

Fuel consumption of segregated waste collection services

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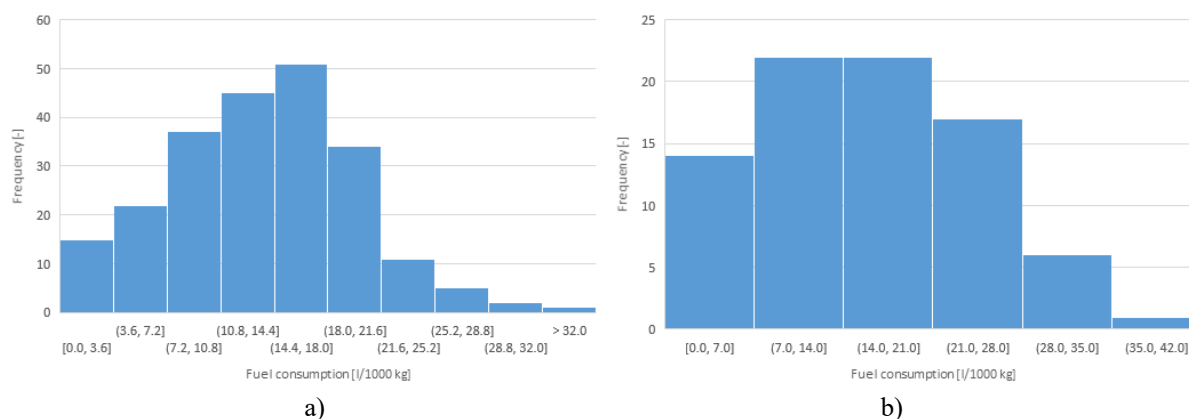
Municipal solid waste collection represents the largest share (from 50% to 70%) of waste management costs and fuel is a substantial expense in waste collection and transportation (Sonesson 2000; Sousa et al. 2018), not only because heavy-duty vehicles are used, but the driving profile requires frequent stops (Nguyen and Wilson 2010), thus consuming high fuel rates. Previous studies of rear- and side-loader waste vehicles reported fuel consumptions from 53 L/100 km up to 235 L/100 km (Agar et al., 2007; Ivanič, 2007; Thiruvengadam et al., 2010; Sandhu et al. 2015). Bender et al. (2014) measured a fuel consumption of 79 L/100 km, from which nearly 60% was due to the compactor operation / idling. In Portugal, Teixeira et al. (2014) estimated an average fuel consumption of 3.96 L/t for mixed waste collection in the city of Porto, Portugal.

A detailed analysis of the fuel consumption on the main segregate waste streams collected in the municipality of Cascais is presented for: i) paper; ii) plastic; and iii) glass. The average characteristics of the segregate waste collection services performance over 2018 and 2019 are presented in Table 1. The performance parameters are quite homogenous, except for the average weight of the glass. Also, the average fuel consumption and collection distance are slightly higher for the glass collection service.

Table 1 – Waste collection service average performance parameters per collection shift

Waste stream	Average Weight [kg]	Average Duration [min.]	Average Consumption [l]	Average Distance [km]
Paper	3357.7	382.7	45.9	53.1
Plastic	2411.9	386.6	44.2	51.1
Glass	8925.4	306.3	52.5	60.7
Overall	5249.5	354.2	48.0	55.5

Considering the usual indicator of fuel consumption per unit of waste collected, the differences between the various waste streams become more perceptible both in terms of average value and variability. Figure 1 presents the histograms of the fuel consumption per unit for paper, plastic, glass and overall segregated waste collection services, comprising 1909 collection shifts.



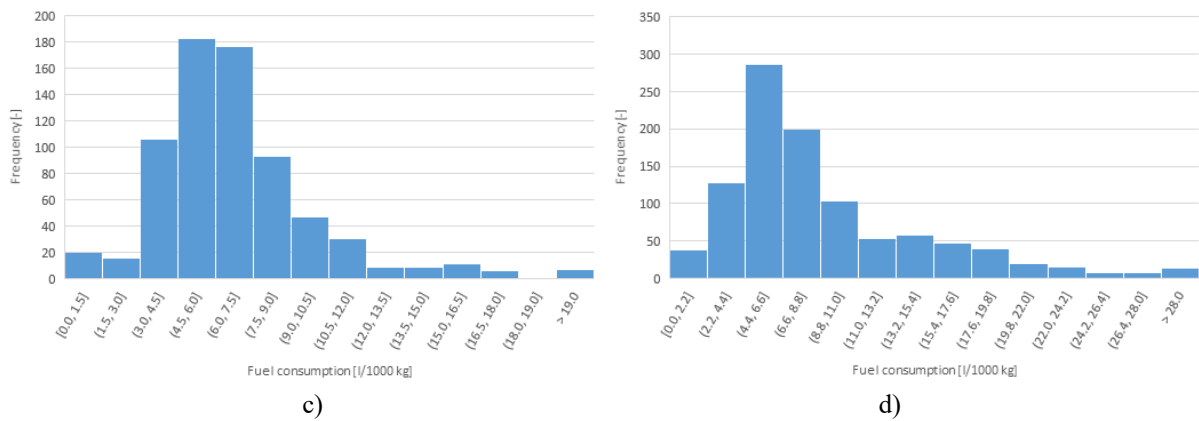
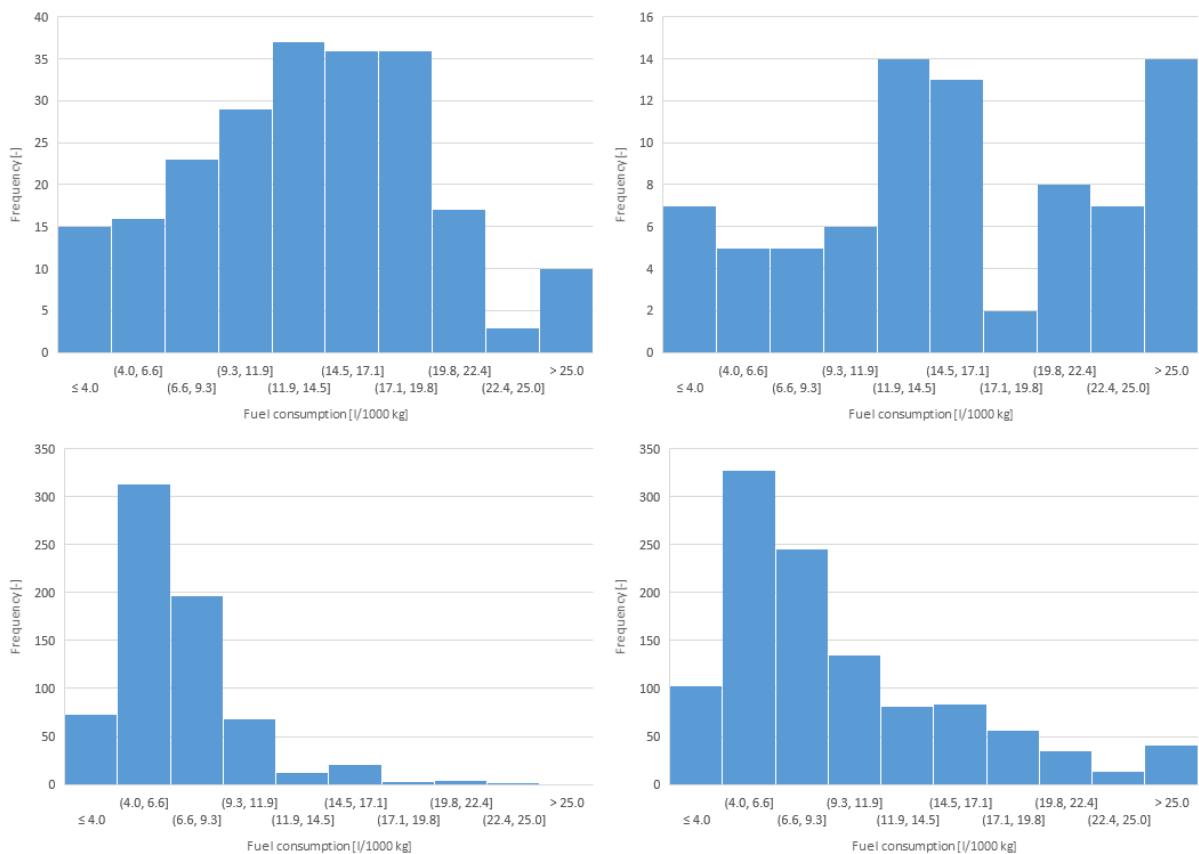


Figure 1 – Fuel consumption per unit of waste collected for a) paper, b) plastic, c) glass and d) overall.



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