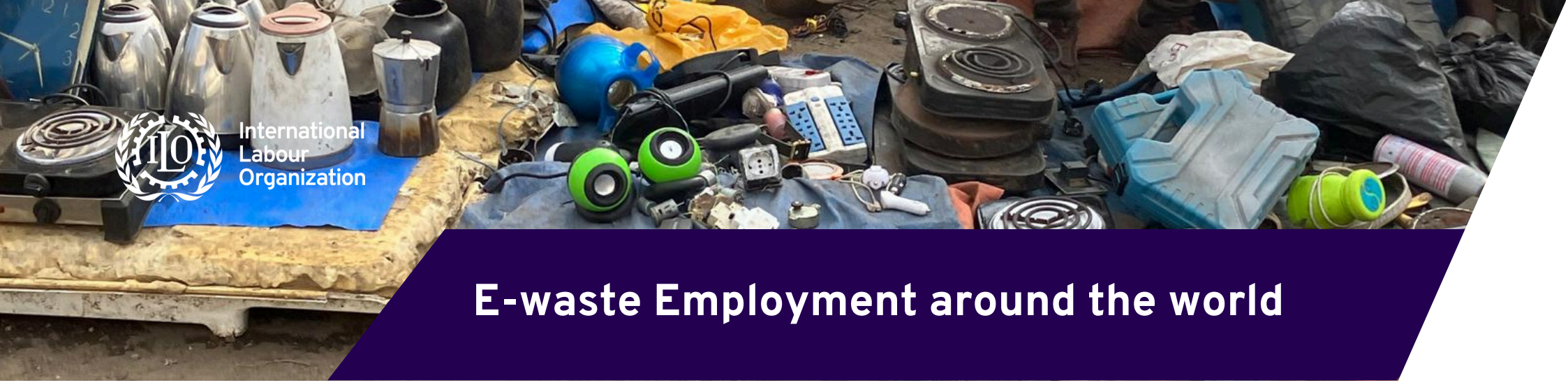


E-waste Employment around the world

Background

The exponential growth of electrical and electronic devices has driven a surge in electronic waste (e-waste), which reached nearly **62 million tons in 2022** and is projected to climb to **82 million tons by 2030** (UNITAR, 2024). Despite this, formal collection and recycling remain below one quarter of generated volumes, leaving much of the burden on informal systems that are often unsafe and environmentally harmful. This study provides the **first global methodological framework to estimate direct and indirect employment in e-waste activities worldwide**, using Input–Output techniques linked with ILO employment data and UNITAR e-waste statistics. The results shed new light on the scale, distribution, and characteristics of jobs across the e-waste value chain, highlighting the opportunities and challenges for decent employment creation within a circular economy transition.

E-waste in the circular economy

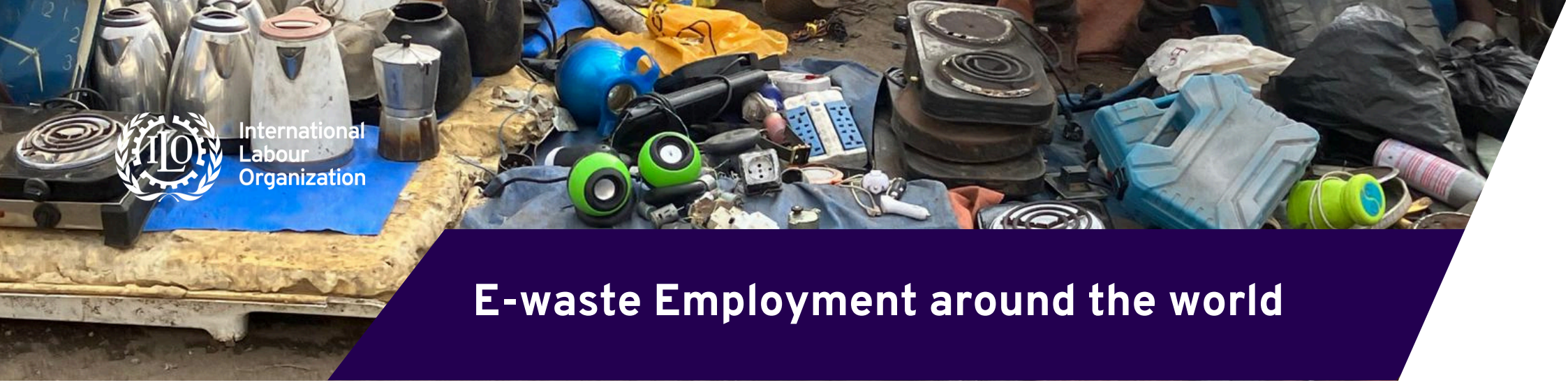
E-waste embodies both risk and opportunity. Improper disposal contributes to pollution, health hazards, and resource loss, yet discarded electronics also contain valuable materials—such as copper, silver, and gold—that can be recovered to reduce reliance on virgin resource extraction. Within the circular economy framework, e-waste becomes a source of secondary materials and new economic activities, including collection, repair, refurbishment, recycling, and material recovery. These activities are highly heterogeneous: high-income countries tend to operate **capital-intensive**, formal systems, while **low- and middle-income countries rely more on informal, labour-intensive processes**. This divergence creates global asymmetries in employment conditions, environmental impacts, and trade patterns.

Methodological approach for e-waste employment estimates

The study develops a modelling framework that combines:

- **Input–Output databases** (Eora26, GTAP-CE 11) with explicit sectors for recycling and material recovery.
- **ILO employment data** (**including 20 Labour force surveys**), disaggregated by formality, gender, age, and skills.
- **UNITAR/Global e-waste monitor statistics**, covering generation, collection, and recycling by product category.

Direct jobs were estimated in e-waste collection, recycling, material recovery, and repair services. Indirect jobs were traced through upstream and downstream linkages activated by e-waste activities. This integrated approach delivers the **first harmonized global estimates of e-waste employment**, broken down by region, income group, and sector.



International Labour Organization

E-waste Employment around the world

Key findings

- **Scale of employment:** Global e-waste activities account for **around 6.32 million jobs**, with nearly 90% classified as direct employment.
- **Regional distribution:** Almost half of all e-waste jobs are in Asia, reflecting higher labour intensity compared to the capital-intensive systems in North America and the EU.
- **Countries by income groups:** Over **80% of jobs are in lower-middle- and upper-middle-income countries**, underscoring the importance of the sector as a source of livelihoods where formal employment is limited.
- **Job characteristics:** Employment is predominantly **male, adult, unskilled, and informal**. However, formality and skill intensity are higher in high-income contexts and in specific activities such as formal recycling and metal recovery.
- **E-waste trade:** Only **0.5% of generated e-waste** and **one-quarter of formally collected waste** enter international trade. High-income countries dominate exports, while middle-income countries absorb most imports. However, there is non-traced illegal e-waste trade.
- **Sectoral composition:** The largest share of jobs lies in **repair services and e-waste formal collection**, followed by recycling. These activities differ widely in technology used and working conditions, shaping both the quantity and quality of employment.

Policy implications

The findings confirm patterns identified in the literature while adding new empirical evidence on job structures and characteristics. Estimated supports the following policy implications that could be addressed:

1. **Increasing collection rates** worldwide is vital not only for environmental sustainability but also for economic and employment reasons.
2. Expanding activities such as **repair, refurbishing, and recycling** can generate substantial new jobs, particularly in lower-income countries motivating the development of economies of scale in recycling and material recovery.
3. Employment creation is highly sensitive to **technological choices**, with labour-intensive systems generating more jobs but often under poorer conditions.
4. Ensuring a "**just transition**"—by promoting decent jobs and skill development—will be key to aligning circular economy goals with decent work (SDG 8) and sustainable production (SDG 12).
5. Policy challenge in developing countries is formalizing their collection process.

Conclusion

This study delivers the first **global evidence-based assessment** of employment embedded in the e-waste value chain. By quantifying both direct and indirect jobs, and disaggregating them by activity, region, countries by their income level, and job characteristics, it provides a foundation for designing policies that harness the socio-economic potential of e-waste while addressing informality and environmental risks. Ultimately, the transition to a circular electronics economy can become not only an environmental imperative but also a pathway to safer, more productive, and more inclusive employment worldwide.

Contact us for the full report and more information: EMPINVEST@ilo.org

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