



Introduction

E-Waste: A Growing Global Challenge & Hidden Opportunity

- Challenges:

- World's fastest-growing domestic waste stream (**>74 million tonnes** by 2030)
- Global recycling efforts lag significantly behind generation rates.

- Opportunity:

- Rich "urban mine" of valuable metals.

Research Objectives

- Visualize global e-waste generation & recycling patterns (2018-2022).
- Quantify regional disparities and key trends.
- Highlight the link between data insights and potential solutions in design and policy.
- **SDG 12 & SDG 11**, hindering resource security and the circular economy.



Methodology & Data Visualization

- **Data:** E-waste Generated (kt, kg/capita), EEE Placed on Market (kt, kg/capita), Formal Collection Rate (%), and Population.
- **Visualizations:** Python, HTML, JavaScript, Tableau;
- **Analysis Methods:** Geospatial & Statistic methods

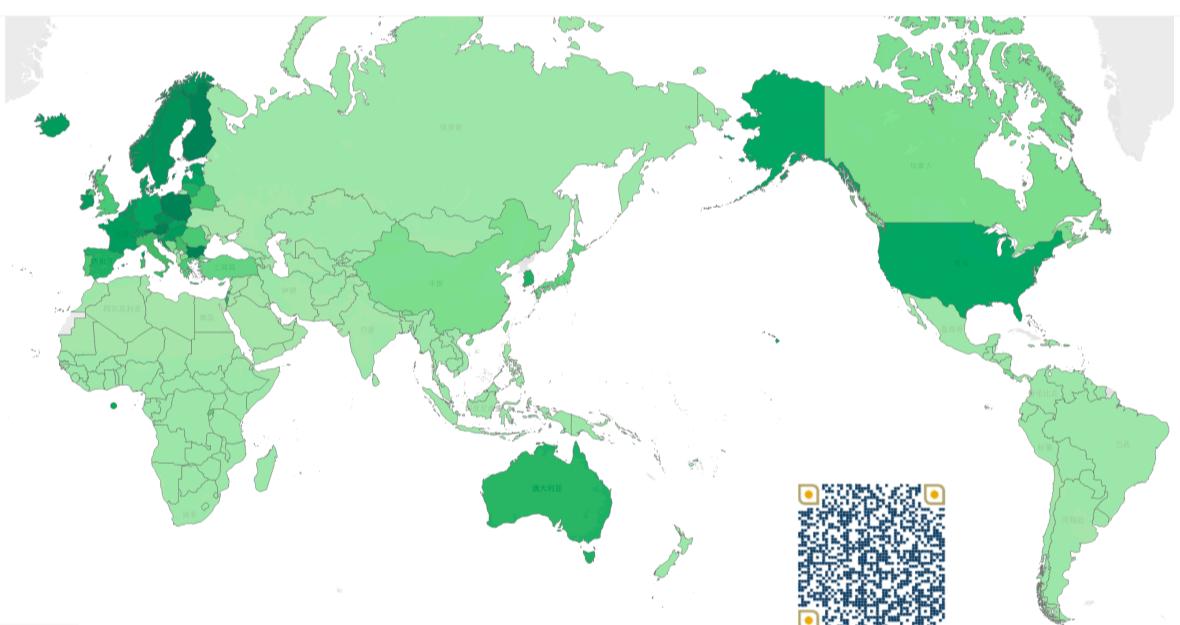


Fig.1 E-Waste Collection Rate 2022 via Tableau: the more green, the higher collection rate

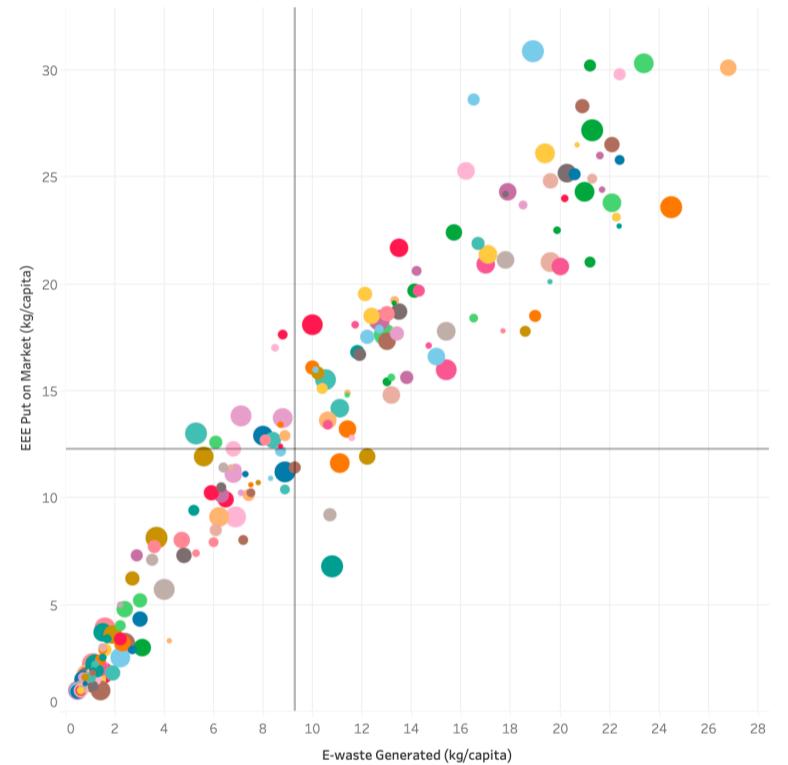


Fig.2 EEE Put on Market V.S. E-Waste Generation via Tableau

- **Formal collection rates :**

- Limited progress between 2018 and 2022 for major economies.
- Germany and Japan saw modest increases;
- US rate slightly decreased;
- China's rate remains the same but has an upwards trends (with the per cap amount).

- **Per capita e-waste generation:**

- Developed regions (Europe, N. America, Oceania) stayed high levels (> 15 kg/cap);
- Most of Asian and African countries remain critically low levels;
- Europe leads in both per capita generation and collection rate (~18 kg/cap , ~43% rate).

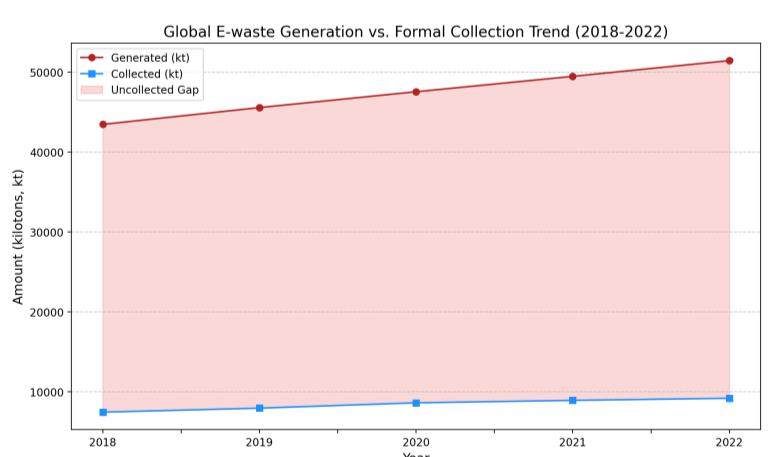


Fig. 3 via Python

Conclusion

- **Overall Analysis:**

- A consistent upward trends for E-waste generation;
- A slow growth in formal collections & recycling rates;

- **Key Entity Dynamics Analysis:**

- China & USA continue to see increases in per capital generation;
- Formal collection rate improvements are generally modest or stagnant.

- **Design & Management:**

- Upstream solutions & Downstream interventions

➡ Recycling Goal, esp. Developing regions

[1] Baldé, C.P., et al. (2024), The Global E-waste Monitor 2024. UNITAR.

[2] Slabe-Erker, Renata, et al. "New thematic relationships in the green recovery literature". Environment, Development and Sustainability, 2023.

[3] Xi, Beidou, et al. "Hazardous Waste Management in the Guangdong-Hong Kong-Macao Greater Bay Area". Engineering, vol.8, 2022: 25-28.

[4] Zhou, Ziqiao, and Zhang Lin. "Sustainable waste management and waste to energy: Valuation of energy potential of MSW in the Greater Bay Area of China". Energy Policy, vol.163, 2022: 112857.