Missouri State University
Sustainability

Recycling 101: The Importance of Recycling at MSU

Sustainability
Recycling 101

Created By
Leo Carpenter

The Importance of Recycling at MSU

PART 1 Recycling History

PART 2 Recycling Facts

PART 3 Recycling at MSU

Missouri State University
September 2022

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Recycling History

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How we view Recycling

- Recycling isn’t a new phenomenon.
- Civilizations have been reusing, reducing, and recycling long before it because fashionable and long before anyone realized how important reusing, reducing, and recycling was to the health of our planet.
- We must learn from the past and how they treated their garbage to ensure a clean and sustainable future.
- Reusing, reducing, and recycling have been a natural part of civilization, and we must continue these practices for the sake of our planet.

BCE 1000:Dubai

- Researchers discovered objects in Sarug Al Hadid, an ancient archaeological site located in the southern part of the Persian Gulf (today's Dubai)
  - Excavations show that metallurgists living 3,000 years ago in the area, used recycling.
- Polish scientists found tools in Dubai made from copper, bronze and iron refashioned from broken ceramic vessels.
  - Broken ceramic vessels were not thrown away, the researchers told Science in Poland, instead they were modified and used as tools.
- Dating to 3,000 years-ago, the range of Iron Age artifacts discovered in Dubai is evidence of recycling
- These inhabitants were “early green pioneers” who rather reshaped ceramics into tools instead of throwing them away

https://doi.org/10.1111/aae.12082

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Pottery fragments found at the ancient recycling site.

1031: Japan

- During the decline of the Imperial court, paper production moved away from the state's control as workers gradually merged into the society of the Zushoryos.
- As a result, private estate owners built paper mills. They hired those workers to continue making paper - and it wasn't long until the process of reusing waste paper became common to conserve materials and maximize output.
- Because of the absence of materials, paper, and skilled workers, owners of private estates began the erection of small paper mills.
- It was recorded that waste paper became a valuable material for remaking into sheets of paper.

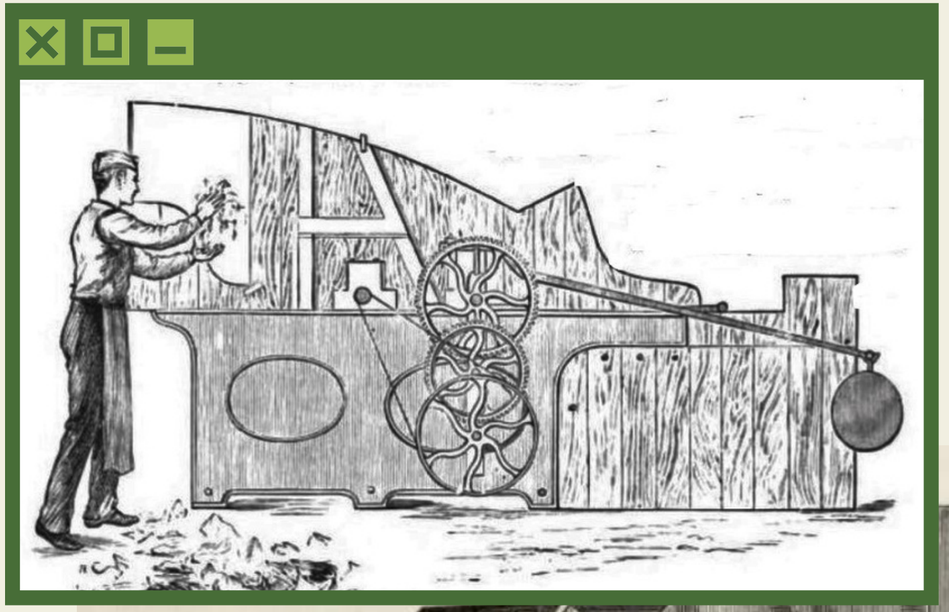
Yakushi -Ji

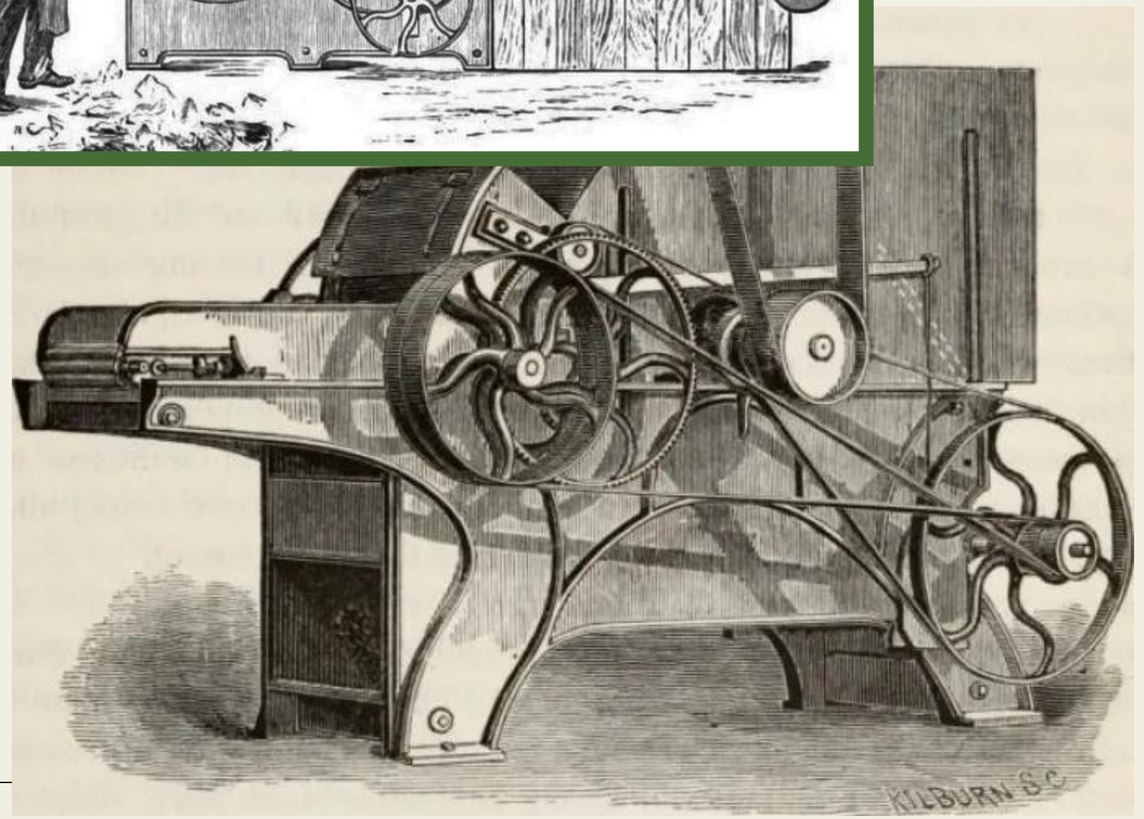
1690: "New World"

- Soon after settling in the newly created town of Germantown, Philadelphia, German immigrant and paper manufacturer William Rittenhouse purchased 20 acres of land to build the first paper recycling plant in the New World.
- Rittenhouse paper was made for the local printers in Germantown and Philadelphia and even traveled north to New York. For the next 40 years, the Rittenhouse plant was the only one operating in North America.
- Old rags and pieces of linen were used as the main raw material for making paper in England and its American colonies. These materials were collected by wagons and transported to the plant.

1800s

- 1813: Benjamin Law invented the Shoddy process. He took old clothes and rags, recycled them, and re-spinning them into wool.
- 1860: The shoddy industry produced more than 7000 tons of recycled wool annually.
- 1881: The New York City Department of Street Cleaning was created in response to the public uproar over litter-lined streets and disorganized garbage collection.
- 1880's: 75% of NYC’s waste was dumped into the Atlantic Ocean.
- 1895: A waste management plan was put in place to eliminate ocean dumping and mandate recycling. Household waste was separated into categories. Some waste was used to make grease, soap products, and fertilizer. Paper and other materials were salvaged, and the rest was landfilled
- 1897: New York Establishes the First Crude Recycling Plant. Scrape metal, paper, rubber, twine, burlap bags, and horse hair were even sorted for recycling and reuse.





1900s-1930s

- 1904: The First Aluminum Recycling Plants Open
  - A real moment in the history of recycling came in 1904, when aluminum can recycling factories opened in Chicago, Illinois – the first of their kind in America.
- 1916: Waste Reclamation Service Implemented during WW1
  - The famous recycling slogan, ‘Don’t Waste It, Save It,’ was created during World War 1. Due to large-scale material shortages the government created a Waste Reclamation Service.
- 1930: Residents Survive The Great Depression by Recycling Scrap
  - The Great Depression was an infamous time of shortages, so residents were encouraged to recycle or reuse everything from scrap metal, to cloth, paper, sacks and more. The saying ‘use it up, wear it out, make do or do without’ became a popular phrase.

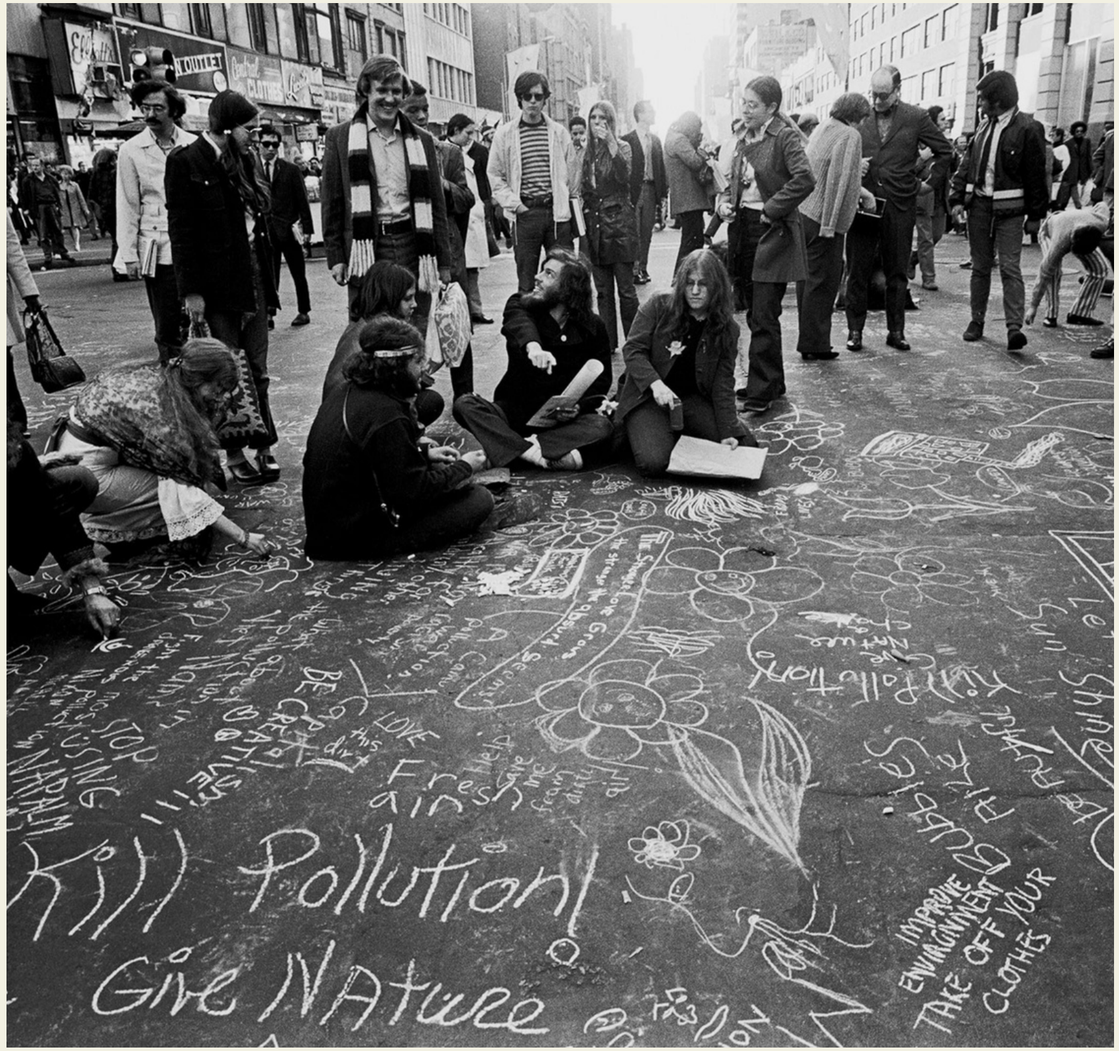
1940: World War II

- In 1941, the British government imposed garment rationing on its population, with a point system that assigned a value to each item of clothing. During that time, everything could have a second use; even the lace that once adorned a dress now served as a bandage.
- In the US, the enormous war effort sparked by its entry into the war led the Roosevelt administration to begin a campaign. It urged the population to collect used cooking fat, tin cans, metals, or any material used to make explosives and weapons.

1960s USA

- The first curbside collections of yard waste, metals, and paper start popping up around the country. Separate waste streams collected at the curb become commonplace.
- Lady Bird Johnson, the wife to former President Lyndon Johnson, demanded that litter be tackled, and the streets become cleaner. She is credited with reviving a love for recycling, and her initiatives paved the way for many modern-day packaging and plastic recycling practices.
- The environmental movement saw scientists explore numerous ways of saving energy, and recycling was among them. It was found that metal and plastic recycling could save as much as 95% of the energy used in comparison to virgin production.
- Greater emphasis on green movements through government-backed initiatives generates public awareness of conservation efforts.
- In 1960, just over 6 percent of municipal solid waste was recycled.

1970s USA



- 1970: This marked the first time that Earth Day was commemorated, dedicated to raising awareness of the environmental problems caused by the accumulation of waste and emphasizing the importance of recycling. This celebration marks the official birth of modern recycling (as we understand it today) as a movement for protecting the environment and sustainability.
- It is also from this moment when the logo with which recycling is currently identified is introduced and begins to be popular. The image was designed by Guy Anderson and initially created for a contest organized by a Chicago recycling company.
- In 1977, Stanley Race dropped an empty jar into the country's first glass recycling bank. This first deposit kicked off the nationwide appearance of bottle banks, where the public can take empty bottles and jars to be recycled.

1980-90s USA

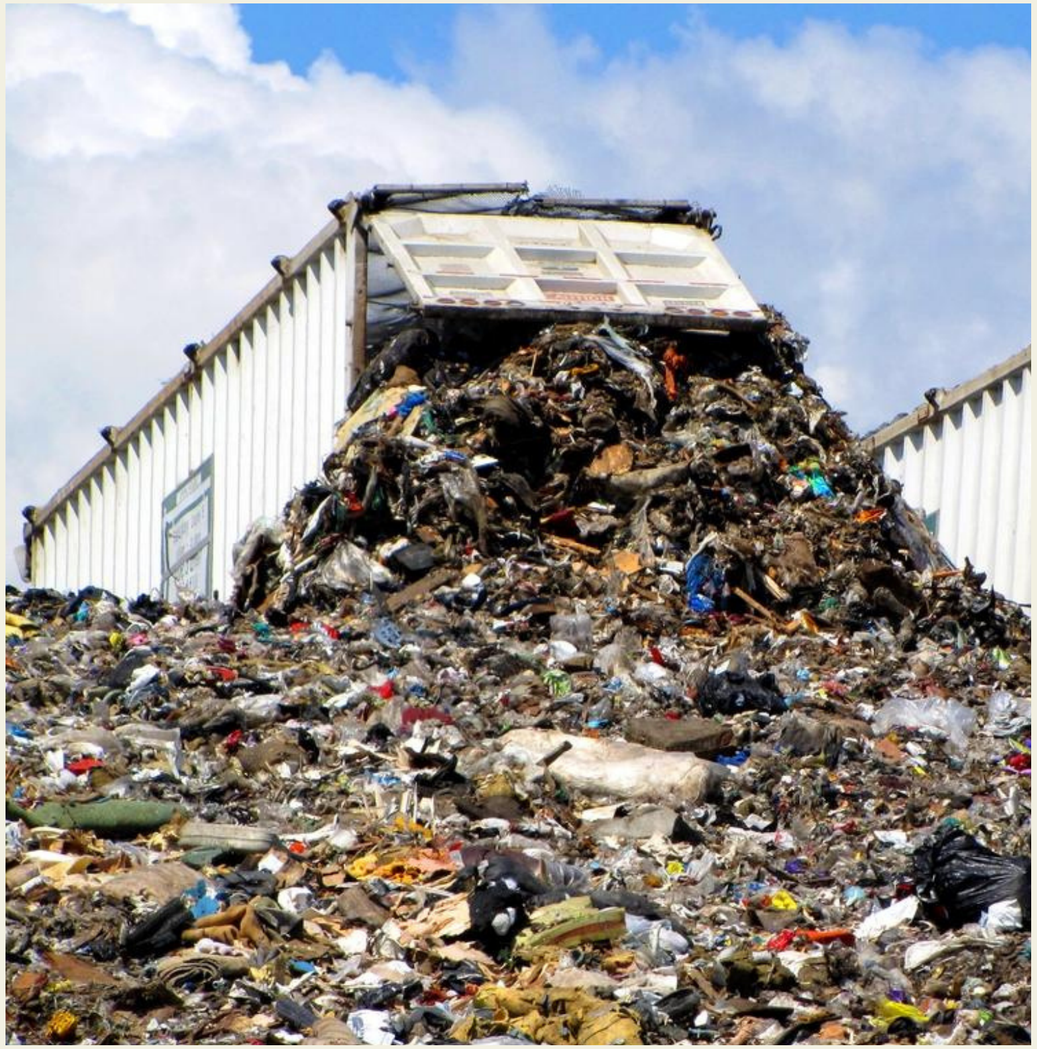
1980s

- 1983: In the city of Kitchener, Ontario, the blue box recycling system was introduced as a way of efficiently sorting and collecting household waste. The blue box system made it simple for the public to recycle plastic, paper, glass, aluminum, steel, and other materials.
- By 1985 America was at 10% nationwide recycling participation.

1990s

- It wasn't until 1991 that there was a focus on recycling electronics. In Switzerland, IT and electronics importers gathered to tackle the issue of electronic waste disposal. Discussions led to the Swico recycling system's development, where electronic waste items would be collected and recycled free of charge to consumers.
- By 1995 America was at 20% nationwide recycling participation, double what it had been ten years ago in 1985, and only three years later, in 1998, it topped 30%.

2000s-2010s



- 2000: EPA Confirms that Recycling Lowers Greenhouse Gas Emissions
- 2006: Dell Computers Starts the First E-waste Recycling Program
- 2018: The China Import Ban
  - Over the next decade, laws were passed, and innovations came to light that improved the industry. Then, China moved to ban 24 categories of recycling imports, which crippled the US – and the global recycling system.
  - With a new 0.5% contamination standard, China declared that America's recycled materials were too contaminated to use longer. As a result, the system began to experience seismic shifts, breakdowns, and closures.
- 2019: The US Recycling System Hits Crisis Point
  - Sixteen more materials from the China ban came into effect in 2019. As a result, mass recycling program closures and plant shutdowns were reported.
  - As programs became more expensive, municipalities were forced to limit or close them altogether severely. As a result, leading industry experts officially announced a recycling crisis.

2020s and Onward

- 2020: COVID-19 Shuts Down Recycling Plants
  - Even though recycling was deemed an essential service, the sweeping effects of the COVID-19 pandemic in 2020 have caused havoc to an already ailing industry. As a result, there have been many more closures, and municipalities have had to dedicate more time, funding, and effort to the increasing issue that is keeping their city recycling programs alive.
- 2021: Ending Wish-cycling and Launching New Models
  - More than 50 million tons of paper were recovered for recycling in 2021, achieving a 68% recycling rate.
  - In 2021, 91.4% of corrugated cardboard was recycled.
  - Almost half of the paper recycled in 2021 was used to make cardboard boxes.
  - Consumption of aluminum in the U.S. was 4.3 million metric tons in 2021, up from 3.98 million metric tons in 2020.

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Recycling Facts

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Things that can be Recycled

BOARD & PAPER

CARDBOARD

PLASTICS

GLASS

ELECTRONICS

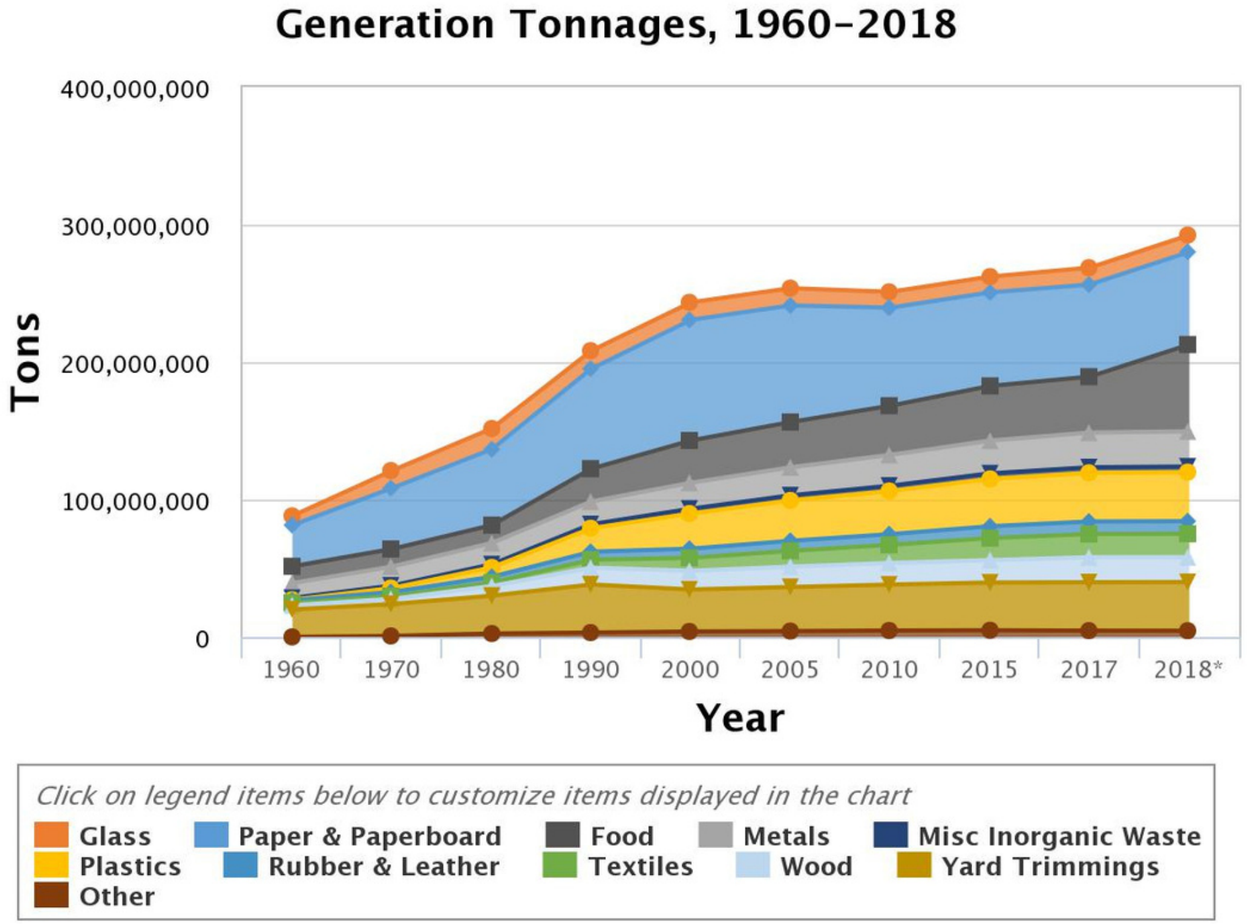
TIN/STEEL/ALUMINUM

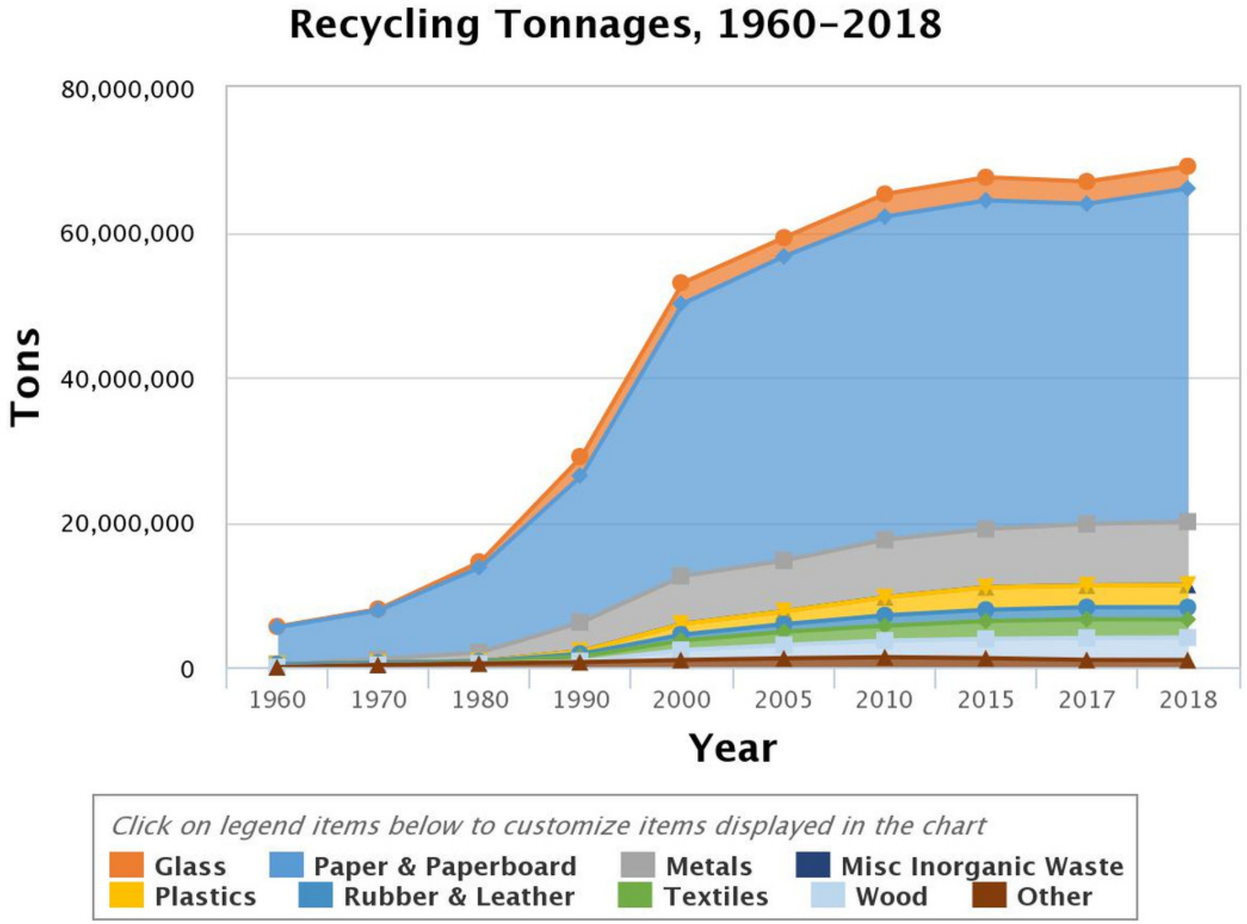
RUBBER

FABRICS

The Recycling Cycle

Statistics of Waste & Recycling in Tonnages





Environmental Benefits

Conserve Natural Resources:

- Recycling reduces the need to extract resources such as timber, water, and minerals for new products.
- 94% of the natural resources used by Americans are non-renewable.
- Using scrap steel instead of virgin ore to make new steel takes 40% less water and creates 97% less mining waste.

Climate Change:

- The improper waste disposal emits gases like carbon dioxide, nitrogen, and sulfur, which contribute to global warming.
- According to the most recent EPA data, the recycling and composting of municipal solid waste (MSW or trash) saved over 193 million metric tons of carbon dioxide equivalent in 2018.

Energy Savings:

- Recycling ten plastic bottles saves enough energy to power a laptop for more than 25 hours.
- It takes 95% less energy to recycle aluminum than it does to make it from raw materials.
- Recycled steel saves 60% of production energy, recycled newspaper 40%, recycled plastics 70%, and glass 40%.

Waste and Pollution Reduction:

- Recycling diverts waste away from landfills and incinerators, reducing the harmful effects of pollution and emissions.

Economic Benefits

Recycling Economic Information (REI) Study in 2020 found that in a single year, recycling and reuse activities in the United States accounted for:

- **681,000 jobs**
- **$37.8 billion in wages**
- **$5.5 billion in tax revenues**

Other Benefits Include

- **Reducing** the need to create **new landfill space**
- Increasing the **investment in** eco-friendly **infrastructure**
- **Improving resource allocation** to recycling programs and facilities
- **Reducing waste** by converting garbage and recycling vehicles to electric
- **Growing the circular economy** involved in all reduce, reuse, and repurpose activities
- **Saving money** by lowering how often people need to buy brand-new items

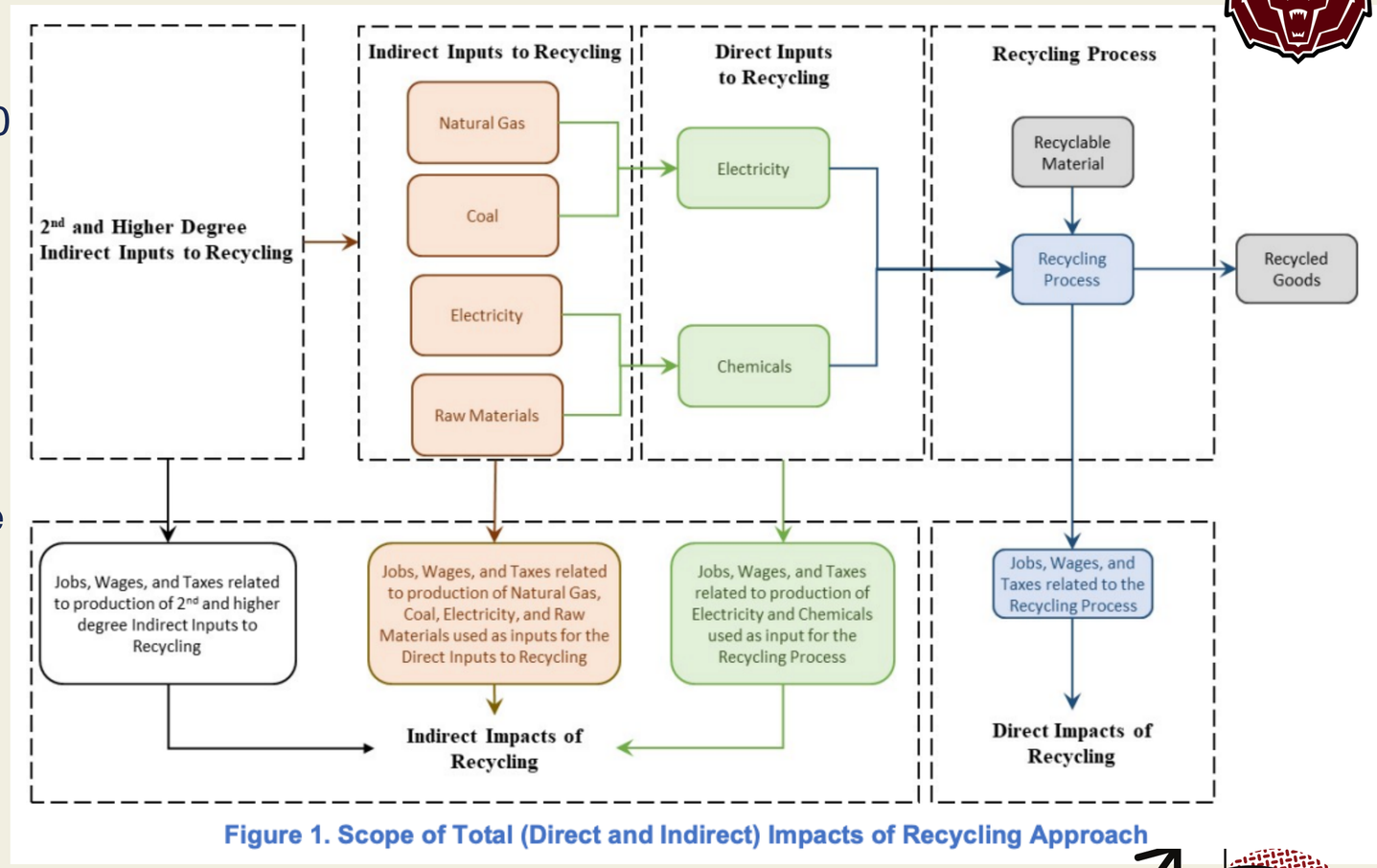
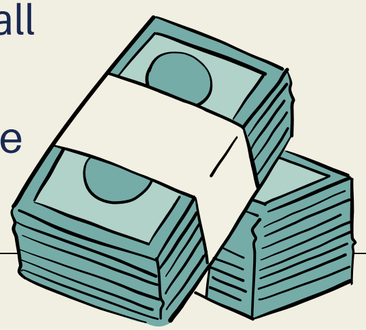


Figure 1. Scope of Total (Direct and Indirect) Impacts of Recycling Approach



Community Benefits

Environmental Justice: Across the country, waste management facilities are concentrated in underserved communities, and they can have negative impacts on human health, property values, aesthetic and recreation values, and land productivity. Recycling provides these areas with a healthier and more sustainable alternative.

By investing time, energy, and resources into recycling, governments and communities around the world can deliver ample benefits we can all appreciate:

- Improved **public health**
- Increases in our shared **purpose** of caring for the planet
- Improved **communal** spirit
- Growth in **public trust**
- Increasing the number of people and businesses **committed to eco-friendly** practices
- Enhancing a people's sense of purpose by contributing to improving community and world

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Recycling at MSU

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Missouri State University: What can be recycled?

In the paper bins:

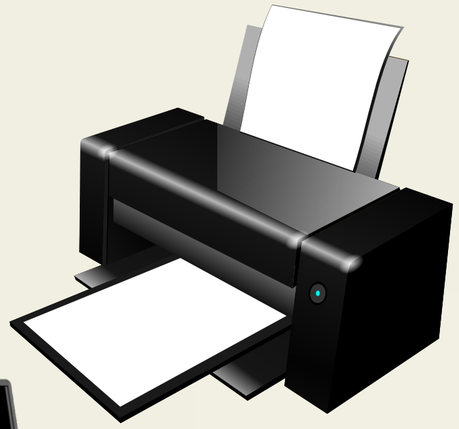
- Opened mail & greeting cards
- White or pastel office paper
- File folders and shredded paper
- Magazines, brochures & catalogs
- Newspapers & inserts (NO BAGS)
- Phone books, paper/hard-back books

In the Commingled Bins:

- #1-7 plastics
- Aluminum cans (don’t crush/flatten)
- Clean, balled aluminum foil/pie pans
- Loose metal jar lids/steel bottle caps
- Paper milk/juice cartons (no foil pouches, do not flatten)
- Empty aerosol cans (no caps)
- Paperboard (cereal boxes)

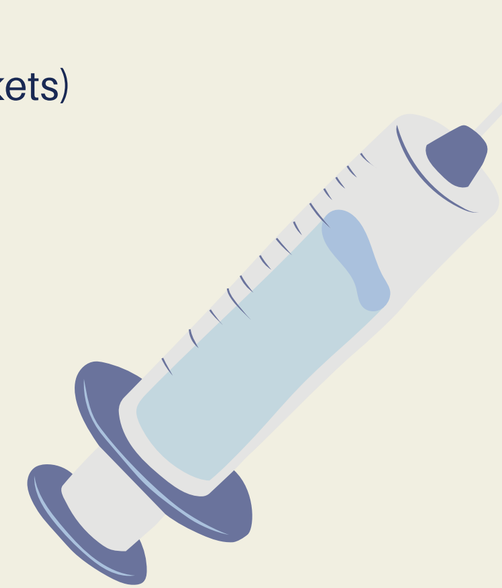
Missouri State University: What else can be recycled?

- Cardboard
- E-waste
- Batteries
- Printer/toner cartridges
- Scrap metal
- Furniture/equipment



Missouri State University: What cannot be recycled?

- Plastic lids and caps
- Plastic bags (recyclable at select supermarkets)
- Scrap metal (dangerous!)
- Plastic 6-pack holders
- Foam packing materials
- Needles or syringes
- Plastic microwave trays
- Frozen food, ice cream containers
- Hazardous/bio-hazardous waste
- Plastics other than those listed
- Tissues, paper towels, napkins
- Waxed paper or waxed cardboard
- Styrofoam®
- Containers that have not been rinsed or cleaned of food



Where can I recycle?

- all of the academic building
- 20 outdoor recycling containers for use between buildings and at the shuttle stops

However, recycling bins across campus come in different shapes, sizes and colors!

To simplify things, just remember: Paper goes in the paper bin, all other recyclables in the commingled bin, and all waste in the trash bin.

Composting: PSU

What can be composted?

- Food waste
- Paper Towels
- Some packaging

Composting: Dining Halls

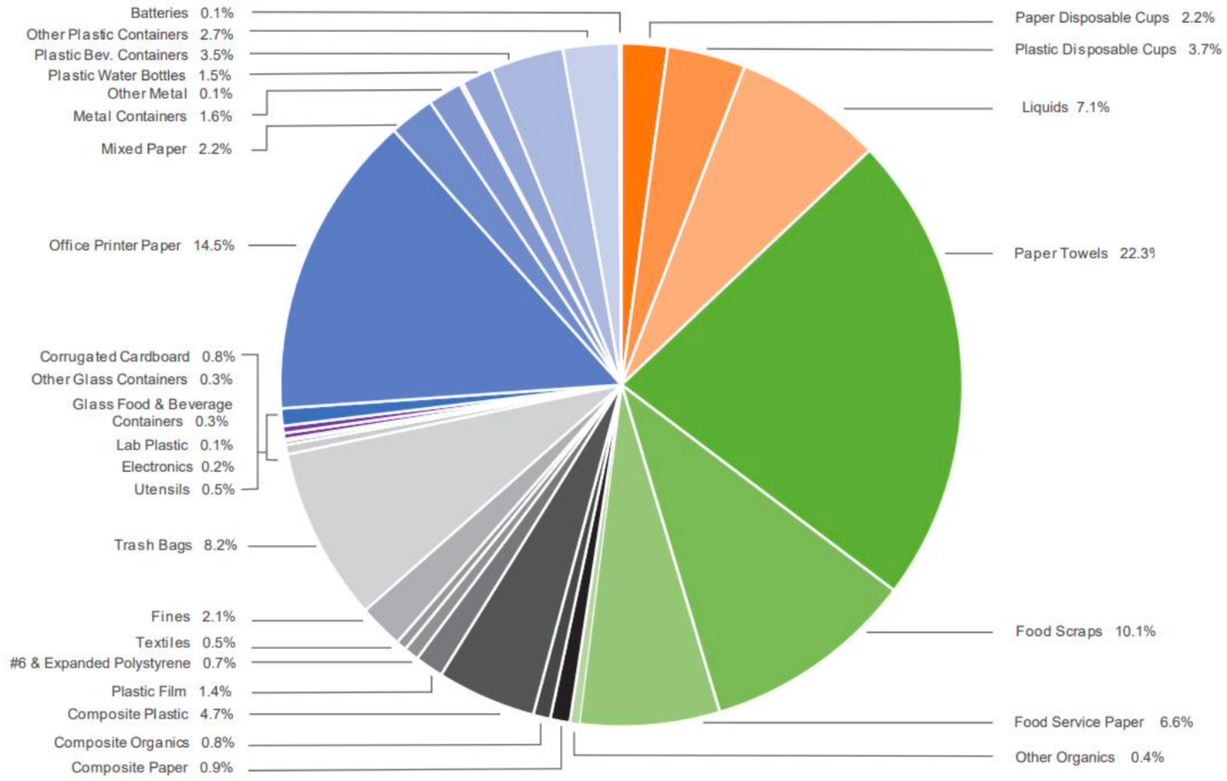
The food waste in both the dining centers and in the Plaster Student Union is **composted**. Composting food **reduces methane**, which is 21 times more potent than CO2. It also means that we operate the garbage disposals only about 5% of what we did in the past. This alone allows us to **save over 3,000,000 gallons of water per year** in the two dining centers.

Composting: Where does it go

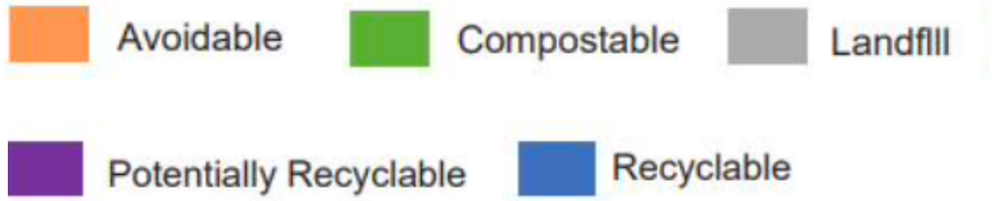
- Green waste makes up over a quarter of America's current landfills (23% as of 2013). Additionally, Missouri's "no yard waste allowed" law means dumping takes more fuel, time, and money to haul green waste to distant landfills.
- Green resource recycling increases the space and life of landfills while re-introducing essential nutrients back to the environment through organic mulch and compost.
- That's why in addition to recycling 100% of the green waste Hansen's generates with their tree services, Hansen's also recycles green waste from builders, developers, businesses, and the greater community.

Academic Buildings

According to the 2021 MSU waste characterization study, over **80% (134.7 tons)** of materials in the landfill waste stream for academic buildings can potentially be diverted into other channels. The top five materials contributing to the overall amount of landfill waste generated in academic buildings include: paper towels (**22.3% or 37.4 tons**), office printer paper (**14.5% or 24.3 tons**), food scraps (**10.1% or 16.9 tons**), trash bags (**8.2% or 13.8 tons**), and liquids (**7.1% or 11.9 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.

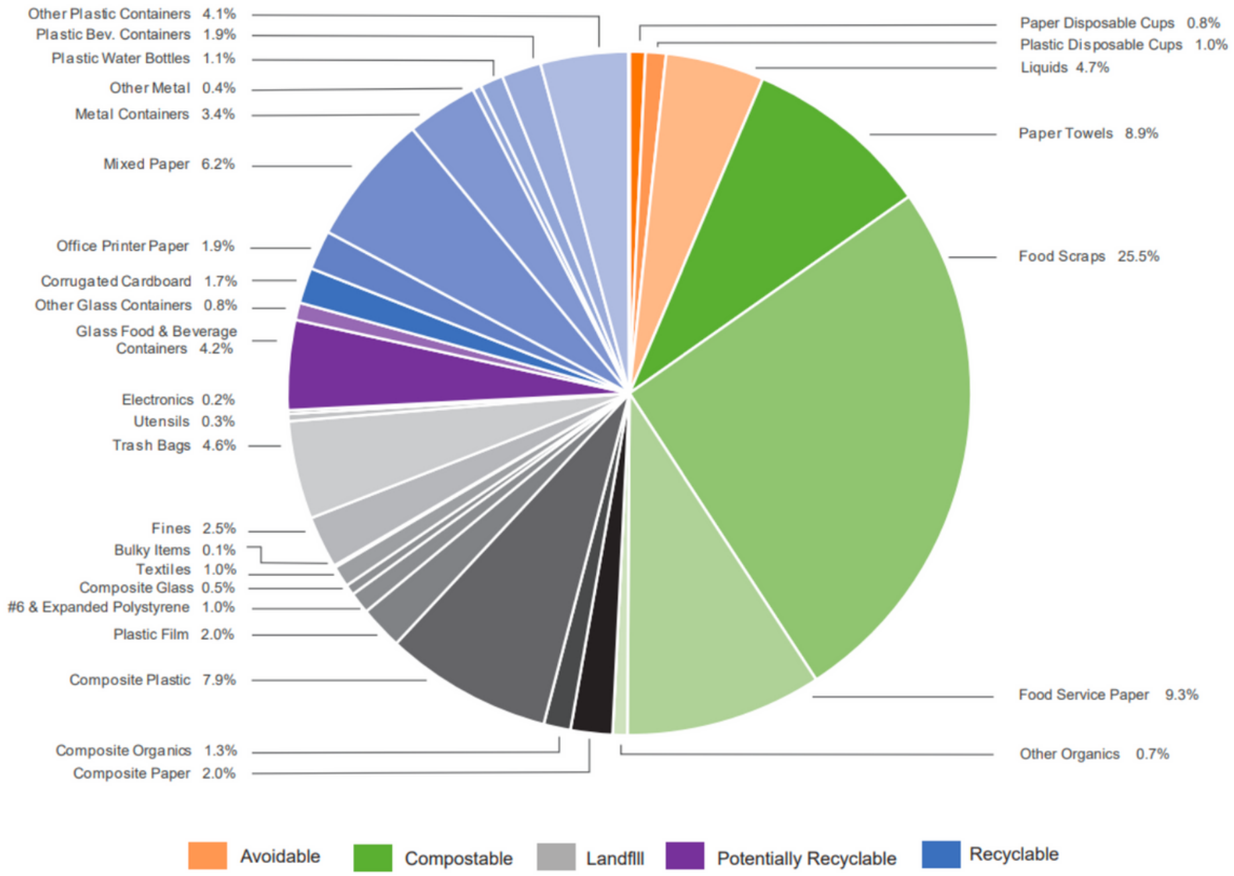


Composition of Landfill Waste from Academic Buildings



Resident Halls

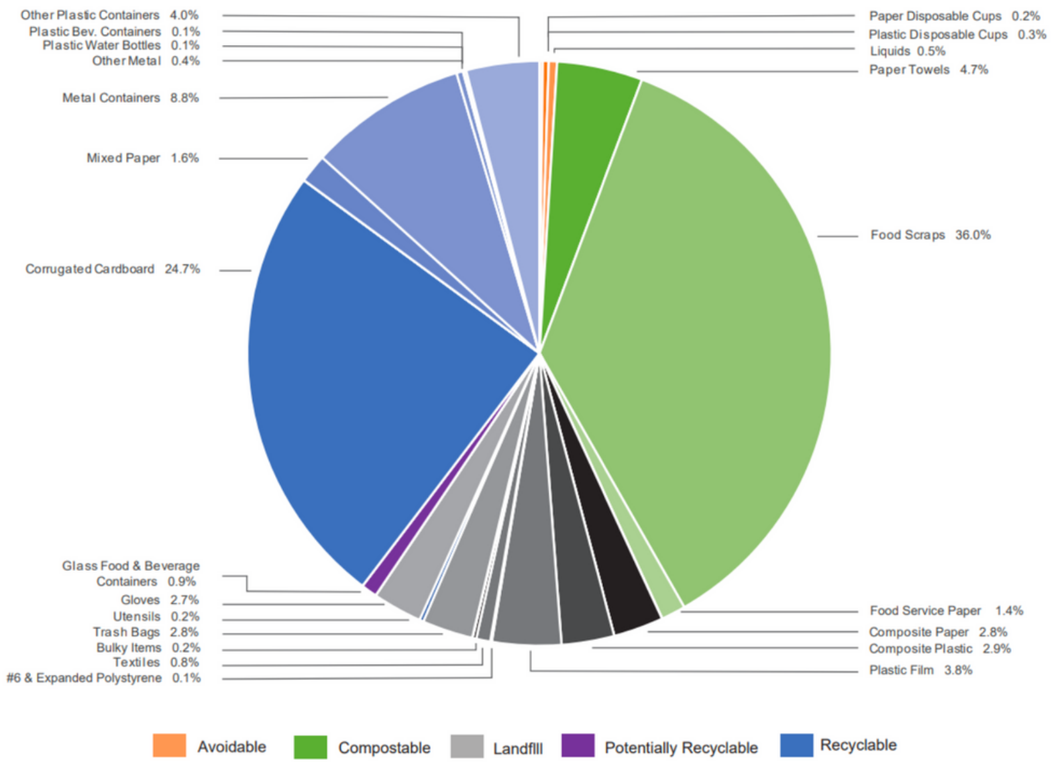
Almost **77% (512.3 tons)** of materials in the landfill waste stream for residence halls can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in residence halls include: food scraps (**25.5% or 170.6 tons**), food service paper (**9.3% or 62.1 tons**), paper towels (**8.9% or 59.1 tons**), composite plastic (**7.9% or 52.8 tons**), and mixed paper (**6.2% or 41.7 tons**). Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream with the exception of composite plastic.



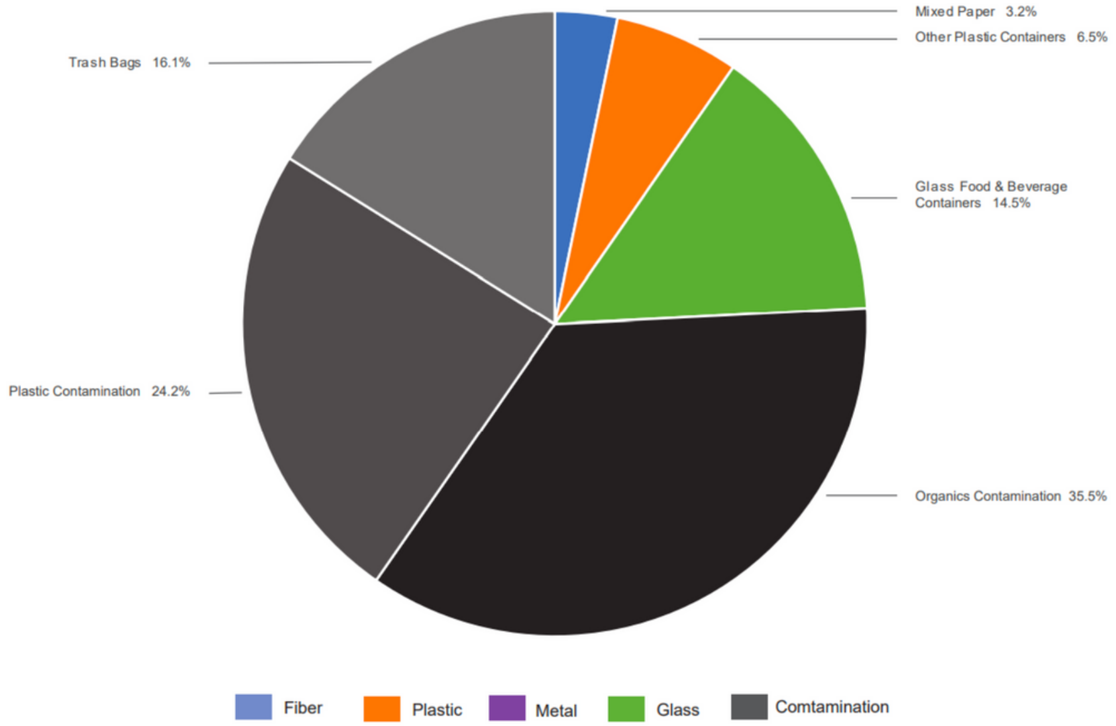
Dining Halls

Nearly **84% (38.7 tons)** of materials in the landfill waste stream for dining spaces can potentially be diverted into other channels. The top 5 materials contributing to the overall amount of landfill waste generated in dining spaces include: food scraps (**36% or 16.7 tons**), corrugated cardboard (**24.7% or 11.4 tons**), metal containers (**8.8% or 4.1 tons)**, paper towels (**4.7% or 2.2 tons**), and other plastic containers (**4% or 1.9 tons** Each of these materials has the potential to be reduced, eliminated or diverted from the waste stream.

Composition of Landfill Waste from Dining Spaces

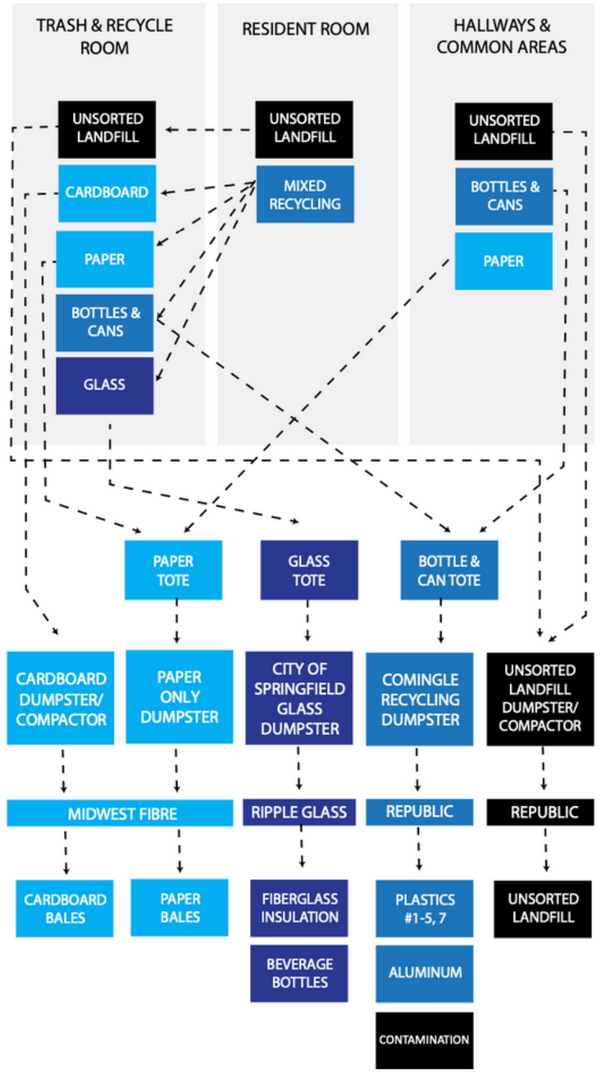


Composition of Recycled Waste from Dining Spaces

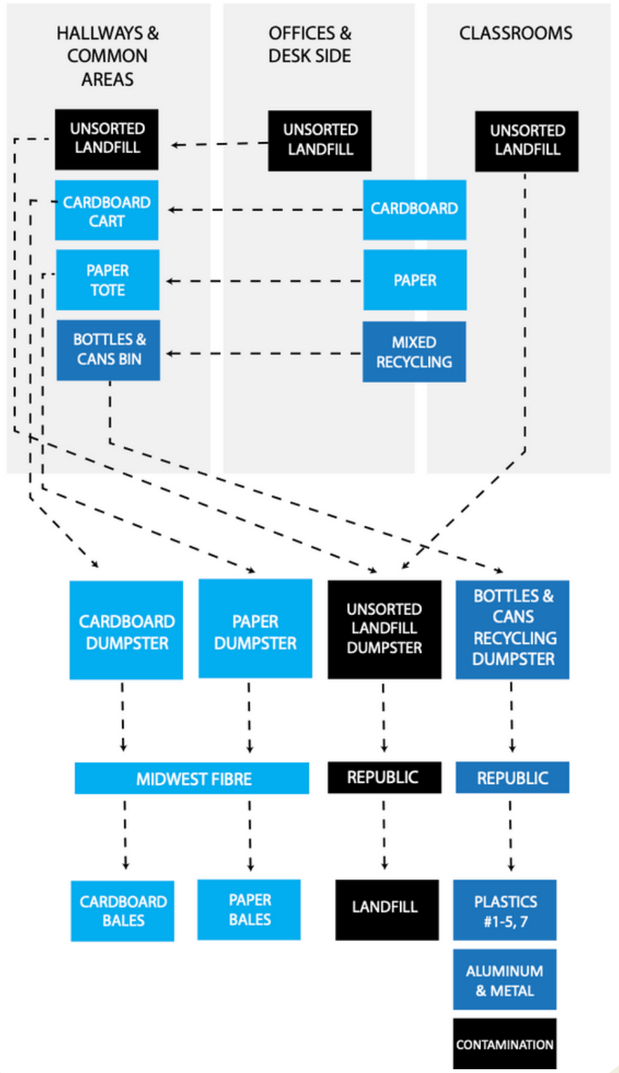


Waste Flow at Missouri State

Waste Flow for Residence Halls



Waste Flow for Academic & Administrative Buildings



HELP MSU RECYCLE

These containers are found in the residence hall's dorms. On average, they hold 3.5 pounds of recyclable material!

If you **fill this container** and recycle it **at least three times** during your stay at MSU, you can help MSU divert over 100 tons per year from the landfill!

If you recycle or reuse 0.25 pounds a week MSU can divert over 100 tons!

GET INVOLVED AT

@MSUSUSTAIN

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Ways to Reduce Waste in Your Life

- **Bring Your Own Bag**
  - Say no to single-use paper and plastic bags and bring your own high-quality reusable bag. Each reusable bag can eliminate hundreds (if not thousands) of single-use plastic or paper bags!
- **Carry a Reusable Water Bottle**
  - Carrying your own bottle cuts waste and can save you money.
- **Pack a Waste-Free Lunch**
  - Do away with throw-away lunch packaging. Each child bringing a brown bag lunch to school daily generates 67 pounds of waste each year.
- **Bring Your Own Cup**
  - The average American once used 500 paper cups a year. Replacing single-use paper, plastic, or Styrofoam cups with a reusable cup or mug can have a huge impact. Try keeping a cup in your bag, office, or car so you always have one around. Most coffee shops offer a discount for bringing your own cup!
- **Slow Down and Dine In**
  - A big reason we have a food packaging problem, to begin with is that people want to eat on the go – whether it's a drive-through or grab-n-go. Take a breath, slow down and dine in. Get your coffee “for here,” or enjoy a home-cooked meal with friends and family and say goodbye to single-use packaging.
- **Consider Reusable Straws**
  - Plastic straws are consistently one of the most littered plastic items, which means they end up in our waterways and are harmful to fish and wildlife. If you need a straw, consider using a reusable straw.
- **Avoid Heavily Packaged Foods**
  - Heavily packaged foods are bad for the environment, and they’re usually unhealthy for you too. Buy foods that aren’t heavily packaged, like fresh produce and bulk items.
- **Bring Your Own Container and Utensils**
  - Need to grab lunch on the go? Bring your own container and utensils to cut down on “the other leftovers” from your take-out meal. You can also bring your own container for leftovers when you eat at a restaurant - no more single-use "doggie bags"!
- **Use No Bag or a Fabric Bag to Carry Produce and Other Grocery Items**
  - You’ve worked so hard to bring reusable bags to the store; why fill them up with plastic produce bags? Bring your own fabric bags for produce and bulk items. Many companies make reusable produce bags from hemp, organic cotton, and even recycled plastic

City of Springfield: Where can I recycle?

HERE'S WHERE YOU CAN RECYCLE!

3790 S. FARM RD 119

Accepted
Aluminum, Cardboard, Glass, Paper, Plastic, and Tin.

731 N. FRANKLIN AVE.

Accepted
Aluminum, Cardboard, Glass, Paper, Plastic, and Tin

3020 S. LONE PINE AVE.

Accepted
Aluminum, Cardboard, Glass, Paper, Plastic, and Tin.

1226 W. NICHOLS ST.

Accepted
Hazardous, toxic, and flammable items such as automotive products, pesticides, household cleaners, aerosol cans, arts and crafts materials, & home improvement products like oil-based paints and stains.

City of Springfield Where do the recyclables go?

City of Springfield: Where do the recyclables go?

MIXED PAPER:
Mixed paper materials go to New American Recycling, here in Springfield.

CARDBOARD:
The cardboard goes to New American Recycling. It is processed here and marketed to companies that manufacture it into new cardboard products, boxboard containers, or similar packing materials.

PLASTICS:
Plastic items also go to New American Recycling where they are processed and marketed to companies that manufacture products like carpet, clothing, composite decking and other building materials and consumer products.

City of Springfield: Where do the recyclables go?

TIN/STEEL:
Tin and steel materials go to Commercial Metals, also located in Springfield. They are processed and marketed to companies that recycle it into new aluminum and steel products.

GLASS:
Glass goes to Kansas City-based Ripple Glass where it is processed and sold to Owens-Corning and is used to make "pink panther" fiberglass construction insulation. Some glass is also recycled into new bottle beverage containers.

Opportunities to get Involved: Sustainability in Springfield

- Community Partnership of the Ozarks: Environmental Sustainability Collaborative
- Springfield Community Gardens
- Wonders of Wildlife
- City of Springfield: Environmental Services
- Watershed Committee of the Ozarks
- James River Basin Partnership
- Clean Green Springfield
- MoDOT
  - Roofs to Roads
- Ozarks Food Harvest

Sustainability Internships

- MSU Pollution Prevention Technical Assistance program to help Missouri companies reduce waste, conserve energy and save money
- Other internship opportunities working directly with regional companies and non-profit

Opportunities to get Involved: Sustainability on Campus

- **MSU Campus Garden**
  - Managed by students and provides all-natural produce to students, faculty, staff, and community members.
- **Sustainability Major**
  - Students complete a core set of courses that create a strong foundation in the principles and philosophy of sustainability. Students may select a traditional geography focus, a focus on Sustainable Development, or a focus on Sustainable Watershed management.
- **Sustainability Minor**
  - An interdisciplinary program that allows students to expand their knowledge on sustainability topics and compete in this growing field.
- **ZipGrow Towers Program** (School of Agriculture and Chartwell)
  - The School of Agriculture and Chartwell's partnered on an internship program that gives students the opportunity to gain real-world knowledge and experience with this innovative sustainable agriculture technology.
- **Bears for Sustainability**
  - This LLC houses 40 students and allows them to engage in sustainability-related activities throughout the year
- **Student Government Association: Sustainability Commission**
  - Implement lasting changes at Missouri State by voting on the proposals submitted to the Student Sustainability Fund
- **Student Sustainability Fund**
  - Provides nearly $150,000 dedicated to sustainability projects on campus
- **Students for a Sustainable Future**
  - Educate students, faculty, staff, and the community about the reality and effects of global climate change.
- **Bear Pantry**
  - The Bear Pantry serves members of the MSU community who face food insecurity.
- **Campus Sustainability Internships**
  - Create and implement new sustainability initiatives for campus or work to improve existing programs.

Educational Resources

Videos

- https://www.ted.com/talks/tierney_thys_and_christian_sardet_meet_the_microbes_that_could_eat_your_trash
- https://www.ted.com/talks/emma_bryce_what_really_happens_to_the_plastic_you_throw_away
- https://www.ted.com/talks/patricia_villarrubia_gomez_the_problem_with_plastics_and_how_they_re_changing_the_environment
- https://www.ted.com/talks/alejandro_duran_how_i_use_art_to_tackle_plastic_pollution_in_our_oceans
- https://www.ted.com/talks/gay_gordon_byrne_you_deserve_the_right_to_repair_your_stuff
- https://www.ted.com/talks/sarah_dudas_microplastics_are_everywhere_but_we_can_do_something_about_them
- https://youtu.be/b7GMpjx2jDQ

Books

- *Cradle to Cradle: Remaking the Way We Make Things*
  - William McDonough & Michael Braungart
- *The Story of Stuff*
  - Annie Leonard
- *High Tech Trash*
  - Elizabeth Grossman
- *Zero Waste: Simple Life Hacks to Drastically Reduce Your Trash*
  - Shia Su
- *No. More. Plastic.: What You Can DO to Make a Difference*
  - Martin Dorey
- *Trash Talk: An Encyclopedia of Garbage and Recycling around the World*
  - Robert W. Collin
- *Nature Recycles: How About You?*
  - Michelle Lord

Articles

- https://www.recyclingtoday.com/news/sustana-fiber-looks-beyond-recycling-sustainability-circular-economy/
- https://www.springfieldmo.gov/5641/Environmental-Services
- https://www.springfieldmo.gov/5532/Waste-Wizard
- https://www.cnbc.com/2021/11/21/how-college-students-can-help-save-the-environment-and-not-go-broke.html
- https://doi.org/10.3390/recycling6040069
- https://www.epa.gov/trash-free-waters/what-you-can-do-about-trash-pollution
- https://www.epa.gov/trash-free-waters/ten-ways-unpackage-your-life

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