Talking Trash

Students explore the relationship between trash and energy by constructing and presenting exhibits on different aspects of trash such as reducing, recycling, landfilling, and incineration.

Grade Level:

- **Elem** Elementary

Subject Areas:

- Science
- Social Studies
- Math
- Language Arts
- Technology
NEED Mission Statement

The mission of The NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

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Teacher Advisory Board

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

Energy Data Used in NEED Materials

NEED believes in providing teachers and students with the most recently reported, available, and accurate energy data. Most statistics and data contained within this guide are derived from the U.S. Energy Information Administration. Data is compiled and updated annually where available. Where annual updates are not available, the most current, complete data year available at the time of updates is accessed and printed in NEED materials. To further research energy data, visit the EIA website at www.eia.gov.
Data in this guide comes from the U.S. Energy Information Administration (EIA), The Organization for Economic Development (OECD), and the U.S. Environmental Protection Agency (EPA). The majority of the data in this guide is taken from the EPA, which updates its Advancing Sustainable Materials Management report annually.
Next Generation Science Standards

- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross cutting concepts within your required curriculum. For more details on these correlations, please visit NEED’s curriculum correlations website.

Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

Individual State Science Standards

- This guide has been correlated to each state’s individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.

Curriculum Correlations

NEED has correlated their materials to the Disciplinary Core Ideas of the Next Generation Science Standards. NEED has also correlated all of their materials to The Common Core State Standards for English/Language Arts and Mathematics. All materials are also correlated to each state’s individual science standards. Most files are in Excel format. NEED recommends downloading the file to your computer for use. Save resources, don’t print!

- Navigating the NGSS? We have What You NEED!
- NEED alignment to the Next Generation Science Standards
  - Common Core State Standards for English and Language Arts
  - Common Core Standards for Mathematics
  - Alabama
  - Alaska
  - Arizona
  - Arkansas
  - California

NEED is adding new energy workshops all the time. Want to
How to Talk Trash

Talking Trash is a cooperative learning activity. Your students will work together in small groups (two to four students) to complete exhibits on trash and energy topics. Each group will study one solid waste and energy topic, and create an exhibit to teach others about it.

This activity has been designed for classroom teachers who wish to have students create exhibits on each topic. There are many more ways to facilitate this activity in the classroom. Here are a few ideas:

- **School Activity**
  Invite all the students in your school (or in one or two grades) to tour your students’ exhibits. You may set up the exhibits in the gym, cafeteria, or hallway. Divide the visiting students into eight groups and rotate the groups through the exhibits. This will avoid a situation in which everyone is crowded around one exhibit.

- **NEED Day Activity**
  Celebrate NEED Day (National Energy Education Development Day) with Talking Trash. NEED Day is always the second to last Friday in March.

- **Community Presentation**
  Make your exhibits move! Take your exhibits to another school, community center, PTA meeting, or shopping mall. Teach others in your community about solid waste and energy and show you care!

**Objectives**

- Students will be able to describe how Americans generate waste.
- Students will be able to describe several methods for dealing with waste in the U.S.
- Students will be able to describe how waste can be turned into energy.

**Preparation**

1. Assign students to groups.

   Divide your students into eight groups. Ideally, each exhibit group should have a good leader, a good speaker, a good writer, and a good artist.

<table>
<thead>
<tr>
<th>Exhibit 1</th>
<th>Exhibit 2</th>
<th>Exhibit 3</th>
<th>Exhibit 4</th>
<th>Exhibit 5</th>
<th>Exhibit 6</th>
<th>Exhibit 7</th>
<th>Exhibit 8</th>
</tr>
</thead>
</table>

2. Make exhibit folders.

   Make an informational packet for each exhibit. Put all the materials in a folder and label it with the exhibit’s name. Each folder should include:

   - the exhibit’s fact sheet (one copy per student);
   - the exhibit’s student guide (one copy per student); and
   - additional materials you have collected.
3. Collect art supplies and materials.

Collect equipment and art supplies for students to use when making their exhibits. Supplies that might be useful include:

- Construction paper
- Bottles
- Newspapers
- Paints
- Tissue paper
- Poster board
- Aluminum foil
- Colored pencils
- Empty cardboard boxes
- Stencils
- Colored markers
- Assorted trash
- Cans
- Plastic wrap
- Crayons

4. Familiarize yourself with each exhibit topic and the information provided to better assist students as needed.

**Day 1**

**Materials**

- Exhibit folders

**Procedure**

1. Introduce the activity to students. Topics you may want to cover in your introduction include:
   - General overview of America’s trash problem
   - The topics your students will be studying (the eight exhibits)
   - How students should work together in small groups
   - A timetable for working on the exhibits and presentations

2. Divide students into groups.
   - Hand out the exhibit folders.

3. Begin work on exhibit information.
   - Review the exhibit guides and fact sheets. Instruct the students to read the fact sheets and underline the important information.
   - Have the groups write down the important and interesting facts for your approval. Make sure they have included the necessary information.

**Day 2**

**Materials**

- Exhibit folders

**Procedure**

1. Work on an exhibit plan and script.
   - Have each group develop a plan for their exhibit, including the visuals they will use, for your approval. Make sure the plan demonstrates the important information.
   - Have each student group write a draft of the script they will use to tell others about their exhibit. Make sure you approve the draft, giving suggestions for the final script.
Days 3 and 4

Materials
- Exhibit folders
- Art supplies/equipment

Procedure
1. Complete exhibits and scripts.
   - Students use Days 3 and 4 to work on their exhibits, refine their scripts, and create their quiz questions.
2. Check work.
   - Make sure all of the groups have completed their exhibits and are prepared to make their presentations on Day 5.

Day 5

Procedure
1. Have the student groups make their presentations with their exhibits.
   - Exhibit 1 should begin, followed by Exhibit 2 and so on. Allow a few moments between presentations for questions and discussion.
2. Evaluate the activity.
   - Use the questions the student groups develop to prepare a quiz for the students.
   - Use the Evaluation Form on page 35 to evaluate the activity.

Extensions
- Have the student groups make their presentations to other classes or the PTA. Use the quiz as a pre and post survey.
- Set up the exhibits in the library or cafeteria for others to see.

Technology Connection
- Instead of exhibits, have the students create digital media presentations, YouTube videos, or podcasts.
Trash

Parents have told their children for centuries, “Please take out the trash!” Trash is anything that homes and businesses throw away. It is old food, bags, boxes, jars, toys, clothes, branches, and furniture. It is paper, wood, cloth, metal, plastic, and glass.

People have always had trash. The Greek city-state of Athens opened the first dump more than 2,500 years ago. During the Middle Ages, people threw their trash out the door. They didn’t know that rotted trash could make them sick.

In the 1700s, cities began collecting their trash to get it off the streets and out of waterways. By the late 1800s, Europeans were even burning their trash and using the energy to make electricity.

America was a little different. To the colonists, the land seemed endless. When dumping on city streets became a problem, they dumped their trash outside of town. Today, we bury a little more than half of our trash in modern dumps called landfills.

Trash Tally

What do you think makes up most of the trash in this country? Paper? Plastics? Metals? The answer is paper. Paper makes up 27 percent of the trash we throw away. Plastics make up 13 percent. Some paper and plastic gets recycled. But, a good bit still goes to the landfill. Paper makes up 14% of the trash in our landfills. Plastic makes up 18%.

Manufacturers are using lightweight aluminum and plastic containers instead of heavy steel and glass containers. There aren’t fewer containers on America’s grocery shelves. They just weigh less.

Does this make landfills last longer? A plastic ketchup bottle takes up more space in a landfill than a glass ketchup bottle. At a landfill,
bulldozers crush the trash and bury it under clay and dirt. Some materials can be crushed more than others. The glass ketchup bottle smashes into tiny pieces, taking up less space than the plastic bottle, which squashes down but stays whole. Yard and food waste get very small in landfills.

**What We Do Today With Trash**

1. **We bury it in landfills.**

   We put lots of trash into landfills that we could recycle or burn. We are wasting resources and energy when we throw things away that we could use again.

2. **We recycle it.**

   We recycle over one-third of our trash today. We could recycle a lot of the trash that goes into landfills. How many times do you throw something away that could be recycled?

3. **We burn it in waste-to-energy plants to make electricity.**

   We could burn a lot of the trash that we put in landfills to use its energy. When we burn trash, we use the energy to make electricity instead of throwing it away.

**Ways to Take Care of Trash**

How can we solve America's waste disposal problem? There is no single answer. Most experts agree that we should use four steps to manage our waste problem in this order:

1. **Source Reduction**
   Reducing the waste we produce in the first place.

2. **Recycling**
   Using old products to make new products.

3. **Waste-to-Energy**
   Burning trash to produce steam and electricity.

4. **Landfilling**
   Burying waste that should not be burned or recycled.
Four Pounds of Trash

Think about all the things you throw away every day. You wake up in the morning and eat breakfast. You throw away a napkin or a wrapper or an empty cereal box.

You go to school. You use paper for math and reading. In art, you use more paper. At lunch, the trash cans are full of trays, juice boxes, sandwich bags, and uneaten lunches.

After school, you throw away more trash. By the end of the day, the average American has created over four pounds of trash. This is more than people in most other countries.

Data: OECD, most complete data available
Reducing Waste

Reducing waste means cutting down on the amount of trash that is created in the first place. This means there will be less trash to be recycled, burned, or buried. Packaging—the materials we wrap products in—is a good place to start. Packaging is the single largest type of trash.

Look at the products in the grocery store. Bread is wrapped in plastic bags. Soup comes in cans. Cookies are in plastic trays inside paper or plastic bags. Packaging is useful. The bread wrapper keeps the bread fresh and clean. The metal can keeps the soup fresh for months. The plastic tray keeps the cookies from getting crushed.

Packaging is a simple and clean way to move and store food and other products. Packaging is a problem, too. Packaging makes up about 30 percent of the trash we generate, and makes up 22 percent of the trash discarded in our landfills.

Changes in Packaging

Companies are making products with less packaging. CDs used to be packaged in cardboard packages twice the size of the CDs. Today, most CDs are in small plastic cases or cardboard sleeves. Many of us don’t even purchase CDs, and music is purchased digitally. Some artists opt for digital purchasing only, to help put less waste into the environment.

Companies are using less material to make bottles, jars, and cans. Today’s two-liter plastic bottles and individual water bottles are around 25 percent lighter than they used to be and bottle caps are smaller. Glass jars are often up to 45 percent lighter. A pound of aluminum used to make 22 cans; today it makes 34.

A drink box is four percent packaging by weight and 96 percent drink. A glass bottle is 37 percent packaging by weight and 63 percent drink. Disposable diapers are thinner. Ice cream cartons weigh 30 percent less. When McDonald’s® made its drinking straws 20 percent lighter, it cut out one million pounds of trash a year.
Taking Action: What You Can Do

- You can reduce trash at home.
- You can buy products with less packaging.
- You can reuse, repair, and recycle products instead of throwing them away.

Reduce

- Buy one large package instead of two small ones.
- Buy products that do more than one thing—shampoo with conditioner, for example.
- Buy concentrated products, such as frozen juice, cleaners, and fabric softener you mix with water at home.
- Look for products with only a little packaging. You will use fewer natural resources, and you will have less to throw away.
- When you mow your lawn, leave the grass clippings on the ground. Grass clippings rot quickly, adding nutrients to the soil.

Reuse

- Buy reusable products, such as rechargeable batteries.
- Pass on or donate magazines, catalogues, and books to neighbors, hospitals, schools, shelters, and nursing homes.
- Reuse plastic or glass containers to store food and other items.
- Reuse plastic shopping bags and boxes.
- Reuse wrapping paper, gift bags, and bows. Use the Sunday comics to wrap birthday presents.

Repair or Repurpose

- Try to repair broken items before you buy new things such as lawn mowers, tools, vacuum cleaners, and TVs.
- Donate items you can’t repair to local charities.
- Keep appliances in good working order. They will last longer.

Recycle

- Buy items that can be recycled.
- Buy items made from recycled materials.
- Recycle newspapers, plastics, cardboard, glass, and cans.
- Start a recycling program if there isn’t one in your school or community.

Compost

- Compost yard and kitchen waste. It makes good fertilizer and improves the soil.
Exhibit 3—Introduction to Recycling

What is Recycling?
Recycling means to use something again. Old newspapers are used to make new newspapers. Old aluminum cans are used to make new aluminum cans. Old glass jars are used to make new glass jars. There are many reasons why recycling makes sense.

- **Recycling Saves Landfill Space.**
  Americans make more trash each year. More than half of our trash is buried in landfills. Recycling is one way to reduce the amount of trash that is buried.

- **Recycling Saves Money.**
  Getting rid of trash isn’t free. Garbage trucks must pay to dump their loads at landfills. Recycling reduces landfill costs because less waste is buried.

- **Recycling Saves Energy.**
  It almost always takes less energy to make a product from recycled materials than it does to make it from new materials. Recycling aluminum cans, for example, uses 95 percent less energy than making aluminum cans from new materials.

  One exception to the rule is plastics. Sometimes it takes more energy to recycle plastics than it does to use new materials.

### Things We Recycle, 2014

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage of Material Recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto (Lead-Acid) Batteries</td>
<td>99%</td>
</tr>
<tr>
<td>Newspapers/Mechanical Papers</td>
<td>68%</td>
</tr>
<tr>
<td>Steel Cans</td>
<td>71%</td>
</tr>
<tr>
<td>Yard Trimming</td>
<td>61%</td>
</tr>
<tr>
<td>Aluminum Cans</td>
<td>55%</td>
</tr>
<tr>
<td>Tires</td>
<td>41%</td>
</tr>
<tr>
<td>Glass Containers</td>
<td>33%</td>
</tr>
<tr>
<td>HDPE Natural Bottles</td>
<td>30%</td>
</tr>
<tr>
<td>PET Bottles and Jars</td>
<td>31%</td>
</tr>
<tr>
<td>Major Appliances</td>
<td>58%</td>
</tr>
<tr>
<td>Corrugated Boxes</td>
<td>90%</td>
</tr>
<tr>
<td>Clothing and Foot Wear</td>
<td>16%</td>
</tr>
</tbody>
</table>

Data: Environmental Protection Agency
Recycling Saves Natural Resources.

Natural resources are valuable. Natural resources include land, plants, minerals, and water. By using materials more than once, we conserve natural resources.

In the case of paper, recycling saves trees, water, and energy. Preventing one ton of paper waste by recycling it saves 15-17 mature trees and 7,000 gallons of water.

Recycling Reduces Air and Water Pollution.

Using old cans instead of raw materials to make new aluminum cans reduces air and water pollution by 95 percent.

Things We Recycle

This chart shows you some of the things we recycle and how we go about recycling them.

<table>
<thead>
<tr>
<th>Material</th>
<th>Can Be Recycled</th>
<th>Can’t Be Recycled</th>
<th>How To Do It</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>Jars, bottles (clear, green, amber), CFL bulb</td>
<td>Dishes, pyrex, crystal</td>
<td>Rinse, remove lids and separate by color. Labels can stay.</td>
</tr>
<tr>
<td>Paper</td>
<td>Newspapers, boxes, egg cartons, phone books, white office paper</td>
<td>Waxed, glued, plastic, or foil coated</td>
<td>Keep clean and dry.</td>
</tr>
<tr>
<td>Aluminum</td>
<td>All aluminum—cans, pie pans, foil wrap, old windows, lawn furniture</td>
<td>All is recyclable. (Aluminum does not stick to a magnet.)</td>
<td>Rinse and crush.</td>
</tr>
<tr>
<td>Steel</td>
<td>Steel (tin) food and drink cans, cast iron, sheet metal</td>
<td>All is recyclable. (Steel does stick to a magnet.)</td>
<td>Rinse and crush, if possible. Labels can stay.</td>
</tr>
<tr>
<td>Plastics</td>
<td>Plastic bottles and containers (milk jugs, soda bottles)</td>
<td>Check with your recycler.</td>
<td>Rinse and remove lids. Labels can stay.</td>
</tr>
</tbody>
</table>
Where To Recycle

Many people think the United States should recycle more of its waste. Here are some ways that people recycle:

- **Curbside Collections**
  People leave their recyclables at the curb or in some other place where regular trash is picked up. Curbside collection has the highest recycling rates. Experts say if every area, town, and building did curbside collection, we could reduce trash by 25 percent.

- **Drop-Off Centers**
  In some areas, people bring their recyclables to collection centers. This costs less than curbside collection, but many people don’t bother to recycle if they have to take it somewhere.

- **Reverse Vending Machines**
  In many places, there are machines that take used cans and pay a rebate on the spot. Reverse vending machines are convenient because they are usually located inside or outside grocery stores.

- **Pick-Up by Volunteers**
  This is recycling the old-fashioned way. Community groups, such as church groups, the Boy Scouts, and even school groups, can collect recyclables to raise money. These groups can pick up aluminum and newspapers because they are worth more than other recyclables. Other groups may have drop-off dumpsters and bins at their meeting place.

How Different Places Recycle

Some places have laws that require people to recycle. People who do not recycle can be fined or their trash may not be picked up. About half of the people recycle in these communities.

Some places have pay-as-you-throw programs. People are charged for each trash can they put out. This encourages them to recycle.
Exhibit 4—Recycling Metals

In the U.S., the metals we mainly recycle are aluminum and steel. Some other metals—like gold, silver, brass, and copper—are so valuable that we rarely throw them away. They do not create a trash problem.

We use a lot of aluminum and steel. Americans use 100 million steel cans and 200 million aluminum cans every day. Recycling is the best way to deal with aluminum and steel waste.

Burning metal trash is not good because metals do not provide any heat energy. Aluminum melts and steel just gets very hot.

Burying is usually not a good idea either. Aluminum, especially, is so valuable that it does not make sense to bury it.

Recycling Aluminum

Like most metals, aluminum is an ore. An ore is a mineral that is mined for a valuable material in it. Bauxite, a reddish clay-like ore, is rich in aluminum. To get the aluminum out, though, takes a huge amount of energy.

That is why recycling aluminum makes sense. It saves energy—a lot of energy. Recycling just four aluminum cans saves as much energy as the energy in one cup of gasoline. Companies save energy and money by using recycled aluminum, so they will pay you for your old cans—about a penny for every can.

After you have put your old aluminum cans in a recycling bin, what happens next? The old aluminum cans are taken to an aluminum plant. The cans are shredded into potato chip sized pieces and put into a furnace. The melted aluminum is made into thin sheets.

The sheets are usually made into new aluminum cans. This is called closed-loop recycling because the old cans are turned into the same thing again. Aluminum cans are recycled into new cans and put back onto store shelves within 60 days!
Aluminum Can Recycling

1. You enjoy your favorite beverage in an aluminum can.

2. You are a good “sort.” You put the aluminum can into a bag or bin for recycling.

3. A recycling company takes the cans to a recycling plant. The aluminum is shredded and melted.

4. The molten aluminum is gradually hardened into ingot form.

5. The ingots are made into flat sheets that canning and bottling companies buy.

6. The aluminum sheets are made into new cans, and the cycle begins again.

Over and Over

Aluminum can be recycled over and over again. It does not lose its quality, and recycling it saves money, energy, and natural resources every time. Today in the U.S. we only recycle 55% of our aluminum cans.

Steel Recycling

Steel is the most recycled metal. We recycle huge amounts of steel from cars, appliances, old buildings, and bridges. Today, all steel products are made with some recycled steel.

You can help at home by recycling steel cans. The cans with your soup, your dog’s food, and Mom’s coffee are made of steel. In fact, about 90 percent of all metal food containers are made of steel.

You have probably heard people call a steel can a tin can. Steel cans are sometimes called tin cans because the inside is coated with a thin layer of tin. Tin protects the food in the can.

Saving Energy by Recycling Steel

Americans use millions of steel cans every day. For every 100 used, 71 are recycled. For every ton of steel recycled, we save:
- 2,500 pounds of iron
- 1,400 pounds of coal
- 120 pounds of limestone
- Enough energy to power the city of Los Angeles for 8 years
The ABC’s of Steel

Steel and aluminum are both mined from ores and are made in a similar way.

Steel recycling saves a lot of energy. It takes 75 percent less energy to make steel from recycled materials than it does from iron ore. That’s why today’s steel makers always use some steel scrap to make new steel products.

Steel is the easiest material to separate from the rest of the trash. Steel is attracted to magnets. If you’re not sure which cans are steel and which are aluminum, use a magnet to separate them. Steel will stick to the magnet; aluminum will not.

Recycling your used steel cans at home is easy, too. All you need to do is rinse the food from the cans and place the cans in a recycling bin. That’s it.

Recycling Steel

Steel can recycling is like aluminum can recycling. Steel is melted in a furnace and then flattened into sheets.

Recycled steel cans can be made into new cars, girders for buildings, or new food cans. Like aluminum, steel can also be recycled again and again. It does not lose any of its strength or quality in the recycling process. It can be a never-ending process that continues to save energy and resources.
Exhibit 5—Recycling Paper and Glass

Recycling Paper


Paper is the number one material that we throw away. Of every 100 pounds of trash, 27 pounds are paper. Paper, cardboard, and paperboard make up 14 percent of the trash sent to landfills.

There are many kinds of paper. It can be glossy or ragged, thin or thick. It can be for newspapers or stuffing diapers. Most paper products are made from trees, though paper can also be made from old cloth or grass.

According to the American Forest and Paper Association, nearly 80 percent of America's paper mills are designed to use paper collected in recycling programs, and they depend on paper recycling to supply the raw materials they need to make new paper. Manufacturing new paper products from recycled paper uses 40 percent less energy than making paper from new wood pulp.

How Paper is Made

Papermaking uses a renewable resource—trees! The first step is cutting down the trees. Paper companies plant trees just for papermaking, like an apple farmer plants apple trees. If one tree is cut down, another is planted.

After the trees are cut, they are taken to a paper mill. Paper mills use every part of the tree so that nothing is wasted. The bark and roots are burned and used for energy to run the paper mill. The rest of the tree is chopped into small chips to be made into paper. The raw paper is the color of grocery bags. Good papers are whitened with bleach and sometimes coated with clay to make them shiny.

Pulp, paper, and wood product mills need a lot of energy to make paper. They generate, on average, 65 percent of their energy needs on site by burning wood scraps they cannot use to make paper. They buy the rest of the energy they need.
Recycled Paper

Recycled paper is made from waste paper, usually mixed with new materials. Almost all paper can be recycled today, but some types are harder to recycle than others. Papers that have wax, paste, or gum—or papers that are coated with plastic or aluminum foil—are usually not recycled because the process is too expensive.

Even papers that are recycled are not usually recycled together. Waste papers must be sorted. Newspapers and corrugated boxes (cardboard boxes) can’t be mixed together for recycling. Today, about 68 percent of newspapers and 90 percent of corrugated cardboard boxes are recycled.

Not Always Recyclable

Paper cannot be recycled over and over again. After a few times, the paper becomes too weak to be used again. That is why new paper fiber is usually mixed with recycled paper. Most corrugated boxes contain 35 percent recycled content.

Saving Energy

Paper recycling saves energy. Making recycled paper also uses fewer chemicals and bleaches than making all-new paper. Paper recycling means fewer trees are used to make paper. All new paper is almost always made from trees grown just for papermaking. A tree harvested for papermaking is soon replaced by another tree, so the cycle continues.

One Ton of Recycled Paper Saves:

7,000 Gallons of Water
15-17 Trees
Almost 6,000 kWh of electricity
One metric ton of greenhouse gas emissions

Data: EPA and EIA
The World of Glass

Glass is used to package many foods: juices, jellies, baby food, and more. Glass makes up four percent of trash, and it makes up five percent of landfill waste. The best way to deal with glass trash is to recycle it.

Burning glass in waste-to-energy plants is not a good choice. Glass does not provide any heat energy. Burying glass recovers none of its value either. So, recycling is usually the best choice.

Recycling glass is a good energy saver. Using recycled glass to make new products uses less energy than making it from new materials. It saves energy because crushed glass melts at a lower temperature than the raw materials used to make glass. New glass is made from sand, soda ash, and limestone.

Old glass is easily made into new glass jars and bottles that can be recycled over and over again. The glass doesn’t wear out.

How to Recycle Glass

Preparing glass containers for recycling is easy. All you need to do is remove the lids or caps and rinse the containers in water. You don’t need to scrub off the labels, since they will burn up when the glass is melted.

Recyclers sort glass containers by color—clear, green, and amber (golden brown). Once glass has been colored, the color cannot be removed. That means a maker of clear glass jars cannot use colored glass.

You cannot recycle all glass products. Ceramics, some light bulbs, mirrors, windows, and dishes are not made with the same materials as glass jars and bottles. Still, it’s the bottles and jars that we throw away every day, not the light bulbs and dishes, that make up most of our trash. Today we recycle a little more than 32% of the glass containers, bottles, and jars we use.
Exhibit 6—Recycling Plastics

It’s Plastic!
We use plastic products more all the time. We cover our food in plastic wrap, drink hot chocolate from Styrofoam® cups, wear clothes made from nylon, polyester, and rayon, and even buy our plastic things with plastic credit cards! We use plastic hundreds of times every day.

What is Plastic?
The basic raw materials for plastic usually come from petroleum and/or natural gas. These fossil fuels are sometimes combined with other elements, such as oxygen or chlorine, to make different types of plastic. Plastic can be soft or hard, clear or colored. It can look like leather, wood, or silk. It can be made into toys or heart valves. There are more than 10,000 different kinds of plastics.

Plastics are energy efficient. It takes less energy to make a plastic ketchup bottle than a glass ketchup bottle. And since plastics are lightweight, it takes less energy to ship a truckload of plastic bottles than a truckload of glass bottles.

Disposing of Plastic
Is plastic trash choking the Earth with Styrofoam® cups and fast-food plates? Not really. Plastics make up about 13 percent of America’s trash. Plastics are generally very lightweight, and they make up 18 percent of the trash sent to landfills.

Burying plastics is not always the best thing to do. There are other choices—recycling and burning. Recycling recovers the raw material, which can be used to make new plastic products. Burning recovers the energy, which can be used to make electricity. Burying plastics does neither of these things. The value of the plastic is buried forever.
Recycling Plastics
Recycling plastics is easy. You need to know what types of plastics can be recycled. Every plastic container has a code on it to tell you what kind it is. Plastics are made of different materials and should be sorted before they are recycled. Mixed plastics can be recycled, but they are not as valuable as sorted plastics.

Once you know what kinds of plastics you can recycle, you should rinse the container and squash it. You can leave the paper labels on the containers, but throw away the plastic caps. Plastic caps are made from a different plastic than the container and cannot be easily recycled.

Energy to Burn
Plastics are made from fossil fuels. Pound for pound, plastics contain as much energy as petroleum or natural gas. That is much more energy than other types of trash. This makes plastic a good fuel for waste-to-energy plants. Waste-to-energy plants turn trash into electricity.

Should we burn or recycle plastics? It depends. Sometimes it takes more energy to recycle plastics than it does to use new materials. In that case, it’s better to burn the plastics at a waste-to-energy plant than to recycle them.

Decoding Plastics

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PET or PETE</td>
<td>Polyethylene Terephthalate</td>
<td>Two-liter beverage bottles, mouthwash bottles, boil-in-bag pouches</td>
</tr>
<tr>
<td>2 HDPE</td>
<td>High Density Polyethylene</td>
<td>Milk containers, trash bags, detergent bottles</td>
</tr>
<tr>
<td>3 PVC</td>
<td>Polyvinyl Chloride</td>
<td>Cooking oil bottles, pipes, packing around meat</td>
</tr>
<tr>
<td>4 LDPE</td>
<td>Low Density Polyethylene</td>
<td>Produce bags, food wrap, bread bags</td>
</tr>
<tr>
<td>5 PP</td>
<td>Polypropylene</td>
<td>Yogurt containers, shampoo bottles, straws, margarine tubs, diapers</td>
</tr>
<tr>
<td>6 PS</td>
<td>Polystyrene</td>
<td>Hot beverage cups, egg cartons, meat trays, CD cases</td>
</tr>
<tr>
<td>7 Other</td>
<td>All other types of plastics or packaging made from more than one type of plastic</td>
<td></td>
</tr>
</tbody>
</table>
Steps in Recycling Plastic

1. Inspection
Workers inspect the plastic trash for contaminants like rock and glass, and for plastics that the plant cannot recycle.

2. Washing and Chopping
The plastic trash is washed to remove any contaminants and is chopped into flakes.

3. Flotation Tank
If mixed plastics are being recycled, they are sorted in a flotation tank, where some types of plastics sink and others float.

4. Drying
The plastic flakes are dried in a tumble dryer.

5. Melting
The dried flakes are fed into an extruder in which heat and pressure melt the plastic. Different types of plastics melt at different temperatures.

6. Filtering
The molten plastic is forced through a fine screen to remove any contaminants that remain after the washing process. The molten plastic is then formed into long strands.

7. Pelletizing
The strands are cooled in water, then chopped into uniform pellets. Manufacturing companies buy the plastic pellets from recyclers to make new products. Recycled plastics also can be made into flower pots, lumber, and carpeting.
Exhibit 7—Burning Trash

Americans are producing more waste every year. In 1960, the average American threw away 2.7 pounds of trash a day. Today, the average American throws away 4.4 pounds of trash! What are we going to do with all that trash?

One answer is to burn it. Some of our trash is full of energy. We can burn it to heat buildings or make electricity. We burn about 13 percent of our trash today.

Why Burn Trash?

Waste-to-energy plants make enough electricity for millions of houses. Burning our trash also reduces the amount we have to bury in landfills. Why is reducing the trash going to landfills so important? Landfills take up lots of land and land is valuable. Some areas are running out of land for new landfills. Most people don’t want landfills near their homes.

Some people worry that burning trash might hurt the environment. Waste-to-energy plants can pollute the air if they are not managed well. People also worry that burning waste will hurt recycling programs. If everyone sends their trash to a waste-to-energy plant, they say, there will be no reason to recycle.
Burn or Recycle?

So, what’s the real story? Recycling and burning can work together. It makes good sense to recycle some materials, and better sense to burn others.

Let’s look at metals. Aluminum and steel can be recycled over and over. Burning them produces no heat energy. Metals are valuable to recycle and not useful to burn. Glass is another material that should be recycled. Burning glass produces no heat energy.

Paper is made of wood and has energy in it. It can be either burned or recycled. Shiny and colored papers are not easily recycled and should be burned for their energy. Other papers should be recycled if there is a demand for the paper. If there is too much paper, it should be burned.

Plastics are another matter. Because plastics are made from petroleum and natural gas, they are good fuels for waste-to-energy plants. Plastics are not as easy to recycle as steel, aluminum, or paper. Sometimes it costs more to recycle plastic than to make new plastic. In that case, plastic should be burned.

Recycle or Burn?

<table>
<thead>
<tr>
<th>Material</th>
<th>Recycle Value</th>
<th>Heat Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>Recycling saves money, energy, and natural resources.</td>
<td>Provides no heat when burned.</td>
</tr>
<tr>
<td>Glass</td>
<td>Recycling saves money, energy, and natural resources.</td>
<td>Provides no heat when burned.</td>
</tr>
<tr>
<td>Paper</td>
<td>Recycling some paper saves money, energy, and natural resources.</td>
<td>Provides heat when burned.</td>
</tr>
<tr>
<td>Plastics</td>
<td>Recycling some plastics saves money, energy, and natural resources.</td>
<td>Provides heat when burned.</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>Composting makes good fertilizer.</td>
<td>Provides heat when burned.</td>
</tr>
</tbody>
</table>

The Energy in Trash

Trash is a mix of energy-rich fuels. In 100 pounds of trash, more than 80 pounds can be burned as fuel to make electricity. Those fuels include paper, plastics, and yard waste.

Trash doesn’t have as much energy as coal. It takes 2,000 pounds of trash to equal the energy in 500 pounds of coal.
Who Burns Trash?

Many countries have waste-to-energy plants to capture the energy in their trash. Forty-one countries worldwide used trash to generate more than 93 million kilowatt-hours of electricity in 2014. For example, the use of waste-to-energy plants in some European and Asian countries has grown, in part because they have little open space and few energy resources. And some countries, such as Germany, have a government imposed ban on putting certain biodegradable wastes into landfills. Germany relies heavily on waste-to-energy and has an exceptional recycling rate, too.

In the United States, there are roughly 80 waste-to-energy plants in operation in more than 20 states. These plants can process more than 95,000 tons of municipal solid waste every day. Burning trash is the fuel source to generate electricity in waste-to-energy plants. This electricity is often used for base load power, and is considered a renewable source of energy.
For hundreds of years, people used dumps to get rid of their trash. The dump was just a pit or field outside of town where people left their trash.

People tossed all sorts of waste into these dumps. The dumps were breeding grounds for flies, mosquitoes, and rats. Rainwater washed filthy, and sometimes poisonous, liquids from the dump into streams and groundwater supplies that people used for drinking, bathing, and clothes washing.

Today, we still bury our trash, but not in the open dumps of yesterday. About 53 percent of our garbage is hauled off in garbage trucks and put into landfills. Landfills are America’s number one way of getting rid of trash.

Building new landfills is hard because people don’t want trash buried near them. It is expensive, too. A new landfill can cost $10 million to build.

There will always be a need for landfills. Why? Because not all waste can be recycled or burned. How do you recycle a broken light bulb, and why burn it if it doesn’t provide any energy?

Landfill burial is the only good way to dispose of some types of waste. Sometimes it’s the safest way, too. The best way of taking care of some dangerous wastes—small batteries, paints, pesticides, and some light bulbs, to name a few—are landfills. The landfills are made to keep dangerous wastes from seeping into underground water supplies.

Some wastes with harmful chemicals, such as paints, should be taken to special facilities for disposal rather than placed in regular trash containers.
A Modern Landfill

Today’s landfills are very different from the dumps of the past. The landfills are lined with layers of clay or plastic to keep any liquid waste from escaping into the soil.

A network of drains collects the liquid and pumps it to the surface where it can be treated. Wells are drilled around the landfill to check the groundwater and make sure it is clean.

At the end of each day, workers spread a layer of earth—called the daily cover—over the trash to reduce odor and control pests.

A Full Landfill

When an entire landfill is full, workers seal the whole landfill with a final cover of clay and dirt, and then seed the area with native grasses. Workers continue to check the wells for years after a landfill is closed to make sure nothing is leaking into the water.

Closed landfills can be turned into parks, parking lots, golf courses, and ski slopes. Building homes and businesses on landfills isn’t allowed, though, since it can take many years for the ground to settle.
Exhibit 1: Introduction to Trash

Your exhibit will teach visitors about trash. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - What is trash?
   - What is the history of trash?
   - What do we do with our trash?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - trash items that are not recycled
   - books
   - recycled items
   - games
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.

Exhibit 2: Reducing Waste

Your exhibit will teach visitors about reducing waste. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - How can we cut down on the amount of trash?
   - What does it mean to reduce, reuse, repair or repurpose, and recycle?
   - How does packaging affect the amount of trash we throw away?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - trash items that are not recycled
   - books
   - recycled items
   - games
   - items with too much packaging
   - items with very little packaging
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.
Exhibit 3: Introduction to Recycling

Your exhibit will teach visitors about the concepts of recycling. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - What is recycling?
   - Why should we recycle?
   - What can be recycled?
   - What are different ways to recycle?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - recycled items
   - games
   - items that should not be recycled
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.

Exhibit 4: Recycling Metals

Your exhibit will teach visitors about recycling metals. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - Why should we recycle aluminum and steel?
   - How is aluminum recycled?
   - How is steel recycled?
   - How can you separate aluminum from steel cans?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - recycled metal items
   - games
   - aluminum and steel cans with a magnet
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.
**Exhibit 5: Recycling Paper and Glass**

Your exhibit will teach visitors about recycling paper and glass. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - How is paper recycled?
   - How is glass recycled?
   - Should we always recycle paper?
   - When should we recycle glass?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - recycled paper and glass items
   - games
   - items that should not be recycled
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.

**Exhibit 6: Recycling Plastics**

Your exhibit will teach visitors about recycling plastics. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.
2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - What is plastic?
   - How are plastics recycled?
   - Should we always recycle plastics?
   - What are other ways to dispose of plastics?
3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - recycled plastic items
   - games
   - different types of plastics
4. Write a script you can use to tell visitors about your exhibit.
5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.
**Exhibit 7: Burning Trash**

Your exhibit will teach visitors about burning trash. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.

2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - What is a waste-to-energy plant?
   - Why should we burn our trash?
   - What kinds of trash are good to burn?
   - Why do people not like waste-to-energy plants?

3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - items that should be burned
   - games
   - items that should not be burned

4. Write a script you can use to tell visitors about your exhibit.

5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.

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**Exhibit 8: Landfills: Burying Trash**

Your exhibit will teach visitors about landfills. Use words, pictures, and objects to explain the ideas. Have things to touch and do. Use your fact sheets and other resources to find information.

1. Read your fact sheets and underline the important and interesting facts.

2. Make a list of the facts you want to teach your visitors. Be sure visitors can answer the following questions:
   - What is a landfill?
   - What should we bury in a landfill?
   - How are landfills different today?
   - What are the problems with landfills?

3. Make a plan for your exhibit. Here is a list of things you can include in your exhibit:
   - pictures
   - charts and graphs
   - models
   - books
   - items that should be buried
   - games

4. Write a script you can use to tell visitors about your exhibit.

5. Write down three questions and answers to use for a quiz and give them to your teacher. Make sure the questions cover the most important facts from your exhibit.
Youth Energy Conference and Awards

The NEED Youth Energy Conference and Awards gives students more opportunities to learn about energy and to explore energy in STEM (science, technology, engineering, and math). The annual June conference has students from across the country working in groups on an Energy Challenge designed to stretch their minds and energy knowledge. A limited number of spaces are available for Full STEM Ahead, a special two-day pre-conference event, which allows students access to additional information, time to discuss energy with their peers, and access to industry professionals. The conference culminates with the Youth Awards Ceremony recognizing student work throughout the year and during the conference.

For More Info: www.youthenergyconference.org

Youth Awards Program for Energy Achievement

All NEED schools have outstanding classroom-based programs in which students learn about energy. Does your school have student leaders who extend these activities into their communities? To recognize outstanding achievement and reward student leadership, The NEED Project conducts the National Youth Awards Program for Energy Achievement.

Share Your Energy Outreach with The NEED Network!
This program combines academic competition with recognition to acknowledge everyone involved in NEED during the year—and to recognize those who achieve excellence in energy education in their schools and communities.

What’s involved?
Students and teachers set goals and objectives and keep a record of their activities. Students create a digital project to submit for judging. In April, digital projects are uploaded to the online submission site.

Want more info? Check out www.NEED.org/Youth-Awards for more application and program information, previous winners, and photos of past events.
Talking Trash
Evaluation Form

State: ___________  Grade Level: ___________  Number of Students: __________

1. Did you conduct the entire activity?  □ Yes  □ No

2. Were the instructions clear and easy to follow?  □ Yes  □ No

3. Did the activity meet your academic objectives?  □ Yes  □ No

4. Was the activity age appropriate?  □ Yes  □ No

5. Were the allotted times sufficient to conduct the activity?  □ Yes  □ No

6. Was the activity easy to use?  □ Yes  □ No

7. Was the preparation required acceptable for the activity?  □ Yes  □ No

8. Were the students interested and motivated?  □ Yes  □ No

9. Was the energy knowledge content age appropriate?  □ Yes  □ No

10. Would you teach this activity again?  □ Yes  □ No

Please explain any ‘no’ statement below.

How would you rate the activity overall?  □ excellent  □ good  □ fair  □ poor

How would your students rate the activity overall?  □ excellent  □ good  □ fair  □ poor

What would make the activity more useful to you?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Other Comments:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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Manassas, VA 20110
FAX: 1-800-847-1820
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