

ENVIRONMENTAL IMPACT OF REUSED CLOTHING USING THE CONSUMER ENVIRONMENTAL INDEX



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Consumer Environmental Index

- The Consumer Environmental Index (CEI)
 - ▣ Developed by Sound Resource Management in collaboration with Carnegie Mellon University's Green Design Institute
 - ▣ Created to support of Ecology's [Beyond Waste Plan](#)
 - ▣ Economic Input Output Hybrid Life Cycle Analysis
 - ▣ Framework within which to estimate environmental impacts from consumer **spending** in Washington State
 - ▣ Environmental impact categories
 - Climate Change
 - Ecosystem Toxicity
 - Human Health (currently being revised)

Consumer Environmental Index

- CEI tracks changes in
 - ▣ Consumer spending choices
 - ▣ Environmental impacts of consumer spending
 - ▣ Changing pollution footprint of commodities
- Inform about environmental impacts
- Potential to guide consumer purchasing decisions

Hybrid Life Cycle Analysis

- Input expenditure data
- Hybrid LCA traces footprint throughout 3 phases
 - ▣ **Upstream manufacturing phase**
 - ▣ Use phase
 - ▣ Disposal phase
- Calculates resulting equivalent greenhouse gas and ecotoxicity emissions

Upstream Phase

- BLS Consumer Expenditure Survey Data
 - Expenditure data for Washington State
 - 600+ categories
- Economic Input-Output Life Cycle Assessment ([EIO-LCA](#)) model from Carnegie Mellon University
 - BEA Economic Input Output tables ([link](#))
 - EPA TRI data ([link](#))
 - EPA AIRData criteria air emissions report ([link](#))
 - IPCC's revised 1996 guidelines for national greenhouse gas inventories ([link](#))
 - National energy profiles
 - USEtox characterizing human and eco-toxicity impact([link](#))

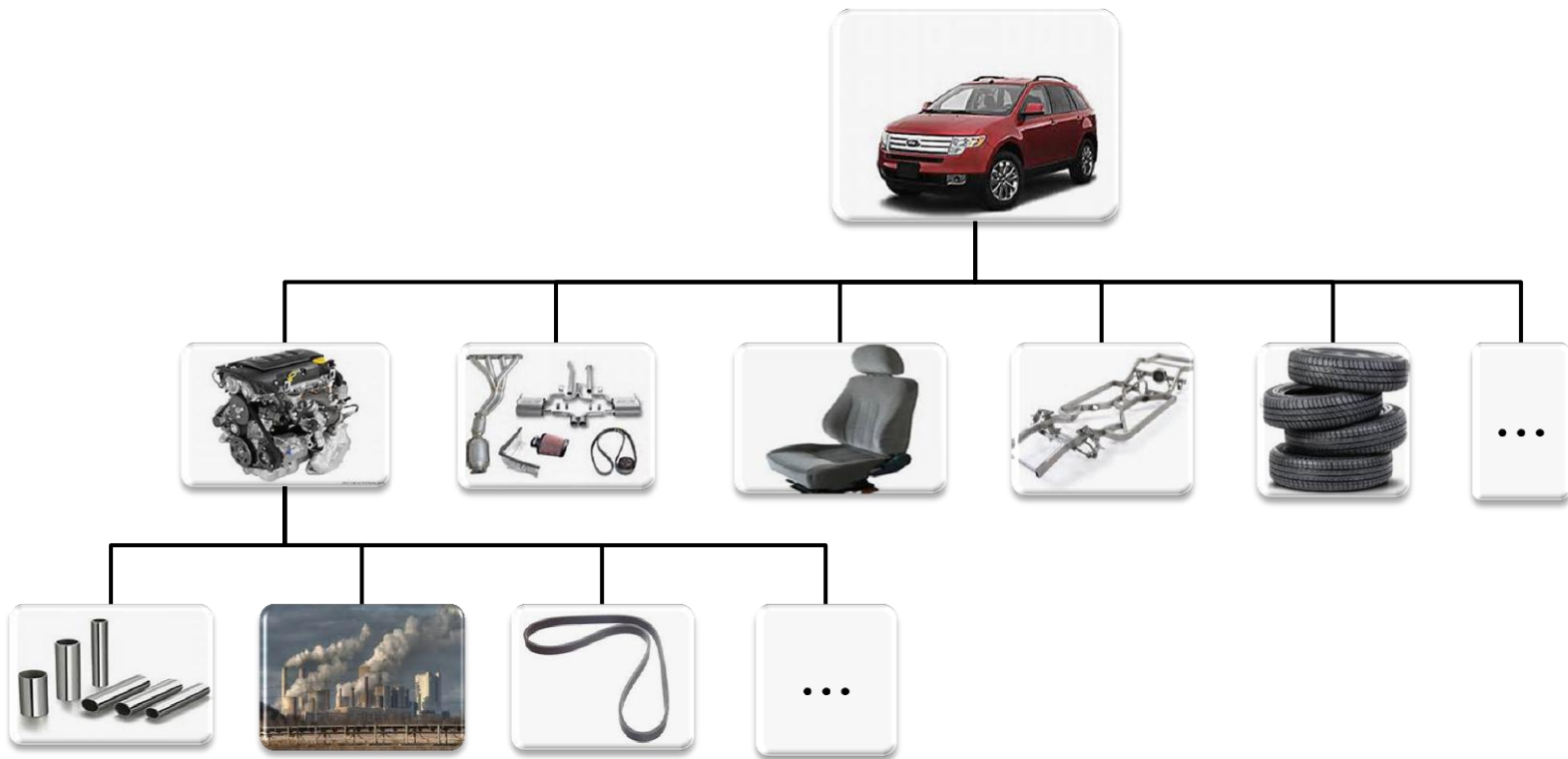
Upstream Phase

□ Traditional LCA



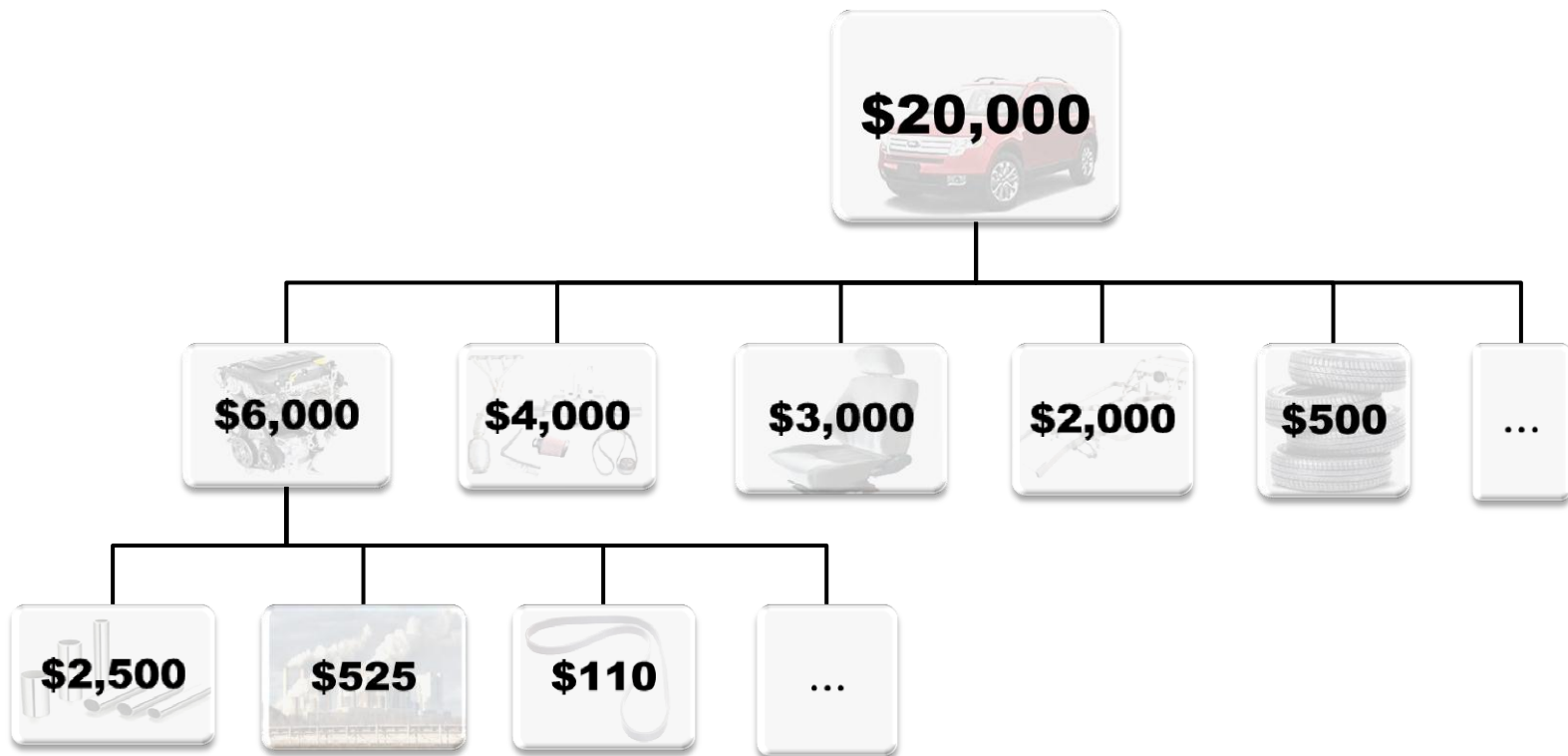
Upstream Phase

- Traditional LCA
 - ▣ Items and components



Upstream Phase

- Economic Input Output Method
 - ▣ Industries and sectors



Upstream Phase

- Economic Input Output Method
 - Traces production through economic activity
 - Captures complex, interrelated nature of economy
 - Paints in broad strokes
 - The entire economy distilled into 486 sectors
 - Assumes domestic production
 - Assigns environmental impacts based on sector profiles

Ecotoxicity: USEtox and TRACI

- Characterizes ecotoxicological impacts of chemical emissions
- Expresses toxicity in terms of equivalent emissions of 2,4-D (2,4-Dichlorophenoxyacetic acid) to freshwater

Use Phase

- Spending data from upstream is converted to actual items (like actual number of vehicles) and usage data (miles driven, emission data...)
- Fully expandable
- Able to prioritize and add sectors or items as needed
- Vehicles, pesticides, paints...

Disposal Phase

- WA Recycling, Diversion, Disposal, and Waste Characterization Data
 - EPA WARM Model ([link](#))
 - EPA/NCUS/Research Triangle Institute Decision Support Tool (DST) for Municipal Solid Waste (MSW) Management ([link](#))
 - ECY Recycling data ([link](#))
- Adjusts for WA State specific recycling and diversion of materials
- Greenhouse gas oriented

Case Study – Reused Clothing

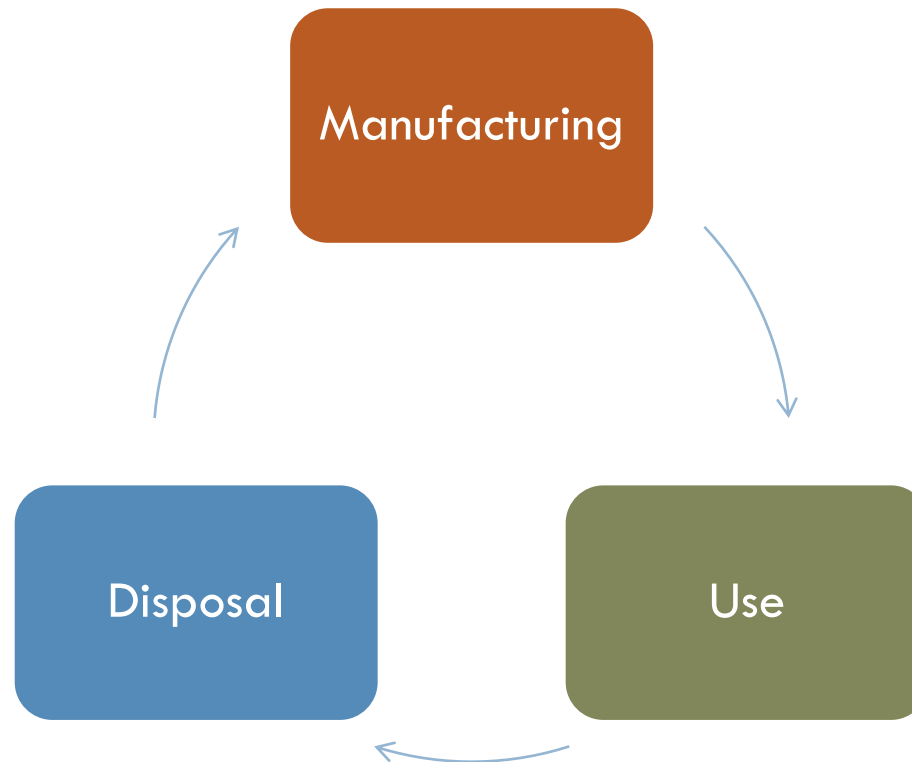
- Minnesota Pollution Control Agency
- Environmental impacts of the reuse industry
- Used clothing store sales figures

Case Study – Reused Clothing

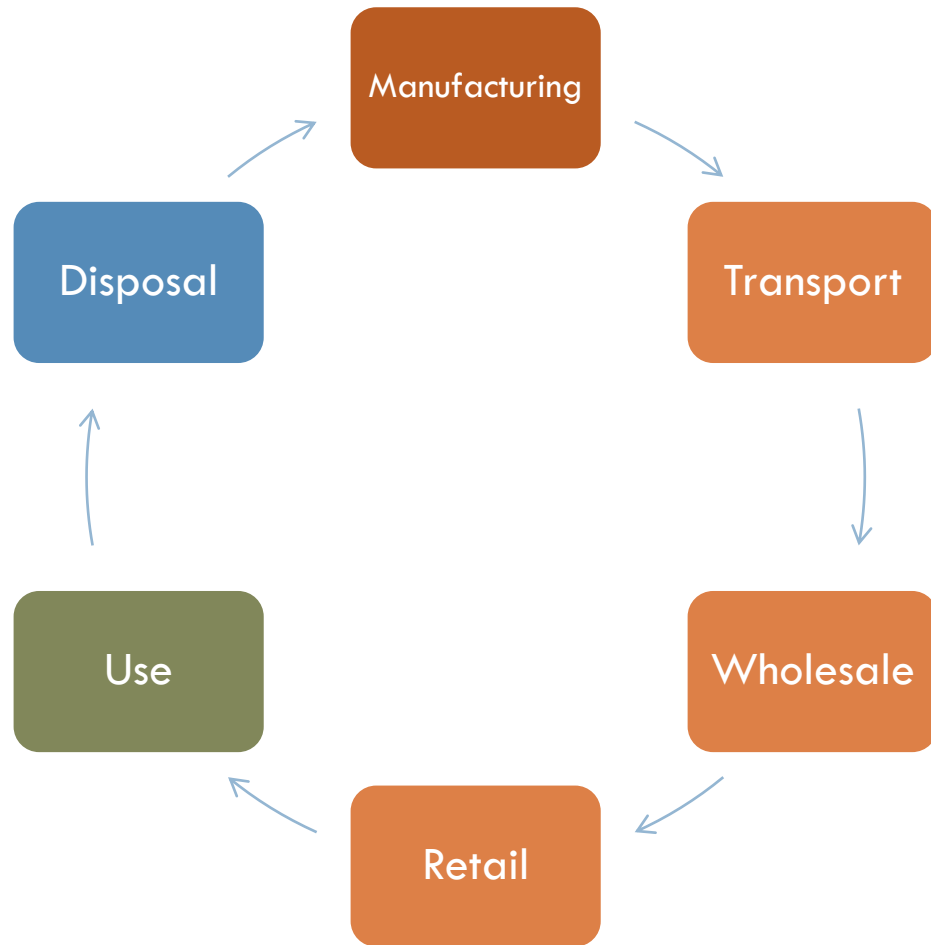
Department	Sub Dept	Quantity	Sales	New Retail Value
Men's	Men's tops	66,981	\$ 278,026	\$ 925,828
	Men's bottoms	29,305	\$ 154,499	\$ 514,483
	Men's outerwear	7,606	\$ 82,028	\$ 273,155
Women's	Women's tops	266,505	\$ 1,050,422	\$ 3,497,905
	Women's bottoms	88,333	\$ 362,189	\$ 1,206,090
	Women's blazers/suits/dresses	40,942	\$ 255,212	\$ 849,858
	Women's sportswear	33,781	\$ 136,941	\$ 456,013
	Women's better quality	21,188	\$ 172,809	\$ 575,455
	Women's maternity	3,029	\$ 12,370	\$ 41,192
	Women's denim	30,063	\$ 143,935	\$ 479,303
Kid's	Kid's clothing	169,024	\$ 436,517	\$ 1,453,602
Accessories	accessories jewelry	65,170	\$ 233,735	\$ 778,337
	accessories shoes	81,850	\$ 569,363	\$ 1,895,980
	accessories purses/wallet	44,033	\$ 213,470	\$ 710,857

Case Study – Reused Clothing

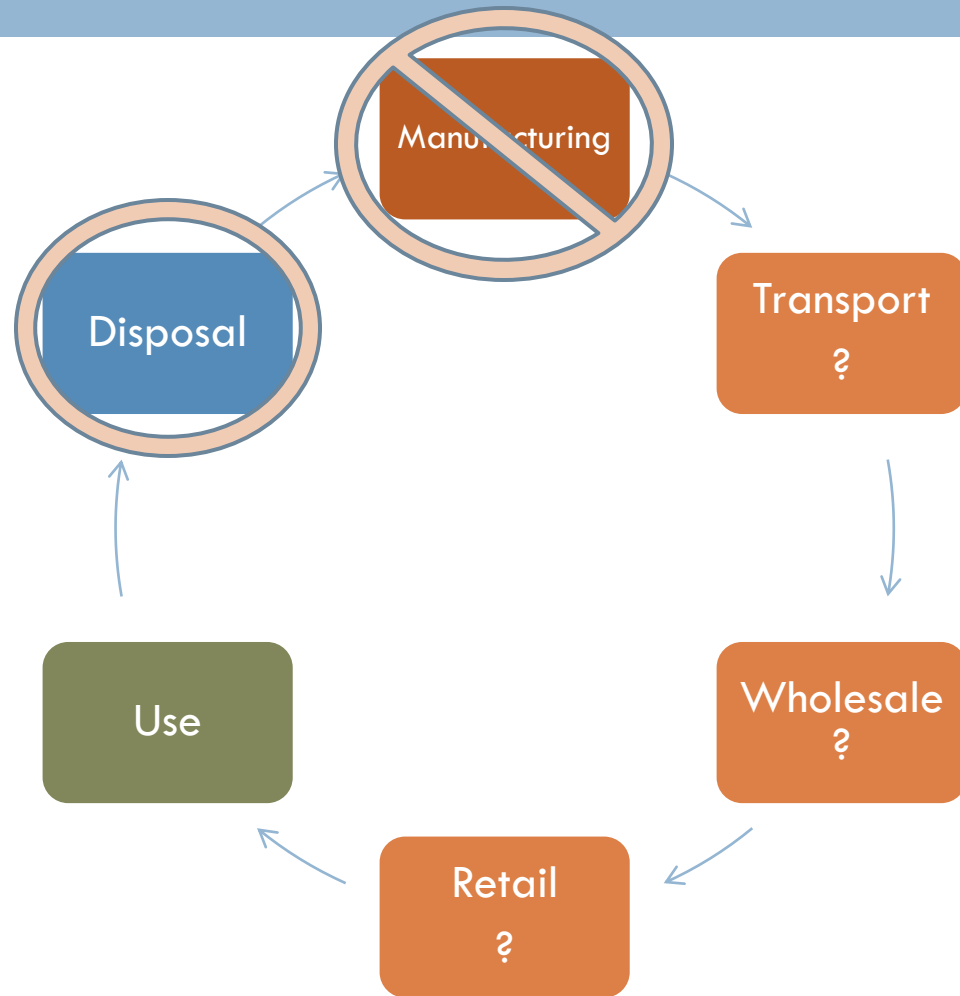
- What can our lifecycle framework tell us?



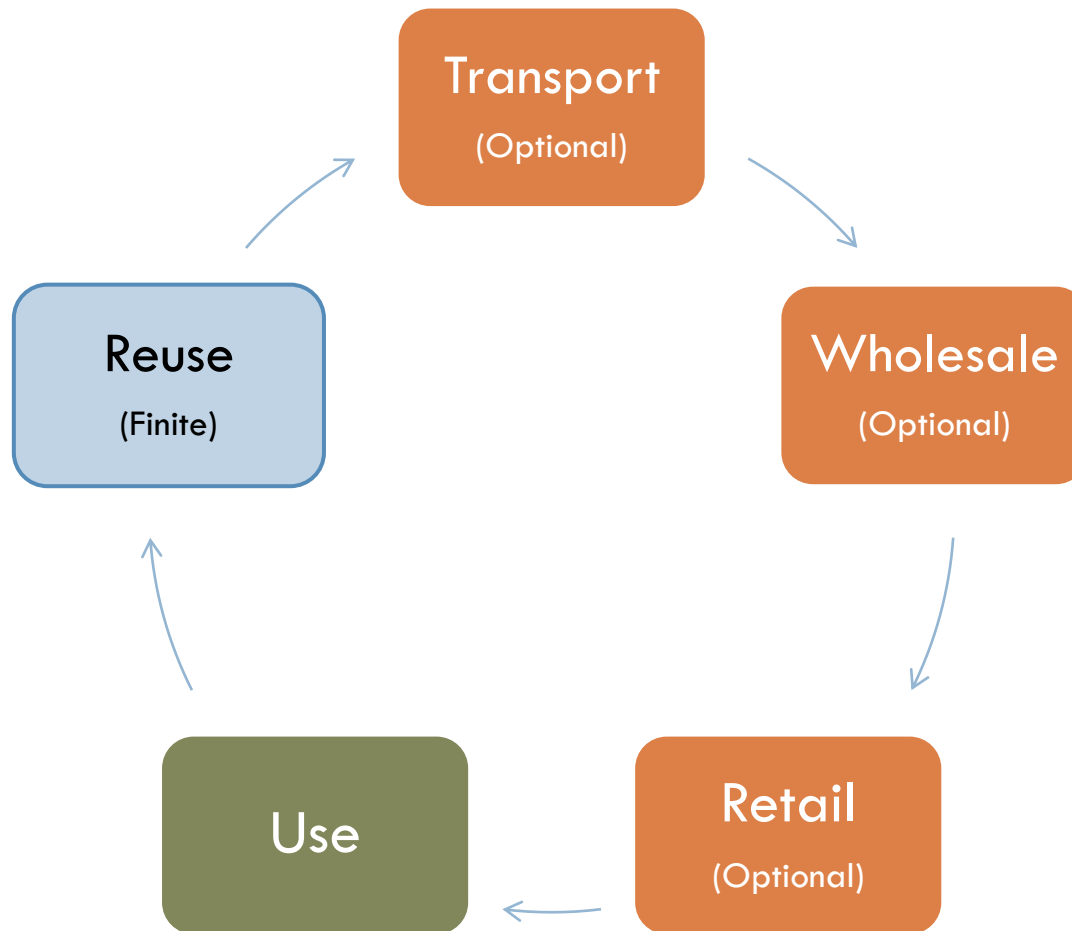
New Shirt



Used Shirt



Used Shirt



Assumptions

- A Reused Shirt:
 - Is NOT manufactured
 - Will still be disposed of... eventually

- Emissions avoided based on alternatives.
Alternative to buying a **used** Brand-X shirt for \$20?
 - Buy a new, cheaper brand shirt for \$20
 - Buy a new Brand-X shirt at retail cost of \$50
 - Somewhere in between

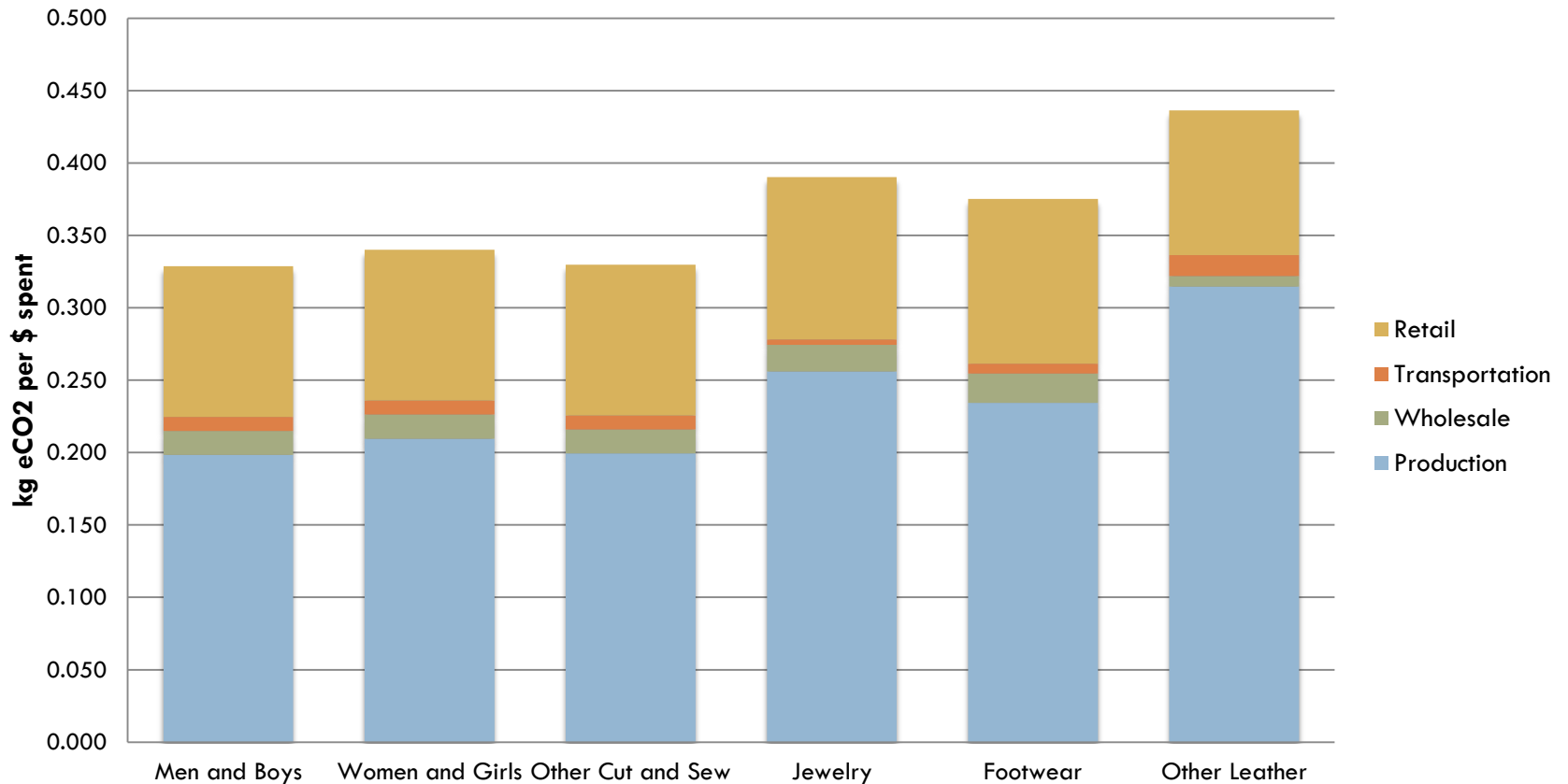
Upstream Greenhouse Gas Savings

Greenhouse Gas Emissions Avoided by Buying Used Clothing:

Reused Clothing Item match to Economic Sector	Sales.	kg eCO2
'Men's and boys" cut and sew apparel manufacturing '	\$ 656,095	215,730
'Women's and girls" cut and sew apparel manufacturing '	\$ 2,401,118	816,751
'Other cut and sew apparel manufacturing'	\$ 722,882	238,458
'Jewelry and silverware manufacturing '	\$ 233,735	91,233
'Footwear manufacturing '	\$ 569,363	213,656
'Other leather and allied product manufacturing'	\$ 213,470	93,143
TOTAL	\$ 4,796,663	1,668,971

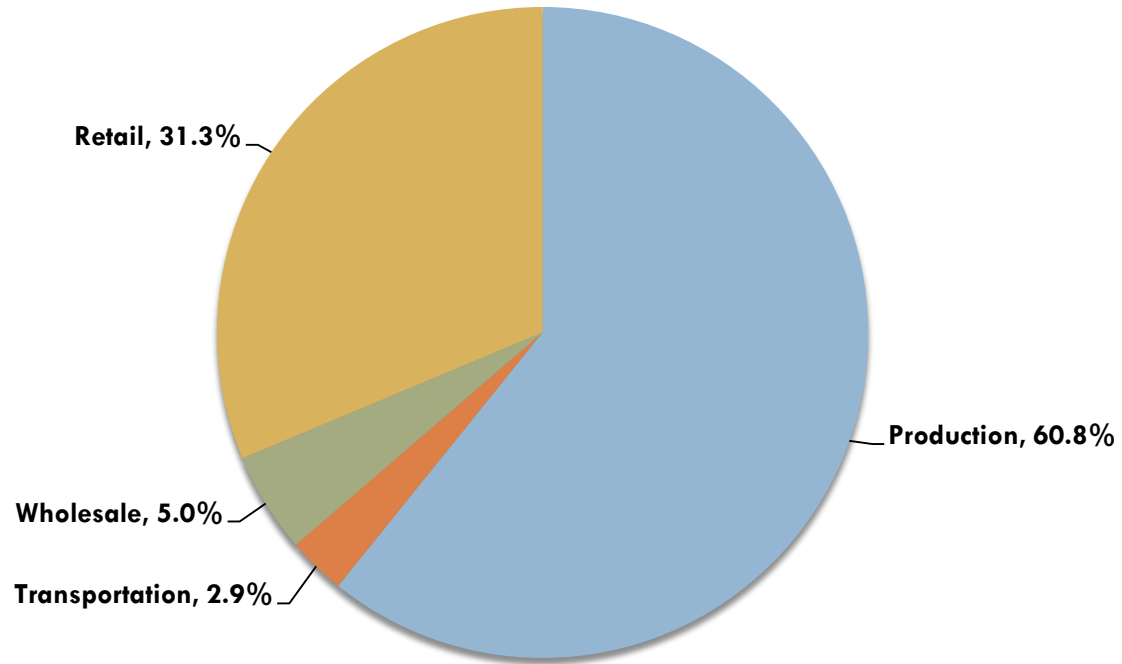
Greenhouse Gas Emissions

Sector GHG Contributions by Upstream Phase

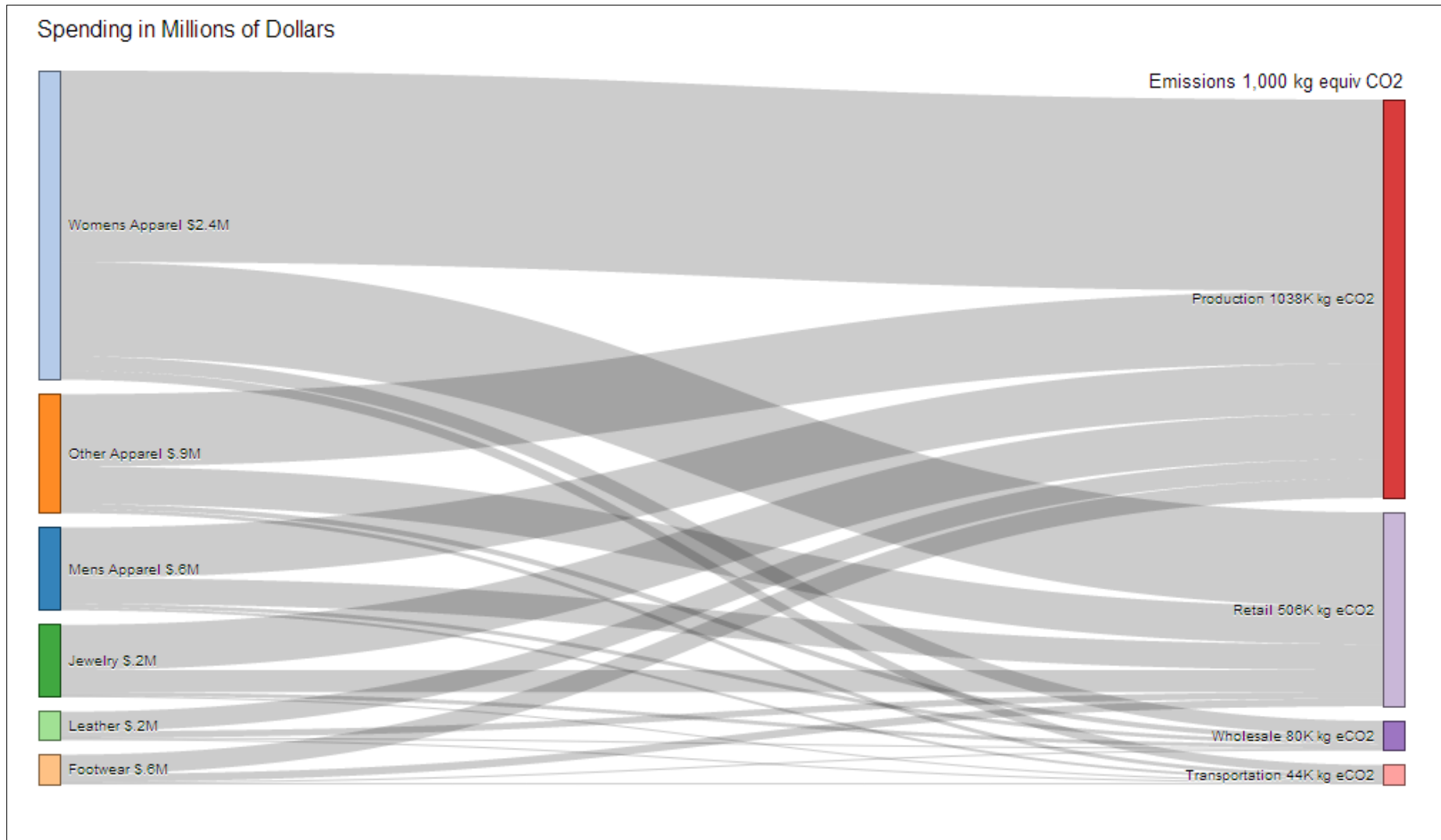


Greenhouse Gas Emissions

Upstream GHG Emissions for Average Cut and Sew Apparel



Greenhouse Gas Emissions

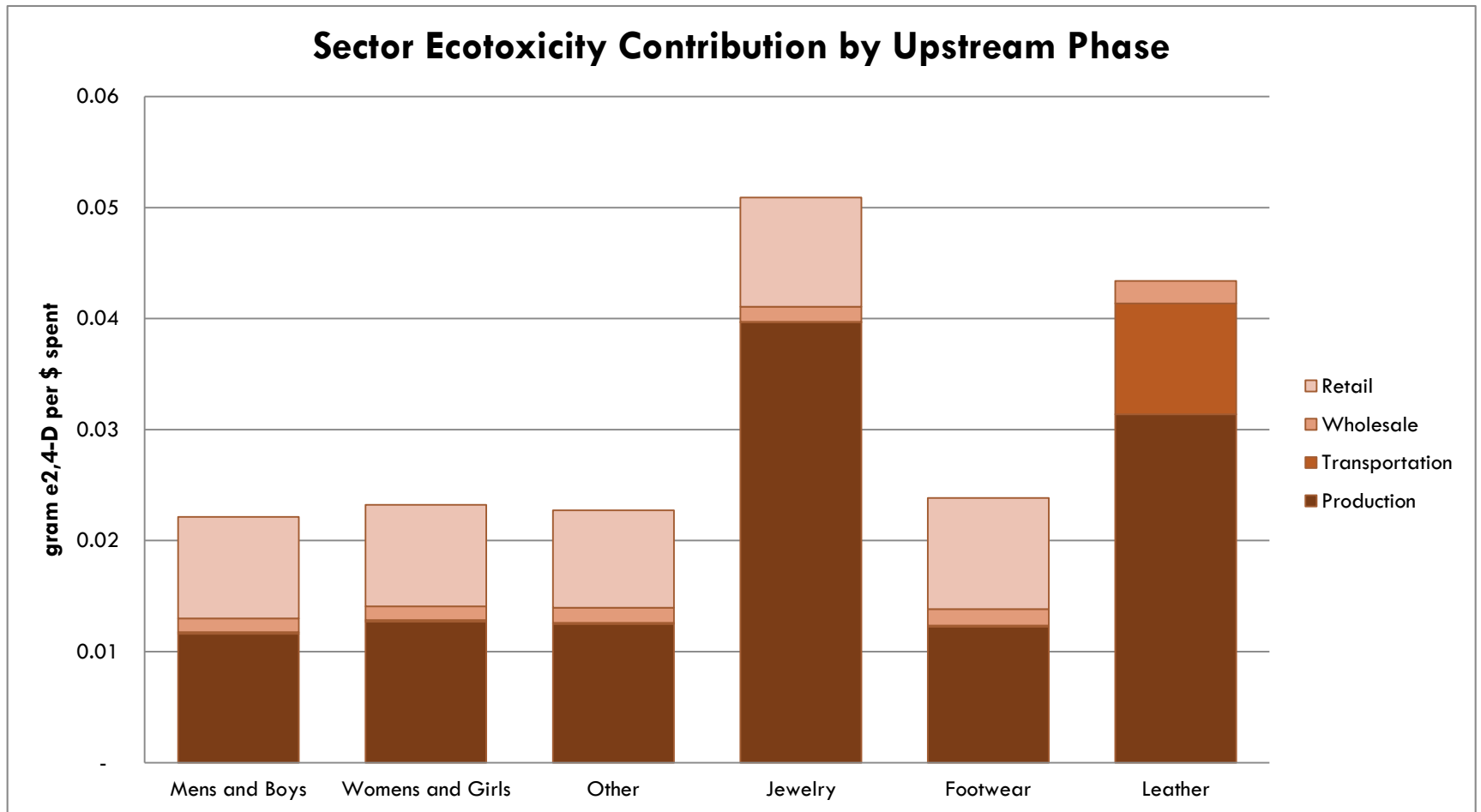


Ecotoxicity Emissions

Ecotoxicity Emissions Avoided by Buying Used Clothing:

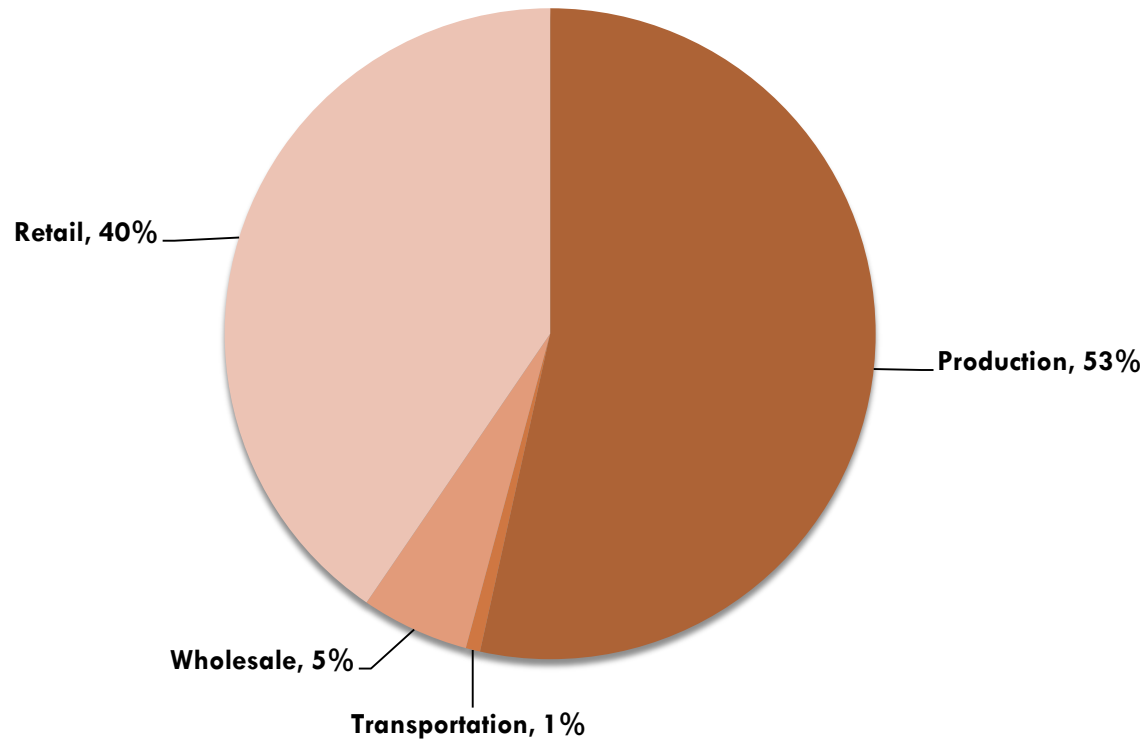
Reused Clothing Item match to Economic Sector	Sales	g e2,4-D to freshwater
'Men's and boys" cut and sew apparel manufacturing '	\$ 656,095	7,612
'Women's and girls" cut and sew apparel manufacturing '	\$ 2,401,118	30,467
'Other cut and sew apparel manufacturing'	\$ 722,882	8,692
'Jewelry and silverware manufacturing '	\$ 233,735	9,267
'Footwear manufacturing '	\$ 569,363	6,969
'Other leather and allied product manufacturing'	\$ 213,470	3,244
TOTAL	\$ 4,796,663	66,250

Ecotoxicity Emissions

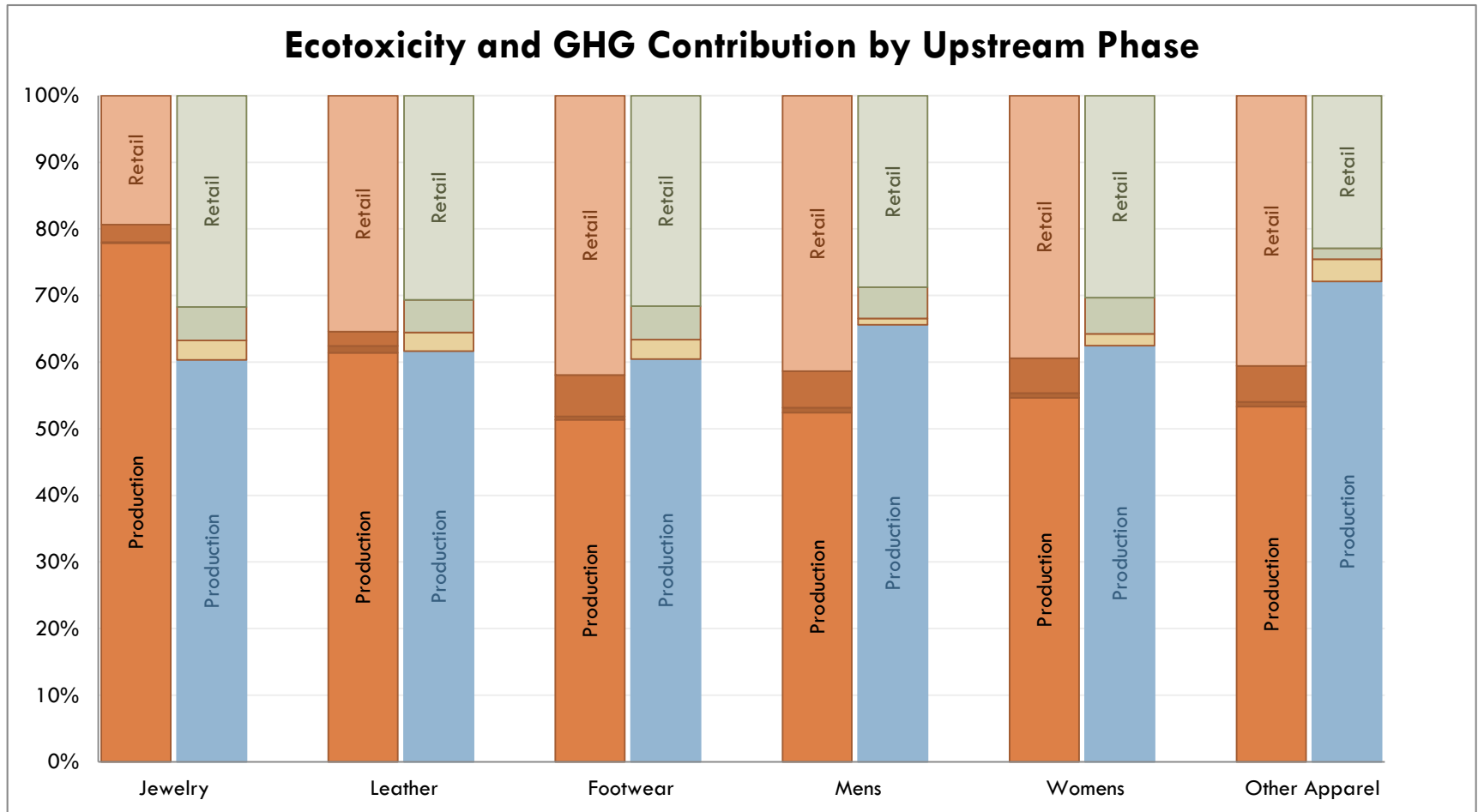


Ecotoxicity Emissions

Upstream Ecotoxicity Emissions for Average Cut and Sew Apparel



Ecotoxicity Emissions



Environmental Impact Tracing

Likely ecotoxicity sources from 'Women's Cut and Sew Apparel'

Chemical	Source Sector
Toluene	Textile and Fabric Finishing Mills Printing Artificial and synthetic fibers and filament ...
Xylene	Artificial and synthetic fibers and filament Accessories and other apparel manufacturing ...
Formaldehyde	Textile and fabric finishing mills Nonwoven fabric mills ...
Styrene	Plastics Pipe and Pipe Fitting Manufacturing Other plastics product manufacturing ...
Chromium	Motor vehicle parts manufacturing Ferrous metal foundaries ...
Ammonia	Fertilizer manufacturing Other basic organic chemical manufacturing ...

Environmental Impact Tracing

Likely greenhouse gas sources from 'Women's Cut and Sew Apparel'

Chemical	Source Sector
CO2	Power generation Textile and fabric finishing mills Truck transportation Oil and gas extraction Knit fabric mills Other basic organic chemical manufacturing ...
N2O	Cotton farming ...

Questions, Comments?



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