



Standard Reporting Omits Most Benefits of Reusing Office Furniture – This Must Change

Call for Manufacturers and Industry to
Adopt Life Cycle Assessments

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Executive Summary

Americans continue to send an astonishing amount of furniture waste to landfill – more than 12 million tons a year. Landfills pose significant health and environmental risks, including methane emissions that contribute to climate change, soil and water contamination, an increase in microplastics and habitat loss.

To address these issues, furniture manufacturers, architects and designers, commercial real estate developers and others are deploying sustainable decommission strategies including reuse, resale, recycling and donations. But our research finds that measuring the impact of these efforts relies on a methodology that significantly underestimates the greenhouse gas (GHG) emissions avoided when furniture waste is diverted from landfill.

Through an ongoing collaboration with Bard College's MBA in Sustainability program, Installnet seeks to understand the existence, availability, and accessibility of metrics, such as life cycle GHG emissions assessments and weights for office furniture items typically encountered in decommission.

In this paper, we summarize our findings and present recommendations for further action the industry can, and we believe must, take to provide greater transparency and accountability of the environmental impact of office furniture, fixtures and equipment. We also highlight the benefits of strategic reuse which significantly reduces waste and pollution while benefiting people and communities.



Background

The challenges and opportunities associated with diverting furniture from landfill are outlined in detail in the White Paper; [“Closing Loops, Opening Opportunities: The Future of Circularity in the Commercial Furniture Industry”](#) published by Installnet in 2024. The U.S. Environmental Protection Agency has been tracking the generation and management pathways of durable goods waste since the 1960s. Despite the slowing rate of increase, the country is still generating an ever-increasing amount of waste. In the last period for which data is available, between 2015 and 2018, a little over 12 million tons per year of that waste was furniture.

Sending furniture to the landfill creates two major environmental issues:

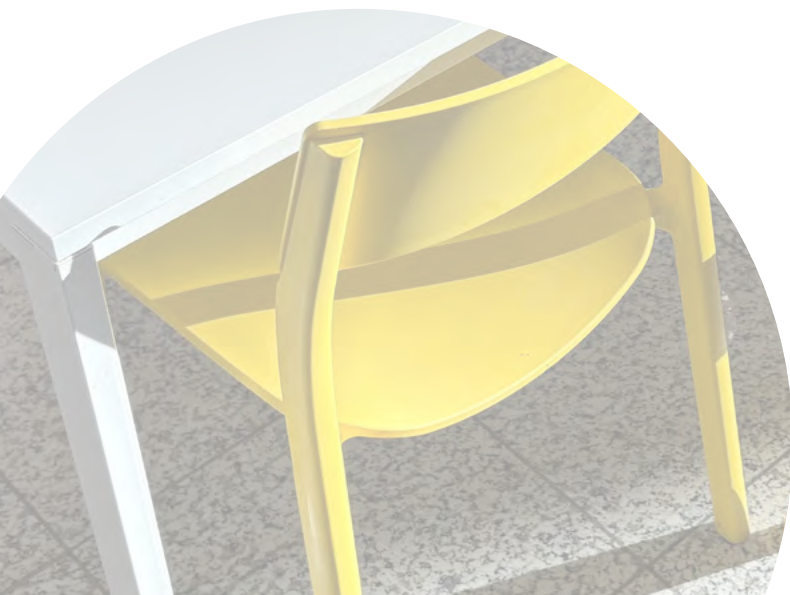
- (1) Per- and polyfluoroalkyl substances (commonly known as PFAs) have garnered major attention for their widespread use and pervasiveness in the physical world. Additionally, the rise of the global plastic furniture market points to an increase in microplastics.
- (2) the increase of methane (a potent greenhouse gas with 28 times the global warming potential of carbon dioxide over the 100 year standard for measurement and comparison) into the atmosphere.

At the same time, donating furniture can have an enormous beneficial impact in communities, helping non-profits, first responders, schools, families in transitional housing and others.

New furniture is often unaffordable and unattainable for organizations with small budgets. A few desks or chairs may not seem like much to a company that is undergoing a multi-million dollar renovation, but often means everything to a struggling school district. Even resale has a positive social impact – it allows organizations or individuals to acquire items that they may not have been able to afford brand new.

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As companies compel and encourage their employees to return to workspaces following the Covid-19 pandemic shift to remote work, they are also reconfiguring and right-sizing their spaces to make them more efficient and conducive to hybrid work arrangements with office-sharing and collaboration spaces. These trends have resulted in a growing amount of surplus furniture. This, combined with an increasing desire to reduce emissions and environmental impact, is prompting more corporate office and facilities managers to pursue sustainable decommissions - strategies that keep the furniture in circulation longer through reuse, resale, donation or recycling.



Methodology

To determine how accurate existing tools used to estimate the environmental impact of furniture diversion from landfill are, we compared them with actual measures developed through Lifecycle Assessments (LCAs) and Environmental Product Declarations (EPDs).

We engaged in online research to identify the publicly available Greenhouse Gas (GHG) emission data available for commercial furniture through LCAs and EPDs. We reviewed [Ecomedes](#), [Transparency Catalog](#), and individual manufacturer's websites to identify available data, focusing on the most often reused furniture items as previously identified in "[Closing Loops, Opening Opportunities](#)."

These are:

1. Task Chairs
2. Guest Chairs
3. Height Adjustable Desks
4. Training Tables
5. Stack Chairs
6. Cafe Tables
7. Storage Cabinets/Credenzas

We focused on seven major manufacturers: MillerKnoll, Humanscale, Steelcase, AIS (Affordable Interior Systems), Haworth, Teknion and HNI Corporation (Allsteel and HON brands).



Key Findings

Our research finds that the current industry standard for measuring the impact of these efforts relies on the U.S. Environmental Protection Agency's Waste Reduction Model (WARM). This model significantly underestimates the greenhouse gas emissions avoided when furniture waste is diverted from landfill.

According to the EPA:

“WARM is a tool that provides high-level comparative estimates of the potential Greenhouse Gas (GHG) emissions, energy savings, and economic impacts of materials managed in baseline and alternative materials management practices, including source reduction, recycling, composting, anaerobic digestion, combustion, and landfilling. The model estimates emissions, energy units and economic factors across a wide range of material types commonly found in municipal solid waste and construction and demolition debris.”¹

While the WARM methodology provides an estimate, new reporting requirements and commitments to curb greenhouse gas emissions suggest a critical need for more accurate and precise data that can be verified and validated. Installnet is working with industry partners to increase the availability of consistent, comparable and decision-useful data for this purpose. We believe this can be achieved through a hybrid model, combining actual and validated metrics (where available) with the EPA's WARM model.

The research identified a significant opportunity for the industry to standardize reporting practices, including weights and LCAs for high-demand items such as desks, task chairs, height-adjustable tables, conference tables, pedestals, and lounge seating.

Based on our analysis, the actual amount of GHG emissions avoided by sustainable decommission is 9 times more than WARM estimates.

Specifically, we found:

- 1. WARM Significantly Underestimates Environmental Benefits:** LCAs not only provide End of Life (landfill) emissions but also provide insights into avoided emissions for items that are reused (ie, donated, sold.) because they displace the need to create new items. Through our ongoing collaboration with Bard College's MBA in Sustainability program, we seek to understand the existence, availability, and accessibility of metrics, such as life cycle GHG emissions assessments and



¹ <https://www.epa.gov/warm/basic-information-about-waste-reduction-model>

weights for office furniture items typically encountered during decommission projects.

In this paper, we summarize our findings and present recommendations for further action the industry can, and we believe must, take to provide greater transparency and accountability of the environmental impact of office furniture, fixtures and equipment.

We also highlight the benefits of strategic reuse, which significantly reduces waste and pollution while benefiting people and communities.

Using LCAs allows us to more accurately measure the GHG emissions avoided through reuse than the estimate typically calculated using WARM.

Our Analysis

A review of 14 items with LCAs - an admittedly limited dataset - revealed that WARM failed to capture 91% of the GHG emissions avoided, on average. The range of missed GHG emissions for the products was 72-93 percent of total emissions associated with each product.

Comparison of WARM End of Life and Total Life Cycle Emissions Avoided with Furniture Reuse

Furniture Type	Material Acquisition and Pre-Processing	Production (Manufacturing / Assembly)	Distribution, Storage and Use	End of Life	Total	Total Upstream	End of Life Percentage	Weight (lbs)	
Side/Guest Chair	32.3	11.5	10.3	5.39	59.49	54.10	9.06%	90.94%	18.00
Stacking Chair	2.86	1.24	92.9	37.5	134.5	97.00	27.88%	72.12%	21.50
Stacking Chair	28.6	12.4	9.29	3.75	54.04	50.29	6.94%	93.06%	21.50
Stacking Chair	28.6	12.4	9.29	3.75	54.04	50.29	6.94%	93.06%	21.50
Stacking Chair	19.4	9.03	8.40	4.09	50.92	46.83	8.03%	91.97%	10.00
Stool	19.1	11.6	8.20	3.49	42.39	38.90	8.23%	91.77%	14
Stool	67.3	42.8	26.7	16.3	153.1	136.80	10.65%	89.35%	13.5
Stool	19.1	11.6	8.20	3.49	42.39	38.90	8.23%	91.77%	20
Task Chair	31.0	34.2	15.0	8.04	88.24	80.20	9.11%	90.89%	n/a
Task Chair	41.7	15.6	11.1	5.64	74.04	68.40	7.62%	92.38%	20.5-21.75
Task Chair	34.5	35.4	13.9	5.64	89.44	83.80	6.31%	93.69%	34.00
Task Chair	34.5	35.4	13.9	5.64	89.44	83.80	6.31%	93.69%	34.00
Task Chair	28.7	22.2	14.0	6.05	70.95	64.90	8.53%	91.47%	34.00
Task Chair	29.1	24.2	11.5	6.33	71.13	64.80	8.90%	91.10%	38.00

	End of Life Percentage	
High	27.88%	93.69%
Low	6.31%	72.12%
Average	9.48%	90.52%
Median	8.23%	91.77%

2. Lack of Available Data: Limited information is available about the products researched. Only a few manufacturers share cradle-to-grave LCAs and only for a select group of newer products. Transparency of a product's environmental impact remains an exception rather than the norm. Only one manufacturer, Humanscale, shares LCAs for new products.

3. Inaccessible Data: For those products with LCAs or EPDs, locating the information presents a challenge, often requiring sifting through extensive manufacturer documents, sometimes exceeding 400 pages. While EDPs are shorter, inconsistencies among definitions and presentation make it difficult to accurately calculate impact.

The lack of accessible, standardized data hinders the industry's ability to accurately measure environmental impact in three ways:

- a. It's almost impossible to calculate GHG emissions avoided through furniture diversion strategies, such as resale, recycling, upcycling, or donation..

- b. Incomplete or inaccurate sustainability metrics make it difficult to track progress.
- c. The lack of existing data limits the industry's ability to leverage emerging technologies such as artificial intelligence and machine learning that show tremendous promise in data collection across disparate sources.

4. Limited and Inconsistent Use of EPDs:

EPDs use data gathered from LCAs to present this information in a structured format, making it accessible and actionable for stakeholders. EPDs are closely tied to LCAs, which are rigorous processes used to evaluate the environmental impact of a product across each stage of its life cycle. The primary benefit to EPDs is that third-party validation is required. But because EPDs rely on various accounting practices, it's impossible to compare the environmental footprints of products.

Table 1: Resources Found

Manufacturer	Number of Items Researched	Information Source(s)
Allsteel	10	Ecomedes
Herman Miller	43	Ecomedes.com/HermanMiller
	27	Transparency Catalog
	1	Herman Miller
Knoll	1	Knoll
	2	Transparency Catalog
Haworth	12 (US) 1 (Asia-Pacific) 9 Europe	Ecomedes
	12	Transparency Catalog
Humanscale	16 LCA reports	Ecomedes
	3	
Hon	5	Ecomedes
Steelcase	71	Ecomedes
	2	Steelcase
Teknion	27	Transparency Catalog

Conclusions

Overall, we find that the furniture industry is at the earliest stages of data collection and reporting, with limits to even the most basic information, such as item weights, often buried within larger reports. We also conclude that the time and expense of engaging in full LCAs is an impediment for many manufacturers and customers.

The data analyzed, however, indicates that the benefits associated with keeping usable office furniture out of landfills is being vastly underestimated and underreported. And with manufacturers facing increasing pressure to provide GHG emissions data, accurately capturing the amount of GHG emissions avoided is imperative. Quantifying the environmental benefits of furniture reuse and take-back programs is a strategic business imperative for the industry.

With increasing pressure to provide GHG emissions data, accurate measurement of emissions avoided becomes an increasing imperative.

Our research reveals that emissions avoided due to office furniture reuse, resale, repurpose, and recycling are vastly underestimated and reported. As this is evident in three of the most often reused furniture items (task, desk and stack chairs), we urge the furniture industry to collaborate on developing more robust measurement and reporting.

Given that this information is currently difficult to obtain even when it does exist, a compelling case can be made for developing an industry solution - a standard set of measurement parameters and a unified reporting format. This will provide stakeholders with consistent, comparable, and decision-useful insights into the benefits of existing programs for which many in the industry are spending time, effort and money.



Recommendations

Short Term

1. Furniture manufacturers that have produced EPDs and/or LCAs for their products should make this information available through a centralized data repository, such as Ecomedes or Transparency Catalog.
2. The industry should collaborate to standardize definitions, boundaries, measurements, and reporting formats. Standardization would help streamline the manufacturers' processes and provide stakeholders with more consistent, comparable, and decision-useful data to evaluate efforts and results.
3. Leverage the use of artificial intelligence to collect and analyze this data.
4. Provide avoided downstream GHG emissions metrics to those donating office materials for their Scope 3 reporting (Downstream transportation and distribution, end of life treatment of sold products).
5. Provide avoided upstream GHG emissions to recipients of donated items as part of Scope 3 calculations (purchased goods and services, upstream transportation and distribution – minus the emissions from delivering the items to their location). Donors can and should report these as emissions reductions they have facilitated.
6. Emphasize the community benefits of avoiding materials going to landfill. Quantify the benefits of donations to community groups (what was donated, to whom, and how it is used locally).

Long Term

1. The industry should commit to using actual GHG measures to supplement estimates from WARM whenever practical and possible. Because developing LCAs is time consuming and costly, the industry should focus on items most often diverted from landfills.
2. Subtract those items (using the number and weight) from the numbers used in the WARM tool to provide an ever-increasingly accurate measure of emissions avoided in landfill as well as avoided emissions associated with not needing to manufacture new products. This will allow the industry to take full credit for its emissions savings efforts.
3. Provide fair market value for donors and avoided purchase costs to recipients.

Table 2: Scope 3 GHG Emissions Categories

Category 1 - Purchased goods and services
Category 2 - Capital goods
Category 3 - Fuel- and energy-related activities
Category 4 - Upstream transportation and distribution
Category 5 - Waste generated in operations
Category 6 - Business travel
Category 7 - Employee commuting
Category 8 - Upstream leased assets
Category 9 - Downstream transportation and distribution
Category 10 - Processing of sold products
Category 11 - Use of sold products
Category 12 - End-of-life treatment of sold products
Category 13 - Downstream leased assets
Category 14 - Franchises
Category 15 - Investments

Limitations

The scale of emissions savings represented by ‘upstream’ sources [material acquisition and pre-processing, production (manufacturing and assembly) and distribution, storage, and use] compared to end-of-life emissions in the landfill was based on data found in the Ecomedes database for task, guest and stacking chairs as well as stools from one manufacturer (Humanscale). This is indicative but inconclusive when estimating the scale of emissions reductions currently not reported as part of furniture decommissions.

The focus on items identified as most commonly kept from landfills limits our understanding of emission savings related to other furniture items.



Collaborating Organizations

Bard College's MBA in Sustainability: Bard's MBA in Sustainability is a globally leading business program that fully integrates a sustainability vision, real world consulting engagements, organizational transformation and entrepreneurial training, equipping graduates who are changing the game.

Installnet: A leading commercial furniture solutions company, Installnet facilitates custom furniture installations and created Ecoserv, an award-winning sustainable decommission program that help people and communities thrive.

This paper was developed as part of a new collective created by Installnet to develop and implement real-world solutions. The collective, **Ecoserv Net Zero (ENZO)**, focuses on documenting practices to become assurance ready and meet new reporting requirements and sharing lessons learned.

About the Authors

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