Resource Revival

Subjects:	Science, Social Studies
Grades:	4-8
Length:	60 minutes
Focus:	Natural Resources

Rationale:

Humans use natural resources everyday of their lives. However, some resources are diminishing at a faster rate than can be replenished and some are completely non-renewable to begin with. By introducing to students the importance of natural resources in our lives, students will learn how their personal choices can affect the environment. As the health of our planet continues to decline as the result of human activity, more and more people are looking at our planet's resources more closely.

Objectives:

The overall purpose of this lesson is to introduce the concept of natural resources and what they mean to humans and the environment. Through short activities, students will recognize that many resources might be diminishing faster than we think.

Students will:

- Define renewable, non-renewable, and perpetual resources and will learn examples of each kind.
- Define fossil fuels, sustainable yield, and other terms.
- Participate in activities that model human use of resources

---

Background:

Natural resources are the raw materials that humans use for everyday things such as housing, clothing, heating, cooking, transportation, and so on. They include the air we breathe, the water we drink, the land we farm, and the space we use for living and recreation. Natural resources are all the things we use in our physical environment to meet our needs and wants. The only natural resource that we use that does not come from somewhere on earth is sunlight. Without resources, we would not survive. Some examples of our use of natural

resources: Natural resources can be categorized into three categories: ***renewable, nonrenewable*** and ***perpetual***.

Some examples of common everyday items and the resources that they come from include:

- Trees = paper and wood
- Oil = gasoline, chemicals and most plastics including carpets and synthetic fabrics
- Metals = aluminum cans, metal chairs, jewelry
- Animals = food
- Water = drinking water, electricity
- Plants = food and cotton clothing
- The sun = solar electricity, light, heat

Renewable resources are things that can be replenished through natural and/or human processes. For example, even though we may harvest trees for wood and paper, trees can naturally reseed themselves or can be replanted by humans. Renewable resources can be used indefinitely as long as they are very carefully managed. If renewable resources are over harvested or used, they have the potential to become non-renewable. Endangered species and species extinction is a prime example of this such as in the case of the passenger pigeon. In the early 1900's, the passenger pigeon was hunted so heavily and irresponsibly that its numbers dwindled and it eventually became extinct. The maximum rate it which people can use a renewable resource without reducing the ability of the resource to renew itself is called a ***sustainable yield***. The sustainable yield of any resource differs from region to region. For instance, the sustainable yield of water in Central Oregon is much different than on the Olympic Coast. There is an important distinction between ***renewable*** and ***recyclable***. Recycling is an important process that can be done with either renewable or nonrenewable resources.

Nonrenewable resources are resources that can not be regenerated naturally or by humans in a human time frame. These are resources that took billions of years to form, only to be extracted by humans at an alarming rate. Nonrenewable resources exist in fixed amounts and once they are used up, they are gone forever. All fossil fuels such as oil, coal, natural gas and minerals and metals are nonrenewable resources. Once these materials are extracted and used by humans, they cannot be replaced.

Perpetual resources are resources that will last indefinitely, with or without human intervention. Things like sunlight, wind and tides occur whether or not we take advantage of their uses. For example, the use of solar panels for energy production does not affect the amount of solar energy that the sun gives to the earth. Perpetual resources are ideal in that, technology withstanding, we can utilize them to their full potential without having to think about replacing them.

Materials:

- Resource Clue Cards
- Resource Question Sheet
- Resource relay cards
- Optional – large world map, push pins.

- For Activity #1 – Penny Generation
    - Large amount of pennies, preferable in a large bowl.
    - Generation cards. Cards will say either "***1st Generation***", "***2nd Generation***", "***3rd Generation***", or "***4th Generation***".
- For Activity #2 – Greed vs. Need
    - Large bowl of pennies

Procedure:

I. Introduction – 5 minutes

- What does it mean to be EarthSmart?

II. The Secret Lives of Everyday Things – 5-10 minutes

- Ask students to look around the classroom. There is a lot of "stuff" in our schools, homers and lives. Where do these things come from? Initially they may say "the store" or "the factory". Continue asking where these come from in the first place. Paper is the easiest example in that most students know that it comes from trees. Continue on with different items such as cotton, a soda can, plastic, and such.
- Where do these natural resources come from? SOMEWHERE ON EARTH. The only resource that we use everyday (and that is essential to our survival) that does not come from this planet is solar energy.
- Have students quickly name things in their classroom that come from natural resources – desks, paper, clock, flag, etc.
- Ask students if there is anything in the classroom that does not come from natural resources/ Earth Materials. Students will often say computer, smartboard, projector. All of these things are manufactured from earth materials, there is one resource we use every day that does not come from the earth…..Let the students think for a bit and see if they can come up with the Sun.

III. Defining Resources – 10-15 minutes

- Write the terms "RENEWABLE RESOURCE", "NONRENEWABLE RESOURCE" and "PERPETUAL RESOURCE" on the board.
- Group students into groups of four.
- Explain that the groups will be formulating short definitions of the terms listed on the board. Pass out the clue cards. Give students about 5 minutes to share their cards with each other.
- Pass out the resource images and have the groups separate them out into three piles. This is also a great opportunity for a relay race with the groups.
- Have students read clue cards 1-4 out loud so all students can hear and write down important parts of the clues. After a few minutes, ask the groups if they could come up with a definition for each of the terms listed and write definitions on the board. Add specific examples of resources that might go under each category.

i. RENEWABLE RESOURCE – any natural resource that can replenish itself naturally over time or from human intervention. We can get more over time. *Trees, plants, animals, water.*
ii. NONRENEWABLE RESOURCE – any natural resource that does not replenish itself within the human time frame. Once its gone its gone. *Oil, coal, natural gas, iron, aluminum, metals and minerals.*
iii. PERPETUAL RESOURCE – any natural resource that continuously replenishes itself indefinitely. The amount never changes. *Sunlight, wind, tides.*

- Pass out the resource images and have the groups separate them out into three piles. (This is also a great opportunity for a relay race with the groups) Check the groupings and ask if the students had any questions about some of the images.
- Review the Resource Question Page with the class together.

IV. Activity #1 – Penny Generation – adapted from Project Learning Tree

1. Divide up the generation cards accordingly. For example, a class of 30 students would be divided up:
    - 3 - 1st Generation cards
    - 6 - 2nd Generation cards
    - 9 – 3rd Generation cards
    - 12 – 4th Generation cards
2. Pass out one generation card for each student. Have them pick the cards blindly. They may look at their card, but have them keep their card secret.
3. Review what "generation" means. It is a way of measuring time through families. You can look at it different ways. You can say that you are the first generation and that your kids, grandkids, etc are the 2nd and 3rd generations and so forth. Or you can say that your great grandparents were the 1st generation, your parents the 2nd, and so on.
4. Bring out the bowl of pennies, and explain to the class that the penny represents a very important natural resource that we have discovered that we cannot live without.
5. Tell the class that the 1st generation gets to have their pick of how ever many resources they would like to take. They can take as much of it as they want. They must be able to carry the resources in their hands and they can't use pockets or clothing to help them carry the candy back to their desk. When they get back to their desks, instruct the students to put the pennies on their desk.
6. Invite the 2nd generation students to come up next and take their share of resources. Follow with the 3rd and 4th generations, if there are any pennies left.
7. By this time, certain students are probably complaining that they did not get anything!
8. After settling the class down, discuss the activity with the students.
    - How did the 3rd and 4th generation students feel?
    - How did the 1st generation students feel about what they got? Did the 1st generation feel as though this was a "fair" activity? How about the later generations?
    - What happened to the total amount of the resource?
    - How much was left for each successive generation?
    - Could this happen in real life?

- In this case, was this natural resource renewable or nonrenewable? What actual resource might this activity represent? *Oil, fossil fuels, minerals.*

9. Collect all of the pennies, and prepare for the next activity.

V. **Activity #2 – Greed vs. Need –** adapted from Project Learning Tree

1. Divide the class into teams of four. Point out that this is another game, but students may have to listen very carefully for some of the rules. Otherwise, they may not be able to play to the best of their abilities.
2. Give each team 16 pennies. Instruct students to not touch the pennies that have been placed in their teams "commons". Review what "the commons" means – shared resources or shared space.
3. Explain that they class will play a game in which the pennies represent the team's supply of a renewable resource that will be replenished after every "round" of the game. However, there are several very important rules to the game:
    - The game will be played in 4 rounds.
    - During each round, each team member needs to take at least one penny per round. For instance, Johnny can't take all of the pennies in the first round. However, students DO NOT have to take more than one penny in each round.
    - At the end of each round, students may not put any of the pennies back into the commons.
    - Because this is essentially a renewable resource, they MAY be renewed or replenished after each round. Stress that this is a variable, depending on what happens with each team.
4. Before starting the game, allow teams 30 second to strategize.
5. Start the game, keeping an eye on each of the teams.
6. After each round, find out how many pennies each group has in the commons and replenish their resources by half that amount.
7. After four rounds, stop the game and take a look at how the teams fared. ***NOTE: Some of the groups may run out of resources right away or after only two rounds. But one or more of the groups should figure out a way to collect at least one penny each round and still have leftovers in their collective pile to be "renewed" each round.***
8. Discuss with the class what happened in different teams.
    - In which teams did the students survive?
    - Which students have the most pennies in their piles?
    - How did the different teams decide what to do during the game?
    - Reiterate that this is a renewable resource. However, introduce the concept of sustainable yield and the fact that a renewable resource can become nonrenewable.
    - Could this happen in real life? With what resources?

VI. Conclusion

- Review with students on how they can conserve resources in their own lives. How can they prevent the depletion of resources? Many students will add to "not be greedy", or "not take more than you need".
- Ask how they might go about doing those things. Examples might be:
    - Not wasting things like food or paper.
    - Recycling.
    - Taking shorter showers.
    - Driving less so they use less gasoline.
- Reiterate that we like to blame these things on other people, other countries, other students, but often times we need to look at our own behaviors first.

Appendix A – Resource Clue Cards
Appendix B – Generation Cards
Appendix C – Resource Question Page
Appendix D – Enrichment Options for EarthSmart Kids Classes
Appendix E – Additional Resources

On Earth, there are only limited amounts of fossil fuels such as oil, coal and natural gas. There are also only limited amounts of minerals such as iron, copper and phosphates. These resources either cannot be replaced by natural processes or require millions of years to replenish.

Some nonrenewable and renewable natural resources can be recycled or reused. This process decreases the rate at which the supplies of these resources are depleted. For example, aluminum cans can be recycled and turned into new cans or other aluminum products many times over. Recycling reduces the need to mine bauxite, the mineral used to make aluminum.

Renewable natural resources include plants, animals, and water, when they are properly cared for. Minerals and fossil fuels, such as coal and oil, are examples of nonrenewable natural resources.

Trees, wildlife, water, and many other natural resources are replaced by natural processes. Plants and animals can also be replenished by human activities. Water is continuously cycled and reused. Sunlight, wind, geothermal heat, tides, and flowing water are perpetual resources.

On Earth, there are only limited amounts of fossil fuels such as oil, coal and natural gas. There are also only limited amounts of minerals such as iron, copper and phosphates. These resources either cannot be replaced by natural processes or require millions of years to replenish.

Some nonrenewable and renewable natural resources can be recycled or reused. This process decreases the rate at which the supplies of these resources are depleted. For example, aluminum cans can be recycled and turned into new cans or other aluminum products many times over. Recycling reduces the need to mine bauxite, the mineral used to make aluminum.

Renewable natural resources include plants, animals, and water, when they are properly cared for. Minerals and fossil fuels, such as coal and oil, are examples of nonrenewable natural resources.

Trees, wildlife, water, and many other natural resources are replaced by natural processes. Plants and animals can also be replenished by human activities. Water is continuously cycled and reused. Sunlight, wind, geothermal heat, tides, and flowing water are perpetual resources.

1st Generation

2nd Generation

3rd Generation

4th Generation

1st Generation

2nd Generation

3rd Generation

4th Generation

Resource Question Sheet

1. Categorize the following as renewable, nonrenewable, or perpetual resources:

    - A field of corn - ***renewable***
    - Oil in the Artic tundra - ***nonrenewable***
    - Coal in the Appalachian Mountains - ***nonrenewable***
    - Sunshine everywhere - ***perpetual***
    - Tides in Newport Bay - ***perpetual***
    - Trees in a forest – ***perpetual***
    - Tuna in the ocean - ***renewable***
    - Gold mines in the western United States - ***nonrenewable***
    - Hot springs in Alaska - ***perpetual***
    - Sand on a beach – ***nonrenewable***
    - A breeze over the Texas plains - ***perpetual***
    - Salmon in streams - ***renewable***
    - Water in a river – ***renewable***

2. Look around the classroom and list as many items as you can that are made from renewable natural resources. Make a separate list of all the items made from nonrenewable natural resources. Are there any perpetual resources that you can see from the classroom?

3. What advantages and disadvantages might there be for using renewable natural resources in place of nonrenewable ones?

4. Under what circumstances, if any, would a renewable natural resource not be renewable? Introduce the concept of ***sustainable yield***.

5. Which resources, if any, would continue to be available no matter how much people used them?

Enrichment Options for EarthSmart Kids

Enrichment #1 – Stuff: The Secret Lives of Everyday Things

Have students trace the origins of their favorite meal, whether it's a hamburger, pizza or spaghetti. Help students with this by using one quick example with the class. Draw a flow chart for each component of the meal. Include hidden resources such as transportation, water, packaging materials and processing. Use the handout "Hamburger, Fries and a Cola" (Appendix E), if appropriate, to give students an idea of the resources it takes to create a basic meal.

Enrichment #2 – The Lorax

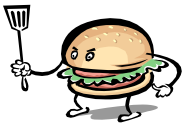
Read Dr. Suess' The Lorax with students and discuss. Make connections between the story and issues that might be happening today with our natural resources. Questions might be: Who, in real life do you think the Once-ler would represent? Who would the Lorax represent? What are some Thneeds of today?

Enrichment #3 – Cookie Mining

Students investigate the effect that extraction of energy resources can have on the environment. Give each student (or small groups of students) a chocolate chip cookie, a paper towel, toothpicks and a sheet of paper. Their task is to "mine" the chocolate chips out of the cookie. Ask them to write down some descriptions of their new cookie on the sheet of paper. What does it look like, how big is it, etc. Let the students "mine" the cookie with the toothpicks for two minutes. Discuss the following questions:

- How did the mining affect the environment of the cookie?
- Can you fix your cookie, making it the same as before?
- How do you think real mining has an effect on the environment?
- What are some resources that might be mined in this manner? ***Coal, minerals***, ***metals, etc.***

Hamburger, Fries and a Cola



What did it take to produce this favorite American meal?

The meat came from cattle grazed initially on public or private land, and later fed grain. About 10% of all public lands in the western United States have been turned to desert by overgrazing, and about two thirds of those public lands are significantly degraded. Stream-side lands, where cattle drink water, have been especially damaged.

When the steer was feedlot finished, it took 600 gallons of water to build that hamburger patty. The grain required to produce the quarter-pound patty caused five times its weight in topsoil loss due to erosion from unsustainable farming methods. Producing that grain also took substantial amounts of pesticides and fertilizers (one fourth of all fertilizer in the US is applied to feed corn for animals) some of which ran off into surface water or seeped into groundwater supplies. Once slaughtered and processed, the meat was frozen, shipped by truck, kept cold and then cooked on a grill using natural gas.

The five ounce order of fries came from one 10 oz potato grown in Idaho on one half square foot of soil. It took 7 ½ gallons of water to raise that potato, plus quantities of fertilizer and pesticides, some of which ran into the Columbia or Snake rivers. Because of that and dams that generate power and divert water for irrigation, the Snake River Sockeye salmon is virtually extinct. A number of other species are also in decline because of these production practices.

The potato was dug with a diesel powered harvester, trucked to a processing plant where it was dehydrated, sliced and frozen. The freezing was done by a cooling unit containing hydroflourocarbons, some of which escaped into the atmosphere and likely contributed to global climate change. The frozen fries were then trucked to a distribution center, on to a fast food restaurant, and fried in corn oil heated by electricity generated by hydropower.

The meal was served in a fast food restaurant built on what was originally forest, then farmland, and then was converted to commercial/industrial uses as the city expanded. The ketchup in aluminum packets came from Pittsburgh and was made from Florida tomatoes. The salt came from Louisiana.

The cola came from a Seattle plant, and was 90% water from the Cedar River. The high fructose corn syrup came from Iowa, as did the carbon dioxide used to produce the fizz, which is produced by fermenting corn. The caffeine came from a plant that makes decaffeinated coffee.

The can was made 1/3 from recycled aluminum and 2/3 from bauxite ore strip mined in Australia. It came to Washington on a Korean freighter, and was processed into aluminum using an amount of energy equivalent to a quart of gasoline. The energy came from some of the same dams mentioned earlier that have contributed to a 97% decline in the salmon runs of the Columbia Basin.

The typical mouthful of food consumed in the US traveled 1,200 miles for us to eat it. Along the way, it requires packaging, energy, roads, bridges and warehouses, and contributes to atmospheric pollution and traffic congestion.

Enrichment Options Resource Revival

Enrichment #1 – Stuff: The Secret Lives of Everyday Things

Have students trace the origins of their favorite meal, whether it's a hamburger, pizza or spaghetti. Help students with this by using one quick example with the class. Draw a flow chart for each component of the meal. Include hidden resources such as transportation, water, packaging materials and processing. Use the handout "Hamburger, Fries and a Cola" (Appendix E), if appropriate, to give students an idea of the resources it takes to create a basic meal.

Enrichment #2 – The Lorax

Read Dr. Suess' The Lorax with students and discuss. Make connections between the story and issues that might be happening today with our natural resources. Questions might be: Who, in real life do you think the Once-ler would represent? Who would the Lorax represent? What are some Thneeds of today?

Enrichment #3 – Cookie Mining

Students investigate the effect that extraction of energy resources can have on the environment. Give each student (or small groups of students) a chocolate chip cookie, a paper towel, toothpicks and a sheet of paper. Their task is to "mine" the chocolate chips out of the cookie. Ask them to write down some descriptions of their new cookie on the sheet of paper. What does it look like, how big is it, etc. Let the students "mine" the cookie with the toothpicks for two minutes. Discuss the following questions:

- How did the mining affect the environment of the cookie?
- Can you fix your cookie, making it the same as before?
- How do you think real mining has an effect on the environment?
- What are some resources that might be mined in this manner? ***Coal, minerals***, ***metals, etc.***

Enrichment#4- Energy for the future

Students read a profile about a fictional community and act as committee members deciding what to do to help the city with their energy needs.
http://www.blm.gov/education/00_resources/articles/energy/energy6.html

Enrichment #5- Energy Sleuths

Divide class into small groups and have them each research an energy source; coal, oil, natural gas, solar, geothermal, biomass, wind, nuclear. Give the groups time to research and develop a report on the; availability, technologies for extracting and processing, economic potential, pros and cons of environmental and social impacts, history of use, potential as future energy use.

Additional Resources – Resource Revival

Websites and Books

Natural Resources

- ***Stuff – The Secret Lives of Everyday Things***, John C. Ryan and Alan Thein Durning, Northwest Environment Watch, Seattle, WA, 1997, http://www.sightline.org/research/stuff/
    - See also "Take the Quiz" and "Curriculum Guide"
- ***The Material World,*** Peter Menzel, Sierra Club Books, San Francisco, 1994
- EcoPros Natural Resources Site - http://www.eco-pros.com/naturalresources.htm
- WRI – World Resources Institute's Resource and Materials site http://materials.wri.org/

For Kids

- King County Natural Resources Kids Page - http://your.kingcounty.gov/DNR/Kidsweb/
- EPA Student Center - http://www.epa.gov/students/
- Kids for Saving Earth – www.kidsforsavingearth.org
- National Wildlife Federation - www.nwf.org/kids/
- Energy Quest's Energy Story - http://www.energyquest.ca.gov/story/index.html
- ***The Lorax***, Dr. Suess, Random House Children's Books, 1971
- ***Earthbook for Kids***, Linda Schwartz, Learning Works, 1990
- EPA Climate Change Kids- www.epa.gov/climatechange/kids/
- A Kid's Guide to Solar Power in the Home- http://houseplansandmore.com/a-kids-guide-to-solar-power-in-the-home.html
- Brain Pop Jr.- Natural Resources- http://www.brainpopjr.com/science/conservation/naturalresources/grownups.weml

Local Resources

- Oregon Department of Environmental Quality – www.deq.state.or.us
- Oregon Natural Resources Council – www.onrc.org
- The Central Oregon Environmental Center – www.envirocenter.org, 541-835-6908
- Oregon Department of Energy - http://www.oregon.gov/ENERGY/Pages/index.aspx

For Teachers

- http://www.energyquest.ca.gov/teachers_resources/lesson_plans.html
- PG&E Education and Safety for Teachers & Kids- http://www.pge.com/myhome/edusafety/teach/
- Mineral Information Institute – Teacher resource on mining and natural resource with lesson ideas and poster to buy for the classroom- http://www.mii.org/teacherhelpers.html
- NeoK12- Energy Resources- http://www.neok12.com/Energy-Sources.htm

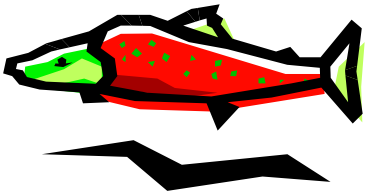
Trees

Wheat

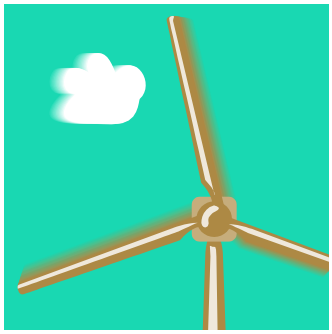
Sunshine

Tuna in the Ocean

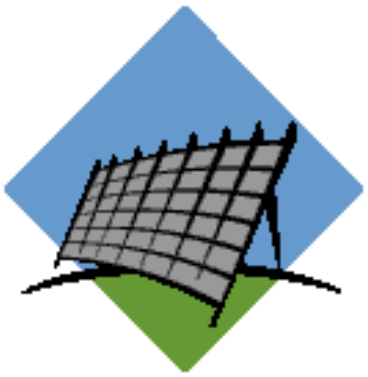
Salmon in Streams



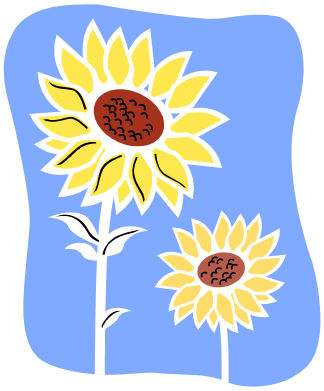
Wind



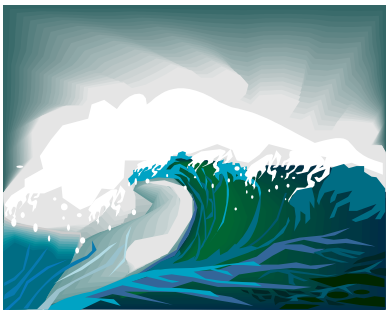
Solar



Sunflowers

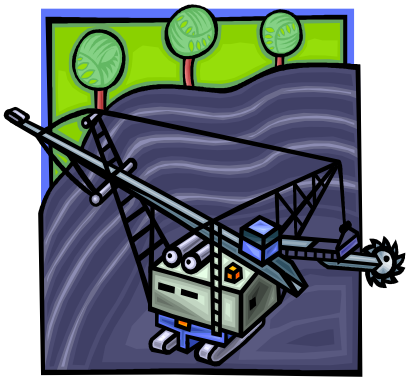


Tides



Coal

Oil



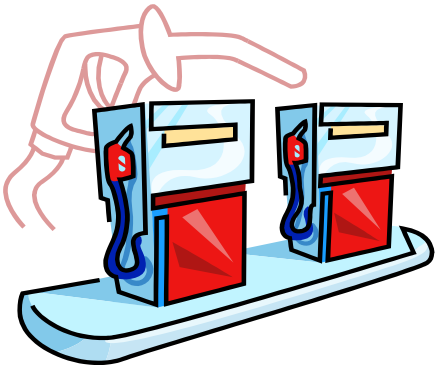
Gold

Moving Water

Food

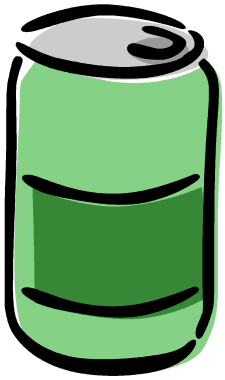
Natural Gas

Gasoline



Corn

Aluminum



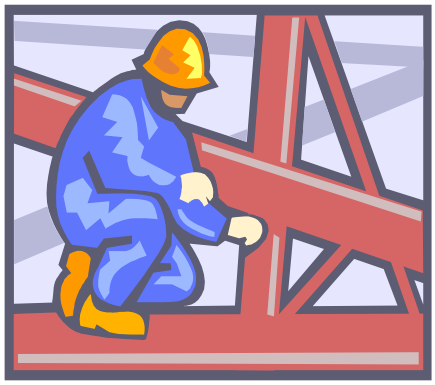
Plastic

Cows

Uranium for Nuclear Power

Field of Cotton

Steel for Building



Paper