

Demographics of a Changing America



American Conservation Issues



Resources

Renewable

Solar Energy

Air, Wind

Water, Tides, Flowing

Soil, Plants

Nonrenewable

Fossil Fuels
Oil
Coal
Natural Gas

Metallic Minerals
Iron
Copper
Aluminum

Nonmetallic Minerals
Salt
Phosphates

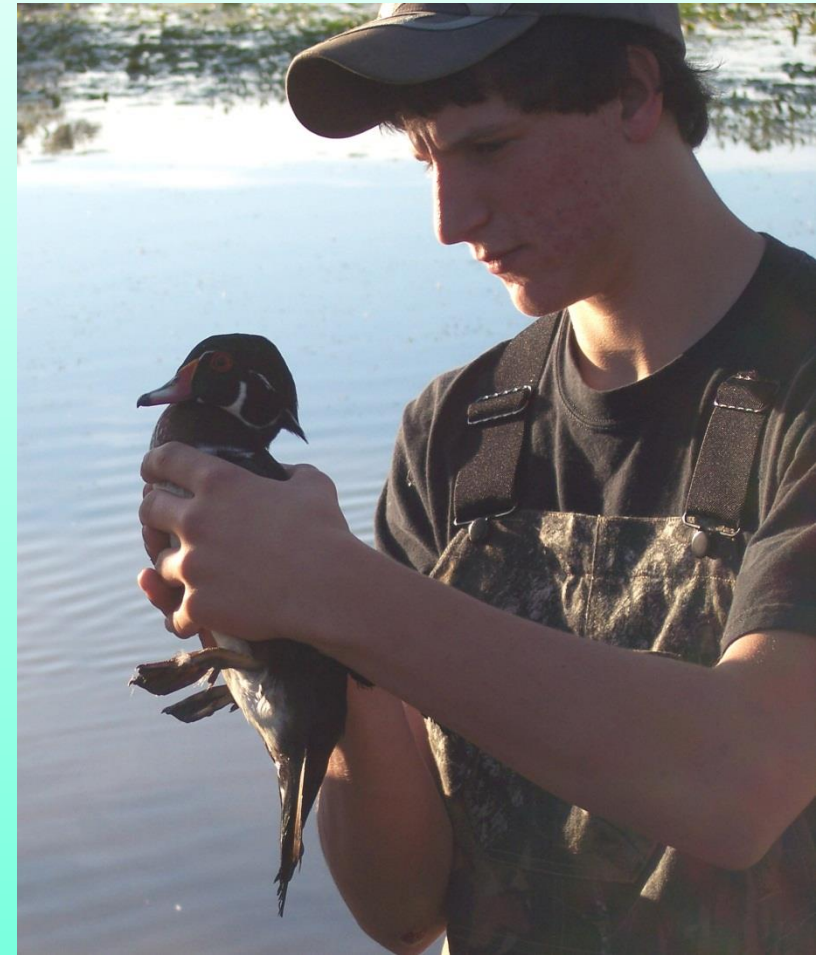
Economical Importance of Forest

- **Timber:** Wood used for commercial purposes like for making furniture and other items like boats, bridges and other day to day uses.
- **Fuel Wood:** The wood is used as fuel for cooking and other purposes by poor people.
- **Raw material for wood based industries:** forest provide raw material for various wood based industries like paper and pulp, sports goods, furniture, match boxes etc.

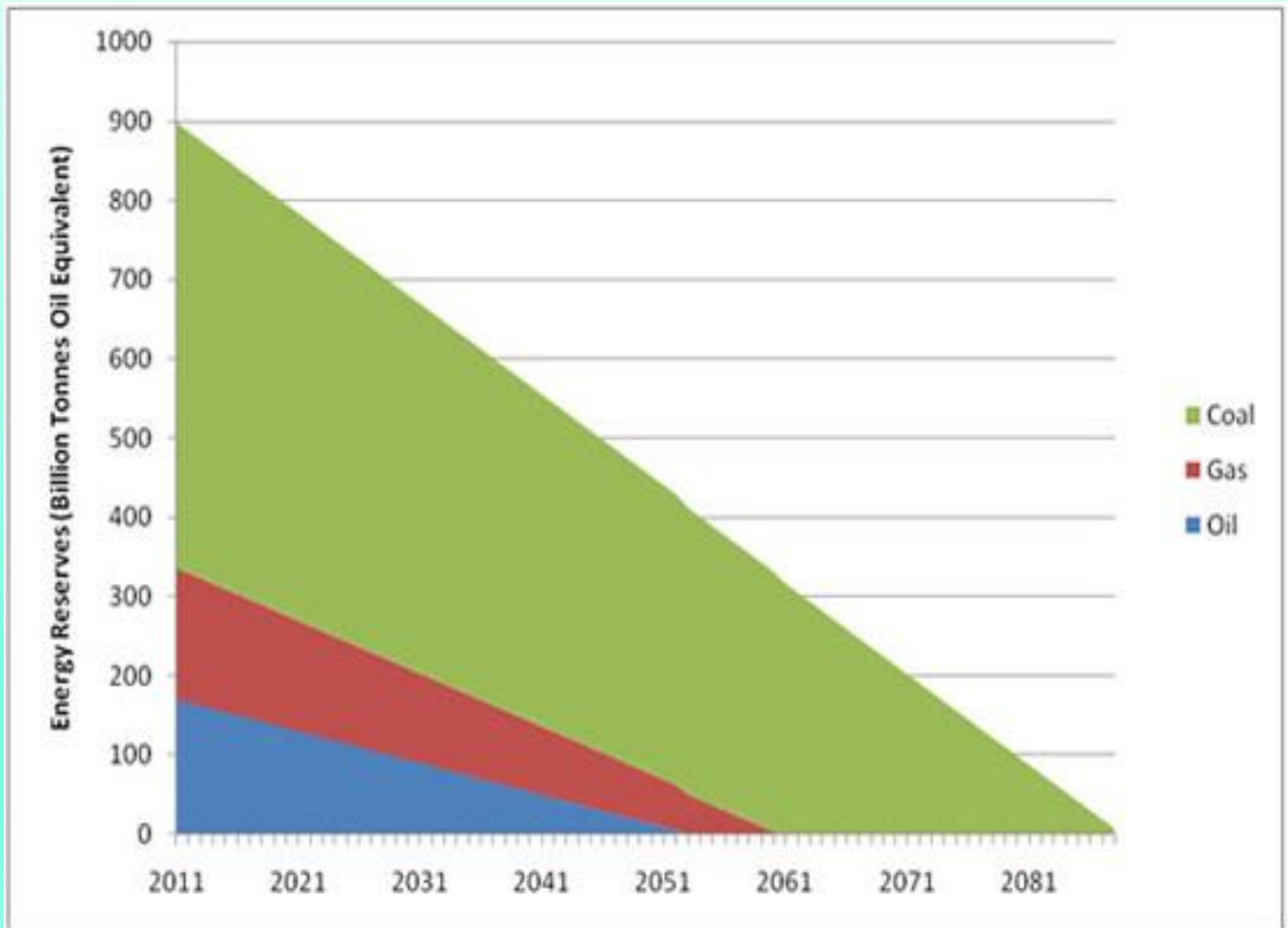


Renewable Resources

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Limits to Non-renewable Resources 6



Two Agencies responsible for Natural Resources in America

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Preservation

Conservation



Many Non-government organizations support as Well

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CAUSES OF FOREST DESTRUCTION

- **Urban Construction**

Forests are cleared to make way for the expansion of urban areas. Trees are cut down for lumber that is used for building materials, furniture, and paper products which creates a major impact on forest life. This results in loss of forest area and massive deforestation.



Agriculture

- Sometimes, forests are cleared to provide space for growing crops, building farms, ranches and other lands for agricultural purposes.



Grazing Land

Forests are cut down in order create land for grazing cattle. Huge herds of animals require food and forests are cleared out to make way for grazing lands.



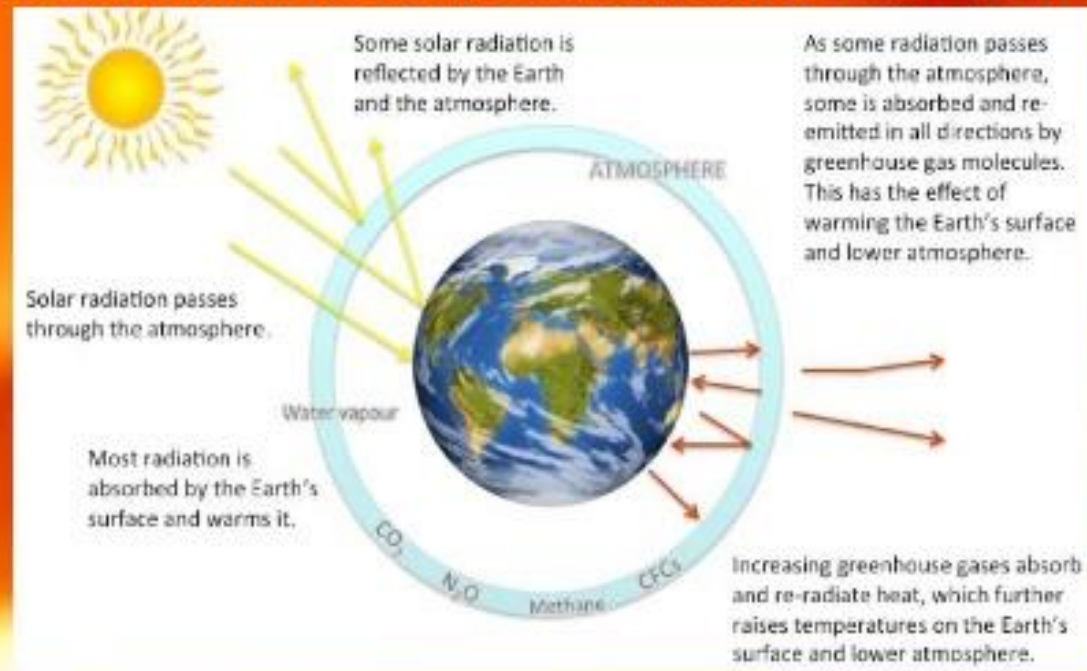
Use for Fuel

- Trees are cut down to be used as firewood or turned into charcoal, which are used for cooking and heating purposes.

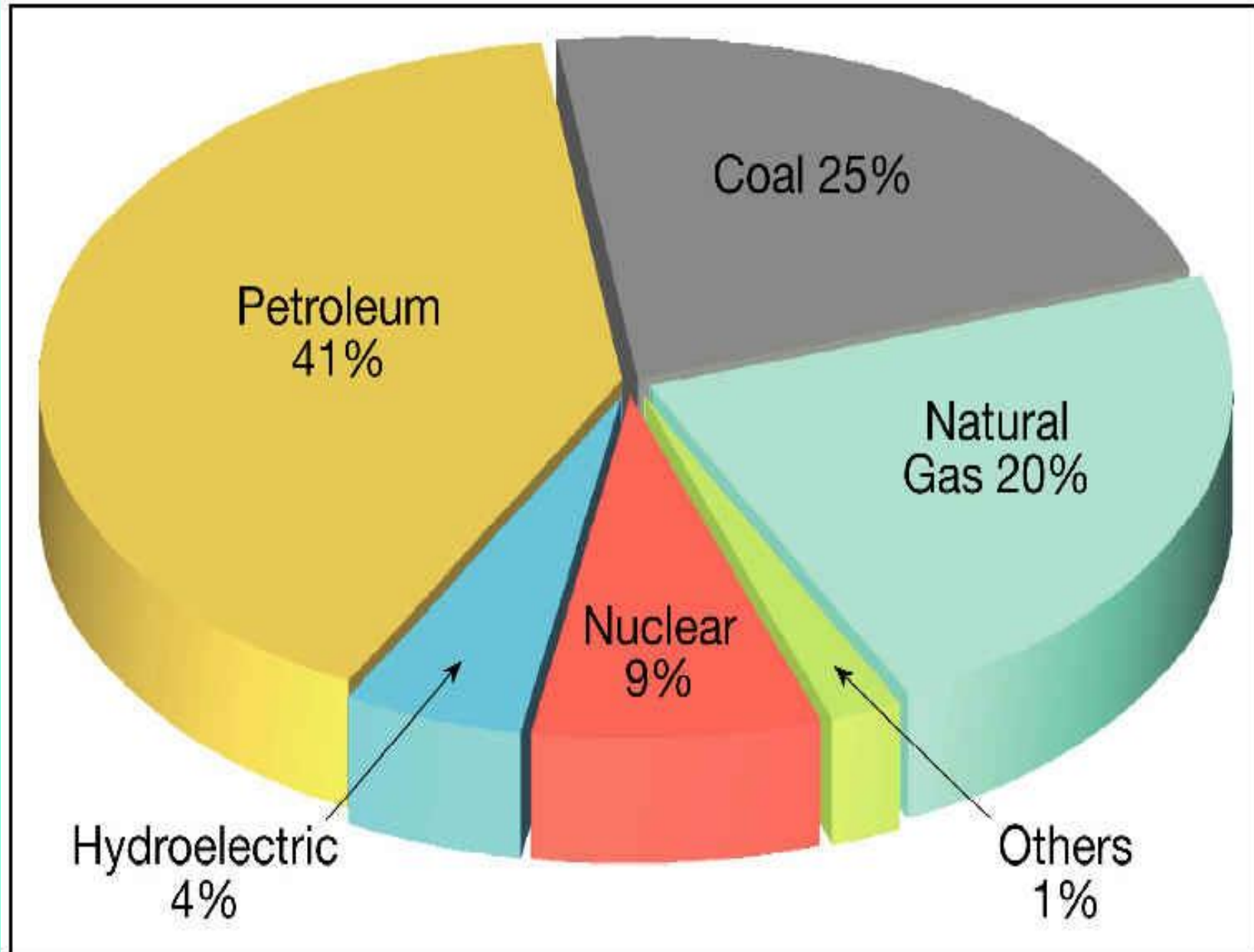


Climate Change

- Trees act as a storage place for carbon, since they absorb carbon dioxide from the atmosphere, which is then used to produce carbohydrates, fats, and proteins that make up trees. When deforestation occurs, many of the trees are burnt or they are allowed to rot, which results in releasing the carbon that is stored in them as carbon dioxide. This, in turn, leads to greater concentrations of carbon dioxide in the atmosphere.



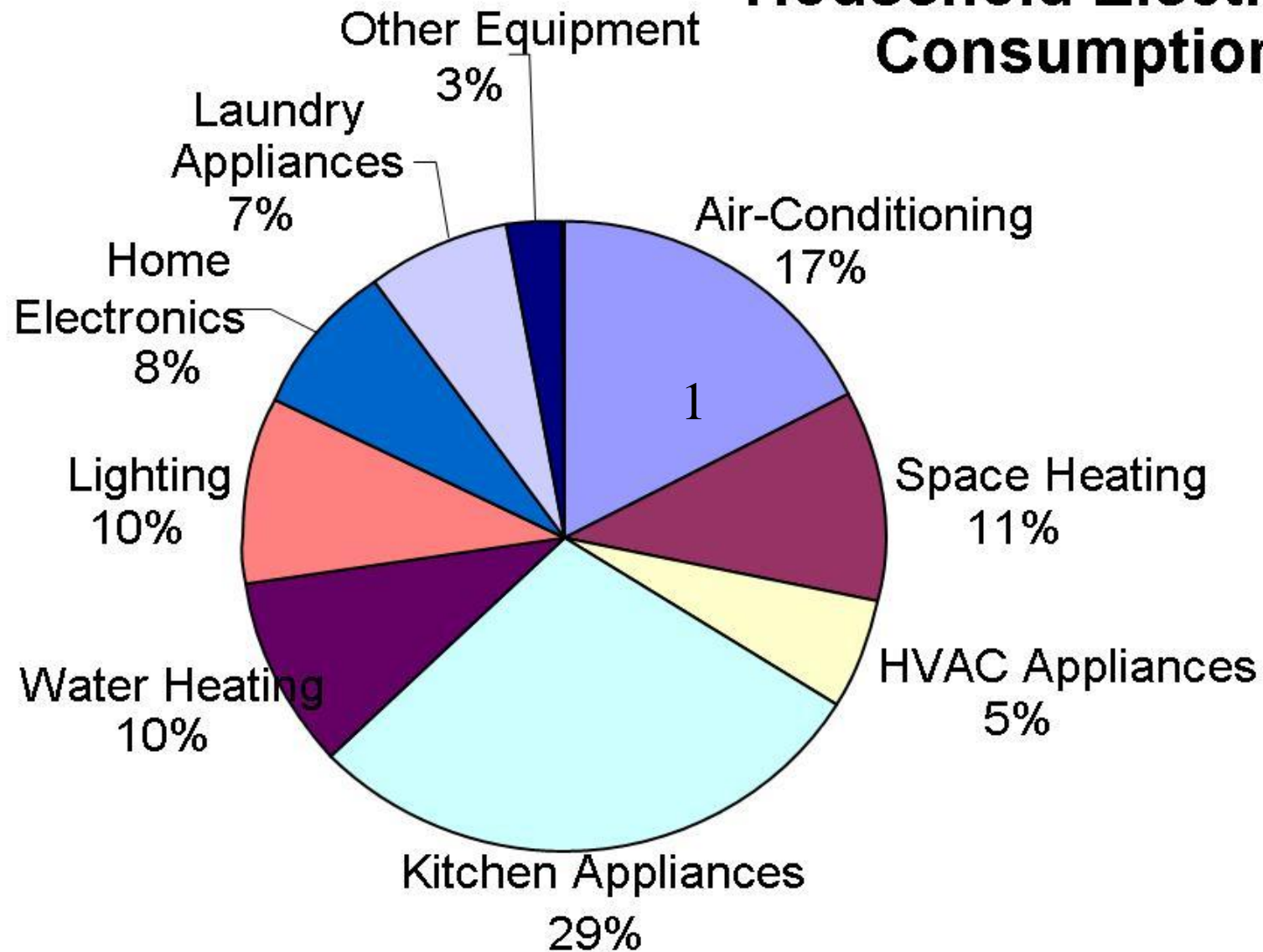
Energy Production in America



American Use

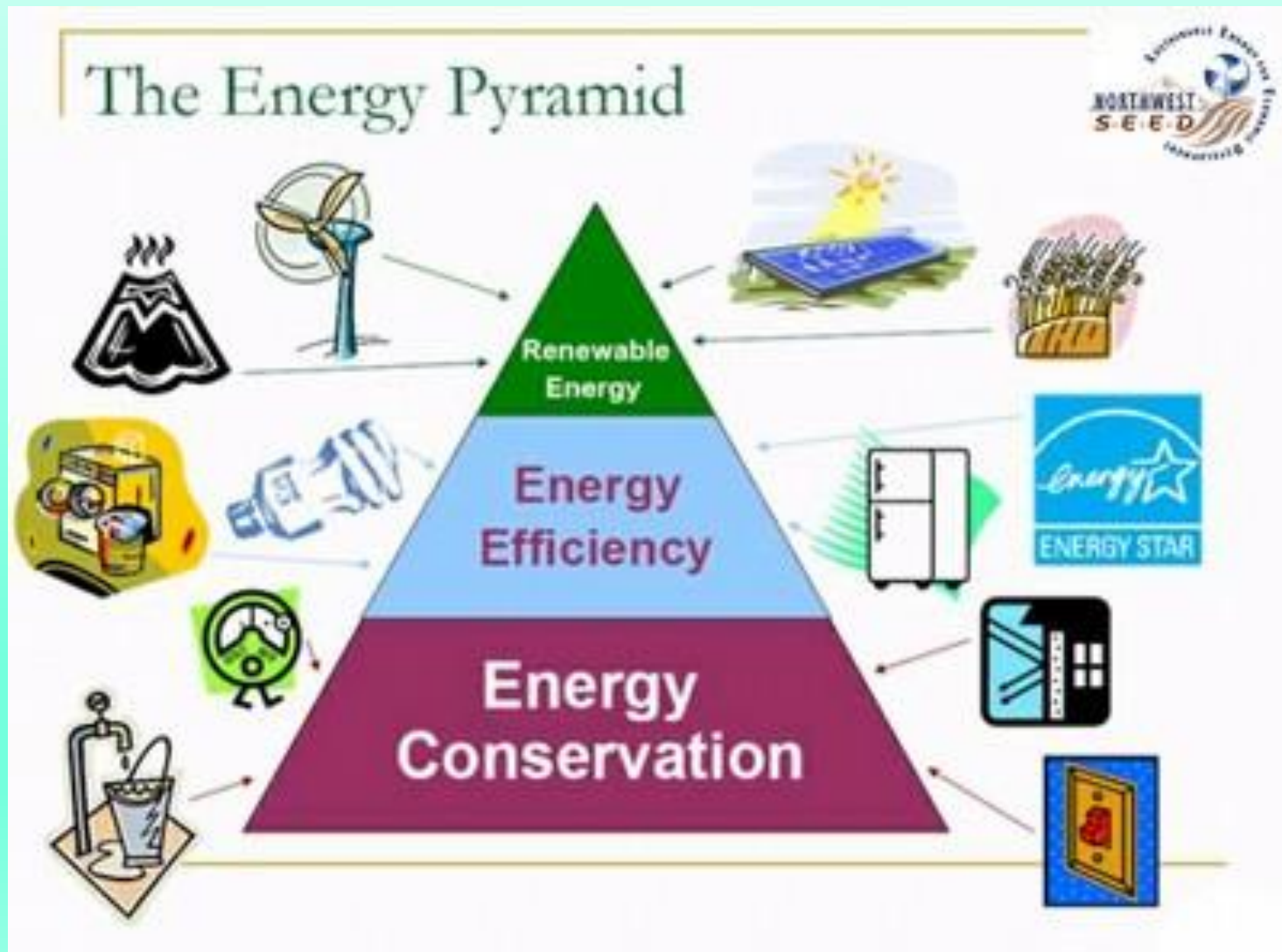
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Household Electricity Consumption



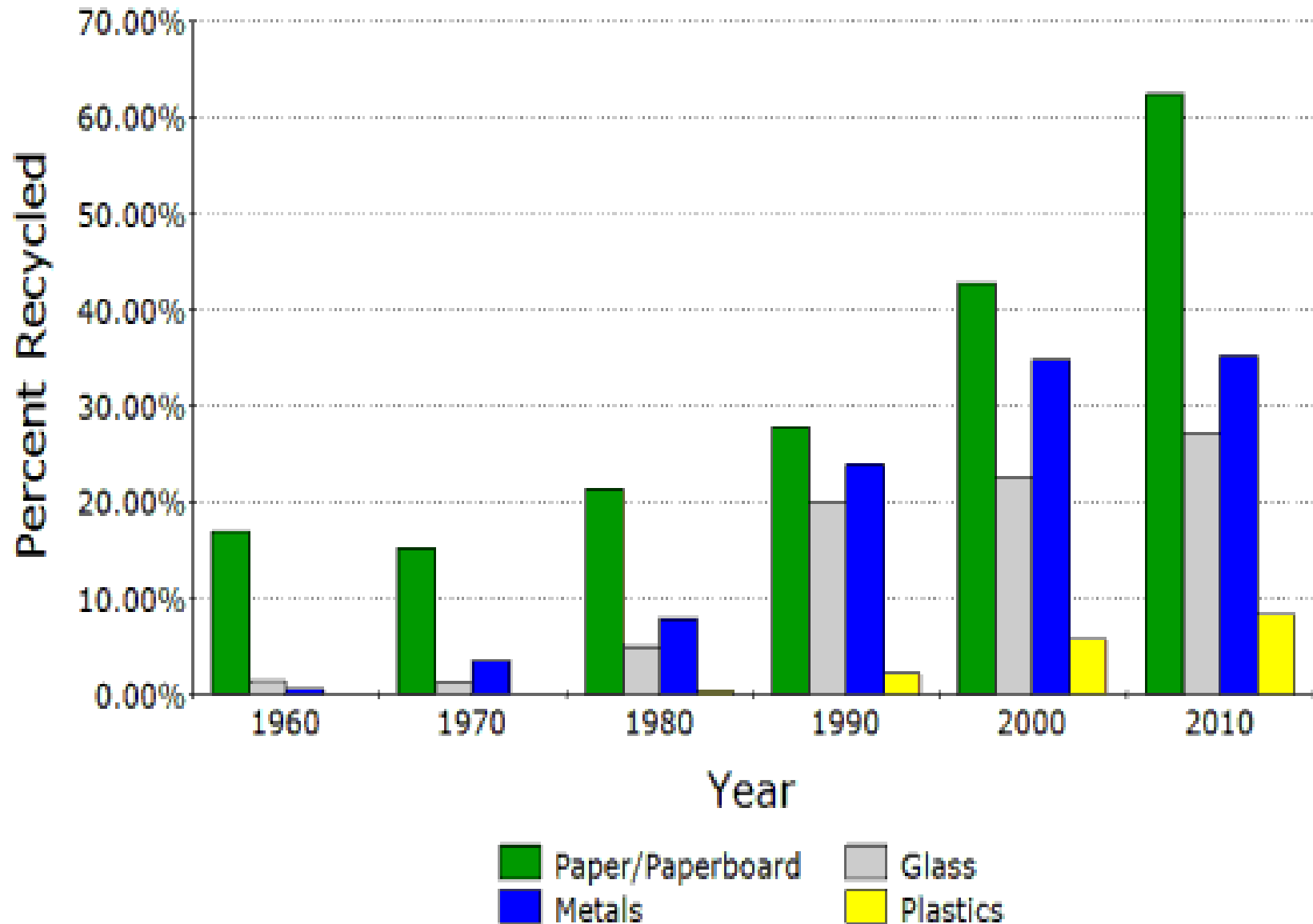
The Energy Pyramid

16

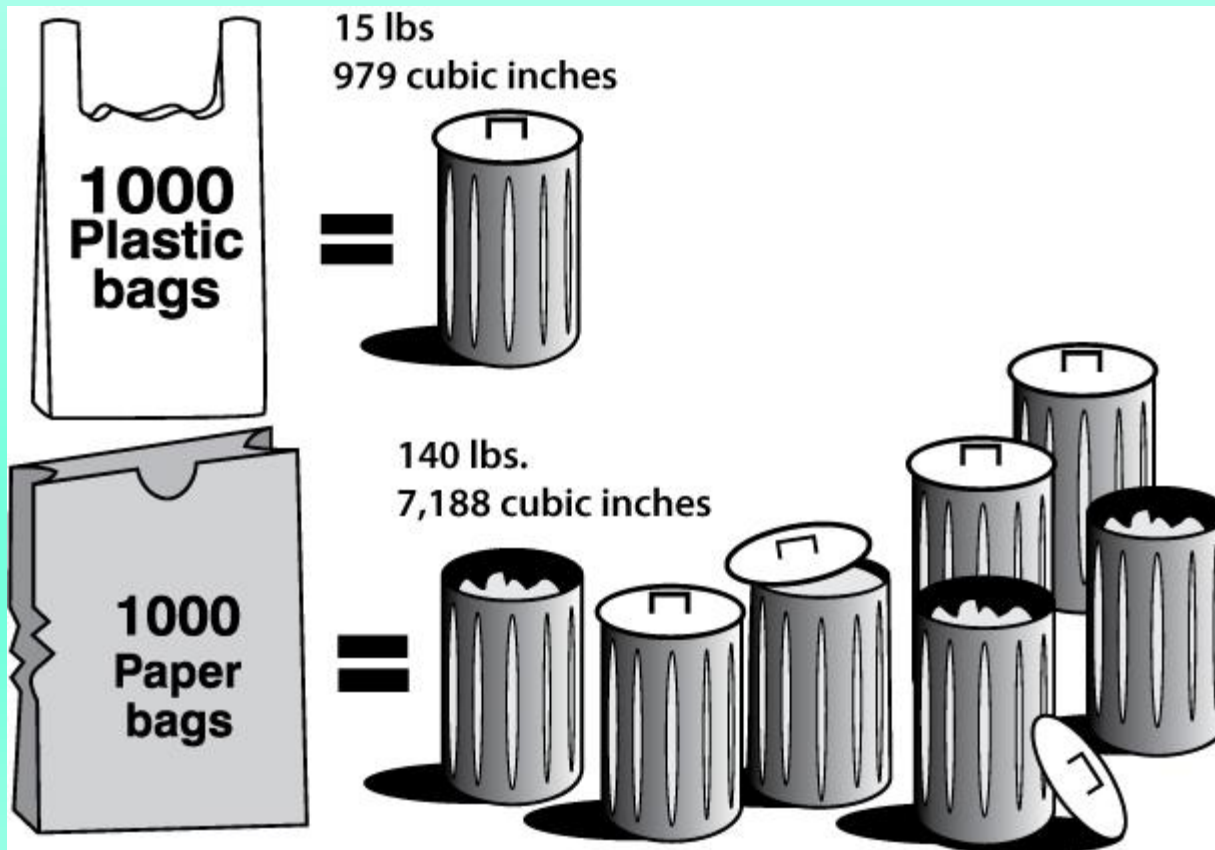


Recycling Rates Over Time

% Recycled for Select Materials



Paper or Plastic?



Some say Neither

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Returnable and Renewable Resources 20



Lets talk Trash (Rubbish)

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Describing magnitude of our trash production

- The U.S. is the #1 trash-producing country in the world at 1,679 pounds per person per year.
- This means that 5% of the world's people generate 40% of the world's waste.

Wars, fads, inventions, boom times, and bad times affect what and how much is thrown away

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- **1890s** Coal and wood fires heated most homes and buildings, so people had to discard lots of ash. Few people had trash cans in their homes. They fed kitchen waste to dogs and pigs; threw garbage into streets, gardens, and outdoor toilets; and burned some trash.
- **1950s** After World War II, the U.S. population grew quickly. Many families had more money to buy new clothing, cars, and furniture, even when the old ones weren't worn out. New disposable products encouraged spending -- and waste. People didn't think about recycling -- resources seemed limitless.
- **1990s** In the never ending search for convenience, we've filled our homes and work places with time and energy saving products and gadgets. Television images and 52 billion pieces of direct mail advertising flood our lives each year offering Bigger! and Better! stuff we can't live without--and we don't.

Brief History of Trash

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1913: Average 0.6 lbs/person/day without ash.

Garbage is offal, as the bowels of an animal or fish; refuse animal or vegetable matter from a kitchen, plus coal ash, bottles and rags.

1960: Average 2.6 lbs/person/day.

Garbage now includes tin cans, aluminum cans, junk mail, and cellose, but little plastic.

2009: Average 4.6 lbs/person/day

Garbage includes plastic bottles, obsolete electronics, styrofoam cups, plastic food wrappers, used batteries, glossy magazines and computer paper.

Why are we so concerned about solid waste?

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Because in the history of humanity, we have never experienced a production rate of trash as high or as complex as we have today.

Then and Now....



Compare the shopping experience between these two eras.

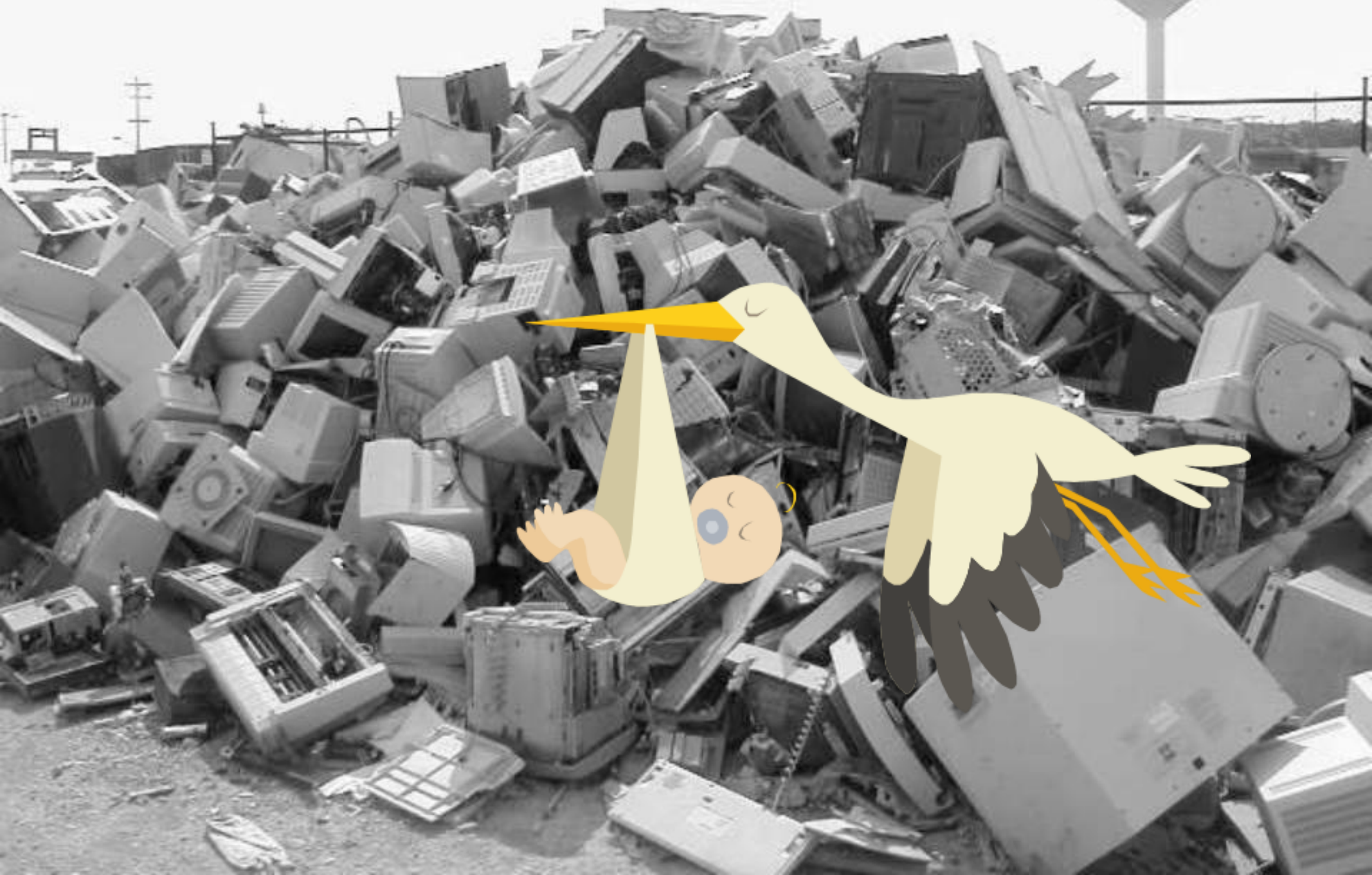
- Number of goods
- Bulk vs. individual packing (note the coffee grinder and scale).
- Roll of wrapping paper vs. plastic bags



Then compare the content of the garbage can between two eras: 22

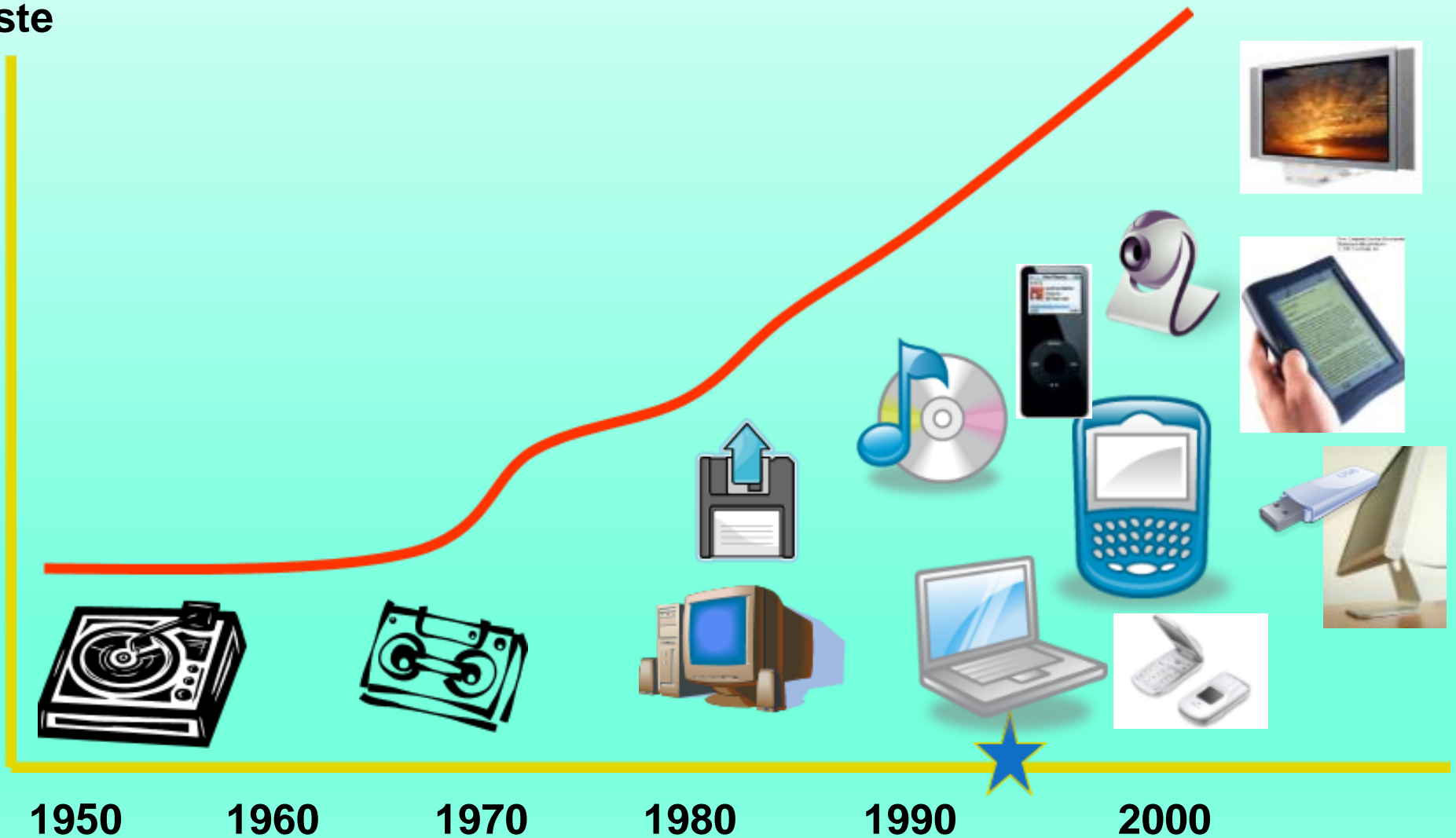
- Percent of recyclable material
- Presence of hazardous materials
- The percent of packaging material
- The number of non-food items.

The E-waste crisis started about the time our present high-school students were born.



Evolution of E-Waste

E-Waste



Comparison of garbage production per person with entire garbage production

Both rates have risen between 1960 and 2006

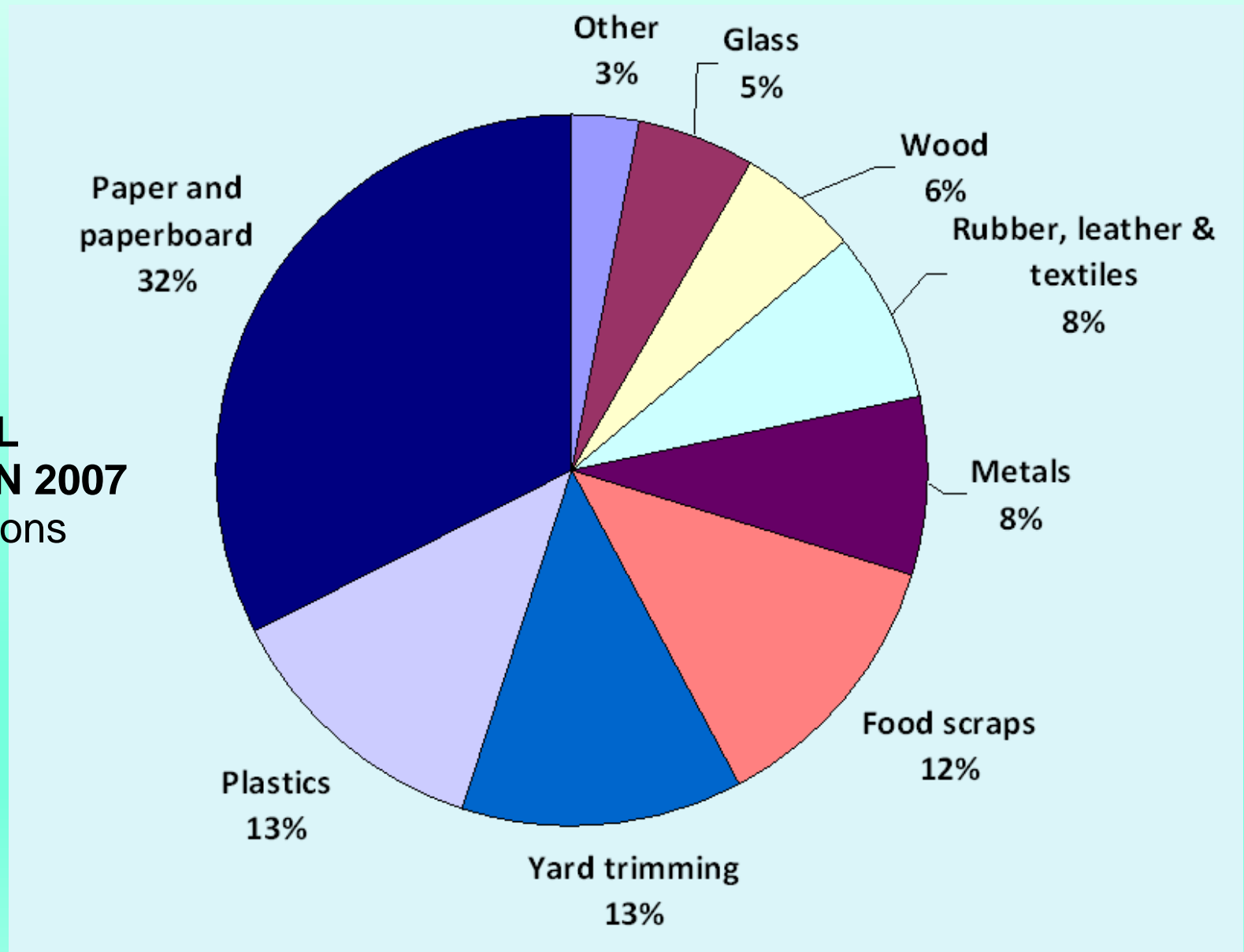
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Just what are we throwing away?

30

**MUNICIPAL
SOLID WASTE IN 2007**
254.1 million tons

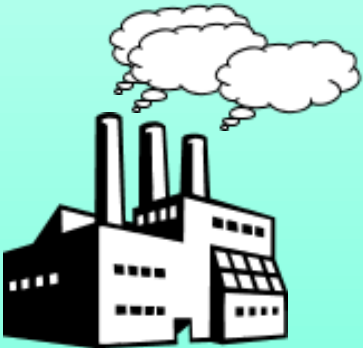


What do we do with all this waste we are producing?

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Burying: which takes space, special construction of lined landfills, off gassing, leaching remediation, and monitoring 30 year after the landfill is closed



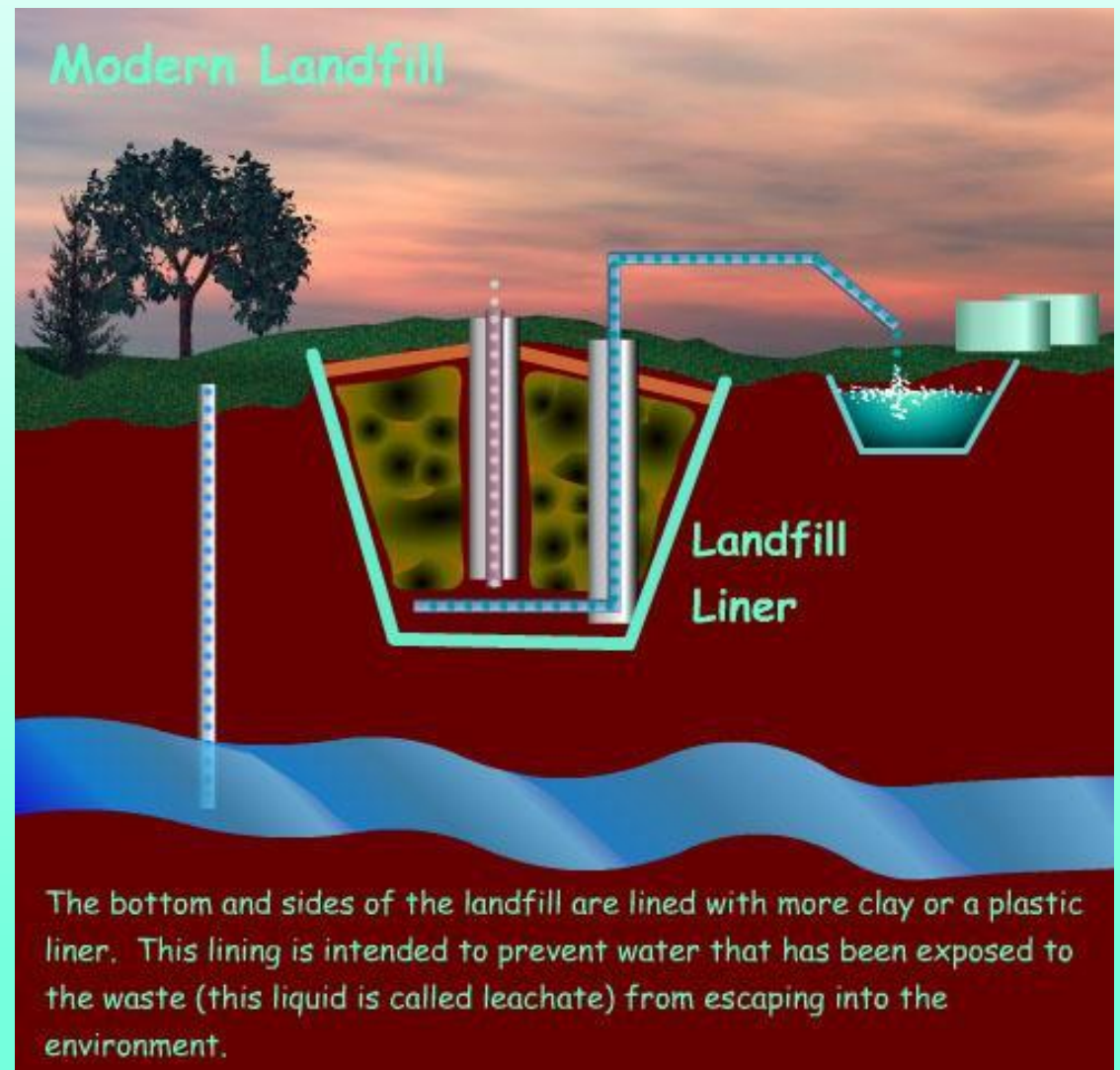
Burning: Incinerators or Waste to Energy Plants reduce the volume of garbage by ~60% but they require special air quality equipment, fly ash must be treated as an hazardous material, and residue ash still has to go to the landfill. This method is more costly than landfills, but suitable for large populations with land storages.



Mining: Mining recyclable material out of our waste stream reduces the volume of garbage going to the land fill, but cost flexes with the market prices.

Landfills

- ~65% of US waste ends up in landfills
- 100% of Fairbanks waste ends up in the landfill.
- Can items decompose underground?



Burning Garbage

33

- The US burns 17% of its garbage in incinerators. Incinerators cost more than landfills. However in density populated area that lack land for landfills rely on incinerators to handle most of their garbage.
- Burning can reduce the volume of garbage by 60-90%. But it produces ash and creates harmful gases and particles that must be filtered out of the air.
- Many experts believe incineration can work safely, but it requires adherence to strict standards and regulations. A 1994 Supreme Court decision requires operators to test their ash and, if it's toxic, to handle it as a hazardous waste.
- Citizens are often reluctant to accept an incinerator in their own community because of concerns about safety, odors, and the conflict between recycling programs and incineration.
- Economic benefit of the waste to energy plants depends on the price of competitive energy sources.

A Duel Problem:

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The issue is not just the volume of trash we are producing, but also the **hazardous composition** our trash.

EXAMPLE: These elements in electronic devices can become hazards if set on fire, placed in acid baths, inhaled as dust, or dumped in waterways. **35**



- **Circuit boards** contain cadmium, lead or beryllium

- **Cathode ray tubes (CRTs)** are coated with barium and phosphor, in addition to containing 2-6 lbs of lead.



- **Batteries** are loaded with lead, mercury, and/or cadmium.

- **Components, switches, or lights** contain mercury-, beryllium- and Polychlorinated Biphenyl-containing materials.



Mercury

36

80
200.5

Hg

Electrical switches, batteries, barometers, thermometers, fluorescent and neon lights

Valuable Properties:

Mercury conducts electricity and expands at a constant rate in response to changes in pressure or temperature.

In its vapor state, mercury can combine with other gases to form more complex molecules that emit light when charged with electricity.



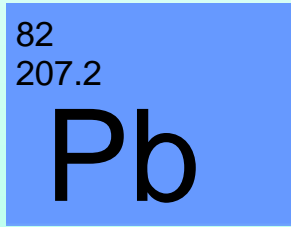
“Mad as a hatter”

Hazardous Properties:

Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus.

Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Lead



outlawed

Lead gasoline 37
Lead Paint
Lead Shot for waterfowl

Lead-acid batteries, solder, x-ray protection, paint

Valuable Properties:

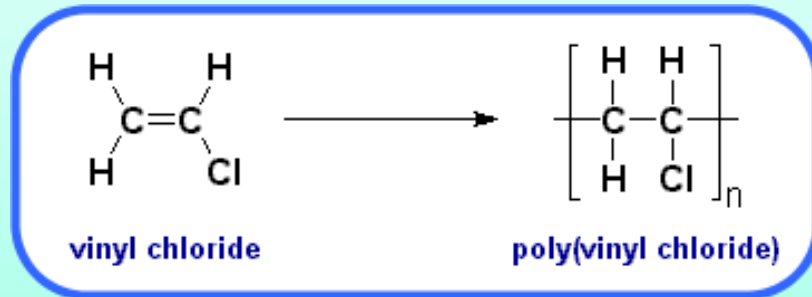
Lead is a very corrosion-resistant, dense, ductile, and malleable metal.

Hazardous Properties:

Lead can cause damage to the central and peripheral nervous systems, blood system and kidneys. Effects on the endocrine system have also been observed and its serious negative effects on children's brain development has been well documented.

The toxicity of lead comes from its ability to mimic other biologically important metals, most notably calcium, iron and zinc which act as cofactors in many enzymatic reactions and interfering with the enzyme's ability to catalyze its normal reaction(s).

PVC



Cabling, insulation of wires, and computer housings, although many computer moldings are now made with the somewhat more benign ABS plastics.

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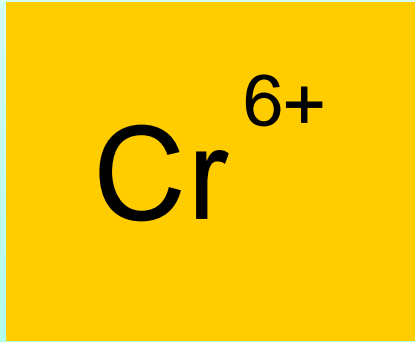
Valuable Properties:

PVC is strong, rigid, light weight, waterproof and flame-resistant. PVC also can be made into a soft and flexible plastic by mixing it with plasticizers.

Hazardous Properties: The PVC itself isn't toxic or carcinogenic, but the monomer used to make PVC, vinyl chloride, is carcinogenic and can be harmful to people who work in the factories where PVC is made. **Dioxin (polychlorinated dibenzo-p-dioxins) is produced as a byproduct of vinyl chloride manufacture and from incineration of waste PVC in domestic garbage.** Also the plasticizers that make PVC soft and flexible can be toxic and carcinogenic.

Hexavalent chromium

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anti-corrosion

Because chromium can go into solution and move through soil, chromium pools and blooms (the crystallized chromium left on the surface when the water evaporates) may occur some distance from the original site of contamination.

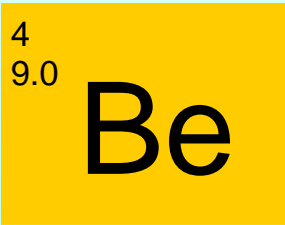
Valuable Properties: It is used as a corrosion inhibitor and in hardening and corrosion protection in metal housing.

Hazardous Properties: While other forms of chromium can be trace nutrients for animals and humans, hexavalent chromium is highly toxic even at low concentrations, and in some cases carcinogenic, site specific cancer-lung and sinus (ATSDR 2000).

Also Hexavalent chromium is far more reactive and soluble in water than other forms of chromium, making it more mobile in the environment (Mukherjee 1998).



Beryllium



semi-conductor chips, ignition modules, transistors, electrical insulator

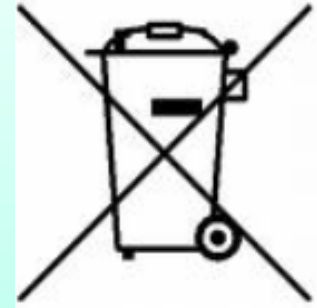
Valuable Properties:

Beryllium is extremely lightweight, hard, a good electrical and thermal conductor, and non-magnetic. Due to its electrical conductivity, it is used in low-current contacts for batteries and electrical connectors

Hazardous Properties:

Handling beryllium in its solid form, such as a finished computer part that contains beryllium, is not known to cause illness. However, some people who inhale beryllium dust or fumes will develop beryllium sensitization or chronic beryllium disease (CBD).

Poisons in our trash



Have you seen this symbol? The crossed out wheeled bin symbol informs you that the product should not be disposed of along with municipal waste because it contains hazardous substances that could impact health and the environment, if not properly disposed.

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The “Take-back” Discussion:

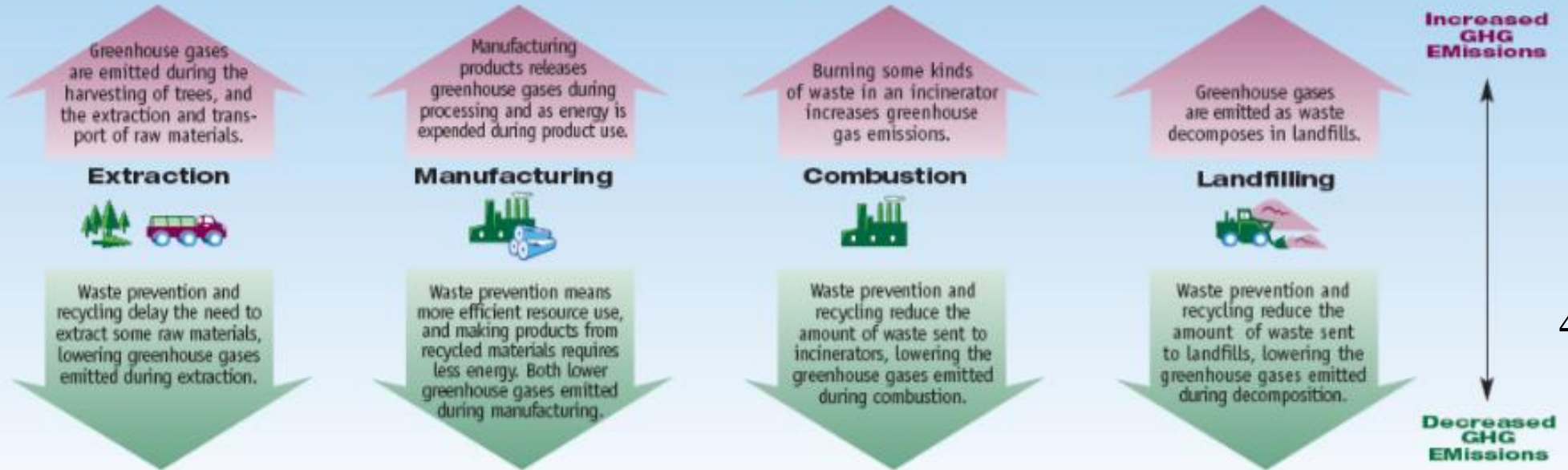
So who's responsibility is it to make sure these hazardous substances do not enter our municipal waste system?? Is a labeling enough? Should it be up to the individual to sort this out? Should the manufacturer “take back” the item to insure proper disposal? Who pays for treating hazardous waste? The public, the government, retailer or the manufacturer? Which method would be the best incentive to reduce hazardous materials in the design and manufacture of items.

The Link between Solid Waste & Climate Change

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- Methane (CH₄), is a greenhouse gas produced in landfills.
- Global Warming Potential of methane is 25 times greater than carbon dioxide.
- Landfills are second only to livestock industries as the greatest anthropogenic source of methane.
- The manufacture, distribution, and use of products—as well as management of the resulting waste—all result in emissions of greenhouse gases that affect the Earth's climate. Reduction and Recycling reduce production of green house gases.

The Link Between Waste Management and Greenhouse Gases



ECONOMICS OF SOLID WASTE

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Whether you use a landfill, incinerator or combine it with a recycling program, managing solid waste is still costly. Waste-to-energy programs are only cost effective when fuel price are high and programs serve a large population. Pay as you throw programs are the most effective at deterring waste production. What do you pay to throw garbage away?

Economically, the best choice is to reduce the amount of material we throw away.

**How can we
reduce our waste
production?**

45

Tools to reduce waste:

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The Four Rs:

Rethink

Reduce

Reuse

Recycle

RETHINK

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We know that most items we purchase will be thrown away eventually, so why not design for the “end of life” of the product? Engineers and product designers need to address:

- **Packaging**: materials comprise 65% of our waste.
- **Toxic substances**: substitute with less toxic or benign materials (i.e. lead-free solder) that can be harmlessly disposed of or recycled.

Rethink Example:

48

Building a Greener Computer

1. Engineer recycling into the design of the computer. Create components which are easily interchangeable for updating or removed for recycling.
2. Solder with lead-free material.
3. Select wire insulation that is free of PBC.
4. Use non-toxic silicon-based flame retardant instead of non-recyclable and toxic brominated fire retardants.
5. Replace chromium corrosion inhibitors with non-toxic forms.

REDUCE

49

As consumers, we make choices about the products we purchase and how much use we get out of them.

- Bottled water vs personal water bottles
- Single use shopping bags vs. reusable bags
- Coffee and soda “go-cups” vs. reusable insulated cups
- Food packaged in individual servings vs. buying in bulk (i.e. oatmeal, pasta)
- News papers vs. On-line news
- Paper bills and newsletters vs. email or on-line

REUSE

50

We can choose when to replace our belongings.

- Repair vs. replace: is it broken, or just “old”?
- Using “hand me downs” and shopping at thrift stores instead of always buying new clothing
- Taking advantage of libraries and rentals instead of buying most books and movies.
- Taking proper care of the items we do purchase, to maximize their lifetime.
- Adapting items for another use instead of discarding (e.g. dryer lint + wax = fire starters)

RECYCLE

51

- This term is often misused, or used too broadly. Proper definition of recycling is "the separation and collection of materials for processing and manufacturing into new products, and use of these new products to complete the cycle".
- Should be the final step, after **rethinking** product design and **reducing** waste production through wise purchasing and **reuse**.
- We are “**closing the cycle**” when we purchase items made up recycled material.
- “**Downcycling**” occurs when the new product is of mixed materials and can not be recycle again (i.e. carpeting and boards made of a mixture plastic bottles and sawdust).

Boom and Bust of Recycling

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The success of a recycling program is tied to market forces, transportation cost, and proximity to manufacturers.



Items made of a single material are costly to recycle

Should you pay for recycling?

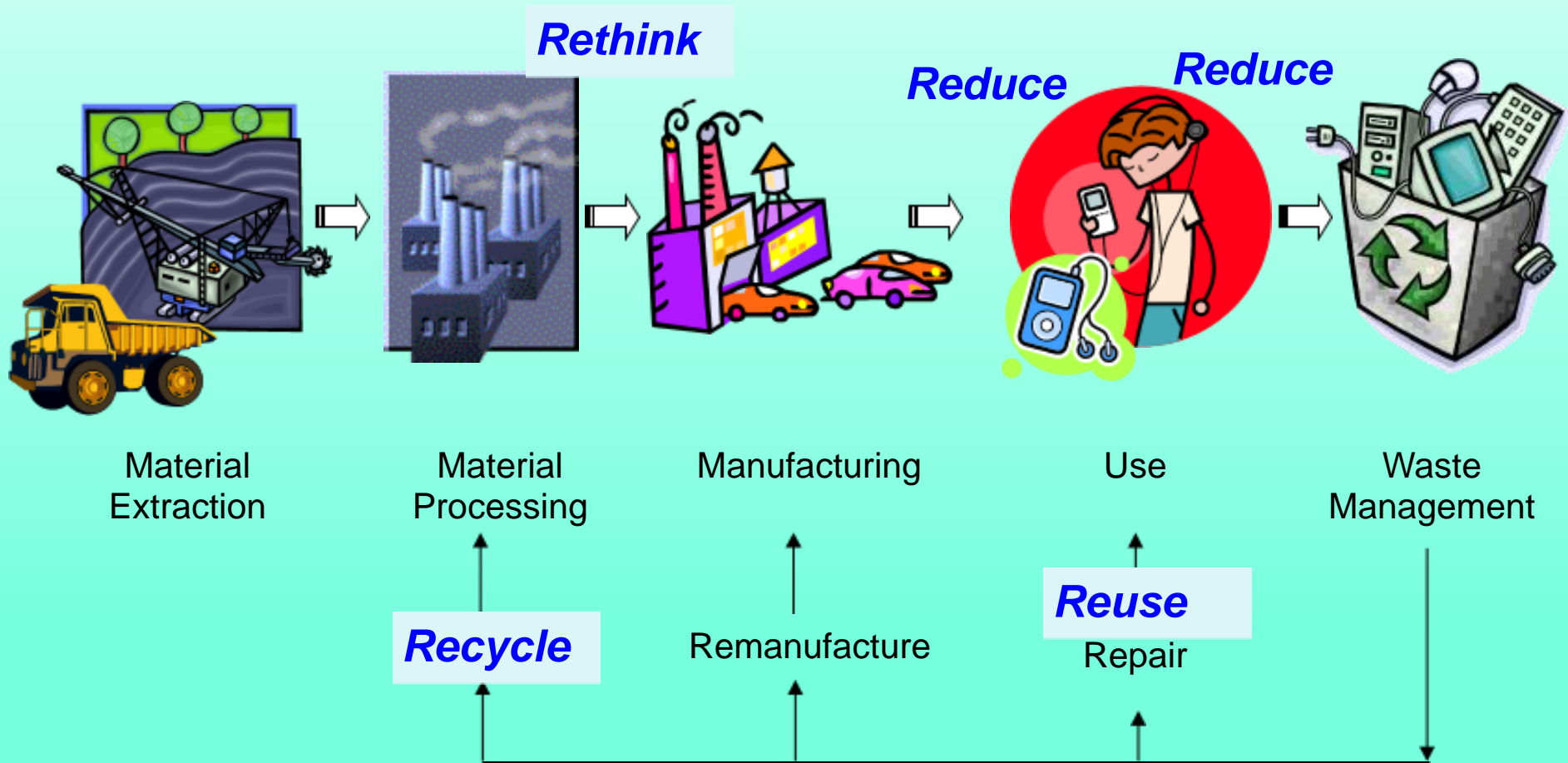
The more complex an item the more labor is needed to separate materials. If the labor is more costly than the recovered material than recycling is expensive. However one should also include the environmental cost of mining raw material versus recycling raw metal.



Items made of many materials have higher labor cost to recycle

The 4 Rs Illustrated: Product Lifecycle

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What Americans Think of Environmental Issues

Percentage of Americans who believe:



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In 2014, the Center for a New American Dream conducted a national survey to determine American attitudes on wealth, sharing, materialism, and more.

View the complete results: www.newdream.org/poll2014

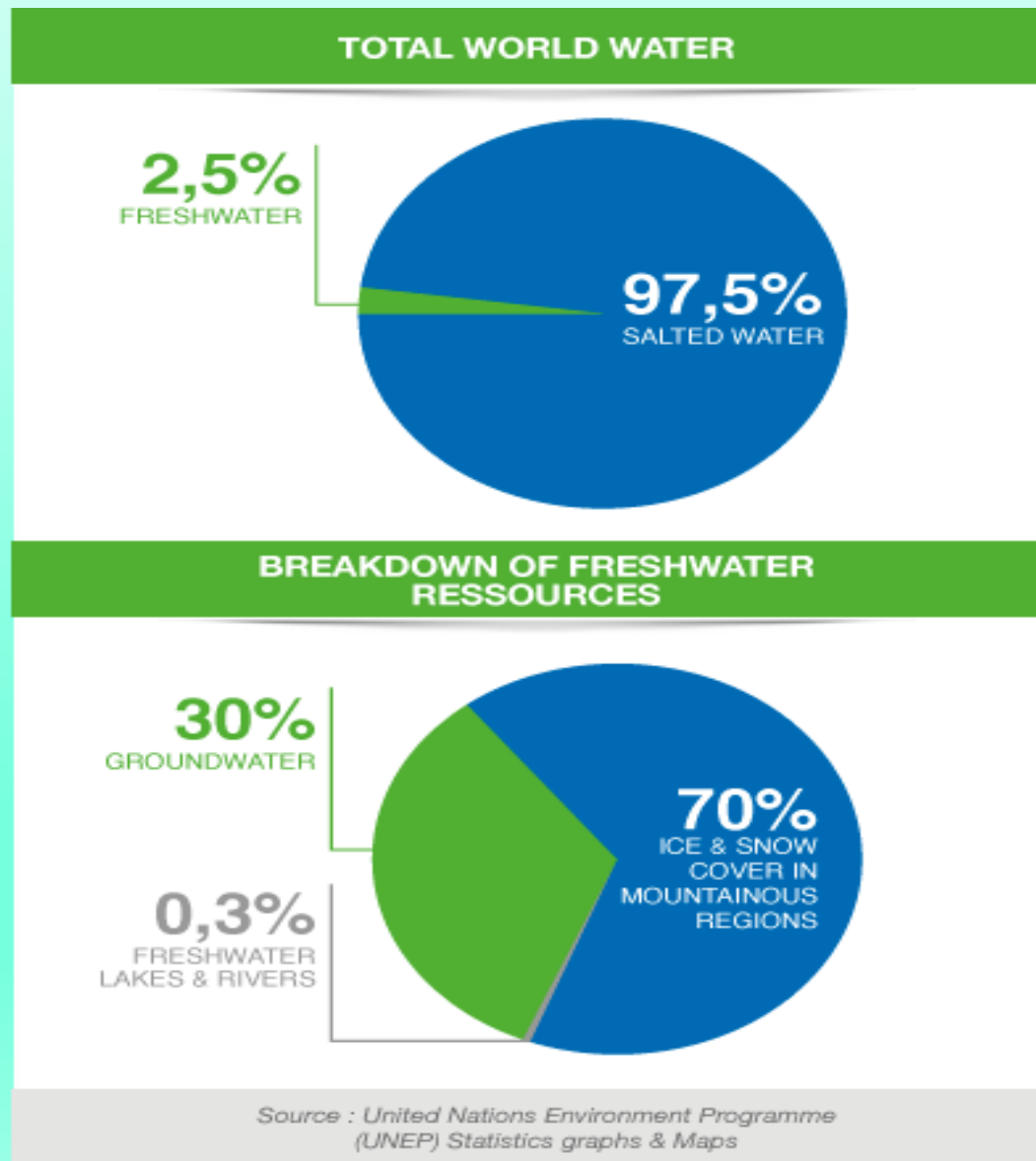
Statement of the Problem

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- Resources on the planet are limited
- Demography relates to the physical space and resources available to mankind.



Water resources as they relate to Sociology



Water

57



We need food, water and shelter to Survive

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Land As A **Scarce Resource**

- **Land = surface area of Earth w/o oceans, seas, lakes and rivers**
- 10% of its surface is habitable
- > 6 billion people living
- Many needs need to be met with the supply of limited land space
- Build houses, grow crops and set up industries on this limited land we have.

Environmental Sociology: Invitation for Research in a new field

59



Environmental problems are the 60 Problems of culture and society

- The numerous efforts of government and non-government agencies, national and international agencies to monitor the environmental condition of the planet with applied science rationality. Environmental sociologists are needed to provide a cultural basis for that planning and to assist with its implementation.

Consumption and Materialism 61

- How do we find a balance between the needs of the environment and the economic needs of Society?
- When to preserve and when to conserve and how much?
- Can businesses voluntarily become less damaging to the environment?



Population and Development

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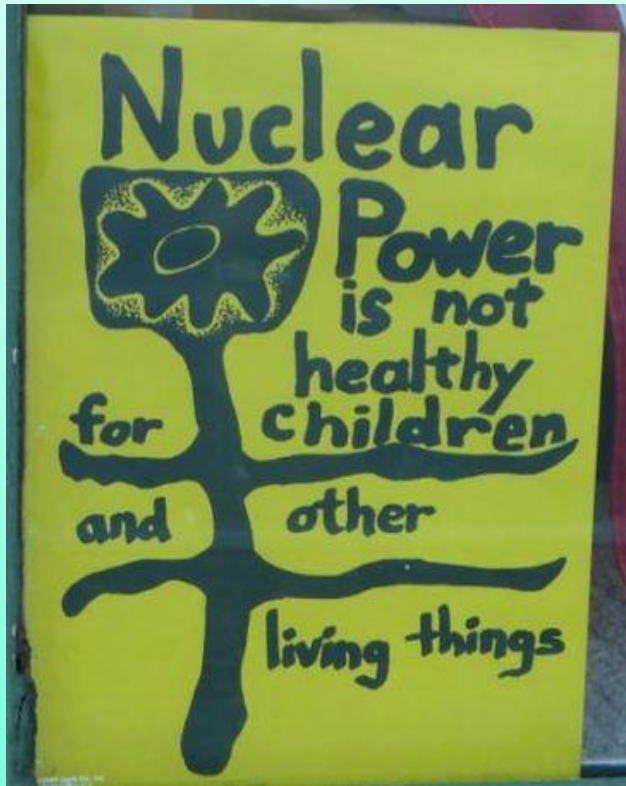
- Housing
- Transportation
- Food and water
- Infrastructure
- Commerce
- Open Space
- Environmental and Human impact



How about specific issues?

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- Anti-Nuclear Movements
- Animal Rights



Political Implications

"You can't change the science; you have to change the politics."

*Kumi Naidoo
on climate change*



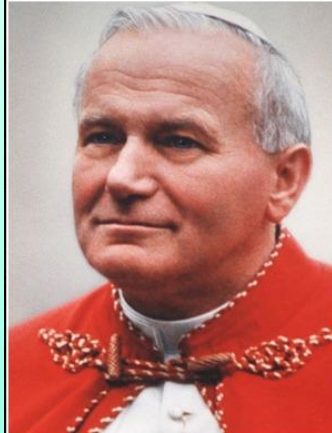
10 Key Values

- Grassroots Democracy
- Social Justice
- Ecological Wisdom
- Nonviolence
- Decentralization
- Community-based Economics
- Feminism
- Diversity
- Responsibility
- Future Focus

**Green Party
OF THE
UNITED STATES**

www.gp.org

Moral Considerations



The ecological crisis is a moral issue.

— Pope John Paul II —

AZ QUOTES

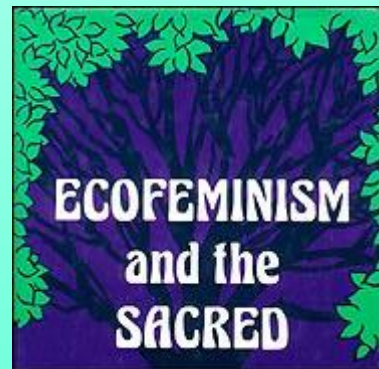
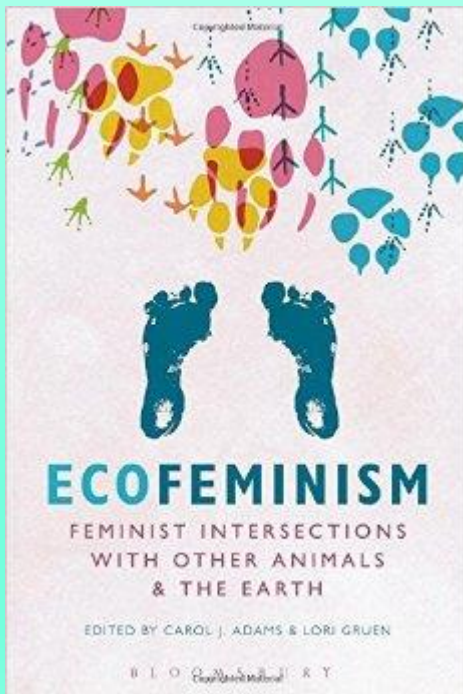


Implications for Research

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Ecofeminism and Movements

- Shamanism in Ecofeminism
- Feminist intersections with other animals



Future Solutions



Integrating New Technology into Environmental Sociology

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- You have to do some thinking on this. How can we merge these new technologies with social Ecology?
- What will be the role of new technology?



