (estimate)**. The rest travels mixed: most to landfill, about 15% to incineration^[2], where its 62% moisture and ~1,435 kcal/kg calorific value^[13] work against energy recovery. Composition also varies within the city by income and lifestyle^[14], and per-capita waste varies more than two-fold between Turkish cities, from 1.53 kg/day in Muğla to 0.66 in Şanlıurfa^[16]. We frame collection as a game between the metropolitan municipality, district municipalities, food businesses, households and collectors, and summarise what the evolutionary-game literature implies for Istanbul: fees and credible penalties beat subsidies alone^{[18][19]}, and multi-actor schemes cost less than government-only ones^[20]. These are hypotheses to test, not results. Istanbul's own pilots — İBB's separate collection from restaurants, hotels and hospitals^[5] and the Adalar district model^[7] — are where to test them.

1. Why Istanbul is the sample

With 15.75 million people^[23], Istanbul produces about a fifth of Türkiye's municipal waste^[16]. Collection is split between 39 district municipalities, which collect, and İBB with its company İSTAÇ, which transfers, treats and disposes^{[5][1]}. Any food-waste model that works here must work with that two-level structure — which is also why a single national policy cannot simply be copied city to city.

2. Data and method

We used only public sources: İBB and İSTAÇ pages and reports, peer-reviewed characterisation studies, national statistics as published by TÜİK and in Efe (2022), independent reports (TMMOB ÇMO) and news reports that quote İSTAÇ data. Where sources disagree — daily tonnage is reported as 16,000, 17,000, 18,000 and 19,000 t; per-capita waste as 0.80 to 1.17 kg — we show the range. Derived numbers (e.g. organic tonnes = total × organic share) are marked **estimate**. Years are mixed (2013–2026) and stated for every figure.

3. The structure: how much, what, and where it goes

Figure	Value	Year	Type	Src
Household waste generated in Istanbul	18,000 t/day	2026 page	reported	[1]
Waste generated per day (İBB climate monitoring)	19,000 t/day	2024	reported	[6]
Recovery rate of the city's waste	26 %	2024	reported	[6]
Organic share of Istanbul waste (İBB characterisation)	48 %	2025	reported	[5]
Recyclable-content share (İBB characterisation)	25 %	2025	reported	[5]

Organic share, transfer-station sampling study	54.09 %	2013	measured	[13]
Average moisture of mixed MSW	62.41 %	2013	measured	[13]
Average calorific value of mixed MSW	1,435 kcal/kg	2013	measured	[13]
Organic share, Kartal district (4 income/lifestyle groups)	57.69 %	2016	measured	[14]
Share of daily household waste incinerated (Eyüpsultan/Kemerburgaz plant, 85 MW)	15 %	2026	reported	[2]
Household waste landfilled (Seymen + Kömürcüoda + Odayeri)	12,500 t/day	2026	reported	[1]
Recovery & composting plant capacity (Kemerburgaz, since 2001)	500 t/day	2026	reported	[3]
Biomethanization plant capacity for separately collected food waste	130 t/day	2021	reported	[4]
Separately collected organic waste composted per day (Jan–Sep 2023)	45 t/day	2023	reported	[8]
Source-separation rate does not exceed	15 %	2024	reported	[11]
Adalar district: organic waste separately collected, Aug 2024–Jun 2026	156 t	2026	reported	[10]
Adalar: growth in homes & businesses delivering waste regularly, Jan–Jun 2026	60 %	2026	reported	[10]
Istanbul population	15,754,053 people	2025	reported	[23]
Organic waste generated per day	8,640 t/day	2024–26	estimate	[1]
Share of organic waste that is separately collected and composted	0.5 %	2023	estimate	[8]
Waste per person per day (18,000 t / 15.75 M people)	1.14 kg/person/day	2025	estimate	[1]

Composition. The organic fraction is consistently around half: 48% (İBB)^[5], 54% in a 44-sample transfer-station study^[13], 58% in Kartal^[14] (a 2024 report quotes 44.2%^[9]). Mixed waste is wet (62–71% moisture) and has a low calorific value^{[13][14]}: food waste is the component that most reduces the value of everything it is mixed with.

Flows. Of ~18,000 t/day, ~12,500–14,000 t go to sanitary landfill (Seymen on the European side, Kömürcüoda on the Asian side)^{[1][8]}, about 15% to the 85 MW incineration plant^[2]; the city reports 26% recovery overall^[6]. Dedicated organic capacity is small: a 500 t/day mixed-waste recovery & composting plant^[3] and a 130 t/day biomethanization plant for separately collected food waste^[4].

The gap. ~8,600 t/day of organic waste (estimate) against ~45 t/day separately collected and composted (2023)^[8]. Even if the biomethanization plant ran at capacity, separately treated food waste would be ~1.5% of the organic stream (estimate). Engineers' reports put source separation overall below 15%^[11].

4. Differences inside the city

In Kartal, samples from high-, middle- and low-income areas and the town centre differed significantly in composition^[14]; districts are not interchangeable. The Adalar model shows what a district-wide system looks like: households and offices on two streams, food businesses on three (organic, packaging, other), every building and business with a barcode, and collection tracked digitally^[7]. Results to June 2026: 156 t of organic waste separately collected since August 2024 and a 60% rise in regularly participating homes and businesses in the first half of 2026^[10]. Adalar is small and car-free; the open question is what the same model costs in dense districts such as Fatih, Beyoğlu or Esenyurt.

5. Every city has a different structure

City	Population	kg/person/day	Year	≈ Mt/year (estimate)
Muğla	1.10 M	1.53	2022	614.04 Mt
İzmir	4.50 M	1.46	2020	2396.99 Mt
Antalya	2.78 M	1.43	2020	1449.81 Mt
Hatay	1.58 M	1.29	2020	740.48 Mt
Mersin	1.96 M	1.21	2020	863.34 Mt
İstanbul	15.75 M	1.13	2022	6492.01 Mt
Konya	2.34 M	1.13	2020	964.83 Mt
Ankara	5.91 M	1.03	2020	2224.14 Mt
Bursa	3.26 M	1.03	2020	1227.92 Mt
Kocaeli	2.16 M	0.98	2020	772.26 Mt
Adana	2.28 M	0.98	2020	813.51 Mt
Mardin	0.90 M	0.72	2022	237.46 Mt
Şanlıurfa	2.27 M	0.66	2022	545.83 Mt

kg/person/day: TÜİK municipal waste statistics as published in Efe (2022) and a 2023 paper (2022 figures)^[16]; population: TÜİK 2025^[23].
 Mt/year = population × rate × 365 (estimate; mixes years).

The spread is more than two-fold. Tourist provinces (Muğla, Antalya) carry hotel and restaurant kitchens and a strong summer peak; large metropolitan areas carry dense food-service districts; lower per-capita provinces (Şanlıurfa, Mardin) likely have more home cooking and informal recovery. A collection model, fee or incentive designed for one is unlikely to be right for another — the policy mix has to be fitted to each city's structure.

6. Collection as a game

Who decides whether food waste is separated? The **metropolitan municipality** (sets treatment capacity, fees, rules), the **district municipality** (runs collection), the **food business** (sorts or not, pays or not), the **household**, and the **collector** (picks up if it pays). Each acts on its own costs and benefits — the setting evolutionary game theory studies. The literature, mostly from Chinese cities, finds that without regulation residents tend not to separate; fee rates and penalties move behaviour more than subsidies^[18]; separation becomes stable once penalties exceed the net cost of sorting and the intermediary (e.g. a building manager) is paid for its effort^[19]; collaborative, multi-actor schemes were ~25% more cost-efficient than government-only enforcement in Shanghai^[20]; for food waste specifically, government–caterer–consumer games show how norms and signalling matter^{[21][22]}.

Hypotheses for Istanbul (to test, not results): (1) Food businesses separate when the fee for mixed waste is visibly higher than for clean organic waste, and inspection is credible. (2) Collectors join when pickups are batched by location so a trip pays. (3) Weighing every pickup and reporting it monthly turns a cost into a measurable result — what the Adalar QR system already does for one district.

7. Where Atikova fits

İBB has decided that biodegradable waste from restaurants, hotels, hospitals, universities and canteens is collected separately^[5]. Atikova does not replace that system; it proposes a measurement and logistics layer next to it: a sealed box per kitchen, location-based matching to couriers with spare capacity, a weighed pickup and a monthly

report — delivered to licensed composting or biogas facilities. Atikova has no paying customer and no signed partner yet; the next step is a limited, measured pilot.

8. Limitations

- Türkiye has no measured national household food-waste estimate in UNEP's 2024 index^[17]; widely quoted per-capita figures for Türkiye are not UNEP measurements.
- Istanbul figures come from different years and definitions (household vs municipal waste); the separate-collection figure is a news report of İSTAÇ data.
- The game-theory findings come from other cities and are hypotheses here.

9. Must-read: papers and news

1. **İBB Çevre Koruma ve Kontrol D.B. — Biyometanizasyon Tesisi (atık karakterizasyonu; Mahalli Çevre Kurulu kararı)** (2025, official) — Official composition (48% organic) and the decision that biodegradable waste from restaurants, hotels, hospitals and canteens is collected separately by İBB. ^[5]
2. **İSTAÇ (İBB) — Evsel Atık Lojistik Yönetimi** (2026, official) — Daily tonnage and where it goes: transfer stations, Seymen, Kömürcüoda, Odayeri, the incineration plant. ^[1]
3. **İBB — 2024 İklim Değişikliği İzleme Raporu** (2026, official) — Newest city-wide figures: ~19,000 t/day, 26% recovery (2024). ^[6]
4. **İBB — Adalar Sıfır Atık Projesi** (2026, official) — The first district in Türkiye with full source separation and QR-tracked collection; restaurants on a three-bin system. ^[7]
5. **ekoIQ — İstanbul'da vatandaş katılımıyla sürdürülebilir atık yönetimi (Adalar)** (2026, news) — Adalar results to June 2026: 156 t organic, +60% participating homes and businesses. ^[10]
6. **Hürriyet Daily News — Istanbul witnesses slight drop in daily waste amount (İSTAÇ data)** (2023, news) — İSTAÇ data: ~45 t/day of separately collected organic waste composted in 2023 — the size of the gap. ^[8]
7. **TMMOB Çevre Mühendisleri Odası — İstanbul Çevre Durum Raporu 2025** (2025, report) — Independent engineers' view: source separation stays below 15%. ^[11]
8. **Characterization of Municipal Solid Waste in Istanbul, Turkey (44 samples, 6 transfer stations)** (2013, paper) — The classic Istanbul characterisation: 54% organic, 62% moisture, 1,435 kcal/kg. ^[13]
9. **Ozcan, Guvenc, Guvenc & Demir (2016) — MSW characterization according to different income levels: Kartal, Istanbul. Sustainability 8(10):1044** (2016, paper) — Composition changes with income and lifestyle inside one district (Kartal). ^[14]
10. **Henden Şolt (2023) — Evaluation of the Zero Waste Project in Istanbul district municipalities. Sustainability 15(15):11896** (2023, paper) — How Zero Waste is being run in Istanbul's 39 district municipalities. ^[15]
11. **Efe (2022) — Türkiye municipal waste statistics by city (TÜİK). Iğdır Univ. J. Sci. 12(4):2396–2407** (2022, paper) — City-by-city per-capita waste (TÜİK) — the basis for 'every city is different'. ^[16]
12. **UNEP — Food Waste Index Report 2024** (2024, report) — Global benchmark (79 kg/person/year household food waste) — and the fact that Türkiye has no measured household estimate. ^[17]
13. **Evolutionary game analysis on behavioral strategies of government and residents in municipal household waste separation. Sustainability 13(20):11421** (2021, paper) — Game theory: fees and

penalties move residents more than subsidies. ^[18]

14. **Hao et al. (2023) — Supervision mechanism of residents' waste separation behavior: a tripartite evolutionary game model.** *J. Environ. Public Health* (2023, paper) — Game theory: when penalties exceed the net cost of sorting, separation becomes the stable outcome. ^[19]
15. **Song et al. (2025) — Collaborative governance for urban waste management: evolutionary game theory (Shanghai).** *Sustainable Cities and Society* 126:106380 (2025, paper) — Game theory: multi-actor collaboration was ~25% more cost-efficient than a government-only model (Shanghai). ^[20]
16. **How to reduce food waste caused by normative illusion? An evolutionary game of government, caterers and consumers (2022)** (2022, paper) — Game theory for food waste specifically: government, caterers and consumers. ^[21]
17. **Evolutionary game of government and residents' participation in waste separation based on cumulative prospect theory.** *IJERPH* 19(21):14589 (2022, paper) — Behavioural (prospect-theory) version of the separation game. ^[22]
18. **Haber7 — Sıfır Atık: 90 milyon ton geri kazanım, depozito sistemi 53 ilde** (2026, news) — National Zero Waste totals to 2025 and the deposit system in 53 provinces. ^[12]

10. How this paper was made

AI research agents searched official İBB/İSTAÇ/TÜİK sources, peer-reviewed papers and news; extracted figures with their year and source; computed the labelled estimates; and drafted this paper, the deck and the narration in English, Turkish and Persian. The figures, city table and reading list are published as open data in the Hugging Face dataset *sosa123454321/atovika-waste-tr* (folder *istanbul*/) and will be refreshed as new data appears. Corrections: info@atikova.com.

Türkçe özet

İstanbul günde yaklaşık 18.000 ton evsel atık üretiyor; İBB'nin karakterizasyonuna göre bunun %48'i organik — günde yaklaşık 8.600 ton (tahmin). 2023'te ayrı toplanıp komposta giden organik atık günde yalnızca ~45 tondu (~%0,5, tahmin). Geri kalan karışık olarak depolanıyor ya da yakılıyor; ıslak gıda atığı enerji geri kazanımını da zorlaştırıyor. Kişi başı atık şehirden şehre iki kattan fazla değişiyor (Muğla 1,53 – Şanlıurfa 0,66 kg/gün), bu yüzden her şehrin kendi politika karmasına ihtiyacı var. Oyun teorisi literatürü, ücretlerin ve inandırıcı denetimin tek başına sübvansiyondan daha etkili olduğunu gösteriyor — İstanbul için test edilecek hipotezler. Bu rapor yapay zekâ ajanlarıyla, açık kaynaklardan hazırlandı.

استانبول روزانه حدود ۱۸,۰۰۰ تن پسماند خانگی تولید می‌کند و طبق تحلیل شهرداری، ۴۸٪ آن آلی است – یعنی حدود ۸,۶۰۰ تن در روز (برآورد). در سال ۲۰۲۳ فقط حدود ۴۵ تن در روز پسماند آلی جداگانه جمع‌شده به کمپوست رسید (حدود ۰/۵٪، برآورد). بقیه به‌صورت مخلوط دفن یا سوزانده می‌شود و رطوبت بالای پسماند غذایی بازیابی انرژی را هم سخت می‌کند. پسماند سرانه بین شهرهای ترکیه بیش از دو برابر فرق دارد (موغلا ۱/۵۳ تا شانلی‌اورفا ۰/۶۶ کیلو در روز)؛ پس هر شهر سیاست خودش را لازم دارد. ادبیات نظریه بازی نشان می‌دهد هزینه و نظارت معتبر از یارانه تنها مؤثرترند – این‌ها فرضیه‌هایی برای آزمودن در استانبول‌اند. این گزارش با عامل‌های هوش مصنوعی و از منابع عمومی تهیه شده است.

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