Measuring Statewide Impacts of Reuse

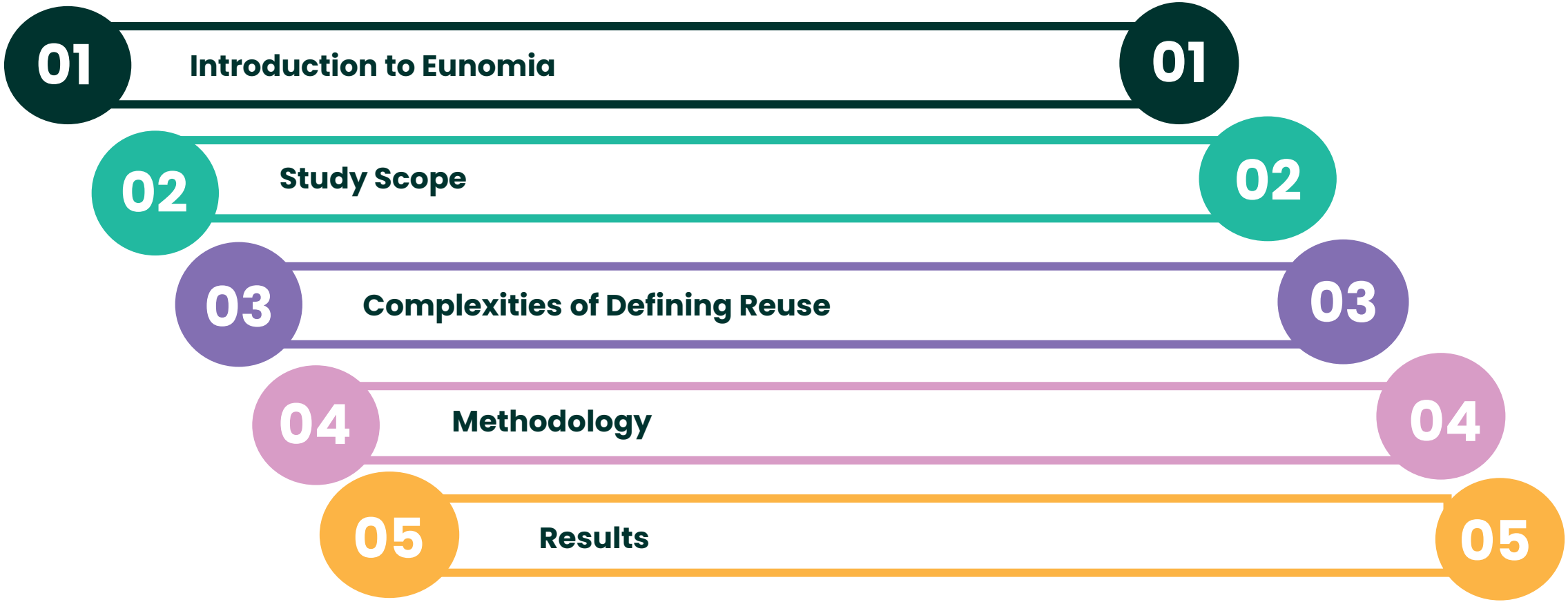
Eunomia Research & Consulting and Reuse Minnesota

October 4, 2022

Sydnee Grushack, Senior Consultant

eunomia

Agenda



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Eunomia Research & Consulting is a leading advisor on resource management and the circular economy

Since 2001, we have provided public, private and non-profit clients with data driven solutions to deliver social, climate and environmental goals.

Our impartial, evidence-led approach combined with a long-standing sector knowledge gained from being at the forefront of environmental solutions for decades means clients have complete confidence in the integrity of our work.

Across policy, strategy, and practical implementation, we can help facilitate the positive change required to create a sustainable world

Eunomia's Services

- Policy Evaluation & Impact Assessment
- Extended Producer Responsibility Design
- Holistic Resource Management
- Lifecycle Analysis (LCAs)
- System Costs and Benefits Assessment
- Recycled Content Considerations
- State & Regional Recycling Needs Assessments
- Reusable and Refillable Landscape Analysis
- Market Assessments
- Deposit Return System Design & Cost Benefit
- Plastics and Packaging Strategy/Road Maps
- Tools – Collections Models, Cost of Litter, Waste Prevention, etc.

Impact Study Partners

- **Reuse Minnesota works to advance the regenerative business sector in Minnesota by bringing attention to and connecting reuse businesses across the state.**
- **Eunomia conducted a state-wide quantification of the reuse sector to measure the success of current efforts and to provide a baseline against which future improvements can be measured.**
- **Funding for this project is provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).**

REUSE MINNESOTA

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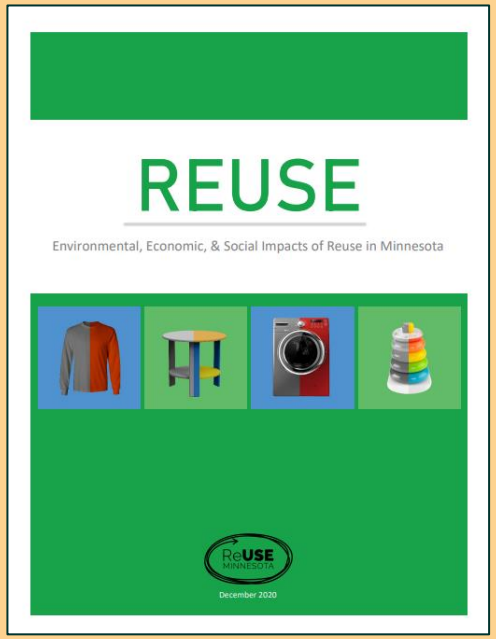
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

Previous Studies

A Study of the Economic Activity of Minnesota's Reuse, Repair and Rental Sectors

November 2011

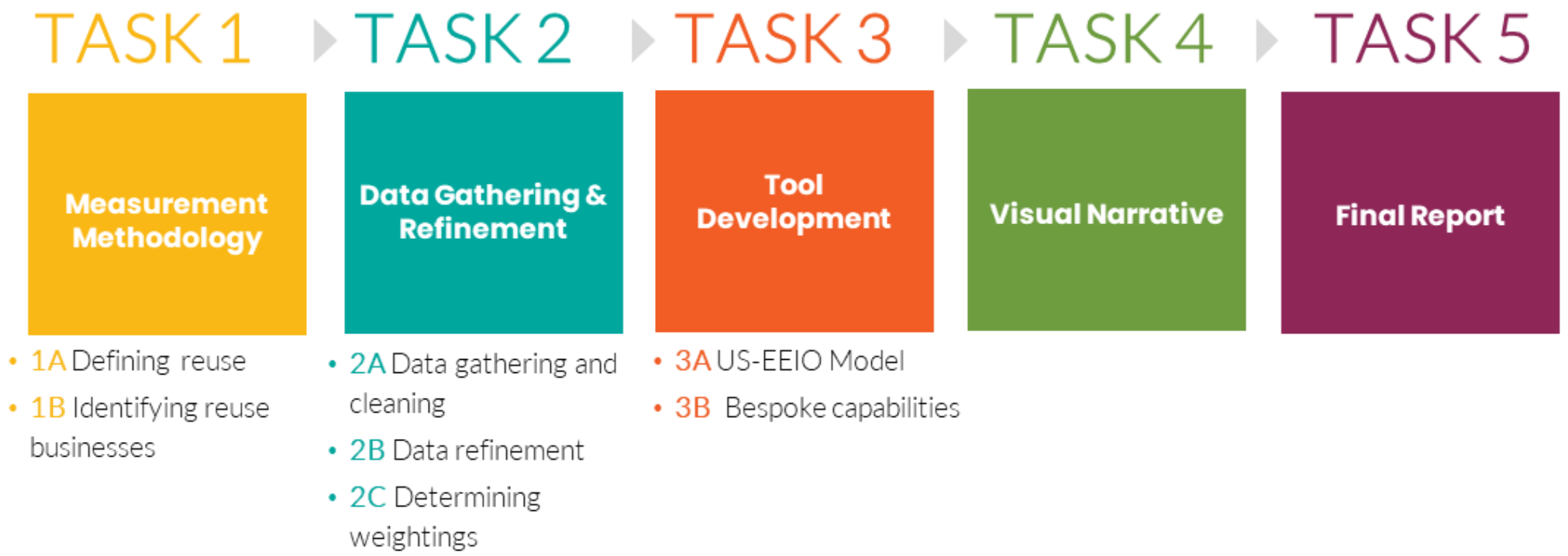


Environmental, Economic, & Social Impacts of Reuse in Minnesota

December 2020

Overview of Methodology

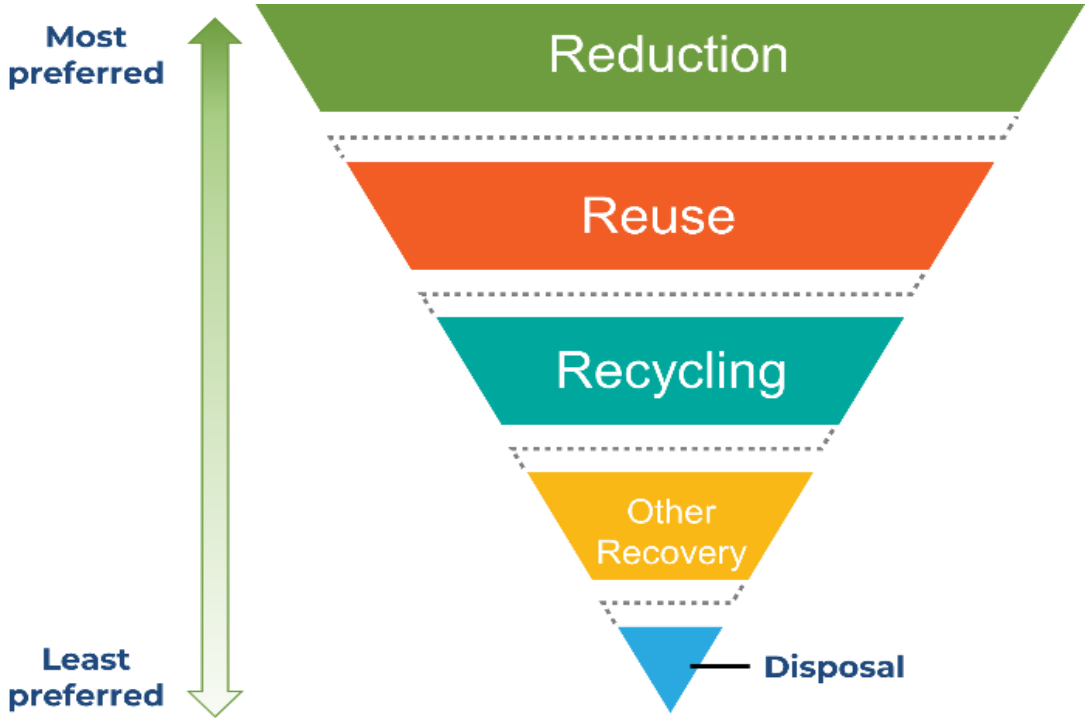
Eunomia's method to measuring statewide impacts of reuse is summarized below.



What is Reuse?

Reuse is a broad term with many interpretations. Useful in its breadth to accommodate the variety of work that Reuse Minnesota engages in overall.

- **Though recently a buzzword, reuse is not new**
- **Recent attention on packaging, but much broader and connected to many industries: repair, rental, sales of used product, etc.**
- **Hard to outsource, jobs are inherently local**
- **Study focuses on telling the story of reuse and its impact**



Defining Reuse

Study Definition

"The continued use, repair, or repurposing of items or materials which extends the life of resources and decreases the demand for new production."

Sample Definitions

Minnesota Waste Management Act	Waste reduction or source reduction. "Waste reduction" or "source reduction" means an activity that prevents generation of waste or the inclusion of toxic materials in waste, including: (1) reusing a product in its original form; (2) increasing the life span of a product
Minnesota Pollution Control Agency SCORE report	"Reuse" is the continued use or repurposing of items or materials without processing (this includes resale, repair, rental, and donation of items to partners that facilitate reuse). Reuse extends the life of existing products to reduce the demand for new production and the associated environmental impacts of that manufacturing.
EU Waste Framework Directive	Preparation for reuse "gives used products a second life before they become waste and includes practices such as cleaning, repairing or refurbishing products or their parts without other pre-processing.
Ellen Macarthur Foundation	The repeated use of a product or component for its intended purpose without significant modification.

Identifying Reuse Businesses

- Auction
- Book stores
- Bridal
- Car rental
- Pawn
- Recreational Vehicles
- Rental
- Repair
- Resale
- Reuse Minnesota Members
- Sporting Goods
- Used Car Dealers
- Other

North American Industry Classification System (NAICS) Codes

Data Provided

- Business Name
- Sales Data
- Location Data
- Number of Employees
- Industry Classifications

Limitations

- Self-Identification
- Incomplete
- Inaccurate matching
- Outliers
- Frequency of updates

Weightings

- 2020 study included categories of businesses that include reuse as a portion of their revenue but were not classified as strictly reuse businesses (e.g. book stores, bicycle shops).
- 2020 also excluded automotive businesses due to overwhelming revenue impacts.
- To acknowledge the important contribution of reuse, repair, etc. within their businesses, used category weightings to highlight the portion of their revenue dedicated to reuse.
- Inexact science based on analysis of businesses categorized under each NAICS code and committee decision-making.

2022 NAICS Title	Weight category	Weight %
Tire Retreading	1	100%
Motor Vehicle Parts (Used) Merchant Wholesalers	1	100%
Industrial Machinery and Equipment Merchant Wholesalers	1	100%
Service Establishment Equipment and Supplies Merchant Wholesalers	1	100%
Used Car Dealers	1	100%
Used Merchandise Retailers	1	100%
Consumer Electronics and Appliances Rental	1	100%
Formal Wear and Costume Rental	1	100%
Video Tape and Disc Rental	1	100%
Home Health Equipment Rental	1	100%
All Other Consumer Goods Rental	1	100%
General Rental Centers	1	100%
Electronic and Precision Equipment Repair and Maintenance	1	100%
Electronic and Precision Equipment Repair and Maintenance	1	100%
Electronic and Precision Equipment Repair and Maintenance	1	100%
Electronic and Precision Equipment Repair and Maintenance	1	100%
Commercial and Industrial Machinery and Equipment (except Automoti	1	100%
Home and Garden Equipment Repair and Maintenance	1	100%
Appliance Repair and Maintenance	1	100%
Reupholstery and Furniture Repair	1	100%
Footwear and Leather Goods Repair	1	100%
Other Personal and Household Goods Repair and Maintenance	1	100%
All Other Industrial Machinery Manufacturing	2	60%
All Other Industrial Machinery Manufacturing	2	60%
Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing	2	60%
Recreational Goods Rental	2	60%
Office Machinery and Equipment Rental and Leasing	2	60%
Other Commercial and Industrial Machinery and Equipment Rental and	2	60%
Recreational Vehicle Dealers	3	20%
Boat Dealers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Clothing and Clothing Accessories Retailers	3	20%
Sporting Goods Retailers	3	20%
Book Retailers and News Dealers	3	20%
Passenger Car Rental	4	5%
Passenger Car Leasing	4	5%

Data Refinements

Revenue Adjustments

Metric	Value	Notes
Raw Data Revenue ($)	$5,633,852,934	Raw data, as exported from D&B *[Sep2022: plus manual edits of Goodwill data]*
Cleaned Revenue ($)	$4,737,979,620	Raw data with blank Sales filled in and outliers replaced
% change from raw data	-16%	
Weighted Revenue	$3,081,244,714	Weightings applied to Cleaned Revenue
% change from raw data	-45%	

Removing Outliers

	Median Value	Current Outlier Bound (High)
Auction	47,232	4,723,160
Pawn	46,000	4,600,000
Resale	31,444	3,144,437
Rental	26,485	2,648,492
Repair	36,810	3,681,033
Rec Vehicles	98,144	9,814,432
Bridal	34,147	3,414,650
RM Members	25,476	2,547,550
Sporting Goods	41,445	4,144,483
Used Cars	126,019	12,601,892
Other	56,600	5,659,983
Car Rental	34,428	3,442,750
Books	40,171	4,017,100

Tool - US Environmentally-Extended Input-Output (US-EEIO) Model

The Recycling Economic Information Report	• Relies on environmental and economic input-output methodologies for estimating environmental and economic impacts associated with recycling
Amazon's Carbon Footprint	• Used US-EEIO as a source for life cycle CO2e factors in their corporate carbon footprint calculation
Green Purchasing in Alameda County, CA	• Used to create a guide for how government purchasing can be a catalyst for matching sustainability with advancing the health and wellbeing of its citizens
EPA Sustainable Materials Management Prioritization Tools	• Used to determine the impact of reducing disposal of different materials to prioritize innovations
Community Sustainability and Prosperity in Georgia—and Beyond	• Web applications for local communities looking to advance economic development and environmental sustainability

About US-EEIO:

US-EEIO melds data on economic transactions between 389 industry sectors with environmental data for these sectors covering land, water, energy and mineral usage and emissions of greenhouse gases, criteria air pollutants, nutrients and toxics, to build a life cycle model of 385 US goods and services.

In comparison with existing US input-output models, US-EEIO is more current with most data representing year 2013, more extensive in its coverage of resources and emissions, more deliberate and detailed in its interpretation and combination of data sources, and includes formal data quality evaluation and description.

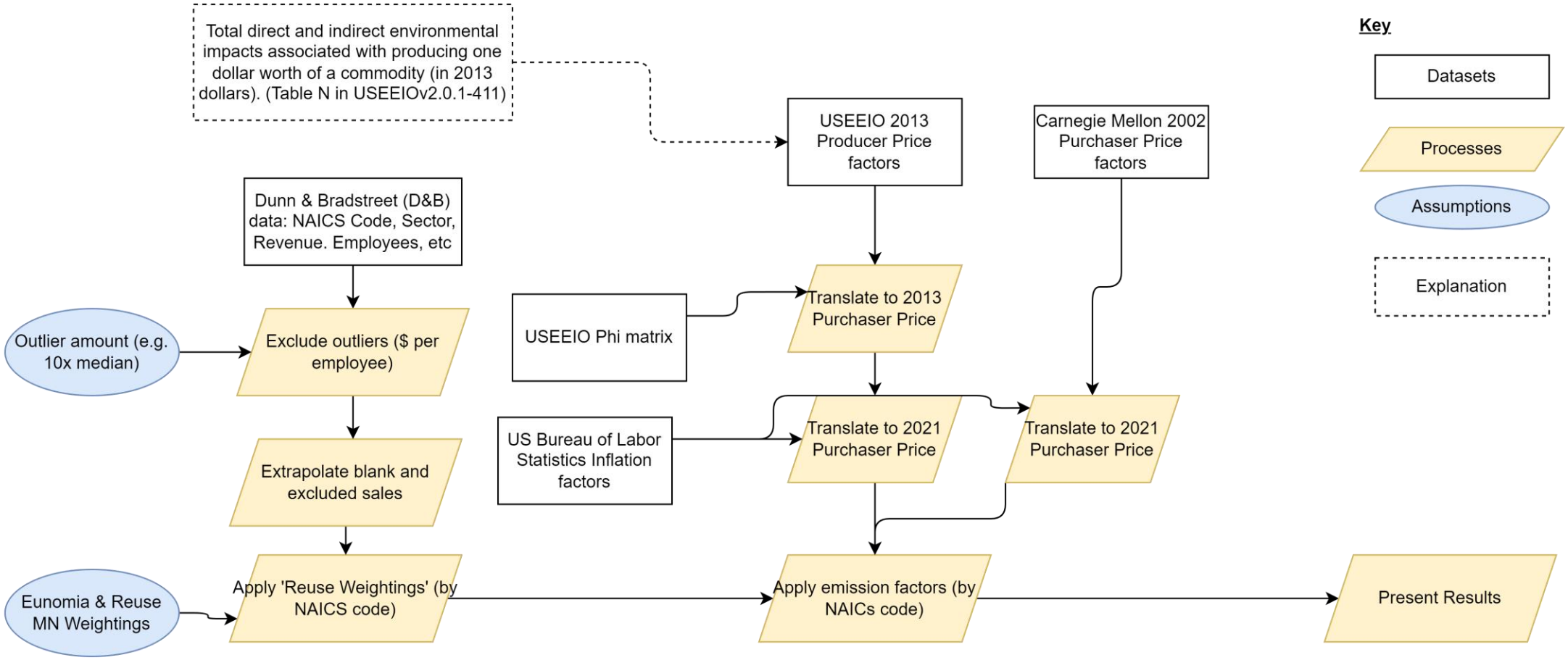
EPA United States Environmental Protection Agency

US-EEIO vs. Carnegie Mellon EIO-LCA Model

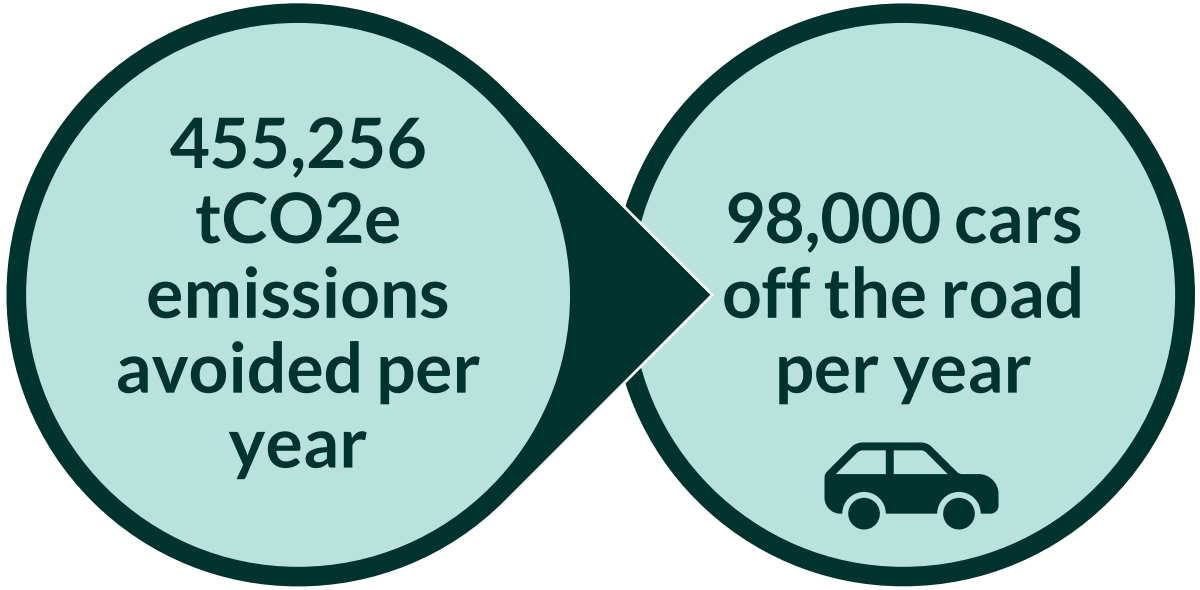
	Carnegie Mellon EIO-LCA	US-EEIO
Inputs	Dun & Bradstreet business revenue data	Dun & Bradstreet business revenue data
Outputs	GHG emissions (measured in 5 types); air pollutants; Water withdrawals; Business revenue and jobs created	GHG emissions (measured in 14 types); air pollutants; Land, water, energy, mineral resource use; Value added ($), jobs created
Cost	$10,000 license fee	Free
Baseline dataset	2002 benchmark input-output table provided by the Bureau of Economic Analysis (BEA); EPA National Emissions Inventory (NEI) 2002 data	2007 benchmark input-output table from BEA; EPA National Emissions Inventory (NEI) 2013 data
Year Created	2007	2017
Use in Excel	No	Yes

- **US-EEIO allows for greater ease of use and customization in Excel**
- **US-EEIO is more up-to-date and will continue being updated; Carnegie Mellon EIO-LCA is no longer being updated**
- **US-EEIO has greater range of goods and services**

Tool Functionality – Model Schematic



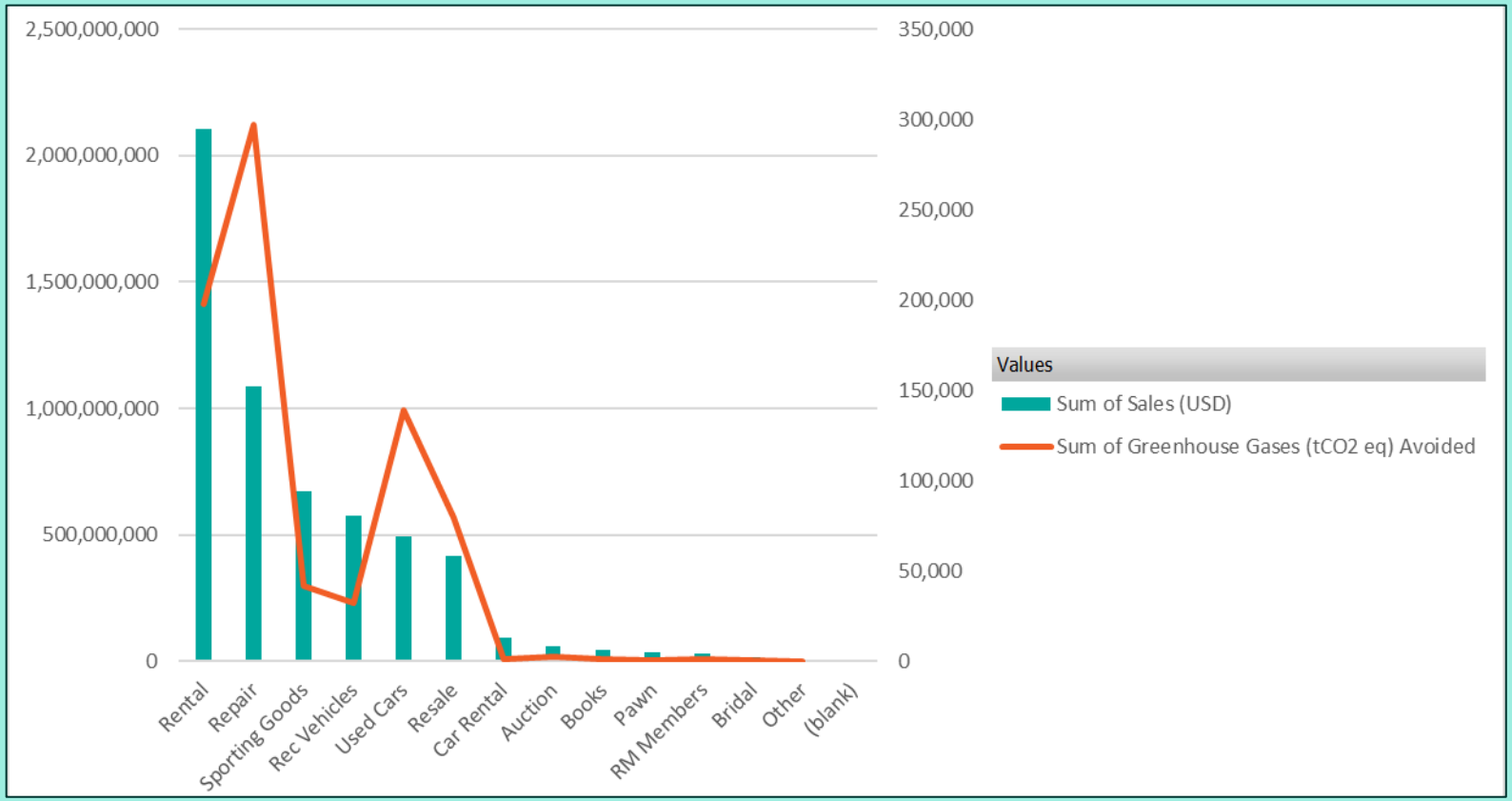
Results



US emissions	5,200,000,000 tCO2e
Minnesota state-wide emissions	160,000,000 tCO2e
% change from 2020 study	-84%
% of total MN state-wide emissions	0.28%

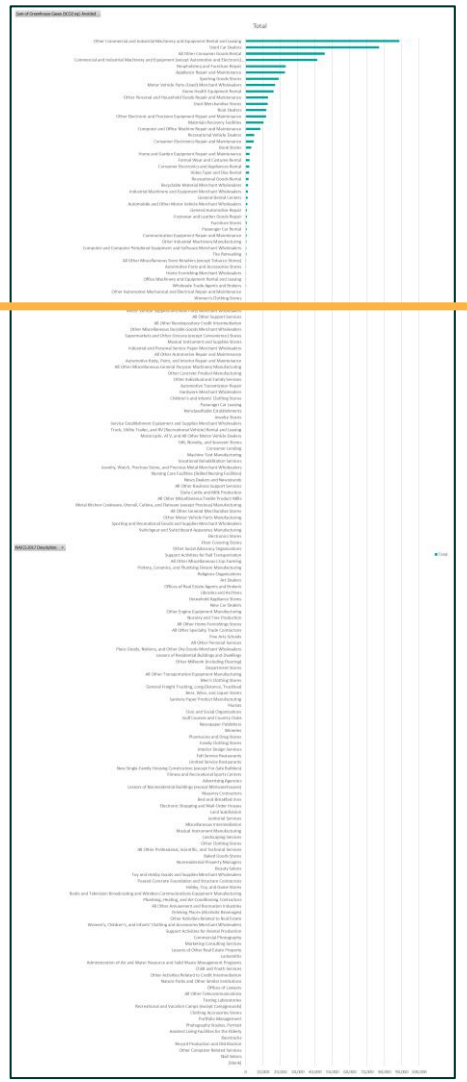
Results

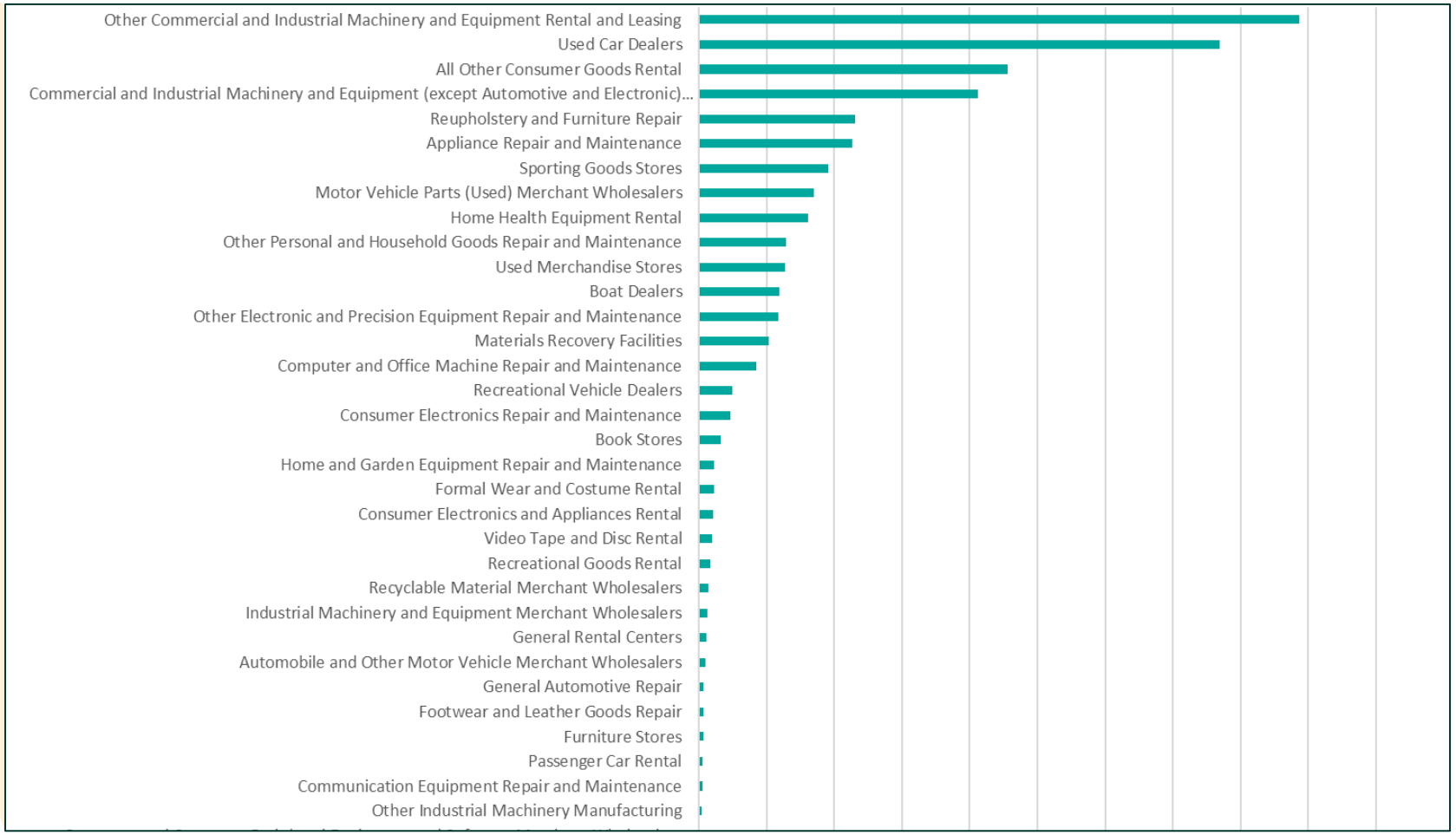
Emissions by Industry Type



Results

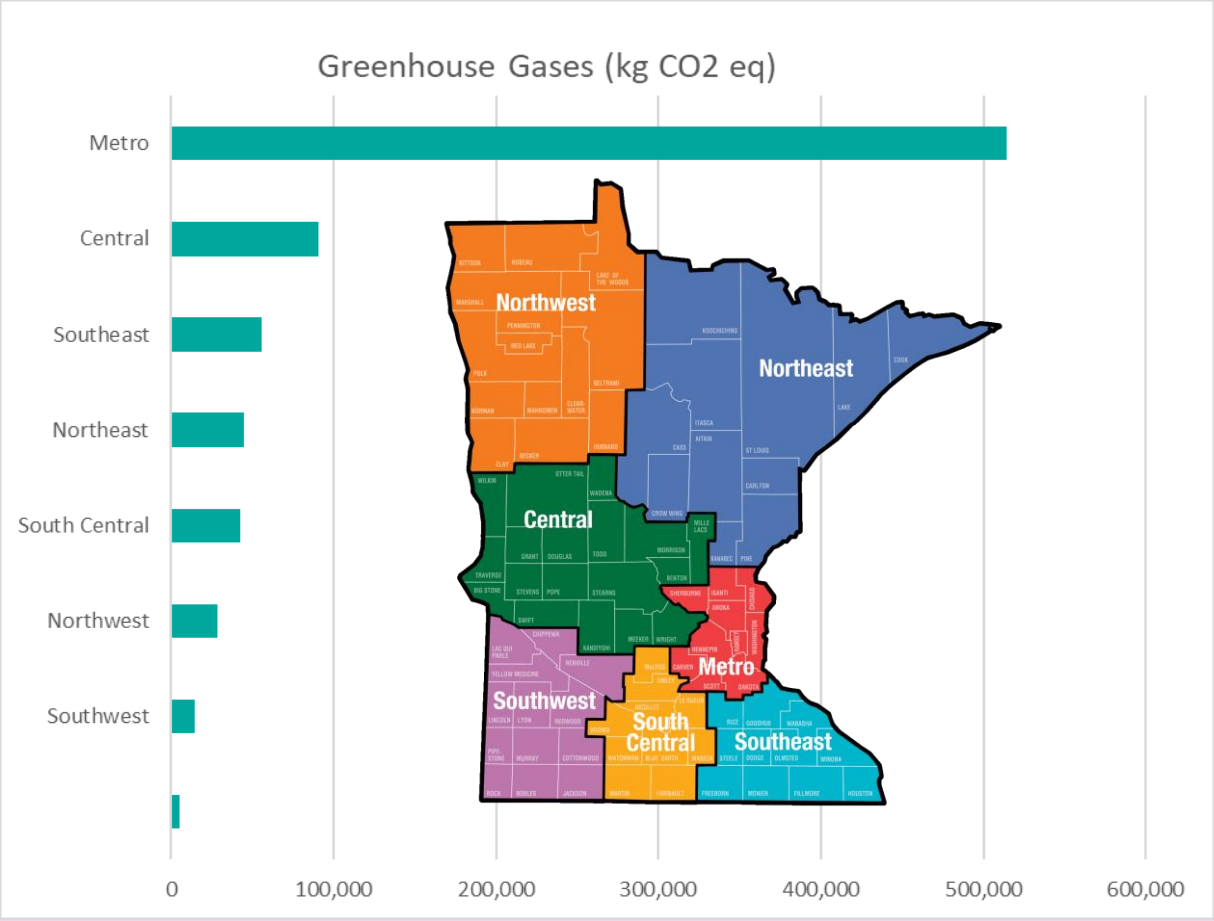
Emissions by NAICS codes





Results

Emissions by Region



Results

Sensitivity matrix

Considers the sensitivity of the results to both the Weightings and the GHG Impacts factors assumed

Values in table are in tCO2e		kgCO2e per $ (Average)																								
		0.025	0.05	0.075	0.1	0.125	0.15	0.175	0.2	0.225	0.25	0.275	0.3	0.325	0.35	0.375	0.4	0.425	0.45	0.475	0.5	0.525	0.55	0.575	0.6
Reuse Weighting (Average)	5%	5,922	11,845	17,767	23,690	29,612	35,535	41,457	47,380	53,302	59,225	65,147	71,070	76,992	82,915	88,837	94,760	100,682	106,605	112,527	118,449	124,372	130,294	136,217	142,139
	10%	11,845	23,690	35,535	47,380	59,225	71,070	82,915	94,760	106,605	118,449	130,294	142,139	153,984	165,829	177,674	189,519	201,364	213,209	225,054	236,899	248,744	260,589	272,434	284,279
	15%	17,767	35,535	53,302	71,070	88,837	106,605	124,372	142,139	159,907	177,674	195,442	213,209	230,977	248,744	266,511	284,279	302,046	319,814	337,581	355,348	373,116	390,883	408,651	426,418
	20%	23,690	47,380	71,070	94,760	118,449	142,139	165,829	189,519	213,209	236,899	260,589	284,279	307,969	331,659	355,348	379,038	402,728	426,418	450,108	473,798	497,488	521,178	544,868	568,558
	25%	29,612	59,225	88,837	118,449	148,062	177,674	207,287	236,899	266,511	296,124	325,736	355,348	384,961	414,573	444,186	473,798	503,410	533,023	562,635	592,247	621,860	651,472	681,085	710,697
	30%	35,535	71,070	106,605	142,139	177,674	213,209	248,744	284,279	319,814	355,348	390,883	426,418	461,953	497,488	533,023	568,558	604,092	639,627	675,162	710,697	746,232	781,767	817,301	852,836
	35%	41,457	82,915	124,372	165,829	207,287	248,744	290,201	331,659	373,116	414,573	456,031	497,488	538,945	580,403	621,860	663,317	704,774	746,232	787,689	829,146	870,604	912,061	953,518	994,976
	40%	47,380	94,760	142,139	189,519	236,899	284,279	331,659	379,038	426,418	473,798	521,178	568,558	615,937	663,317	710,697	758,077	805,457	852,836	900,216	947,596	994,976	1,042,356	1,089,735	1,137,115
	45%	53,302	106,605	159,907	213,209	266,511	319,814	373,116	426,418	479,720	533,023	586,325	639,627	692,930	746,232	799,534	852,836	906,139	959,441	1,012,743	1,066,045	1,119,348	1,172,650	1,225,952	1,279,254
	50%	59,225	118,449	177,674	236,899	296,124	355,348	414,573	473,798	533,023	592,247	651,472	710,697	769,922	829,146	888,371	947,596	1,006,821	1,066,045	1,125,270	1,184,495	1,243,720	1,302,944	1,362,169	1,421,394
	55%	65,147	130,294	195,442	260,589	325,736	390,883	456,031	521,178	586,325	651,472	716,619	781,767	846,914	912,061	977,208	1,042,356	1,107,503	1,172,650	1,237,797	1,302,944	1,368,092	1,433,239	1,498,386	1,563,533
	60%	71,070	142,139	213,209	284,279	355,348	426,418	497,488	568,558	639,627	710,697	781,767	852,836	923,906	994,976	1,066,045	1,137,115	1,208,185	1,279,254	1,350,324	1,421,394	1,492,464	1,563,533	1,634,603	1,705,673
	65%	76,992	153,984	230,977	307,969	384,961	461,953	538,945	615,937	692,930	769,922	846,914	923,906	1,000,898	1,077,890	1,154,883	1,231,875	1,308,867	1,385,859	1,462,851	1,539,843	1,616,836	1,693,828	1,770,820	1,847,812
	70%	82,915	165,829	248,744	331,659	414,573	497,488	580,403	663,317	746,232	829,146	912,061	994,976	1,077,890	1,160,805	1,243,720	1,326,634	1,409,549	1,492,464	1,575,378	1,658,293	1,741,208	1,824,122	1,907,037	1,989,951
	75%	88,837	177,674	266,511	355,348	444,186	533,023	621,860	710,697	799,534	888,371	977,208	1,066,045	1,154,883	1,243,720	1,332,557	1,421,394	1,510,231	1,599,068	1,687,905	1,776,742	1,865,579	1,954,417	2,043,254	2,132,091
	80%	94,760	189,519	284,279	379,038	473,798	568,558	663,317	758,077	852,836	947,596	1,042,356	1,137,115	1,231,875	1,326,634	1,421,394	1,516,153	1,610,913	1,705,673	1,800,432	1,895,192	1,989,951	2,084,711	2,179,471	2,274,230
	85%	100,682	201,364	302,046	402,728	503,410	604,092	704,774	805,457	906,139	1,006,821	1,107,503	1,208,185	1,308,867	1,409,549	1,510,231	1,610,913	1,711,595	1,812,277	1,912,959	2,013,641	2,114,323	2,215,005	2,315,688	2,416,370
	90%	106,605	213,209	319,814	426,418	533,023	639,627	746,232	852,836	959,441	1,066,045	1,172,650	1,279,254	1,385,859	1,492,464	1,599,068	1,705,673	1,812,277	1,918,882	2,025,486	2,132,091	2,238,695	2,345,300	2,451,904	2,558,509
	95%	112,527	225,054	337,581	450,108	562,635	675,162	787,689	900,216	1,012,743	1,125,270	1,237,797	1,350,324	1,462,851	1,575,378	1,687,905	1,800,432	1,912,959	2,025,486	2,138,013	2,250,540	2,363,067	2,475,594	2,588,121	2,700,648
	100%	118,449	236,899	355,348	473,798	592,247	710,697	829,146	947,596	1,066,045	1,184,495	1,302,944	1,421,394	1,539,843	1,658,293	1,776,742	1,895,192	2,013,641	2,132,091	2,250,540	2,368,990	2,487,439	2,605,889	2,724,338	2,842,788

2020 study 'weighted' value

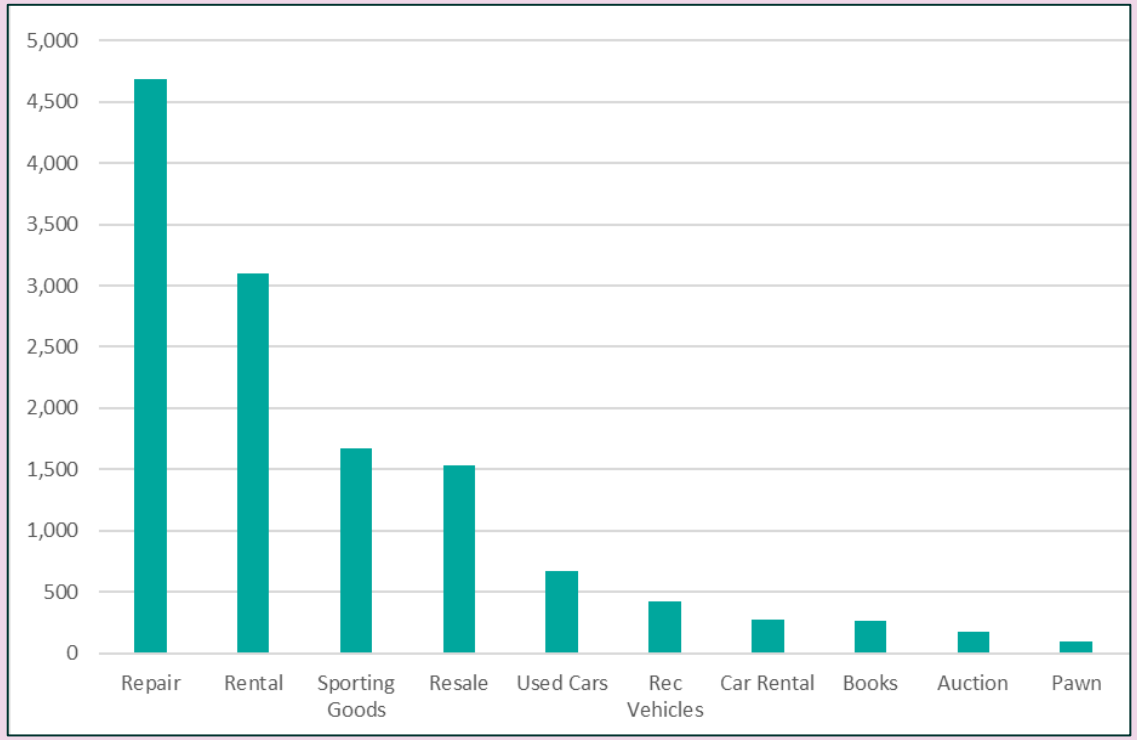
2022 USEEIO default value

2022 Carnegie Mellon default value

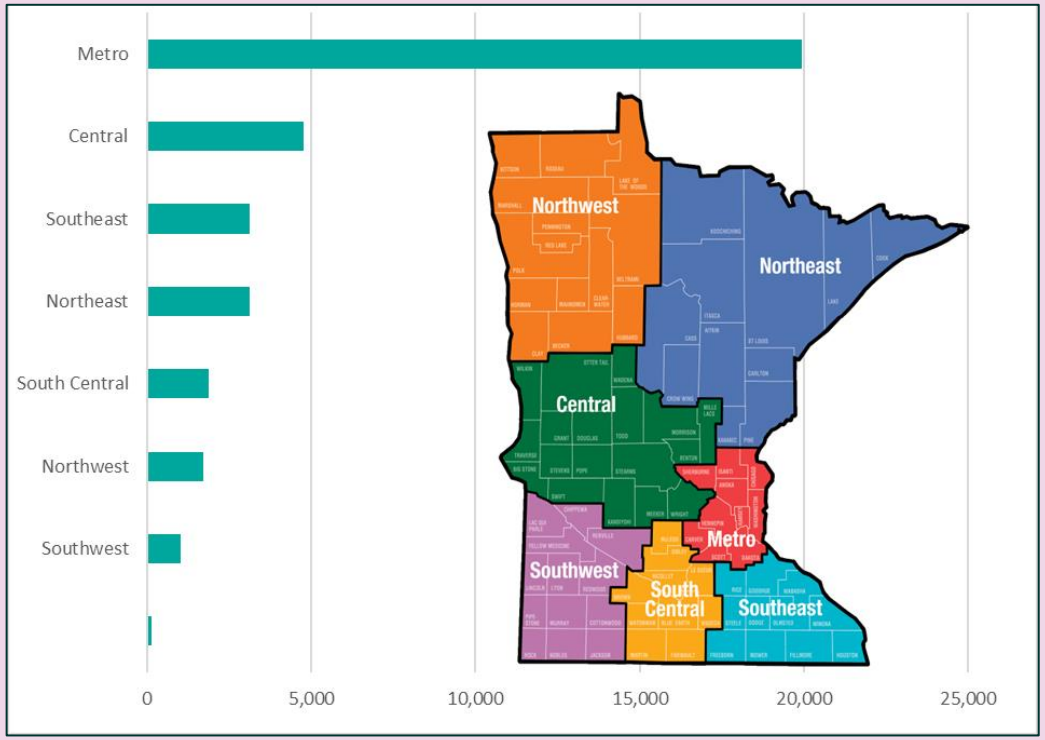
Results

Local Jobs in Reuse: ~36,000

By Industry Category



By Region



Takeaways

Reuse is a varied and significant part of the state economy

Having a consistent definition and data for reuse is important

Putting bounds on reuse businesses is difficult, better business data is needed for more accurate assessment

Utilizing a tool that allows for nuance is key, allows for further refinements in the future

As reuse continues to grow, being able to track the impact will allow for additional resources and supportive policy to be created

www.eunomia-inc.com
@Eunomia_RandC

Sydnee.grushack@eunomia-inc.com