

• Resources for High School •

Earth Day 2024's theme is **Planet vs. Plastics**. The activities below explore the magnitude, inequality, and impacts of plastic pollution at home and across the planet. They'll also inspire and guide students to take informed action and be part of a solution to the plastic problem.

Lesson Plans:

Great Bag Debate – *Students conduct research either in favor of or against plastic bag bans and taxes, then debate their assigned stance.*

Trash Trouble in Paradise – *Role playing a city council meeting, students weigh various real-world economic, social, and environmental factors when siting a landfill on the Hawaiian island of O'ahu.*

Secret Life of Tees – *Students use guided research to perform a five-stage life cycle analysis on a t-shirt and brainstorm ways to reduce the garment's social and environmental impact.*

Needs vs Wants in a Finite World – *Students discuss the varying levels of human needs, then evaluate their own needs and wants and the resources required to meet them.*

Readings:

What a Waste – *How do we deal with the growing problem of waste? This reading provides an overview of waste disposal options and the need for waste reduction.*

Cheap Threads, Costly Impacts: The Price of Fast Fashion – *While fast fashion has made stylish clothing more affordable, it has created an endless cycle of wear–throw away–buy again, that has harmful impacts on both people and the planet.*

*For more great resources, visit us at www.PopulationEducation.org!

THE GREAT BAG DEBATE

introduction

Americans throw away an estimated 100 billion plastic bags annually. Because a single bag can take over 1,000 years to break down, that means a lot of used space in **landfills** or the ocean.¹ Plastics can also act as a sponge for toxic chemicals in marine ecosystems, harming and sometimes killing animals that eat them. Even **biodegradable** plastic bags, which are made of different polymers, present challenges. As they break down they can use up oxygen in marine ecosystems which leads to algal blooms. In addition, people may see their compostable status as permission to litter, even though most take at least 18 months to break down.

In 2014, California was the first state to pass legislation banning the use of non-compostable plastic bags. At the same time, they implemented a 10-cent tax on compostable plastic bags at checkouts. Since then, other state legislatures have passed laws concerning plastic bags. In some cases, states have tried to implement bans or taxes like those in California; in others, states have actually moved to prohibit cities from creating these bans.² The United States isn't the only country to approach this issue with legislation. Over 40 countries have implemented taxes or bans on plastic bags. In 2017, Kenya passed the harshest of these laws, with makers, sellers, and importers of plastic bags facing up to four years in prison if caught.³

Critics of plastic bag bans and taxes cite concerns about consumer choice, grocery stores receiving the fees as profit, increased cost of alternative bags, and the unfairly distributed burden of bag taxes on poor consumers. Others express concern that these laws do not do enough to decrease the use of plastic bags, and believe that bag fees should be abolished and bans should be made more stringent. In the case of Kenya, some have noted that plastic bags are used as a makeshift toilet in areas without access to running water, especially in informal urban settlements. Their ban may lead to decreased health conditions and an increase in open defecation.

While evidence shows that the use of all kinds of plastic bags has detrimental effects on our environment, it is difficult to determine the best way to decrease their use. As our population grows, along with our demand for resources, it is important that we think critically about plastic bag policies and their impacts.

Vocabulary: biodegradable, landfill



Studies For Our Global Future

concept

When policymakers attempt to solve complex environmental issues with a particular law or approach, they must weigh the benefits and challenges of each possible course of action. Critical thinking skills are essential in determining which practices are the most environmentally sound, cost effective, and socially responsible.

objectives

Students will be able to:

- Present and defend an argument during a debate about plastic bag use.
- Discern the relative costs and benefits of a plastic bag policy that affects the environment and people's lifestyles, and determine the best solution.

subjects

Environmental Science (General and AP), Government, English Language Arts

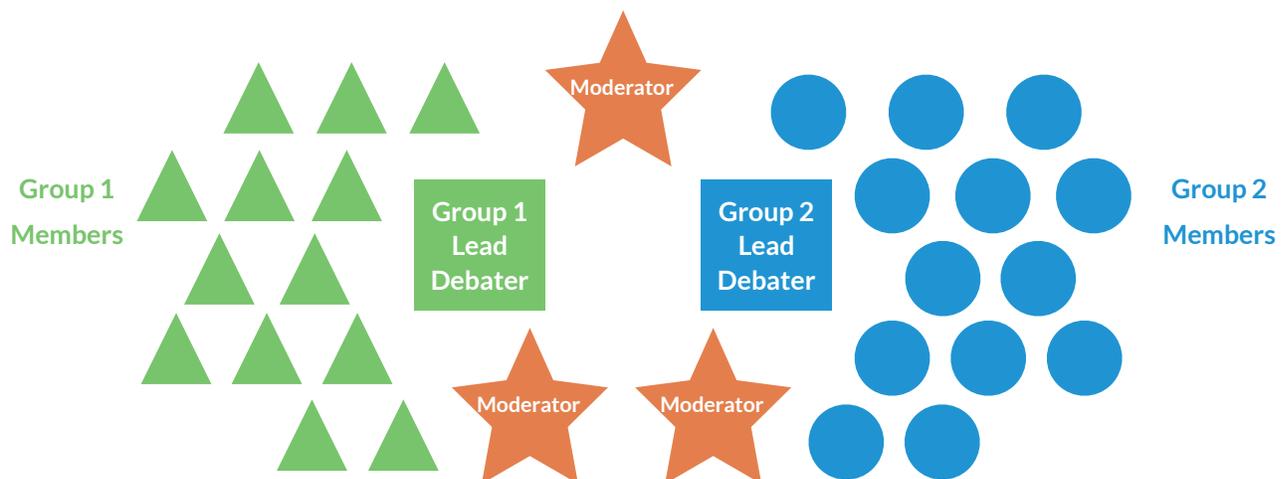
skills

Researching, debating, public speaking, defending a position using evidence

method

Students conduct research either in favor of or against plastic bag bans and taxes, then debate their assigned stance.

- From the information on the map, ask students to identify the different laws and programs states have enacted to reduce the use of plastic bags. As students identify them, explain any details about what is meant by the following:
 - Ban** – Stores are not allowed to provide plastic bags at checkout. This usually applies only to certain kinds of plastic bags, such as non-biodegradable or non-recyclable.
 - Fees/taxes** – The government collects a tax or stores are required to charge a fee for the use of plastic bags at checkout. While this fee is usually small (5-10 cents) it discourages customers from using plastic bags.
 - Labeling, recycling, or reuse programs** – These laws vary widely but usually include a requirement that plastic bags have a recycling message printed on them or that stores provide places for customers to drop off plastic bags for reuse/recycling.
 - Preemption** – The state legislature passed a law preventing local governments (such as cities or municipalities) within the state from making plastic bag laws such as those described above. It’s essentially a “ban on bans.”
- Assign 2-3 students to be Debate Moderators. Divide the rest of the class in two equal groups. Group #1 will present arguments in favor of bag bans and bag taxes/fees. Group #2 will argue against bans and taxes, and in favor of other solutions such as mandatory labeling, recycling, and reuse, or in favor of other policies they determine. Group #2 should plan to propose alternate solutions as part of their argument (rather than denying the problems posed by plastic bags, which are scientifically evident). The Moderators will be responsible for asking questions and deciding which group’s policy makes the most sense.
- The class will be conducting a fishbowl debate but first, Groups #1 and #2 will need facts and evidence to present convincing arguments for their sides of this issue. For their research, they should contact individuals and organizations representing each side of the issue. Students might seek out local waste management experts, grocers, consumers, and environmentalists in their area. Moderators will research both sides so they can make sure all evidence used is accurate, and they will write probing questions that push both sides to defend their arguments further during the course of debate. A list of Suggested Resources is provided at the end of the lesson plan.
- Set up the room for a fishbowl debate with two single chairs in the center of the room, facing each other. Group #1 and Group #2 should each send one student that will conduct the opening statement to sit in the chairs facing each other. The remaining members of Groups #1 and #2 can either stand or sit in a semi-circle behind the lead debater for their team. This will create a fishbowl effect around the two chairs in the center. The Moderators should stand in the circle so they can easily announce new questions or call time as needed.



7. Conduct the debate.

- a. Groups #1 and #2 will flip a coin to see which will be the first to present its argument. A representative from each group will then have a set time (one to two minutes) to make an opening statement. The maximum time that each person from each group can spend in the fishbowl is three minutes. The teacher should act as timekeeper (choose a sign that indicates when time is up) to make sure that no one goes over the allotted time.
 - b. Explain that for each round of the debate, every person in Group #1 and Group #2 has to speak at least once (for no less than one minute) before someone who already spoke can speak again. Once someone has spoken for the minimum of one minute or the maximum of three minutes, they have to be tapped out (a group member will tap that person on the shoulder to indicate that he or she would like to enter the fishbowl to debate). Any speaker in either of the debating groups can tap out another, as long as that person is not going twice before every group member has had a chance to speak.
 - c. Moderators may ask questions in response to facts presented in the opening arguments or during the course of the debate. Since the debate should be ongoing, if a Moderator has a question to pose to either group, they can share it. Once the question is answered, if the other group wishes to give a rebuttal, one of their representatives may do so. The person in the fishbowl can make the rebuttal, or that person can be tapped out by a group member who would like to make the rebuttal. A one-minute limit is recommended for answers and rebuttals. In order to involve as many students as possible, students in each group should take turns asking, answering, and rebutting questions.
 - d. You may want to limit the questions to ten or fewer. Moderators should take notes on the answers they receive and on the persuasiveness of the arguments. It might be helpful for them to divide lined paper into two columns to list points and counterpoints.
8. After the debate, Moderators should convene to decide which policy decision is the most sound. Their decision should be based more on the facts and strength of the arguments than on the oratorical skills of their classmates. Once a decision has been reached, Moderators should report this to the class, including a summary of the reasoning on which they based their decision.

Suggested Resources:

The following sites can provide students with evidence to support their proposed policy. Remind students to note the author of each piece and identify any potential bias they may have.

“Loophole in NY Plastic Bag Ban Could Let Stores Hand Out Thicker Plastic Bags”

<https://gothamist.com/news/loophole-ny-plastic-bag-ban-could-let-stores-hand-out-thicker-plastic-bags>

“Heavy-handed legislation not a way to reduce plastic-bag litter” *Letter to the editor

<https://www.islandpacket.com/opinion/letters-to-the-editor/article151899567.html>

“South Carolina Bill to Prohibit Citywide Plastic Bag Bans Advances”

<https://www.charlestoncitypaper.com/TheBattery/archives/2017/02/02/south-carolina-bill-to-prohibit-citywide-plastic-bag-bans-advances>

“Plastics in the time of pandemic”

<https://www.politico.com/newsletters/the-long-game/2020/05/26/plastics-in-the-time-of-pandemic-489320>

“State lawmakers block plastic bag bans, like Philadelphia’s, in move one representative calls ‘huge abuse of power”

<https://stateimpact.npr.org/pennsylvania/2020/06/01/state-lawmakers-block-plastic-bag-bans-like-philadelphias-in-move-one-representative-calls-huge-abuse-of-power/>

“Finally, A Real Plastic Bag Ban for Honolulu”

<https://www.civilbeat.org/2019/12/finally-a-real-plastic-bag-ban-for-honolulu>

“In Kenya, Selling or Importing Plastic Bags Will Cost You \$19,000 – or Jail”

<https://www.nytimes.com/2017/08/28/world/africa/kenya-plastic-bags-ban.html>

American Recyclable Plastic Bag Alliance

<https://bagalliance.org/>

“War on waste: NT environmental groups claim plastic bag ban has failed” (Australia)

<https://www.abc.net.au/news/2017-05-24/war-on-waste-nt-plastic-bag-ban-fails-say-environment-groups/8553614>

“Plastic bag bans are spreading. But are they truly effective?”

<https://www.nationalgeographic.com/environment/2019/04/plastic-bag-bans-kenya-to-us-reduce-pollution/>

“127 Countries Now Regulate Plastic Bags. Why Aren’t We Seeing Less Pollution?”

<https://www.wri.org/blog/2019/03/127-countries-now-regulate-plastic-bags-why-arent-we-seeing-less-pollution>

“Plastic bag bans can help reduce toxic fumes”

<https://www.unenvironment.org/news-and-stories/story/plastic-bag-bans-can-help-reduce-toxic-fumes>

discussion questions

1. Which pieces of supporting evidence from the research do you believe had the strongest impact on the decision made? Why?

Answers will vary.

2. Was the decision reached by the Moderators fair in your opinion?

Answers will vary.

3. Do you believe that the policy on plastic bag use should be the same across the state, country or even worldwide? Or should it be different based on place? Explain.

Answers will vary. Some students might argue that a policy is only “fair” if it is the same everywhere. Others might take outlying factors into consideration and argue that policies work better when created and enforced at the local level.

assessment

Students complete a written reflection after the debate describing why they believe their policy was accepted or rejected by the Moderators, and what they would do differently to make their argument in the future. Alternately, individual student verbal contributions to the debate can be assessed for how complete, compelling, and accurate they are.

follow-up activities

1. Have students research a current bill or law in their own state or city that relates to plastic bags. A full list of all such bills can be found here: <http://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx>. After researching the bill, have students write to their legislators on the state or local level encouraging action on the bill one way or the other, using the research they compiled during the debate. If no plastic bag legislation is currently in progress in their local or state government, students should make a suggestion for such a bill.
2. Invite students to conduct a survey, collecting data from local stores as to how many customers choose plastic bags, how many choose paper, and how many bring their own reusable bags. Then, using population data from their city or state, they compute the number of bags used each day or week. If your state has enacted bag-related legislation, students could interview locals about whether the policy impacts their behavior and decisions about getting a bag when they shop.
3. Students can devise a plan to increase the use of reusable bags, involving both the grocer and the consumer, and present the plan to a local grocery store.

¹Plumer, B. (2019, March 29). Plastic Bags, or Paper? Here's What to Consider When You Hit the Grocery Store. *New York Times*. Retrieved from <https://www.nytimes.com/2019/03/29/climate/plastic-paper-shopping-bags.html>

²National Conference of State Legislatures. (2017, July 5). Fees, Taxes and Bans, Recycling and Reuse [Web log post]. Retrieved from <https://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx#Bans>

³de Freytas-Tamura, K. (2017, August 28). In Kenya, Selling or Importing Plastic Bags Will Cost You \$19,000 – or Jail. *New York Times*. Retrieved from <https://www.nytimes.com/2017/08/28/world/africa/kenya-plastic-bags-ban.html>

TRASH TROUBLE IN PARADISE

introduction

The Hawaiian Islands are the most geographically isolated location on Earth, more than 2,000 miles from the nearest landmass, and so the question of waste disposal there is an urgent one.¹ Historically, land use and equity have been major issues in Hawai'i, where many native people were displaced from their homes when the United States' military and economic forces dominated the use of arable land. This tension is particularly felt on O'ahu, the most populated island and home to almost a million people on just under 600 square miles of land.

Currently, the majority of O'ahu's residential waste is burned in **incinerators**, but this generates large amounts of ash which must be placed in a municipal **landfill**. In 2012, O'ahu's landfill was at capacity and the island's residents had to determine the appropriate site for a new one. In 2019, Hawai'i's land commission ordered the landfill to permanently close by 2028, further hastening the urgency to find a new site. One of the top possible sites for the new landfill was directly adjacent to the old one in Wai'anae. However, this raised concerns about environmental injustice, as Wai'anae is a high-poverty community with the highest concentration of ethnically Native Hawaiian people in the world. As its population continues to grow, Hawai'i must further consider economically, socially, and environmentally sound solutions to the problem of waste disposal.

Vocabulary: environmental justice, incinerators, landfill, zoning laws

materials

Part 1

- None

Part 2

- Article "Politics of Waste Management and Environmental Justice in Hawai'i" (provided)
- Community Data Sheet (provided)
- Community Profiles (provided)
- Planning Guide (provided)



Studies For Our Global Future

concept

As the population increases, so does the amount of solid waste produced, creating a dilemma of how and where to equitably dispose of the garbage.

objectives

Students will be able to:

- Define and identify examples of environmental injustice.
- Read and annotate an article on waste management and respond to comprehension questions.
- Analyze demographic, wealth, and education data of three communities in a case study about siting a landfill.
- Conduct research on a specific Hawaiian community and role-play a city council meeting.
- Use quantitative and qualitative data to draft and argue for a proposal about improving the health of a particular community.

subjects

Environmental Science (General and AP), AP Human Geography, Geography, Government, Economics, English Language Arts

skills

Reading and listening comprehension, role playing, researching, writing, public speaking, analyzing costs and benefits, decision making

method

Role playing a city council meeting, students weigh various real-world economic, social, and environmental factors when siting a landfill on the Hawaiian island of O'ahu.

Part 1: Understanding Environmental Justice

procedure

1. Introduce students to the concept of **environmental justice**. This short video can serve as a discussion starter: https://www.youtube.com/watch?v=dREtXUij6_c

Note: If you would like to go deeper into this issue, show students one of the videos from Follow-Up #1 (at the end of the lesson plan). Each video focuses on a specific case of environmental injustice.

2. Go through the Discussion Questions as a class.

discussion questions

1. Who is affected most by pollution and other environmental problems?

People who live near these sources of pollution are most impacted. This tends to be people living in poverty, especially minorities.

2. Who receives the benefits of the factories, power plants, landfills, or waste sites that cause pollution?

Everyone who generates waste, purchases consumer goods, and uses electricity need these to live their everyday lives. So, all members of society benefit.

3. Why is it that people living in poverty, who are often racial minorities, end up living in close proximity to pollution sources?

*In the United States, some **zoning laws** can separate people by race and economic status. There may also be more indirect factors. For example, people may not have enough money to move to a new neighborhood where it is less polluted. Or, they may not have access to the political and economic power they would need to prevent these pollution sources from being placed in their neighborhoods. In addition, industrial sites are often placed on cheaper land, which is usually located in lower-income areas.*

Part 2: Case Study of O‘ahu’s Landfill Question

procedure

1. Once students have an understanding of environmental justice, explain that they will be focusing on a specific issue: waste management. Through a case study of the Hawaiian island of O‘ahu, students will analyze the process of siting a new landfill, while role playing as residents of three different communities.
2. Distribute the article “Politics of Waste Management and Environmental Justice in Hawai‘i” to each student. Students should complete and annotate the article independently, and then answer the comprehension questions with a partner.

3. Review the comprehension questions as a class.

- a. What is the biggest challenge faced by O'ahu when it comes to waste management?

Answer: There is a lack of space for placing a landfill, as O'ahu is a densely populated island with limited land.

- b. Explain at least three ways O'ahu is successfully cutting back on the amount of trash going into landfills.

Answers should include at least three of the following: green waste composting; a successful beverage bottle redemption law; a municipal energy recovery plant, the Honolulu Program of Waste Energy Recovery (H-POWER); bans on plastic bags; the "Tour de Trash" program that brings residents and educators to recycling facilities; farmers' markets with "zero waste" policies; used restaurant oil reclaimed for biofuel.

- c. Where does much of O'ahu's residents' trash currently go? What are some problems with this?

Answer: The H-Power program burns residential trash and uses it to generate electricity. However, this produces 1 ton of ash for every 10 tons of residents' trash that is burned. This ash must be placed in the landfill, and the landfill is at capacity.

- d. Identify two ways that the Wai'anae coast, a high-poverty area, has been negatively impacted by environmental hazards.

Answers should include at least two of the following: medical waste washed up on the beaches after heavy rains flooded the landfill; Wai'anae is home to 11 of 18 sewage treatment plants and two oil refineries; the privately owned construction landfill causes asbestos dust and other toxic particles to enter people's homes and schools; isolated back roads become illegal dumping sites for trash, including hundreds of televisions from a hotel.

- e. Why do you think that the report on landfill siting suggested putting the new landfill next to the old one? Why did they then suggest other locations besides Kailua for the landfill?

*Answers will vary but can function as a starting point for discussion, connecting the case study to the definition of environmental justice students examined previously. Students may identify that because Wai'anae has a high poverty rate, its residents tend to have less political power to prevent undesirable things like a landfill from being placed in their community. After suggesting Kailua, a relatively wealthy community, the report added other suggestions due to outcry and pushback from the residents of Kailua. *Note: you may want to probe students here to discuss other reasons the landfill may have been sited in Wai'anae, like the routes taken by trash trucks or the groundwater conditions in other places.*

- f. What do you think would be the best location for the new landfill: Kahuku, Kailua, or Wai'anae? Defend your answer with evidence from the reading.

Answers will vary but should be defended with evidence. This question and resulting discussion will transition students to the next part of the lesson. Note: These three locations were based on a 2012 report. A 2017 report cited different locations but these are also subject to change over the next decade, as the island grapples with where to place the new landfill.

4. Explain that students will represent a waste disposal steering committee for O'ahu. They will be responsible for choosing which of the three communities should have the landfill, and they will be required to outline a plan that all members of all communities feel is equitable. The council will ultimately vote for a plan to site the new landfill and to provide additional beneficial projects or services to the community where the landfill is placed to offset some of this burden.

5. Prepare the class for the city council simulation.

- a. Distribute the Community Data Sheet (census data and profiles) to each student. All students should use this information to support their resolutions and as a starting point for their research.
- b. Identify five students who will represent the council members. These students will not be assigned to any community group; they will study the goals and challenges of all three communities to aid them when considering the plans put forward.
- c. Divide the remainder of the class into three equal community groups representing Wai'anae, Kahuku, and Kailua. Students in a given group will role play as people who live in the community they have been assigned. Distribute the appropriate Community Profile to each student.
- d. Distribute copies of the Planning Guide to each student. Provide them time to complete the Guide in their groups. Students will need access to the internet to do more detailed research on their assigned community. On the Guide, students are directed to identify the benefits to their community that could offset the challenges associated with having the landfill sited there. They will create a proposal for what should happen if the landfill is placed there and be ready to present the proposal to the class.
- e. During this planning time, the five council members should research each community to be prepared for their peers' proposals. They may find it helpful to divide a piece of lined paper into three columns and make notes about each community as they review the data and profiles.

6. Set up the class to represent a council meeting and ask each group to present their plan. Council members should record the main ideas of each presentation on the board for all to see. Other community groups will have the opportunity to ask questions or identify possible additions to the plan. Ultimately, the five council members will vote on the plan that is most sound.

discussion questions

1. Is the council's decision an example of environmental justice – is it fair to all parties?

Answers will vary. Students should note that while one community had to accept the landfill site, they hopefully received some other concessions such as funding for schools or guarantees of certain precautions to protect the health of the nearby residents. Some students may feel that it is unfair if the landfill was ultimately placed in Wai'anae, since they have the previous landfill.

2. What was realistic and what was unrealistic about this simulation? How do you think that people from each community might differ in their ability to attend council meetings and advocate for their rights?

In real life, community members may attend a council meeting to protest the placement of a landfill in their home area, and if it is placed there, they may demand that the government provide them with certain assurances or support in other areas of need. However, in reality, people from wealthier communities may be more politically powerful and able to influence the council. They have more income to support political campaigns and are more likely to have a job and transportation that allows them to attend these kinds of events such as council meetings.

3. Can you think of any examples of environmental injustice in your area or community?

Answers will vary based on your location. Ask students to consider where power plants, industrial sites, landfills, or other sources of pollution are located in the region. They should also consider bodies of water and parks – how do the rivers near wealthier neighborhoods compare to those that border impoverished communities? Are there more trees and green spaces in certain parts of town?

4. What might it take to truly have environmental justice and make environmental use fair for all?

Answers will vary. Students may note that new laws, raising public awareness, and civic engagement activities to bring about change are possible solutions. Students may suggest regulations to make it fairer when deciding where a pollution source is placed. Students may also suggest that reducing environmental hazards – landfills, pollution, or toxic waste sites – in the first place will improve living conditions for all, especially those who are victims of environmental injustice.

5. How can we avoid the problem of siting a landfill in the future? What steps should everyone take?

Reducing our consumption, reusing when possible, and recycling materials can decrease the flow of waste to landfills. Students may also suggest donating items, trading in old electronics, and upcycling as possible ways to do this.

assessment

Collect and evaluate the Planning Guides. Students may evaluate themselves or their peers on contributions to the council discussion.

follow-up activities

1. Have students watch one or more of the following videos. Each video focuses on a specific case of environmental injustice. You may also want to find an example from your region or local community to make it more relevant for students.
 - Warren County, SC
<https://whut.pbslearningmedia.org/resource/envh10.sci.life.eco.envracism/environmental-justice-opposing-a-toxic-waste-landfill>
 - Dallas, TX
<https://whut.pbslearningmedia.org/resource/envh10.sci.life.eco.envdallas/environmental-justice-in-dallas>
 - Flint, MI
<https://www.cnn.com/videos/us/2016/01/21/flint-michigan-water-crisis-ganim-dnt-ac.cnn>
2. Have students research the location of their local landfill or other possible sources of pollution. They can use this EPA “EJ Screen” tool to map demographic data and environmental issues from pollution to proximity to hazardous waste: <https://www.epa.gov/ejscreen>. If students identify examples of environmental injustice, have them write to local government officials, write an op-ed to a local newspaper, or create a campaign to raise awareness about the issue and argue for a solution. If their community seems to have environmental hazards fairly distributed, then students can identify the existing laws or regulations that helped make this happen.

3. The activity only deals with one kind of waste disposal – landfills. Have students consider other possible means of waste disposal for the people of O’ahu or their own community. What are the major drawbacks of these? What are some benefits compared to the current plan? Students can become “reporters” by gathering data and interviewing people (non-profit staff, local activists, government officials, etc.) about this. They can create a podcast (the Anchor app is free) or write an article with their findings, published to a class blog.
4. In October 2019, Hawai’i’s State Land Use Commission ordered the closure of the Waimanalo Gulch landfill by 2028. A few years earlier, Hawai’i’s Department of Environmental Services released a report ranking the top choices for a new landfill location, with the top spot being Upland Nanakuli. The report also said that the Waimanalo Gulch landfill has enough space to continue accepting garbage until 2038. However, many people oppose building a new landfill, including the mayor of Honolulu, citing that the goal of the island should be waste reduction and that it would be a waste of taxpayer money to build a new landfill with the current one still able to function for decades.

Assign students to one of two groups – pro or con – to research arguments for or against the fast-track construction of a new landfill and the closure of the Waimanalo Gulch landfill. Ask students to consider environmental impacts, environmental justice issues, and current and projected solid waste trends for the island, and be prepared to present their findings and arguments with the class.

¹National Park Service. (2016, April 29). *Hawaii Volcanoes National Park, Learn About the Park, Nature*. Retrieved from <https://www.nps.gov/havo/learn/nature/index.htm>

Politics of Waste Management and Environmental Justice in Hawai‘i

By Rachel Harvey and Annette Koh

An island ecosystem, the state of Hawai‘i has no “away” in which to throw away its waste. Calls to “malama ‘aina” —the Hawaiian phrase “to take care of the land”—are common in the halls of education and politics. O‘ahu, Hawai‘i’s most populous island and home to Honolulu, is facing a deadline. Waimanalo Gulch Sanitary Landfill, the sole site for residential and commercial waste, is at capacity. Only a Hawai‘i Supreme Court decision averted its planned closure on July 31, 2012. The debate over the placement of the next landfill foregrounds long-standing community tensions of class, culture, and residency.

Hawai‘i’s Wastescape

The unglamorous issue of waste management is at odds with a tourism-based economy that sells images of pristine Pacific beaches. Yet O‘ahu residents generate 6.6 pounds of trash per person per day, two pounds more than the national average. The island’s near 1 million residents (and 400,000 monthly tourist arrivals) generate roughly 1.6 million tons of waste each year. O‘ahu is plotting a progressive path with a growing landfill diversion rate based on green waste composting, a successful beverage bottle redemption law, and a municipal waste-to-energy plant, the Honolulu Program of Waste Energy Recovery (H-POWER).



Photo Credit: By Eric Guinther (English Wikipedia, user-contributed.)

Modern landfill operation at Waimanalo Gulch, the municipal sanitary landfill for the City & County of Honolulu.

Furthermore, as of May 2012, O‘ahu and Hawai‘i’s other three counties have all banned or will implement a ban on the distribution of single-use plastic bags. Honolulu’s Department of Environmental Services runs a popular and award-winning “Tour de Trash” program that brings residents and educators to the various recycling and composting facilities. Civil society is also taking up the cause of waste reduction. Several farmers markets have implemented “zero waste” policies, and used restaurant oil is reclaimed for biofuel. Coalitions of surfers and environmentalists sponsor regular beach clean ups to address marine debris and plastic pollution that threatens sea turtles and birds. Several local non-profits have set low-waste behavior as their primary educational or policy emphases. But as yet, these piecemeal public and private initiatives do not reduce waste sufficiently to eliminate the need for a landfill.

Community Tensions

For the majority of O‘ahu’s population, as in the rest of the U.S., “away” is the garbage truck that picks up trash once or twice a week. “Away” is H-POWER, where the contents of the kitchen trash are transformed into electricity. For the average isle resident, the existence of an incinerator justifies a lack of concern. Yet for every 10 tons of municipal solid waste received at H-POWER, one ton of ash is generated in incineration. This ash and the hundreds of tons of solid waste that exceed H-POWER’s daily capacity are brought to Waimanalo Gulch Sanitary Landfill. Yet little incentive exists to systematically tackle waste reduction or diversion. In fact, the success of the state bottle redemption bill relies on elderly or homeless recyclers and guerrilla recycling bins.

For the residents of O‘ahu’s Wai‘anae coast, “away” is home. When heavy rains overtopped a reservoir above the municipal landfill and spilled into storm sewers, medical waste washed up on Wai‘anae beaches. The Wai‘anae coast is also home to eleven of eighteen sewage treatment plants, two oil refineries, and the privately owned PVT Nanakuli Construction and Demolition Material Landfill. Residents complain that construction debris includes asbestos dust and other toxic particles blown downwind, contaminating their homes and the nearby elementary school. From an environmental justice viewpoint, Wai‘anae has a poverty rate double the island average and is home to O‘ahu’s largest Native Hawaiian population. In fact, the media often refer to the homeless encampments that line the beaches as “infestation” or trash; the isolated back roads in this largely rural area often serve as illegal dumping sites, including hundreds of televisions from a Waikīkī hotel.

Most local politicians acknowledge that Wai‘anae has shouldered the burden of waste disposal for O‘ahu. Former Honolulu Mayor Mufi Hanneman told residents that it was time for another community to step up. Indeed, the Mayor’s Advisory Committee on Landfill Selection included as one of its 20 criteria the environmental justice metric that the landfill not be located in communities that already host other “disamenities.” An April 2012 report commissioned by the Advisory Committee determined two new potential sites with at least 100 useable acres; both sites are adjacent to the current landfill.



Photo credit: Forest Starr and Kim Starr

Aerial image of the Wai‘anae coast.

In the same report, the consultant calculated the number one option as Kailua, an affluent beach town most famous for hosting the Obamas every Christmas. Amid uproar from Kailua residents, the consultant stated that, due to a “data error,” the best option was in fact the rural North Shore community of Kahuku. All three communities (Kailua, Kahuku, and Wai‘anae) reject the placement of the new landfill in their backyard, citing the need to protect cultural and natural heritage. Kailua

residents are fiercely protective of their bedroom community, limiting commercial uses of local beaches and banning bed-and-breakfasts in residential areas. The decades-long fight against hotels and subdivisions on the North Shore has given rise to a cottage industry of “Keep the Country Country” bumper stickers and a grassroots coalition of surfers and farmers. If Wai‘anae has the moral high ground, due to the inequity of making O‘ahu’s most Native Hawaiian community bear the brunt of waste disposal for the entire island, the economics of land prices and efficiencies of scale and highway access still make it an attractive option to site the next landfill. Wai‘anae has some monied allies despite the community’s poverty. Hotels in the adjacent Ko Olina development that includes a new Disney resort have spent lobbying dollars to close the current landfill.

Implications

Siting of locally unwanted land uses (LULU) in Hawai‘i occurs on a terrain shaped by socio-cultural and political forces that belies the happy-go-lucky depiction of a Pacific paradise. Periods of colonial settlement, plantation farming, military build-up, and immigration have resulted in entrenched social stratification and residential segregation of stakeholders. Despite the small size of the island, each ahupua‘a (traditional watershed area) claims a local identity distinct from the next. Questions of localness, such as high school affiliation, prove or disprove legitimacy. The Hawaiian sovereignty movement places the rights of Native Hawaiians, as the host

culture, above the rights of a fourth-generation descendant of a plantation immigrant, and definitely above that of a newcomer fresh from the mainland. Paul Theroux wrote of Hawai'i: "An island is a fixed and finite piece of geography, and usually the whole place has been carved up and claimed" (Smithsonian, May 2012). In waste management as usual, throwing one's trash away becomes a zero sum proposition where away is next to somebody's home. Communities argue against a landfill by asserting their way of life is worth preserving. But does that mean Wai'anae, as home to O'ahu's only landfill, must see itself as the unusable, discarded margins? Setting aside the science of siting landfills on a volcanic island with limited land mass and vulnerable watersheds, a public process based on criteria like property costs further burdens marginalized communities. The tone of this debate has kept a focus on location and waste management. As a result, municipal incentives for household waste reduction are often overshadowed while community-based tensions are fueled. In larger perspective, this debate speaks to cultural and civic ideas about waste, the politics of Hawai'i's land-use planning, and situated perceptions of social and environmental justice. Ultimately, waste in the context of Hawai'i, provides a stage on which to view how municipal governance and community identities are positioned upon the landscape. A constitutional amendment was proposed in the 2011 Hawai'i State Legislature that would have introduced environmental justice language into the state statutes: "Each person has the right to be free from any form of subconscious or institutional discrimination, such as actions that may disproportionately impact the health and environment of native Hawaiians, ethnic minorities, and low-income populations." The legislation never made it out of committee.

Reprinted with permission. Harvey, R. and Koh, A. (2012, October). Landfill in Paradise: Politics of Waste Management and Environmental Justice in Hawaii. *Anthropology News*, 53(8), 8-9. <https://www.americananthro.org>

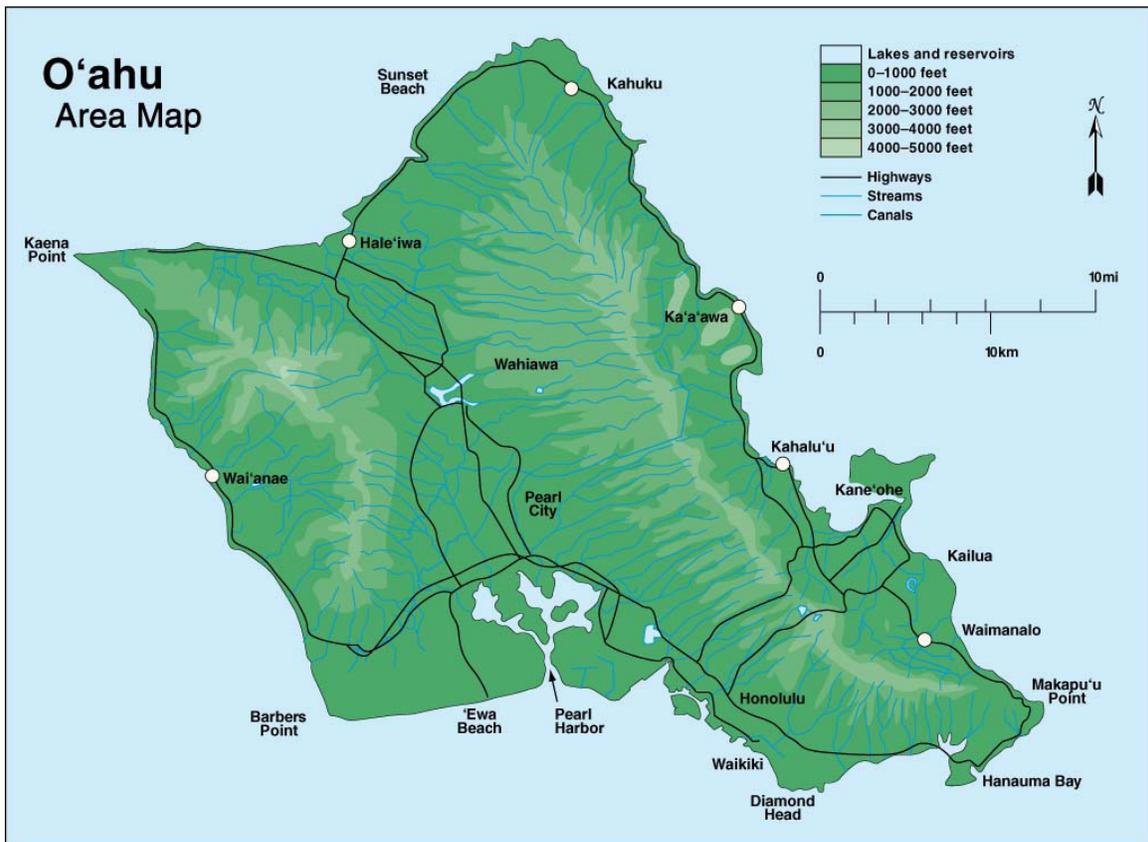
Update since this article's publication: In October 2019, the Hawai'i Land Use Commission voted in favor of the Waimanalo Gulch Sanitary Landfill's permanent closure by March 2028.

comprehension questions

Discuss the following questions with a partner.

- a. What is the biggest challenge faced by O'ahu when it comes to waste management?
- b. Explain at least three ways O'ahu is successfully cutting back on the amount of trash going into landfills.
- c. Where does much of O'ahu's residents' trash currently go? What are some problems with this?
- d. Identify two ways that the Wai'anae coast, a high-poverty area, has been negatively impacted by environmental hazards.
- e. Why do you think that the report on landfill siting suggested putting the new landfill next to the old one? Why did they then suggest other locations besides Kailua for the landfill?
- f. What do you think would be the best location for the new landfill: Kahuku, Kailua, or Wai'anae? Defend your answer with evidence from the reading.

TRASH TROUBLE IN PARADISE | community data sheet



Population Basics

	Waiana'e	Kahuku	Kailua
Total population, April 2010	13,177	6,138	38,635
Population density, April 2010	2,459/mi ²	4,584 /mi ²	4,976 /mi ²
Persons under age 5, April 2010	9.8%	6.1%	5.4%
Persons under age 18, April 2010	32.5%	22.7%	20.5%
Persons age 65 years+, April 2010	9.1%	5.6%	16.4%

Racial Makeup of Population

	Wai'anae	Kahuku	Kailua
% White, non-Hispanic or Latino	6.9%	27.9%	42.1%
% Hispanic or Latino	15.9%	5.2%	6.5%
% Black or African-American	0.8%	0.8%	0.6%
% American Indian or Alaska Native	0.2%	0.2%	0.2%
% Asian	14.5%	13.7%	20.3%
% Native Hawaiian	30.6%	30.1%	6.7%
% Two or more races	44.8%	24.9%	27.3%

Income and Education Levels

	Wai'anae	Kahuku	Kailua
Median household income (in 2014 dollars), 2010-2014	\$68,348	\$81,948	\$104,911
% Persons in poverty	27.5%	11.0%	5.8%
High school graduate or higher, percent of persons age 25 years+, 2010-2014	83.9%	97.9%	95.3%
Bachelor's degree or higher, percent of persons age 25 years+, 2010-2014	8.3%	44.3%	46.2%

Land and Housing Data

	Wai'anae	Kahuku	Kailua
Median value of owner-occupied housing units, 2010-2014	\$308,900	\$661,000	\$813,600
Median gross rent, 2010-2014	\$1,281	\$1,298	\$2,000+
Mean travel time to work (minutes), workers age 16 years+, 2010-2014	43.1 minutes	18.0 minutes	27.9 minutes

Source: United States Census Bureau, 2010

Community Profile: Wai‘anae (wahy-uh-nahy)



The community of Wai‘anae is somewhat isolated on the western coast of O‘ahu, accessible by only one road leading in and out. Because of the rain shadow effect on the mountainous island, Wai‘anae is dry and, in the summer months, becomes extremely hot and dusty. Over a quarter of Wai‘anae’s inhabitants live below the poverty line, and the community’s economy struggles from a lack of available jobs. Very few inhabitants have a college degree. A large tent city, where people of all ages live without access to running water or steady electricity, has grown on the beach near Wai‘anae High School. Wai‘anae is also the location of the current municipal landfill, as well as a private construction landfill.

Despite the challenges faced by their community, residents of Wai‘anae have fierce pride in their home and work hard to improve their surroundings. For example, several high schools in the area have partnered with an organic farm, Ma‘o, to provide at-risk students job and scholarship opportunities. Wai‘anae has the highest concentration of people of Native Hawaiian descent in the world, and some non-profit organizations have made it a goal to help community members connect with their heritage through traditional hydroponics, removing invasive species and planting native ones, and sharing oral histories of the area.

Community Profile: Kahuku (kah-hoo-koo)



Turtle Bay Resort, Kahuku, Hawaii.



Kahuku Shrimp Wagon.

Even if you've never been to Hawai'i, you may have seen Kahuku – especially its Turtle Bay Resort, which has been featured as the setting for a number of TV shows and movies. While the resort brings a lot of tourists and development, it's also been taking part in recent conservation efforts. The resort installed solar panels on its roof, buys local and organic ingredients for its restaurants, and funds a program that recycles Styrofoam to make surfboards. Near the resort, several World War II-era runways have been converted to golf courses.

Beyond the resort, several family-owned farms trace back for generations. Kahuku is also home to beaches beloved by surfers and to the James Campbell National Wildlife Refuge, which protects the habitats of several native waterbirds, green sea turtles, and the endangered Hawaiian monk seal. Many consider Kahuku to be a quiet town that harkens back to the "Old Hawai'i" days before the island's tourism industry rapidly grew.

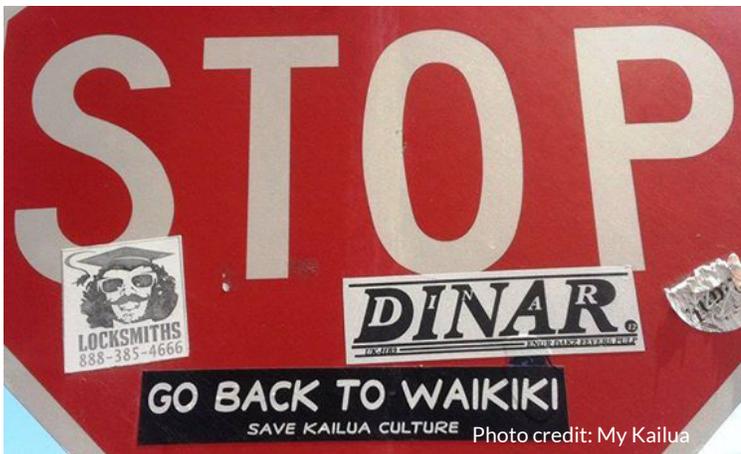
Community Profile: Kailua (kahy-loo-ah)



View of Kailua from the Lanikai Pillboxes Trail.

Kailua is one of the wealthiest communities on the island of O’ahu. Lanikai Beach in Kailua is considered by many to be the most beautiful beach in all of the Hawaiian Islands. It’s also a favorite of Hawai’i-born President Obama, who often vacations there. Because of the shape of the island and the resulting wind patterns, the waters off Kailua are usually calm and perfect for swimming, kayaking, and snorkeling.

However, not all tourists are welcomed by the residents of Kailua. Some signs around town urge them to “go back to Waikīki” (the tourism district of downtown Honolulu). People who live in Kailua worry that their small-town feeling will be ruined if tourism continues to grow.



TRASH TROUBLE IN PARADISE | planning guide

Name: _____ Date: _____

Complete the chart below using the Community Data Sheet and your Community Profile. Answer Question #6 on a separate piece of paper and be ready to present your proposal to the class.

1. Identify at least one reason your community was selected as a good site for the landfill.	
2. Identify at least two arguments against placing the landfill in your community.	
3. What are some of the benefits of your community? What do you love and want to protect about it?	
4. What are some of the challenges of living in your community? What do you wish could change?	
5. Describe one way that your community could be improved through public policies and funds. (E.g. would you like more affordable housing, more parks, better education?)	

6. Create a proposal: Write a plan that outlines the conditions under which your community would be willing to accept the landfill. What would you expect the council to provide if they decide that the landfill site is going to be located in your home community? Identify the benefits to your community that could offset the challenges associated with having the landfill sited there. Outline your plan in detail and be prepared to defend its components to the council.

SECRET LIFE OF TEES

introduction

Our stuff has a secret life – a life that exists long before it reaches you as a consumer and extends long after you’re done with it. Most people aren’t aware of the life cycle stages our stuff goes through, not to mention how those stages impact the planet and other people’s lives and economic well-being.

Consider the garment industry and a single cotton-polyester t-shirt. Arable land, fossil fuels, and water are consumed to provide its raw materials. The shirt’s production impacts the lives, jobs, and homes of the people who manufacture it. It is responsible for carbon dioxide emissions as it is shipped, sometimes thousands of miles, to the store where it will be sold to consumers. Once it’s in use, the shirt is washed in detergents, often in heated water, and then sheds synthetic microfibers that wreak havoc on local waterways. After the consumer tires of the shirt, it may be exported and sold on a shipping pallet to a lower-income country, where reselling it provides jobs for some but disrupts the market for local craftsmanship. Or, it is simply tossed in the trash – an estimated 10.5 million tons of clothing from the U.S. ends up in landfills every year.

A **life cycle analysis (LCA)**, is a technique that assesses the impact of a product and can help identify changes that will decrease a product’s eco-impact over the course of its life. As our population grows, it is more important than ever to consider how the clothes we wear are intricately connected to other people’s lives and to our environment.

Vocabulary: compost, greenhouse gas, life cycle analysis (LCA)

materials

- Paper bag
- T-shirts with legible tags
- 5 personal computers/tablets
- Student Worksheet

preparation, before class:

1. Arrange the room in five collaborative work stations that can each accommodate 4-6 students. (If you prefer smaller groups of students, make two of each station so there are



Studies For Our Global Future

concept

Every human-made product has a life cycle, each stage of which contributes to its environmental footprint and social impact. Consumers can change these impacts through their purchasing decisions.

objectives

Students will be able to:

- Analyze the factors that influence a product’s environmental, social, and economic impact.
- Conduct guided research to complete a basic life cycle analysis of a t-shirt.
- Create an action plan, including responsible parties and possible consequences, that would decrease the impact of their t-shirt by altering key parts of its life cycle.

subjects

Environmental Science (General and AP), AP Human Geography, Geography, Economics

skills

Guided research, critical thinking, analyzing costs and benefits, creating an evidence based action plan

method

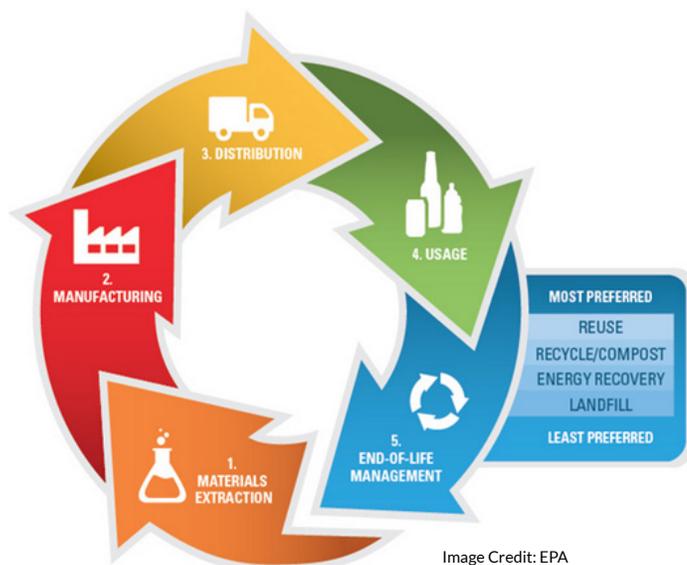
Students use guided research to perform a five-stage life cycle analysis on a t-shirt and brainstorm ways to reduce the garment’s social and environmental impact.

10 total, each accommodating 2-3 students.) Each station should have a computer or tablet with sound and internet access.

2. Ask students to bring in a clean t-shirt from home. It can be any material, design, or size if it has a legible tag and does not display inappropriate images or messages. The t-shirt will not be damaged during the lesson. Bring in 5-10 additional t-shirts, preferably from different countries of origin and made of different fabrics, for students who are unable to provide their own; each student will need one shirt. If you prefer to bring in t-shirts for all students rather than asking them to bring their own, make sure there is a good variety of different fabrics and countries of manufacture.

procedure

1. Bring a paper bag to class, and ask students to hypothesize what they think it means to conduct a life cycle analysis (LCA) of a product. Then brainstorm the paper bag's LCA as a class. You can display the circle image below if they have trouble determining the five stages. As you go through each stage as a class, ask students to think about what factors influence the environmental impact of that stage.



Here's an overview of potential impacts during each stage:

Materials – The materials used to create a product must come from somewhere. Some are extracted from mines, others are grown specifically to be used by humans, while others might be taken from the ocean or a forest. Removing these materials impacts the Earth's natural resource base and gathering them requires labor and energy.

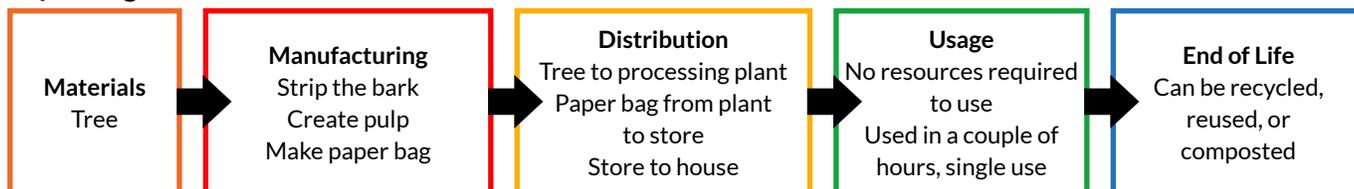
Manufacturing – Each piece of a product has to be created separately before being combined with the other parts. The manufacturing of each piece requires energy and water and can produce toxic waste. The processing of metals and plastics is especially resource intensive because they must be melted and refined before use.

Distribution – Many things must be transported for a product to exist – the raw materials to the production factory, the product to stores, and finally, the product to consumer homes. All of this transportation emits **greenhouse gas** and contributes to the eco-impact of the product. The product also must be packaged, which can require additional materials and manufacturing.

Usage – Some things require energy to work (appliances, electronics, cars, etc.), and this gets factored into their life cycle analysis. Others may require energy to maintain and reuse them, such as clothing. Length of use also plays a role – items that can be used longer have less of a footprint, since they don't need to be replaced by new versions as often. This often means that buying high-quality or reusable items (such as rechargeable batteries) contributes to a lower impact over time than lower-quality, often less-expensive items.

Disposal – Both the product itself and its packaging must be eliminated. Materials that can be recycled or **composted**, like cardboard, have less of an impact than those that cannot, like Styrofoam. Some items are also easier to reuse or donate than others.

Paper Bag LCA:



2. Divide students into groups of 4-6 and distribute a Student Worksheet to each student. Explain that they will build on their experience of conducting a quick life cycle analysis for the paper bag by doing an in-depth LCA of another everyday consumer product: a t-shirt.
3. Students should follow the directions on the Worksheet to complete LCA of their t-shirt. For each life cycle stage:
 - a. Students conduct guided research, accessing specific articles and/or videos.
 - b. Students then use their own data (from the t-shirt they brought in, or from their own experiences and habits) to describe the social and environmental impact of the t-shirt in that stage.
 - c. They will then describe at least one idea for improvement that could lessen that impact.

Students should work together in their groups to access all of the resources for each life cycle stage and collaborate when discussing answers. However, every student should complete his or her own Worksheet and use the t-shirt brought from home or provided by the teacher. So, some answers will be different within a particular group.

4. Each stage should take approximately 20-30 minutes to complete. Provide students with a time check and let them know when they should switch to the next step.
5. Once all stations are complete, explain the final question on the Student Worksheet, which asks students to write an action plan based on their ideas for improvement. Give students time to write this plan in their groups collaboratively.

discussion questions

1. Which stage of your t-shirt's life cycle do you believe had the greatest environmental impact overall?

Answers will vary. Some students may say that the materials stage has the greatest impact because of the amount of arable land and water required to grow natural fibers, or the plastic and energy required to create synthetic ones. Other students may note the growing scientific concern over microplastic fibers during washing and argue that usage is the stage with the largest ecological impact.

2. Which stage of your t-shirt's life cycle had the greatest social impact overall?

Answers will vary. Students will likely focus on the manufacturing stage, as most shirts are made in developing countries with low minimum wages and often difficult working conditions. However, some students may note that this provides job opportunities for those who need them – these students may focus more on the disposal stage and the impact of the massive shipments of donated clothes from the U.S. to parts of sub-Saharan Africa, which can disrupt the local economy by flooding the market.

3. Could we assign a monetary cost to these environmental and social impacts? Explain.

Right now, most items with lower environmental and social costs tend to have higher monetary costs because they require higher quality materials or more expensive labor. So it would be difficult to flip that paradigm, although regulations (laws, fines) may help discourage products that have an especially high impact on the Earth. When consumers are more aware of the impacts of a product, though, some may be willing to pay more money for a product that has a smaller footprint.

4. Would you be more likely to buy a product that had a smaller environmental impact over another one? Why or why not?

Answers will vary.

5. When and how does a consumer have the most power to change the t-shirt's impact? What are some of these possible changes?

Answers will vary. Students might argue that usage is the best place to reduce impact, since that is the stage where the consumer is in possession of the item and can decide when and how to launder it, as well as how long to wear it before disposal. Others may note that when you buy a t-shirt, you have the power to affect both materials and manufacturing, since you can select the fabric and the country of origin, as well as purchase from companies with sustainable and socially responsible practices.

6. Based on your research, what would be the "perfect" t-shirt? How would it be made, shipped, used, and disposed of?

Answers will vary. You may wish to have each group briefly share its action plan for improvement. Students should combine the ideas shared to come up with an "ideal" t-shirt. It is likely that some groups did the same stage for their action plan and may disagree with each other. You can discuss with students why that is the case and provide them with opportunities to defend their action plan with notes from their research. If no group chose a particular stage to improve upon, briefly come up with some potential suggestions as a class and jot them down on the board.

7. Why do you think companies don't make the "perfect" t-shirt? What factors are stopping us from creating clothing with the smallest possible impact?

Cost is a major prohibitive factor. Companies must be profitable, and so they tend to go for the cheapest options. If the company pays more for higher quality materials or for better wages for its workers, then it will pass these additional costs on to the consumer. Many people cannot afford to buy more expensive clothing. There is also an awareness factor – consumers are not always educated about the ways their purchases impact the Earth and other human beings' lives around the world, so they do not see the point of changing their buying habits. Finally, all may not agree on what constitutes the "perfect" t-shirt. For example, some people may say that we should save our valuable crop land for growing food by avoiding cotton clothing, while others would argue that synthetic fibers have a major impact on the world's bodies of water and we should avoid them instead.

assessment

Assess students' action plans for clarity and creativity, as well as incorporation of the research findings.

follow-up activities

1. Students send their LCA of the t-shirt to their favorite clothing store. They can explain their concerns and interests as consumers, and describe what steps the store should take to improve the footprint (social and environmental) of the clothes for sale.
2. Students create an LCA for products that the school or district uses, such as desks, carpets, or textbooks. They can identify ways to decrease the school's impact and share it with the principal or school board.
3. Students research other everyday items, besides t-shirts, to see if anything is being done to lower their impact. For example, Nike uses a program called [Nike Grind](#) to create sports fields out of pieces of old shoes that were otherwise bound for the landfill.

SECRET LIFE OF TEES | student worksheet

Name: _____ Date: _____

For each stage of your t-shirt's life cycle, first visit the listed websites and examine the information provided. Then fill in the chart columns for pros and cons beside each fact. Next, answer any additional questions in that life cycle stage. In the "Impacts" portion, provide a detailed analysis of the environmental and social effects of your particular t-shirt, using your answers to the questions that came before it. Finally, identify at least one way to decrease the impact in this life cycle stage as an "Idea for Improvement."

life cycle stage 1: materials

- **Article:** Tatiana Schlossberg, "Fig Leaves Are Out. What to Wear to Be Kind to the Planet?" *New York Times*, May 24, 2017. <https://www.nytimes.com/2017/05/24/climate/eco-friendly-organic-clothing.html>
- **Video/article:** "COTTON: One farmer. A Shocking number of T-shirts." NPR. <https://apps.npr.org/tshirt/#/cotton>

Fact	What are some pros of this?	What are some cons of this?
Rayon is a natural fiber harvested from bamboo forests and refined using chemicals in factories.		
Synthetic fibers like polyester and nylon make up over half of the global market for fabric.		
Cotton, which is the most widely used fabric in the world, uses about 2 percent of the Earth's arable land and almost 3 percent of the global water supply.		
About 90 percent of all cotton crops grown in the United States are genetically modified to be pest-resistant or higher yield.		

Look at the tag on your t-shirt to determine what fabric(s) it is made of and record them here, with percentages:

Impacts of My Shirt: _____

Idea(s) for Improvement: _____

life cycle stage 2: manufacturing

- **Video/article:** "PEOPLE: The lives of the workers who made our shirts." NPR. <https://apps.npr.org/tshirt/#/people>
- **Podcast/article:** Caitlin Kennedy and Zoe Chace, "Two Sisters, A Small Room and the The World Behind a T-Shirt." NPR, December 2, 2013. <https://www.npr.org/sections/money/2013/12/03/247360855/two-sisters-a-small-room-and-the-world-behind-a-t-shirt>
- **Article:** Jim Yardley, "Bangladesh Pollution, Told in Colors and Smells," *New York Times*, July 14, 2013. <https://www.nytimes.com/2013/07/15/world/asia/bangladesh-pollution-told-in-colors-and-smells.html>

Fact	What are some pros of this?	What are some cons of this?
Compared to other countries that make and export large amounts of clothing, Bangladesh has one of the lowest minimum wages.		
Many women in Bangladesh are leaving subsistence farming villages and moving to cities to work in garment factories.		
Due to lack of regulation by the government, pollution from factories (such as chemical dyes) often enters the living areas of people in Bangladesh.		

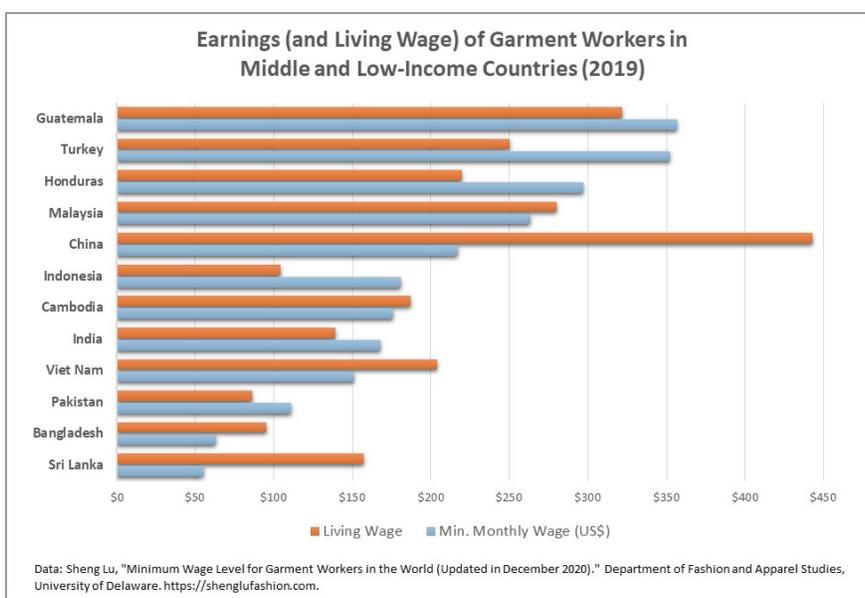
In what country was your t-shirt made? _____

Describe any dyes or colorings used in your t-shirt. _____

What is the minimum wage in that country* for garment workers? _____

Is garment workers' minimum wage higher or lower than the country's living wage? _____

*If it isn't available in this chart of the top 20 apparel-exporting countries, look it up on the internet.



Impacts of My Shirt: _____

Idea(s) for Improvement: _____

life cycle stage 3: distribution

- **Article:** Lucy Siegle, “How ethical is shipping goods by sea?” *The Guardian*, November 2, 2014. <https://www.theguardian.com/environment/2014/nov/02/environmental-impact-of-shipping-goods>
- **Article:** Mike Scott, “Sustainable shipping is making waves,” *The Guardian*, August 1, 2014. <https://www.theguardian.com/sustainable-business/2014/aug/01/sustainable-shipping-is-making-waves>

Fact	What are some pros of this?	What are some cons of this?
Over 90 percent of the world’s exports are shipped by sea.		
New regulations will require the world’s freight ships to invest in better fuel or install scrubbers to remove pollution.		

Impacts of My Shirt: _____

Idea(s) for Improvement: _____

life cycle stage 4: usage

- **Web page:** Emily Frydendall, "How Laundry Detergent Works," Howstuffworks. <https://home.howstuffworks.com/laundry-detergent4.htm>
- **Article:** Ernest Hamilton, "Environmental Cost of Doing Laundry," *Nature World News*, September 18, 2019. <https://www.natureworldnews.com/articles/42111/20190918/environmental-cost-of-doing-laundry.htm>
- **Article:** Leah Messinger, "How your clothes are poisoning our oceans and food supply," *The Guardian*, June 20, 2016. <https://www.theguardian.com/environment/2016/jun/20/microfibers-plastic-pollution-oceans-patagonia-synthetic-clothes-microbeads>

Fact	What are some pros of this?	What are some cons of this?
Newer models of washing machines and dryers tend to be more efficient and use less energy to do laundry.		

How often do you (or someone in your family) wash your clothes? _____ machine loads/week

Do you use hot/warm water, cold water, or a mix? _____

How do you dry a typical t-shirt after washing it? _____

What type of detergent do you use when washing clothes? _____

What type of fabric is your shirt made of? _____

Impacts of My Shirt: _____

Idea(s) for Improvement: _____

life cycle stage 5: disposal

- **Article:** Zhai Yun Tan, “What Happens When Fashion Becomes Fast, Disposable and Cheap?” NPR, April 10, 2016. <https://www.npr.org/2016/04/08/473513620/what-happens-when-fashion-becomes-fast-disposable-and-cheap>
- **Article:** Eleanor Goldberg, “These African Countries Don’t Want Your Used Clothes Anymore,” *Huffington Post*, September 19, 2016. https://www.huffingtonpost.com/entry/these-african-countries-dont-want-your-used-clothing-anymore_us_57cf19bce4b06a74c9f10dd6

Fact	What are some pros of this?	What are some cons of this?
“Fast fashion” is growing rapidly, much more quickly than traditional fashion retailers.		
The United States exports over 1 billion pounds of used clothing every year, shipping it across the ocean to developing countries.		
The East African Community inter-governmental group considered a ban on imported clothing.		

How long do you usually own an article of clothing before getting rid of it? _____

What do you usually do with your clothing when you don’t want to wear it anymore? _____

Impacts of My Shirt: _____

Idea(s) for Improvement: _____

Suggested Answers to Student Worksheet

stage 1: materials

Fact	What are some pros of this?	What are some cons of this?
Rayon is a natural fiber harvested from bamboo forests and refined using chemicals in factories.	<i>It's not made from fossil fuels, unlike synthetic fibers. Bamboo is very fast-growing so it takes relatively little space to grow.</i>	<i>Some chemicals are dangerous to the workers who breathe them in. Often, old-growth forests are cut down to make room for bamboo fields to make rayon. Arable land is sometimes dedicated to rayon instead of food.</i>
Synthetic fibers like polyester and nylon make up over half of the global market for fabric.	<i>No arable land is dedicated to growing these materials, and they do not require watering as crops do. Consumers may find synthetic fibers to be lighter-weight and better for athletic activities.</i>	<i>Making these fabrics requires plastic which is fossil-fuel based. Melting the plastic into fibers involves energy and water. Also, these synthetic fabrics shed tiny microplastic fibers that can get into waterways and cause harm to ecosystems.</i>
Cotton, which is the most widely used fabric in the world, uses about 2 percent of the Earth's arable land and almost 3 percent of the global water supply.	<i>Cotton is a natural fiber that isn't made from fossil fuels. Unlike synthetics, it doesn't break down into microplastics in the wash. It's biodegradable too.</i>	<i>This arable land could be used to grow food for those who are malnourished. Growing cotton diverts water from other sources, such as food crops or drinking water.</i>
About 90 percent of all cotton crops grown in the United States are genetically modified to be pest-resistant or higher yield.	<i>This produces more cotton per plant and prevents pests from eating the cotton. It could lower the use of pesticides if plant is genetically pest-resistant. It saves money for farmers and thus saves money for consumers in the long run.</i>	<i>Pest-resistant cotton could harm other non-pest insects. Many consumers don't trust GMOs. Some companies own the rights to certain seeds and charge more money for them.</i>

stage 2: manufacturing

Fact	What are some pros of this?	What are some cons of this?
Compared to other countries that make and export large amounts of clothing, Bangladesh has one of the lowest minimum wages.	<i>Bangladesh is a major exporter of garments, which can help its economy. The huge number of factories there can reduce poverty by providing jobs.</i>	<i>It can be difficult for workers to get out of debt or make enough money to save for a future outside of the factory job. It is also energy intensive to ship large quantities of garments for U.S. consumers to and from Bangladesh, increasing the emissions that cause climate change.</i>
Many women in Bangladesh are leaving subsistence farming villages and moving to cities to work in garment factories.	<i>Women are able to earn more money in the new job than they were before. They are also empowered to work outside the home and support their families, and have more choice about when they get married and have kids.</i>	<i>Cities become crowded and living conditions deteriorate. Working prevents some girls from finishing school, limiting their options later in life. In addition, women have to leave their homes and families (including their kids) to move to cities. Factories can also be dangerous places to work.</i>
Due to lack of regulation by the government, pollution from factories (such as chemical dyes) often enters the living areas of people in Bangladesh.	<i>This column should be left blank.</i>	<i>This harms the health of people nearby, as well as of factory workers. It also negatively impacts the economy by ruining crops and destroying ecosystems.</i>

stage 3: distribution

Fact	What are some pros of this?	What are some cons of this?
Over 90 percent of the world's exports are shipped by sea.	<i>It's more efficient and less polluting than air travel. Thus, it contributes less to climate change than if it were being flown on planes.</i>	<i>This requires significant amounts of fuel. The people who work on the ships often lack safe and healthy working conditions.</i>
New regulations will require the world's freight ships to invest in better fuel or install scrubbers to remove pollution.	<i>These decrease the negative health impacts of shipping on workers. It reduces air pollution that causes illness.</i>	<i>The scrubbers are not addressing major greenhouse gases that cause climate change. These higher costs to the company mean higher consumer costs. If shipping by sea becomes more expensive, it could lead to more air freight, which is a bigger polluter.</i>

stage 4: usage

Fact	What are some pros of this?	What are some cons of this?
Newer models of washing machines and dryers tend to be more efficient and use less energy to do laundry.	<i>People can contribute less to climate change if they upgrade their appliances. This requires no additional work on your part once you have the newer machines. This saves money on your water and electric bills.</i>	<i>Making and buying these new washers and dryers requires energy and labor. These appliances have their own LCA with social and environmental impacts. It also might encourage people to use the laundry machines more often if they think it's better for the Earth, rather than doing less laundry and/or air-drying their clothes.</i>

stage 5: distribution

Fact	What are some pros of this?	What are some cons of this?
"Fast fashion" is growing rapidly, much more quickly than traditional fashion retailers.	<i>The clothing is cheaper for consumers. This allows people of all income levels to express themselves according to the latest fashion trends.</i>	<i>Frequent turnover of styles creates lots of excess waste. The clothing doesn't last very long, so consumers have to buy new clothes more often, which may not be as cheap in the end and means a higher footprint from the previous life cycle stages.</i>
The United States exports over 1 billion pounds of used clothing every year, shipping it across the ocean to developing countries.	<i>It is better to keep using the clothes than for them to take up landfill space. Sending these clothes overseas allows secondhand stores to get rid of clothes no one will buy. This provides clothing in places where there aren't as many reliable retailers.</i>	<i>The used clothes are shipped which requires energy, contributing to carbon emissions. Because people in the U.S. think they are doing good for the world by donating clothes, they may choose to do that, instead of doing more eco-friendly options, such as keeping their clothes for longer, upcycling them, or swapping with friends/family.</i>
The East African Community inter-governmental group considered a ban on imported clothing.	<i>People who make clothes locally would be able to compete better if imports were banned. This would mean less shipping of clothes from other countries which requires energy and causes carbon emissions. This ban may encourage pride in local fabrics and artisans.</i>	<i>Many people in these East African nations would lose their jobs reselling clothes. It would be difficult for local retailers or artisans to meet the demand for clothes. The U.S. and other developed countries would have a huge excess of used clothes that they would likely sell to countries outside the EAC instead.</i>

NEEDS VS. WANTS IN A FINITE WORLD

introduction

North American culture emphasizes abundance. Students are constantly bombarded with messages that tell them to want and seek more material satisfaction. In such an environment, it can be difficult to appreciate what they already have, much less understand what it means to live with less. This relative affluence is reflected in diets (more animal-based proteins and convenience foods), the quantity and variety of material goods (clothing, furnishings, vehicles, electronics) and experiences (hobbies, recreation, and travel). The U.S. **ecological footprint**, the amount of land and resources used to satisfy people's lifestyles, is three times the global average. Many items considered luxuries for many people around the world are considered needs in U.S. society.

Students may have learned the difference between needs and wants at a younger age. It often comes up in requests (or demands) of parents for desired consumer goods. A child may ask for toys by expressing that they "need" them. To which a parent may respond that these are "wants" rather than "needs." Now, as teens, it's worth revisiting the difference between needs and wants as a way of building their skills in personal/family economics, as well as social and environmental responsibility. As environmental stewards, all people must consider the real costs of items in terms of natural resources used and other environmental impacts so they can be more judicious consumers in their roles as global citizens. As they are learning about inequities in the wealth of people around the globe, they can also begin to view "needs" and "wants" as somewhat relative depending on people's economic situation.

Vocabulary: ecological footprint, Maslow's hierarchy of needs

materials

Part 1

- None

Part 2

- Bag of assorted common household items



Studies For Our Global Future

concept

In today's world, people require more than what is necessary for mere survival, making it difficult at times to differentiate between needs and wants.

objectives

Students will be able to:

- Explain Maslow's hierarchy of needs in their own words.
- Differentiate their own needs from wants.
- Analyze their needs and wants in order to prioritize them.
- Distinguish between what constitutes a need or a want for different people.

subjects

Economics, Environmental Science

skills

Critical thinking, decision making

method

Students discuss the varying levels of human needs and then evaluate their own needs and wants and the resources required to meet them.

Part 1: What is a Need?

procedure

1. Pose the following thought experiment to your students:

“You were on a small boat in the ocean that has sunk. You and the other passengers were all wearing life jackets, survived, and have now washed up on an uninhabited island. You don’t know how long it might take to get rescued, as there is no way to contact anyone who might be able to help you. What are some of the things you will now do to try to survive on this island until help comes?”

2. Write students suggestions on the board. Especially highlight the ones that speak to fulfilling basic physiological needs such as finding a source of potable water, finding or catching food, and setting up shelters to protect people from the tropical sun. Some students may also mention actions to provide for the safety and security of those on the island, like protecting themselves from wild animals, venomous insects, snakes, or each other.

3. Ask students if they can think of people in their community or in the country who have struggled to have their physiological and/or safety needs met.

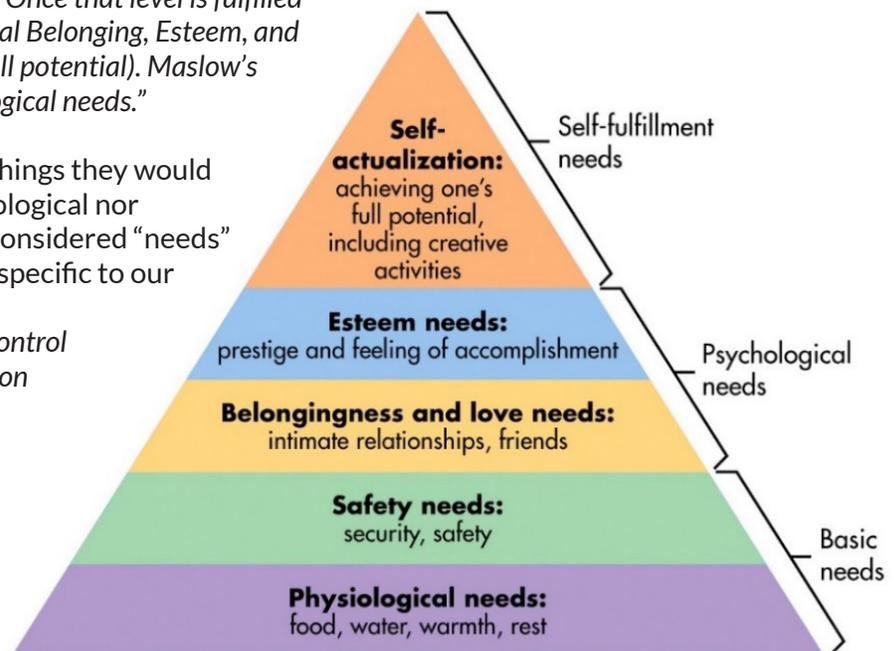
Answers will vary. Students may be aware of homeless people in their community. They may have also read/seen news of communities grappling with the aftermath of a natural disaster that damages the infrastructure, making it difficult to access food, water and energy.

4. Project the chart below and read the following paragraph to introduce **Maslow’s hierarchy of needs**:

“Abraham Maslow was a 20th century American psychologist who stated that people are motivated to achieve certain needs and that some needs take precedence over others. Our most basic need is for physical survival, and this will be the first thing that motivates our behavior. Once that level is fulfilled the next level up is Safety, followed by Social Belonging, Esteem, and finally Self-Actualization (realizing one’s full potential). Maslow’s hierarchy addressed physical and psychological needs.”

5. Ask students if they can think of other things they would consider “needs” that are neither physiological nor psychological. Would these have been considered “needs” at an earlier time in history or are they specific to our modern era?

Answers may include: electricity, climate control (heat/air conditioning), mass communication (e.g. internet, broadcasting), means of transportation, healthcare/medicine, and education.



6. Ask students if there any flaws they can see in Maslow’s hierarchy. Would people with other perspectives have pyramids that look different? Is this pyramid applicable to everyone globally?

Answers will vary. Maslow’s choice and ranking of needs is influenced by U.S. culture. In other cultures, where individualism is not as prized, the fourth level of “prestige and feeling of accomplishment” might not be present. Additionally, in places with a strong emphasis on communalism, the social needs of the third tier may be considered more integral to a person’s life.

Part 2: Needs vs. Wants

procedure

1. Before class, fill a large bag with assorted household items such as a newspaper, cosmetics, hand soap, a pencil, fork, book, lightbulb, aspirin, various food items – both healthy and junk food, a comb, plastic cups, matches, smartphone, air freshener, etc.
2. In class, draw each item out of the bag one by one and ask students if they consider the item a need or want. There will most likely be disagreement on some of the items so allow students time to explain why they’ve chosen their particular stance. Make two separate piles of the items – needs and wants – as students categorize each.
3. Instruct all students to fold a piece of paper lengthwise in thirds and label the left column “Needs,” the middle column “Wants,” and the right column “Resources Used.”
4. In the left column, students should list the physiological, or basic, needs of every human for survival. (They should list water, food, oxygen, shelter, etc.) After the last item they’ve listed, have students draw a line and add “Second-Tier Needs.” Here they should list items beyond what is necessary for mere survival; they should list items that are necessary to live in your location and within their culture in the present-day.
5. In the middle column, students should list things they want for their own lifestyle. Here they might include a large-screen TV, sporting equipment, a video game console, a car, fast food, smart phone, hot water, etc. Give the students enough time to write 10-15 items. Specify that the list be realistic (e.g. no 100-foot yachts or palaces in France).
6. In the right column, have students name some of the resources or products needed to produce, use, and maintain the “Wants” they listed in the middle column: oil (for plastic and fuel), electricity, iron, aluminum, pesticides, grain, water, etc. This may require some quick internet searches as sometimes it’s not obvious what types of materials are used in every day products.

Note: You may want to go through some examples of products we use regularly, and the resources they are made out of. Example: a smart phone contains raw materials like gold, copper, silver, aluminum, lithium, graphite, cobalt, and several rare earth minerals. The minerals and raw materials are found all over the world, so they need to be mined and extracted and transported to a production facility. Processing the materials and minerals requires water and energy, and produces waste in the process.

7. Given that the Earth is a finite system, there simply aren't enough natural resources in the world for all people to consume as much as people living in the United States (e.g. three cars for every four people, a diet rich in animal products). Every person's environmental impact would decrease if he/she lessened the amount they consumed.

Ask students to select three items from the "Wants" column of their charts that they would be willing to give up or reduce their use of in order to lessen their environmental impact. Students should cross those items off their lists.

Sample Chart		
Needs	Wants	Resources Used
Food	Smartphone	Oil (plastic), water, metals
Water	Game console	Metals, oil (plastic), electricity
Shelter	Fast food hamburger	Grain, pesticide, oil, fertilizer, wood, metal, beef
Energy	Hot water	
Second-Tier Needs	Pets	
Indoor plumbing	New car	
Indoor heat/air conditioning	Vacation home	
Phone	Designer clothes	
	High-end jewelry	
	Ski vacation	
	Motor boat	
	Dirt bike	

8. Ask students to select an additional three items to cross off their Wants lists.
9. Continue to have students cross off items until they only have a few left.

discussion questions

1. Which were the first items deleted from your list? What did you elect to keep? What criteria did you use to make these deletions or choose what to save?

Answers will vary.

2. Are there alternatives to totally giving up the items on your list that you crossed off? What are they?

Answers may include: sharing, using less of the item without fully giving it up, or finding more efficient/less wasteful ways to make or use products.

3. Ask the students to re-examine items they listed as second-tier needs as opposed to wants. What distinguishes these two categories?

Answers will vary. Items that students considered second-tier needs are most likely not needed for survival, but are considered essentials given cultural norms or geography. Examples might include a pair of shoes, indoor plumbing, indoor heat in a cold climate, silverware, etc.

4. Would people in a different location or from a different culture have listed items similarly or differently than you? Explain.

Answers will vary. A car might be a second-tier need for people living in a rural area where public transportation does not exist but is a want for people in a big city with public transit. A parka is a need for someone living in a cold area but not for someone living in a place that is warm year-round. A computer might be a need for someone in a community where college or job applications are only available to complete online but could be a want in other areas.

5. How do you think giving up these items on your list would affect your happiness? What makes you the happiest? What do you enjoy doing?

Make a list on the board – be sure to include items like friends, family, playing sports, reading, singing, playing in a band, etc.

6. Do you think it's possible that you giving up these second-tier needs or wants could benefit other people in the world?

Answer may include: other people would benefit if it meant less natural resources were consumed or less trash/pollution was created; if the money saved on the item was donated, etc.

assessment

Students complete an exit ticket where they briefly explain Maslow's hierarchy of needs and list two things that surprised them from the discussion of their own needs and wants.

follow-up activities

1. Students select one of the wants from their list that they ultimately crossed off. You may want to ask them to select the item before telling them why. Once selected, challenge students to go one week without using that item. They should keep a journal of the experience, noting what was most challenging. How did their life change? How did they modify their actions to live without the item? Was any part of the experience unexpected?

2. Listen to the episode [Shipwrecked on an Island](#) by the podcast Extremes. This episode details the experiences of six Tongan teenagers who were stranded on an uninhabited island for 15 months in 1966. Ask students to take notes on what the boys did to meet their basic needs until rescue, as well as the secondary needs that emerged over the course of their predicament. When the episode is completed, students write a paragraph comparing and contrasting the ways that their own needs are met to the methods used by the teenagers. Which methods require more resources? What are the trade-offs to methods of survival that are less resource intensive? Is there anything from the boys' experience that students wish they could adapt to their own lives?
3. Screen the 20-minute video, [The Story of Stuff](#), developed and narrated by sustainability expert Anne Leonard. Using simple line-art animation, she explains the consumption chain from extraction to waste, and the U.S. national drive to consume. She also tries to reframe the conversation from unlimited production and consumption to sustainability and equity. Lead a class discussion or have students discuss in groups what they learned from the video, whether they agree with Ms. Leonard's ideas for shifting to a lower consumption lifestyle, and how effective they think her production is at influencing others.

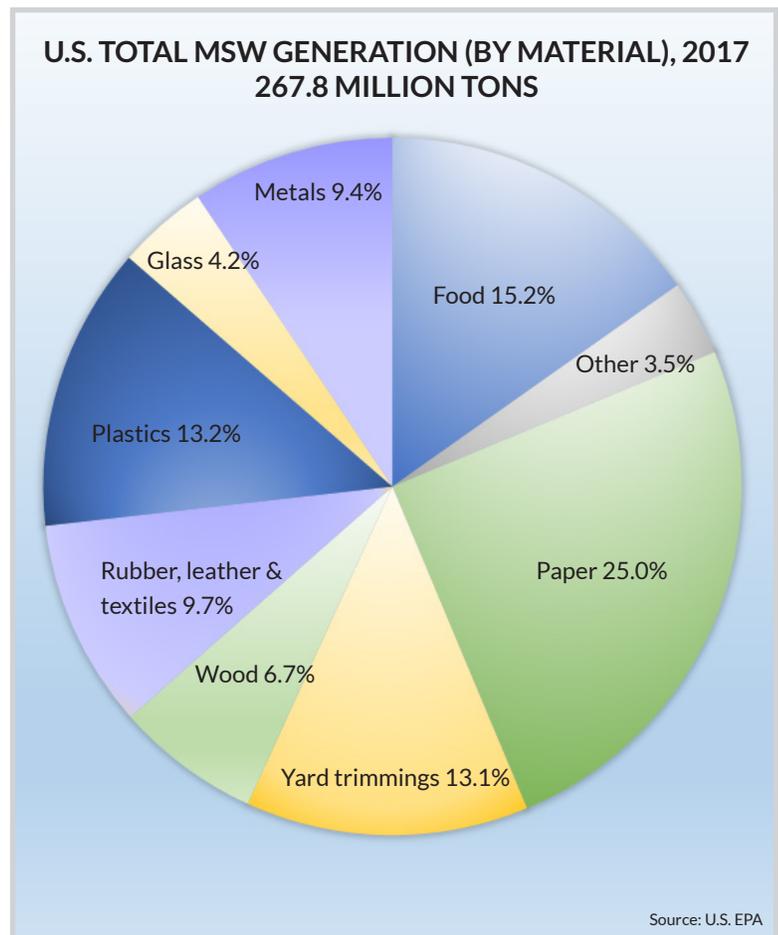
WHAT A WASTE!

background reading | solid waste unit

As the global population continues to grow by 80+ million people each year, much of it in urban areas, the world must manage an ever-growing amount of **solid waste**. In fact, waste management already comprises the largest portion of most municipalities' budgets around the globe. Since the middle of the last century, we have become an increasingly disposable society, throwing away everything from diapers to food packaging to electronics that are frequently replaced. How discarded items are disposed of is, and will remain, a cornerstone of public health.

Solid waste generation is on the rise thanks to continued population growth (more people creating waste) but also to rising affluence around the globe (more waste generated per person). In 2016, urban residents generated over 2 billion tons of garbage (2.6 pounds per person).¹ By 2050, urban waste is projected to increase 70 percent, to 3.4 billion tons, due to urban and economic growth.² Urban residents produce, on average, twice as much waste per capita as their rural counterparts. As countries urbanize, their economic wealth increases. As standards of living and disposable income rises, so does the consumption of goods, resulting in an increase of waste.

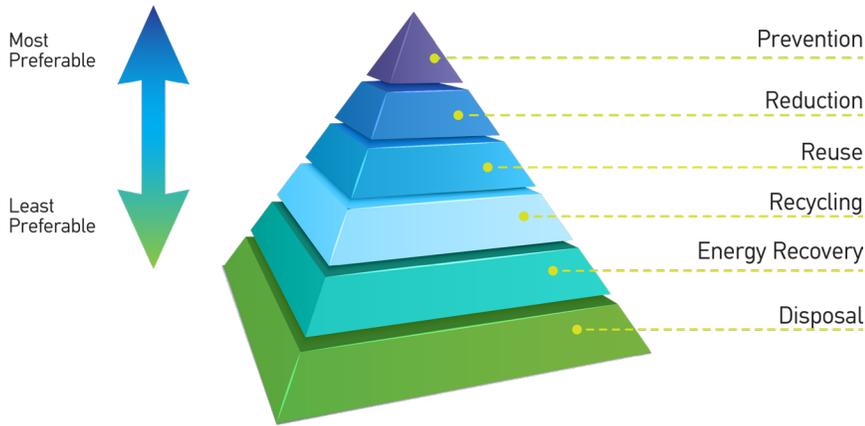
Just as living standards vary across the world, so do the types of waste and disposal challenges. Higher income countries produce the most garbage per person and much of that is made up of paper, plastics and other inorganic materials. Low-income countries have the highest portion of organic waste (food, yard and wood wastes). Most low- and lower middle-income countries dispose of their waste in open dumps, while higher income countries are more apt to use sanitary landfills, incinerators and recycling plants.



The waste management pyramid

Proponents of sustainable waste management promote an integrated approach to dealing with solid waste. It takes the form of an inverted pyramid with the most preferred waste management strategies at the top and the least preferred at the bottom. In this case, the top of the inverted pyramid is source reduction and reuse of materials, followed by recycling and composting. Moving down the hierarchy is energy recovery – creating energy from waste, usually through incineration. Finally, the bottom tip of the pyramid is treatment and disposal, mostly in sanitary landfills.

THE WASTE HIERARCHY



Source: European Commission Environment Programme

Source reduction (or waste prevention) involves practices that prevent waste from being generated in the first place. On a household level, this can include reusing items, donating items for others to use and buying in bulk to reduce packaging. Industries can redesign products to minimize waste. Aside from reducing waste, source reduction also saves natural resources, conserves energy, reduces pollution and saves money for consumers and businesses.

In managing the more than 2 billion tons of waste that the world's people generate, recycling and composting are the most sustainable

strategies. **Recycling** involves sorting and processing recyclable products (e.g. paper, cardboard, glass, plastics and aluminum) into raw materials that can be used to create new products. **Composting** is the decomposition of organic materials, such as food scraps and yard waste, into usable, nutrient-rich fertilizer. Recycling and composting have a number of benefits to the environment. These practices prevent water and air pollution, save energy, supply raw materials to industry, create jobs, conserve resources and reduce the need for landfills and incinerators.

For trash that is not easily recyclable, **energy recovery** (often through combustion) offers a waste management option that reduces the volume of waste and provides energy generation. With energy recovery (sometimes called waste-to-energy), non-recyclable waste is converted into useable heat, electricity or fuel through a variety of processes. Using this energy in place of energy generated by burning fossil fuels reduces carbon dioxide emissions. The resulting ash (representing just 10 percent of the original waste volume) can then be disposed of in landfills but must be treated carefully, as it contains high concentrations of toxic metals such as lead. Despite careful pollution regulations on what **incinerators** release into the air, gaseous emissions frequently include toxic compounds called dioxins, as well as carbon monoxide and sulfur dioxide, all of which can be harmful to humans and the environment.



Photo Credit: zelijosantrac/istockphoto.com

Waste that can't be recycled or converted to energy would be disposed of in landfills. **Landfills** are holes in the ground consisting of a liner made of clay or plastic to contain the wastes, pipes and pumps to remove water and other liquids that collect in the landfill, and a cover to keep water out and to prevent wastes from spilling over the sides. The pumping system is essential to prevent **leachate** (the liquid mix of rainwater and waste) from contaminating groundwater and surface water. Landfills can also emit hazardous, and sometimes highly flammable, gases such as methane if not built and managed with safeguards in place. Methane from landfills represent 12 percent of total global methane emissions.³ Over the course of 100 years, methane has 34 times the impact of carbon dioxide.⁴



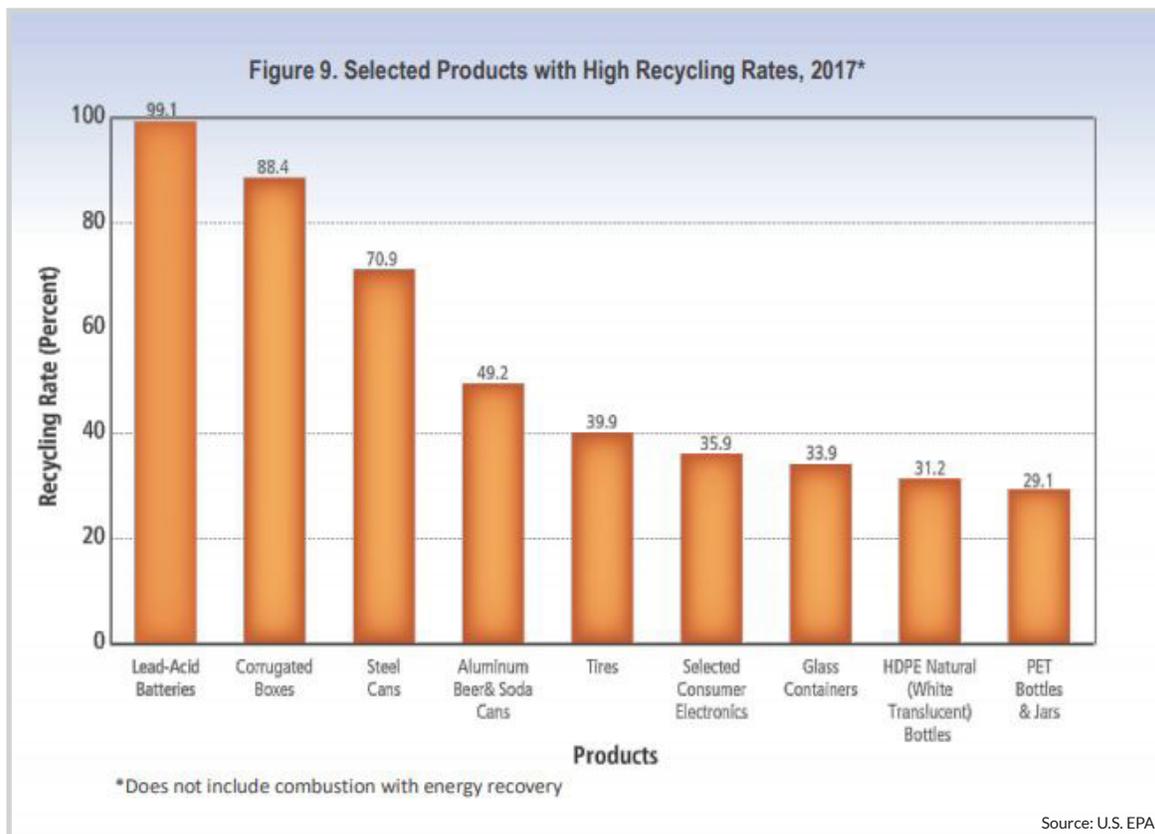
Environmental justice

It is important to note that more often than not, municipal waste incinerators and landfills in the United States are located in or near low-income communities and communities of color.⁵ As a result, health issues related to such sites disproportionately affect these communities. Toxins from landfills can and do leak into the local water supply, resulting in cancer, birth defects, and other serious health issues.⁶ In the early 1980s, residents in Warren County, North Carolina organized and protested a proposed PCB-contaminated landfill in their community, creating momentum for the modern-day **environmental justice** movement.⁷

According to the EPA, two goals of environmental justice are to ensure people have “the same degree of protection from environmental and health hazards” and “equal access to the decision-making process to have a healthy environment in which to live, learn, and work.”⁸

Recycling in the U.S.

In most places, the hierarchy of integrated waste management is more an aspiration than reality. In the United States, more than half of solid waste ends up in landfills. About one-third is recycled and composted, and about one-eighth is incinerated. Out of the 4.5 pounds of garbage each U.S. resident generates, about 1.6 pounds is recycled or composted. Significant amounts of paper and yard trimmings are recovered (over 65 percent of each), but smaller amounts of other waste items are, such as food waste (6 percent), plastics (8 percent) and aluminum (16 percent).⁹ Most of those items wind up in landfills. So even while the percentage of waste that is recycled has grown (it was just 10 percent in 1985 and was around 35 percent in 2017), success has been uneven.¹⁰



The benefits of increased recycling rates can't be overstated. When manufactured products use recycled materials, it reduces the need for virgin materials. This saves energy that would be required to extract and process the virgin materials, which includes the burning of fossil fuels. Every ton of paper recycled can save 322 gallons of gasoline. Recycling one ton of aluminum cans conserves the equivalent energy of 1,024 gallons of gasoline.¹¹ The materials recycled in 2014 alone, saved 1.1 quadrillion BTUs of energy – the amount consumed by 25 million households in a year.¹² Beyond energy savings, recycling more of our waste would reduce **greenhouse gas** emissions and conserve natural resources that are extracted and harvested at a cost to manufacturers and the environment. Over 40 percent of U.S. greenhouse gas emissions are associated with materials management (extraction or harvest of materials, production and transport of goods, provision of services and disposal). The 94 million tons of waste recycled and composted in 2017 reduced emissions by 184 million tons (equal to the

amount emitted by 39 million cars in one year).¹³ Recycling also creates jobs to collect, sort, and process items. The EPA's most recent 2016 report on the economic benefits of recycling showed that in 2007, recycling created over 750,000 jobs and generated over \$6 million in tax revenues.¹⁴ At a state level, more recent data amplifies the economic benefits. In California, for every job in recycling, eight jobs are created to manufacture the recovered material into a new product.¹⁵

So why aren't we recycling and composting more of our waste? Surveys show that most individuals want to be effective recyclers but sometimes lack current information on what can be recycled in their communities, or they don't have convenient access to recycling services. Because recycling is a \$200 billion business globally, driven by supply and demand of raw materials in the marketplace, items that are being recycled can change.¹⁶ To be effectively recycled, materials need to be of high quality, meaning that they are not contaminated by other waste. In order to drive up recycling participation, many communities have opted for "single-stream" recycling where all recyclables can go into one bin. While this makes it easier for households, single-stream recycling doubles the contamination rate, so that many items that we think we've recycled have to ultimately be discarded.

In 2018, China banned the imports of dozens of types of solid waste from abroad, including paper and plastics. For decades, China imported the majority of the world's scraps, from plastic shampoo bottles to junk mail. The U.S. is now scrambling to find ways to sort through and process the millions of tons of waste it previously sent to China each year. Some municipalities have started tossing recycling waste into landfills. Others are using advertising campaigns to better educate people about what can and cannot be recycled, in an effort to reduce the work needed to sort through all the waste.¹⁷

As far as high-income countries go, the United States is in the middle of the pack for recycling rates although the U.S. generates far more waste than it recycles compared to other high-income countries. Germany recycles and composts nearly twice as much (66 percent) of its waste. Other countries that recover more than half of their nations' waste include Wales, Singapore, South Korea, Taiwan, The Netherlands, Austria, and Slovenia.¹⁸

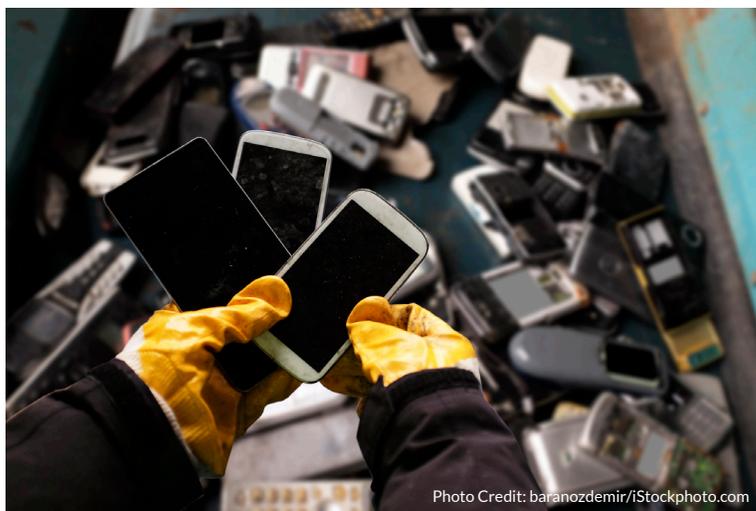


Photo Credit: baranozdemir/iStockphoto.com

A global problem

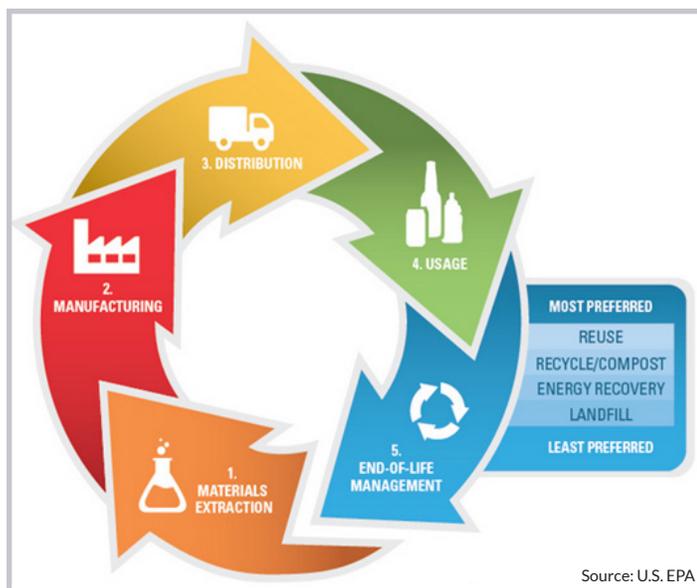
Solid waste management is essential for maintaining public health and is one of the **United Nation Sustainable Development Goals (SDGs)**. However, solid waste is also one of the most harmful local pollutants worldwide. Uncollected garbage is typically the leading contributor to local flooding and air and water pollution. Even when garbage is collected, it is usually placed in unsanitary, open dumps. In poorer countries, where waste is dumped in low-lying areas and adjacent to slums, there is the potential for infectious medical and **hazardous waste** to mix with household garbage, contaminating

groundwater and surface water supplies. Over 40 percent of the world's garbage is burned, which creates air pollution and countless health issues. For example, about 12 percent of the world's solid waste is plastic. When burned, plastic releases toxic fumes, such as dioxins, that settle on crops, soil, waterways, and then enter our food and bodies. Burning plastic also contributes to black carbon (soot) that fuels climate change.¹⁹

Per capita waste generation in lower income countries is considerably less than for high-income countries (about one-third of a pound per person per day in Ethiopia, for example, compared to nearly 5 pounds per person per day in the U.S.).²⁰ But because the world's poorest countries are experiencing the highest population growth rate, there is a lack of infrastructure needed to adequately deal with the growing problem of solid waste. Recycling programs in all but the most developed countries are virtually non-existent.

One of the newest challenges in global waste management is what to do with the burgeoning stream of electronic waste, or “e-waste,” from discarded cell phones, computers, televisions, and other personal electronics. E-waste contains toxic materials such as lead, mercury, arsenic and chromium, all of which can threaten wildlife and human health. The world economy generated over 53 million tons of e-waste in 2019, and worldwide, only 17.4 percent was formally collected and recycled.²¹ Much of the e-waste collected in the U.S. for alleged “recycling” or “reuse” is actually exported to less developed countries for unsafe salvage and metals recovery. Most of these receiving countries lack the capacity to safely recycle and dispose of discarded and used electronics, and as a result, face health risks from leeching chemicals. Discarded electronics also contain many raw metals, such as gold, silver, copper and platinum. In 2019, the value of raw materials from all e-waste had an estimated worth of \$57 billion.²² If all of this material was properly recycled and reused, it could reduce greenhouse gas emissions caused from extracting and processing virgin raw materials from the Earth.

The COVID-19 pandemic has shaken solid waste management practices as the demand for single-use plastic items, from face masks and latex gloves to takeout containers, has increased.²³ Despite this rise, many cities limited or halted their recycling and composting services. New York City suspended curbside compost pick-up until further notice, asking residents to instead discard food scraps with their trash. This means more solid waste ended up in landfills or was incinerated.



The future of cutting waste

Landfills, incinerators, and recycling centers are the last stops in the lifecycles of all the products the nearly 8 billion of us use. The first stage starts with resource extraction and harvesting the raw materials – 97 billion metric tons annually – that then get manufactured into an astonishing array of goods. “The lifestyles of people in the richest nations are heavily dependent on resources extracted from poorer countries,” the United Nations states.²⁴ Most of the extracted materials are nonrenewable resources – fossil fuels and minerals. Environmental costs weigh on every stage of this lifecycle of our disposable goods. In the long run, source reduction provides the most environmentally sound way of dealing with our growing solid waste problem. Even as the rate of global population growth

declines, our rate of materials use continues to grow, as societies become more affluent. Finding ways to boost economies without producing more waste will be a challenge for individuals and businesses around the globe.

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CHEAP THREADS, COSTLY IMPACTS: The Price of Fast Fashion

case study | personal consumption unit

EARTH matters

Studies For Our Global Future

The fashion industry is infamously fickle and prone to quick changes. Members Only jackets, Ed Hardy paraphernalia, and puka shell necklaces may have been the height of style in years past, but the ephemeral nature of trends means that even the most popular designs can be destined for the waste bin.

The internet and other forms of mass communication have gotten this sartorial wheel of time to spin faster than it ever has before. Social media has seized the trend-setting power from heavyweights like *Vogue* and *Elle*, and decentralized it across a much wider swath of the population. Popular style has atomized into a flurry of different approaches to dressing in the modern era with short, but viral trends on TikTok and Instagram influencing wardrobe choices.

And you certainly won't have any trouble finding clothes. While walking into Macy's in search of the perfect wallet chain might have once consumed an entire afternoon, the proliferation of thousands of online-only clothing retailers makes it a matter of a few clicks to find the hyper-specific clothing item of your dreams. Better yet, these brands massively undercut their competitors, selling shirts for \$4 and jumpsuits from \$5. Such bargains, plus the thousands of items available, have turned retailers like Shein and Fashion Nova into powerful market players, offering a level of choice to consumers unlike anything seen before.¹



Unfortunately, the dubious quality of this clothing lands these retailers firmly in the realm of **fast fashion**, or poorly-made, mass market clothing and accessories that are expected to only be worn a few times before they fall apart. In fact, this new fashion is so shoddily constructed that a term has arisen to separate them from quintessential, fast fashion retailers like Zara or H&M. **Ultra fast fashion** now describes retailers that exclusively sell online for comically cheap prices while remaining vague about fundamental aspects of their companies.² These basic details – such as who owns the company, what country it originates from, and where products are manufactured – are hidden by the company's entirely digital footprint. Laws that regulate labor conditions and environmental impact typically only apply to companies with physical locations within a country, and are more difficult to enforce with online-only stores.³

The trend toward fast fashion has accelerated in recent years and shows no signs of abating. And while it may be entertaining or even aspirational to watch TikTok stars revealing the hundreds of items of clothing they can get for \$500, the consequences of ultra fast fashion for both laborers and the environment are too pressing to ignore.

A bad look for the environment

Well into the 20th century, a person might only own a few pieces of clothing at any given time, and these garments were expected to last years and withstand numerous repairs. People's wardrobes have expanded as advancements in technology made it easier to produce large quantities of clothing at less cost. The fast fashion industry has been booming for years and is projected to be worth USD\$43 billion in 2029, nearly double its valuation in 2009.

Unfortunately, clothing production is one of the most environmentally destructive industries in the world. The fashion industry, as a whole, is responsible for 10 percent of global carbon emissions— in line with those of the entire European Union.⁴ The impacts of the fast fashion industry are even more stunning when we look at pollution. Water is an intensive part of creating clothing, from growing material like cotton to dyeing textiles. All of that water is eventually expelled into rivers and oceans and amounts for 20 percent of all wastewater worldwide.⁵ Even beyond the production process, synthetic materials shed up to 35 percent of the world's **microplastics** when they are washed in typical washing machines. These microplastics cannot be removed from the water and ultimately spread into oceans, marine life, and the human food chain.

The enormous cost of this production makes the sheer amount of waste produced by the fashion industry each year all the more striking. While buying more clothing may lead to a dopamine rush, it's unlikely to significantly expand your daily repertoire. Most people wear only 20 percent of their clothes on a regular basis, with the rest of their closets filled with items that were rejected almost immediately after purchase and never worn or returned.⁶ Clothing is difficult to recycle, and the poorer construction of fast fashion items makes few of them viable to be resold. Instead, 85 percent of this textile waste is either burned or dumped into landfills. Much of this waste is shipped to countries including Ghana and Chile, creating enormous landfills whose sizes far outstrip the level of consumption found in each country.⁷



Source: Environmental Protection Agency⁸



Thousands of garment workers and their unions rally on the one-year anniversary of the Rana Plaza collapse that killed more than 1,100 garment workers on April 24, 2013 in Dhaka, Bangladesh.

Conditions for garment workers

On top of the environmental destruction, labor abuse runs rampant in fast fashion production. The majority of apparel is created by women between the ages of 18 and 24 living in low or lower-middle income countries. In Bangladesh, a particular hub for clothing production, garment workers earn on average \$96 a month, far below a comfortable wage relative to their communities. The fashion industry has also been implicated in using child labor and forced labor: dozens of countries including Turkey, Argentina, and Vietnam have been found to use these abusive labor practices. Garment workers are often already from the most marginalized classes in their communities, and work conditions in these environments can be incredibly dangerous. In 2013, a building in Dhaka, Bangladesh that contained multiple

garment factories began to show signs of structural damage. Garment workers were ordered back to work, and when the building collapsed, over one thousand people died.⁹

Thrifty and chic

As fast fashion takes over more and more of the clothing market, it can feel impossible to dress ourselves in a sustainable way. Perhaps that is why the market for thrifted, vintage, and reused clothing has grown so rapidly over the last several years. In fact, market researchers estimate that by 2030, the market value of resale clothing will be double that of fast fashion.¹⁰

Secondhand clothing has found such a reappraisal for a number of reasons. Beyond the traditional drivers, such as lower prices and the ability to find rare gems, people are taking more abstract concepts into account as they shop. As more people assess the impact of their lives on the global environment, the perception of thrifted clothing shifted from “embarrassing” to “cool.” The Internet has also made shopping for thrifted items significantly easier with sites like Depop and ThredUp making it much simpler to find specific, appealing clothing.

Dress for (eco) success

Our clothing choices have the potential to make an enormous difference for people and the planet. Two parallel visions of a clothed future have emerged: one where any style is available on instant demand and for cheap, and one that examines clothes through their effect on the environment. Our individual choices are only one aspect of fixing production problems within the fashion industry. Extended Producer Responsibility laws, which hold producers responsible for what happens to items once they are sold, are increasingly considered an option for reining in fashion waste. More and more brands are also offering clothing with sustainable lifecycles and transparent production chains. Perhaps most impactful is the rise of “slow fashion,” which emphasizes buying a small number of timeless, durable items that can last a person years.

Over the 70,000 years that people have worn clothing, fashion has served as everything from a status symbol to a sign of protest. Today, we can add another goal to that list with a style that focuses on creating an equitable, sustainable, fashionable world for everyone.¹⁰

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