

Municipalities Report

1. Executive Summary

This report presents an analysis of hardware lifecycle emissions, with a focus on municipalities' role in managing emissions, planning equipment upgrades, and forecasting e-waste. The findings highlight key factors such as device lifetime, weight, and local assembly, providing actionable insights for policy development and strategic procurement.

2. Introduction

Municipalities face increasing pressure to address the environmental impact of electronic devices, particularly regarding emissions and e-waste. By analyzing hardware lifecycle data, this report offers insights that can help municipalities reduce their carbon footprint, enhance sustainability, and foster circular economy practices.

3. Key Findings

a. Correlation Between Device Lifetime and GHG Emissions

- **Pearson Analysis:** A weak positive linear correlation ($R = 0.129$) indicates that as the device lifetime increases, total GHG emissions also slightly increase. While the relationship is statistically significant ($p\text{-value} = 0.000$), the effect size is small.
- **Spearman Analysis:** A weak positive monotonic correlation ($\rho = 0.216$) suggests that longer device lifetimes lead to a higher share of emissions during the usage period. The relationship remains statistically significant ($p\text{-value} = 0.000$).
- **Policy Insight:** Devices with longer lifespans, though more emission-intensive at the outset, become more efficient over time. Encouraging the use of durable devices can reduce long-term emissions.

b. Differences in Device Weight by Category

- **ANOVA Analysis:** Datacenter devices are, on average, 4.5 times heavier than Home and Workplace devices combined. The statistical significance ($F\text{-statistic} = 286.30$, $p\text{-value} = 0.0000$) reinforces the need to consider device category when planning for emissions.
- **Policy Insight:** Municipalities should focus on procurement policies that prioritize lightweight, energy-efficient devices for non-datacenter use cases, while supporting sustainable Datacenter infrastructure.

c. Sustainable Classification and Device Lifetime

- **Point-Biserial Correlation:** A strong positive correlation ($r = 0.8018$) between device lifetime and its classification as sustainable (≥ 5 years). The result is statistically significant ($p\text{-value} = 0.0000$), confirming that longer-lasting devices are more likely to be environmentally sustainable.
- **Policy Insight:** Municipalities can integrate a 5-year durability standard into procurement policies to enhance sustainability and reduce landfill waste. This could be accompanied by incentives for manufacturers who meet or exceed this standard.

d. Local vs. Foreign Assembly

- **Chi-Square Analysis:** The distribution of local vs. foreign assembly varies significantly across device categories ($\chi^2 = 253.939$, $p\text{-value} = 0.0000$). Datacenter devices are more likely to be locally assembled, while Home devices are entirely foreign-assembled.
- **Policy Insight:** Encouraging local assembly for strategic categories, like Datacenter infrastructure, can reduce transport emissions, create local jobs, and support regional repair and recycling practices.

4. Recommendations

Based on the findings, the following recommendations are made for municipalities:

- **Promote Long-Life Devices:** Legislate for devices that last at least 5 years to reduce e-waste and lifecycle emissions.
- **Financial Incentives:** Provide tax benefits and funding to manufacturers producing durable, repairable hardware.
- **Support for Clean Energy in Recycling:** Invest in clean energy solutions for recycling centers and refurbishment hubs to align with circular economy goals.
- **Localized Electronics Production:** Encourage local assembly, particularly for Datacenter devices, to reduce transportation emissions and support local economies.

5. Conclusion

Municipalities can play a pivotal role in managing the environmental impact of hardware devices by using lifecycle data to inform policy and procurement strategies. By encouraging longer-lasting devices, local assembly, and circular economy practices, cities can reduce emissions, promote sustainability, and support a greener future.