STUDENT IMPACT PROJECT IDEAS

Sustainability Ambassadors

Rapidly advancing a sustainable future

ZERO WASTE

Building the Circular Economy

Take action at home, at school or in the community. Communicate your impact to peers, stakeholders, and policy makers to urge collective action. Post your actions on the map.

TOP TEN: If you are especially proud of the impact of your project, and it meets our criteria, we invite you to submit your work to our Annual Top Ten Impact Projects.

Definitions

Zero waste means that we think like nature, that we redesign the current, one-way industrial system into a circular system modeled on Nature's successful strategies where all materials at all scales cycle and interact for maximum productivity and efficiency.

A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles. What is the Circular Economy?

The Nine principles of Biomimicry: Can we apply the fundamental principles for how nature engineers everything to transform our own design, engineering, and manufacturing systems? Understanding these principles is essential because following them is how we turn biomimicry from a theory into a practical application.

EPA created the Waste Reduction Model **(WARM)** to help solid waste planners and organizations track and voluntarily report greenhouse gas (GHG) emissions reductions, energy savings, and economic impacts from several different waste management practices. WARM calculates and totals these impacts from baseline and alternative waste management practices—source reduction, recycling, anaerobic digestion, combustion, composting and landfilling. WARM can be used by individuals and organizations ranging from state and local governments, solid waste planners, students, small businesses, and other organizations interested in the GHG, energy and economic impacts from materials management decisions. https://www.epa.gov/warm

National Geographic Video 4:30: How our consumption of plastics has affected marine species deaths and increased human health risks, and it explores possible long-term solutions.

Smarter Shopping

1. **Think before you buy.** Americans shop a lot, and as a result, we have among the highest consumer water and carbon footprints in the world.

2. **Buy less and reuse or repurpose** what you already have.

3. **Buy quality, reusable products** such as non-disposable cameras, reusable or electric razors, reusable dishes and mugs and utensils and have carry your school lunch in a reusable lunch box.

Recycle Everything

1. From big appliances, to electronic devices, to styrofoam, take advantage of the King County website: What do I Do With?

Recycled Paper

1. **Use less paper or recycle it** – there are lots of ways to do this. Think, "saving paper (or plastic, glass, aluminum) equals saving water and energy."

2. **Take advantage of your digital devices** and cut back on printing.

3. **Recycle your mail** once you've read it. Better yet, get off of junk mail lists and sign up for paperless billing.

4. **If you receive a lot of newspapers,** check with your local animal shelter or SPCA since they might need them. Better yet, go digital with your newspaper subscription.

5. **Compost those paper towels.** Some forms of composting will let you include paper. Better yet, don't use paper towels. Use rags that can be washed and reused.

6. **When you do buy paper products,** look for those made from recycled content.

Recycled Plastics

1. **Plastic Calculator: Here are a couple different plastic calculators. Which one is best? Which site has the most useful background information and tips?**

    a. Carbon Footprint Plastic Calculator
    b. Omnicalculator Plastic Footprint

2. **When you have other options, avoid plastic** because it's a bad deal for the environment. Plastic manufacturing takes a lot of water and energy and it often ends up polluting our waterways, especially the ocean.

3. **Don't add to the mountain of plastic** we already have on the planet. Unless it was melted and turned into something else, every single piece of plastic ever made is still around.

4. **Don't drink bottled water.** It's the ultimate form of wasteful convenience. It takes at least as much (and often much more) water to make the bottle as the drinking water it holds. **Choose tap water** over bottled – it takes about 1.5 gallons of water to manufacture a single plastic bottle (how crazy is that?) and plastic bottles are always made from new plastic material. **Get a reusable drinking container**, fill it with your own beverage or water from a fountain and reduce the need for more packaging-intensive, single serving sizes. Recycled plastic bottles aren't refilled with water. Most plastic water, juice and soda bottles are made from virgin plastic. This fast-paced animated video hits home: The Story of Bottled Water

5. **Carry a set of reusable tableware** with you if you eat takeout a lot. All those plastic spoons, forks, sporks and knives take water and energy to make. Make it your thing and bring your own nice set with you or consider using chopsticks.

6. **Use cloth or reusable shopping bags.** Support the banning of single use plastics in your community. Google "Reusable Produce Bags, Washable Mesh Bags for Fruits and Vegetables." Pretty cool solution.

7. **Skip the compostable plastics** if a more sustainable option exists (like using washable plates and silverware). They might seem like a good idea, but most only compost under specific conditions that most recyclers and landfill operators aren't equipped to create.

Reuse or Recycle Clothes and Linens

1. **Stop and ask yourself** whether you really need that new piece of clothing.

2. **If you do really need that new top,** consider thrift stores for a wardrobe update. Thrift is in! And you can often find really great items at your local thrift store for a lot less than you'd pay for new. Complete the circle and donate your clothes to Goodwill.

3. **Have a clothing swap** with friends/co-workers/social networks and donate the leftover goods to a charity.

4. **Need to buy new clothes?** Choose organic cotton. Most cotton is grown in arid locations and with heavy pesticide use. It takes 1,320 gallons of water to produce one pound of cotton, so you can significantly lower your water footprint by buying less cotton.

Sample Classroom Problems Aligned with Standards

Earth Science Performance Expectations - NGSS-ESS3: Students use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development.

Sample Classroom Problems

1. Prove or disprove that we are entering a new geological age... the “Anthropocene.”

2. What is the relationship between energy, manufacturing, consumption and waste? Identify the most promising leverage points in the system to conserve energy and eliminate waste.

3. How do we design backwards from a time when landfills are full?

4. How do we clean plastics out of the ocean?

Life Science Performance Expectations - NGSS- LS2: Students can analyze and interpret data, develop models, and construct arguments and demonstrate a deeper understanding of resources and the cycling of matter and the flow of energy in ecosystems.

Sample Classroom Problems

1. Analyze one or more products that you use daily for its life cycle impacts on the environment and human health.

2. Build one or more interactive models for how Nature follows a “zero waste policy”.

3. Create a series of infographics on new products that use the principles of biomimicry. Design a new product using biomimicry to add to your list.

4. What are the chemical processes going on inside a pile of compost?

5. Create a model for how to compost organic materials at an industrial scale?

Physical Science / Chemistry Performance Expectations - NGSS-PS1: Students will be able to provide molecular level accounts to explain states of matters and changes between states, that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions.

Sample Classroom Problems

1. What is the chemical history (and future) of synthetic materials like plastic and styrofoam?

2. What are the chemical processes going on inside a landfill? Can we take advantage of any of these?

3. Why does plastic solar-degrade but not biodegrade?

4. Apply the principles of green chemistry to improve at least one product in your house.

5. Establish a wiki of the most promising and practical green chemistry solutions related to your everyday needs and consumer habits.

6. In building a new home, or school that is as sustainable as possible, what materials would you choose to avoid every chemical on the “Red List” in the materials petal on the Living Building Challenge?

Engineering Design Process

Definition: Engaging in the practices of engineering helps students understand the work of engineers, as well as the links between engineering and science. Participation in these practices also helps students form an understanding of the crosscutting concepts and disciplinary ideas of science and engineering; moreover, it makes students’ knowledge more meaningful and embeds it more deeply into their worldview. The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times, the solution involves designing a product that meets certain criteria and/or accomplishes a certain task. **The steps of the engineering design process** which can be both sequential and iterative include:

- Define the Problem
- Do Background Research
- Specify Design Requirements (constraints, limitations, opportunities)
- Brainstorm Solutions
- Choose the Best Solution
- Do Development Work
- Build a Prototype
- Test and Redesign

Sample Classroom Problems

1. Your curbside recycling bin that gets picked up every other week goes somewhere to be recycled somehow. Engineer a system for separating out, bundling and shipping all of the different material types in the bin and do it quickly to make sure you are handling the many tons a day coming in from around your city.

2. Design a material that functions like plastic or styrofoam but comes from organic stocks and will breakdown into useful, nontoxic elements.

3. Design an IT product like a phone or laptop where all component parts can be recycled for new applications. What are the design limitations to solving this problem?

4. Design a bike with materials that can be 100% recycled into new uses. What are the design limitations to solving this problem?

5. Design a system for mining landfills for resources.

6. Engineer a system to burn waste. What are the issues and opportunities? Who is already doing this?

7. Engineer systems to achieve zero waste at a sports stadium. Is there anyone working on this?

8. Engineer systems to achieve zero-waste in the construction and operation of a new school.

9. Design a plan for a zero-waste city. Is it possible? Where do you start?

10. Engineer systems that will help society successfully shut down landfills in your lifetime.

Stewardship, Civics and Policy Making: Students understand that stewardship practices at home and at school can have a significant collective impact on the long term sustainability of their community. When these collective practices of citizens reach a tipping point of shared value, they become a new platform for elected officials to align policies, design programs and regulations, and allocate resources that support and advance the will of the people.

1. Create a home, family or school plan to reduce food waste.

1. Create a home, family or school plan to increase recycling including e-waste.

2. Track and report the combined waste reduction practices in your community. How does measuring what matters create the conditions for more of it to happen?

3. Ban plastic bags, bottles and styrofoam food containers in your city. Which cities are leading?

4. Establish fact sheets that compare the zero waste strategies of different cities.

5. Advocate for stronger product stewardship laws in our state.

6. Develop 3 scenarios for how your city can achieve zero waste by the year 2050.

7. To engage and empower local residents and businesses in your community, create a zero waste policy framework that balances education, regulation and taxation.

8. Apprentice or job-shadow an industry professional related to zero waste.

9. Develop effective lesson plans to teach younger students about zero waste.

10. Lead a letter writing campaign to encourage businesses (local to global) to adopt a zero waste policy.

11. Establish a database of colleges that support careers in zero waste or the circular economy.

Economics and Business

1. Establish fact sheets that compare the zero waste strategies of different waste haulers.

2. Create a roadmap for how your school could go paperless including an economic argument for ending the externalization of the full cost of producing a standard piece of paper.

3. Analyze businesses in your city that have strong waste reduction and recycling programs. Rate as many businesses as possible and develop an advocacy plan with the Chamber of Commerce.

4. Establish case studies for one or more companies practicing the circular economy.

5. What is the economic value of nature's ecosystem services? Who is tracking this and how can we apply it at different scales: home, school, city, region?