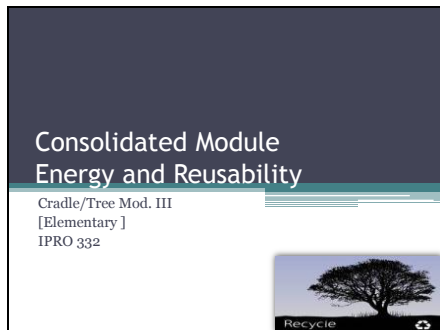


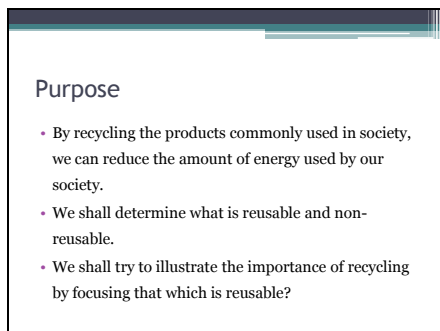
4. Appendix 4: Slides Not Included in Teaching Kits

Slides for overarching theme.

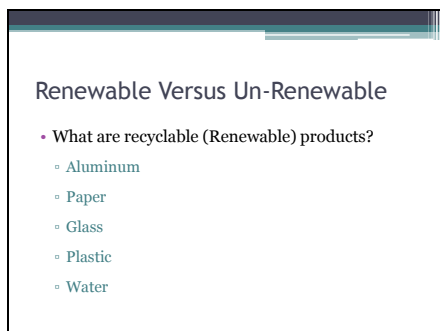
Slide 1



Slide 2



Slide 3



Slide 4

Renewable Versus Un-Renewable

- What are not recyclable (Un-Renewable) products?
 - Food
 - Disposable diapers
 - Clothes
 - Mirrors

Slide 5

Raw Materials

- What are some raw materials?
 - Ore (Steel or Iron)
 - Coal
 - Timber (Wood)
 - Oil
 - Etc.

Slide 6

Energy Used to Create a Product

- Imagine a glass bottle of Mr. Pure Juice (Fruit Punch for instance).
- How is the glass bottle created?
 - To create new glass, substances such as sand must be heated to 2,600° Fahrenheit, which consumes energy and creates pollution from factories.

Slide 7

Energy Production

- Where does heat needed to create glass come from?
- Raw Materials such as:
 - Coal
 - Petroleum
 - Natural Gas

Slide 8

Waste Produced

- How many pounds of paper would you think is wasted within a year?
 - Every day, people produce about 4.6 pounds of paper waste. In a week, this comes out to 32.2 pounds. And in a year, the amount of paper waste produced is about 650 pounds.

Slide 9

Why Recycle?



- By recycling we can:
 - Reduce the amount of raw material need to create products.
 - Reduce the amount of energy needed to create products.
 - Reduce the amount of waste produced.

Slide 10

What are some steps towards Recycling?

- Try to deposit used renewable products into their respective recycling bins for proper collection.
- [Point out notes on various locations that can offer more information on recycling]

Slide 11

The Continuous Life Cycles



Slide 12

Conclusion

- Recycling saves energy and natural resources through conservation.
- By using materials more than once we conserve natural resources.
- Recycling also helps control waste disposal problems.



New Elementary School Version for Tree Farming Module

Slide 1

PRO 332 SUSTAINABILITY

Sustainability:
With every kilowatt-hour that is created by clean energy is one less pound of coal burned.
Price Security:
Electric prices are relatively stable.
It is true that having an alternative energy source is a key role in creating the ideal zero energy home, but what's more effective and more eco-friendly is to have a house that is designed to be energy efficient.
Ask students what appliance uses the most electricity yearly than all other appliances? The answer to this question is the refrigerator.

Slide 10: The Light Bulb
Incandescent light bulbs run current through a wire filament that heats the filament until it starts to glow.
In a CFL, an electric current is driven through a tube containing mercury and a small amount of phosphor vapor.
ACFL takes more electricity to start, but in the end a CFL uses 75 percent less energy than incandescent bulbs.

Slide 11: The Difference it Makes
Question: what are some of the notable differences between the two types of bulbs?
Answer: Bulb lifetime, overall cost in the end, and energy consumption.

Slide 12: Big Picture
Less coal burned over the 13 year period of the CFL means less CO2 emissions than incandescent bulb.

Slide 13: Household Appliances
Question: Where can the label be seen?
Possible answers:
Refrigerators
Clothes Washers
Refrigerators
Room AC
Home Audio
Televisions
Computers
Printers
Lightbulbs

Slide 14: Energy Star
In 1992 the US Environmental Protection Agency (EPA) introduced ENERGY STAR. ENERGY STAR label is now on major appliances, office equipment, and home electronics.
The label is taken off of two refrigerators that are currently being sold in local stores.
The standard Refrigerator:
The Energy Star rate Refrigerator:
Possible Question: What are the dangers of standby mode?
Possible Answers:
Video Games

PAPER AND THE ENVIRONMENT



Slide 2

OBJECTIVES

- Raise awareness of sustainability issues
- Pass the knowledge of sustainability to students
- Teach young generation about sustainable solutions to the problem
- Encourage them to participate in future sustainability efforts and nurture their commitment to environmental stewardship

PAPER AND THE ENVIRONMENT



Slide 3

ABSTRACT

Paper is an expression of everyday living. It is hard to imagine what life would be like without paper. Most of the paper that we use today is made from virgin wood pulp.

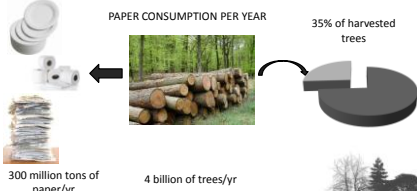
PAPER CONSUMPTION PER YEAR

300 million tons of paper/yr

4 billion of trees/yr

35% of harvested trees

PAPER AND THE ENVIRONMENT



Slide 4

PROBLEM

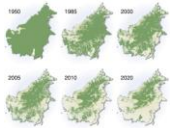
• Planetary deforestation



Growing a tree: 10 years



Cutting a tree: 1 hour



Deforestation rate over 70 years

- Pulp and paper account for approximately 40% of deforestation worldwide.
- World consumption of paper has grown 400% in the last 40 years

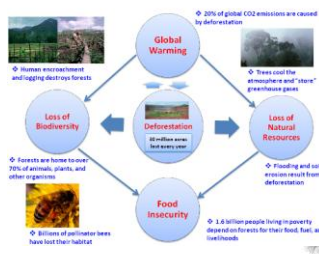
PAPER AND THE ENVIRONMENT



Slide 5

PROBLEM

• Planetary deforestation (diagram)



- Global Warming**
 - 20% of global CO2 emissions are caused by deforestation
 - Trees cool the atmosphere and "store" greenhouse gases
- Loss of Biodiversity**
 - Forests are home to over 70% of animals, plants, and other organisms
 - Billions of pollinator bees have lost their habitat
- Loss of Natural Resources**
 - Flooding and soil erosion result from deforestation
- Food Insecurity**
 - 1.6 billion people living in poverty depend on forests for their food, fuel, and livelihoods

PAPER AND THE ENVIRONMENT



Slide 6

PROBLEM

• Pollution released from paper mills





The processing of virgin wood paper uses harsh chemicals. It also wastes more energy and generates greenhouse gas emissions. Solid waste material is usually dumped on the land, liquid waste is generally flushed into streams or the sea and gases are left in open air contributing to global warming.

PAPER AND THE ENVIRONMENT

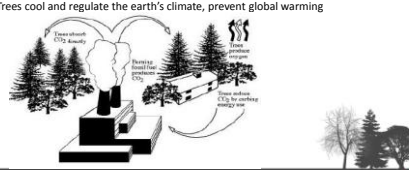


Slide 7

FACTS

Why are trees important?

- They provide precious habitat for animals
- They help control erosion by holding soil in place
- Trees remove carbon dioxide from the air while adding valuable oxygen to our atmosphere.
- The leaves they drop in autumn decompose into new soil that's rich in nutrients.
- Trees determine rainfall and replenish the atmosphere
- Trees cool and regulate the earth's climate, prevent global warming

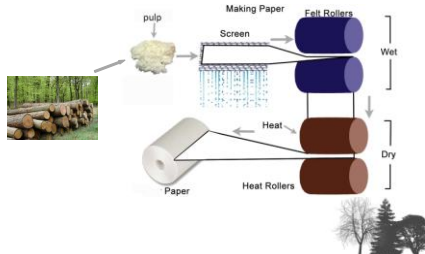


PAPER AND THE ENVIRONMENT

Slide 8

FACTS

How to make paper out of wood?



PAPER AND THE ENVIRONMENT

Slide 9

SOLUTIONS

alternatives that we can do



PAPER AND THE ENVIRONMENT

Slide 10

A. REDUCE/CONSERVE

- **Use both sides of the paper.** It's called "duplex printing"
- **Go digital.** Save on postage by sending electronic files
- **Be selective: print what you need when you need it.**
- **Reach for the right paper.** Use paper with recycled content.



PAPER AND THE ENVIRONMENT

Slide 11

B. TREE FARMING

- Wood is a renewable resource, we can grow new trees on a tree farm by planting seeds.
- Much of the wood used by paper companies in the U.S. comes from privately owned tree farms where forests are planted, groomed and thinned for harvest in 20 to 35 year cycles.
- Today, an average of 5 trees/year are planted for every American.



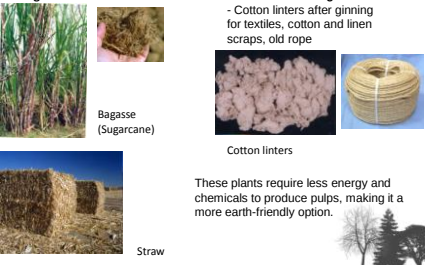
PAPER AND THE ENVIRONMENT

Slide 12

C. TREE-FREE FIBERS

4 Tree-Free Fiber Sources

- **Agricultural Residues**
 - **Bagasse (Sugarcane)**
 - **Straw**
- **Textile and Cordage Wastes**
 - Cotton linters after ginning for textiles, cotton and linen scraps, old rope



These plants require less energy and chemicals to produce pulps, making it a more earth-friendly option.

PAPER AND THE ENVIRONMENT

Slide 13

C. TREE-FREE FIBERS

- Wild Plants** - Wild grasses, Sisal, Bamboo
 


Sisal

Bamboo
- Fiber Crops** - The most promising is kenaf. Kenaf is a fast growing plant which yields more fiber per acre than a tree plantation
 




Hemp

Kenaf

Plant sources used for tree-free papers grow rapidly compared to trees



PAPER AND THE ENVIRONMENT

Slide 14

D. RECYCLED PAPER FIBERS

How is paper recycled?

- Sorting** : Sort your paper by grade, or type of paper
 
- Collection and Transportation**
 Sorted paper is taken to a recycling center, then transported to a paper mill.
 

PAPER AND THE ENVIRONMENT

Slide 15

D. RECYCLED PAPER FIBERS

How is paper recycled?

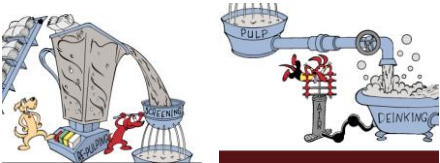
- Storage**
 When the paper mill is ready to use the paper, forklifts move the paper from the warehouse to large conveyors.
 

PAPER AND THE ENVIRONMENT

Slide 16

D. RECYCLED PAPER FIBERS

How is paper recycled?
What's next?



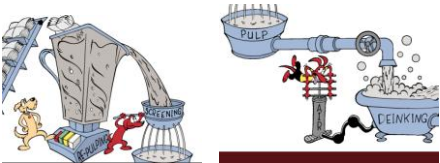
What do you think they're doing?

PAPER AND THE ENVIRONMENT

Slide 17

D. RECYCLED PAPER FIBERS

How is paper recycled?



4. Re-Pulping and Screening
The paper moves by conveyor to a big vat called a pulper

5. Cleaning
Mills also clean pulp by spinning it around in cylinders.

PAPER AND THE ENVIRONMENT

Slide 18

D. RECYCLED PAPER FIBERS

How is paper recycled?
What's next?



What do you think they're doing?

PAPER AND THE ENVIRONMENT

Slide 19

D. RECYCLED PAPER FIBERS

How is paper recycled?



6. Deinking
The pulp must undergo a "pulp laundering" to remove printing ink and "stickies"

7. Refining, Bleaching and Color Stripping

PAPER AND THE ENVIRONMENT

Slide 20

D. RECYCLED PAPER FIBERS

How is paper recycled?

Last steps?



8. Papermaking – Wet End

9. Papermaking – Dry End

PAPER AND THE ENVIRONMENT

Slide 21

CONCLUSION

These more earth-friendly options (Reduce, Recycle, Tree-free fibers and Tree farming) help the environment by:

- Conserving our natural resources, our precious forests – or even growing more by tree farming
- Energy conservation – saving on landfills space, keeping down the pollution generated by mills and incineration
- Keeping ecosystems in balance
- If we use recycled paper products it will not only save more trees but ultimately help save our planet from accelerated global warming.

PAPER AND THE ENVIRONMENT

Slides for HVAC Portion of Zero Energy House

Slide 1

Zero Energy Home

- What make zero energy home:
 - › Well insulated home
 - › Taking advantage of natural resources
 - › Efficient appliances
 - › Efficient lighting practices
 - › Efficient heating and cooling



Slide 2

Interesting fact

- 4% savings on A/C energy use for every 1 degree increase
- 10% energy consumption can be used standby power
- 70% of energy use by refrigerator and heating and cooling unit



Slide 3

HVAC

- Heating, Ventilating and Air Conditioning.
- What are your home using for heating?
- Ventilating is the processes exchange the air
- Air conditioning



Slide 4

Central Air

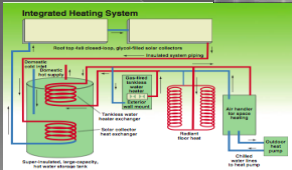
- Furnace: a heating device.
- Air conditioner: cooling device
- Heat Pump



Slide 5

HVAC

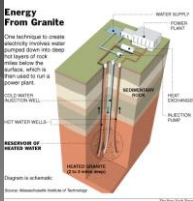
- Many methods of heating and cooling:
 - Geothermal
 - Chilledbeams
 - Solar heating

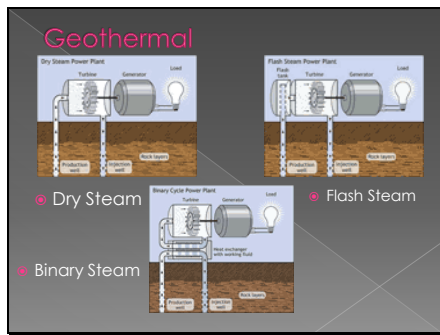
Slide 6

GeoThermal

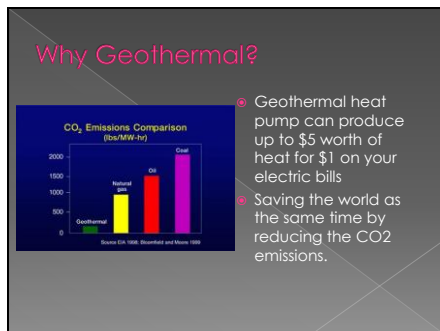
- Power extracted from heat stored in the earth
- Cold water is pumped into the Earth Crust, then heated up and rises to the surface. The steam are captured to drive electric generator



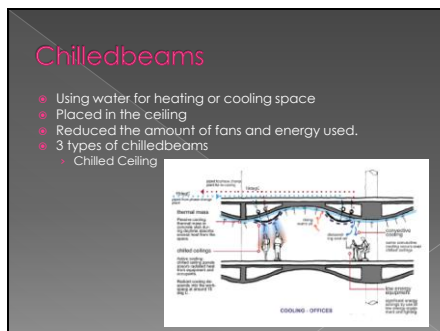
Slide 7



Slide 8



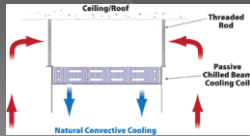
Slide 9



Slide 10

Chilled Beam

- Passive Chilled Beam:
 - > Second generation
 - > Increased the heating and cooling capacity



The diagram illustrates a passive chilled beam system. It shows a cross-section of a room with a ceiling. A horizontal beam is mounted to the ceiling, connected by a threaded rod. Inside the beam is a passive chilled beam cooling coil. Red arrows indicate air rising from the beam, and blue arrows indicate air descending, creating a natural convective loop. Labels include 'Ceiling/Beam', 'Threaded Rod', 'Passive Chilled Beam Cooling Coil', and 'Natural Convective Cooling'.

Slide 11

Chilled Beam

- > Active Chilled Beam
 - Third generation
 - Two and four pipe beams available
 - Temperature regulation accomplished by the change in water flow and induction rate



The image shows a 3D perspective view of an active chilled beam unit. It is a rectangular device with a grid of small circular nozzles on its top surface. Red arrows point upwards from the nozzles, indicating the flow of air. The unit is shown in a perspective view, highlighting its three-dimensional structure.

Thermal Mass

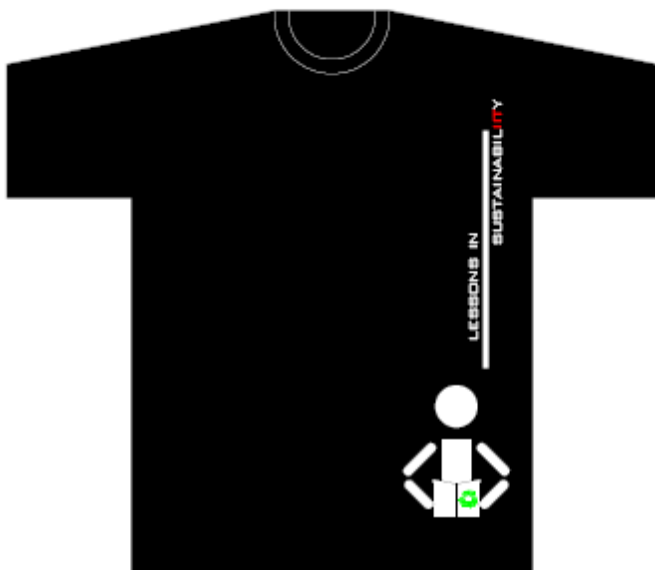
- Other names heat capacity, thermal capacitance

The diagrams show a house with thermal mass (represented by a large block) and its interaction with the environment during different seasons and times of day:

- Winter:** Shows the house absorbing heat from the sun during the day and releasing it at night. The sun is shown as a small circle, and the house is labeled 'Winter Day' and 'Winter Night'.
- Summer:** Shows the house absorbing heat from the sun during the day and releasing it at night. The sun is shown as a large circle, and the house is labeled 'Summer Day' and 'Summer Night'.

Small text at the bottom left: "Thermal mass is a property of a material to store heat. The more mass, the more heat it can store." "Thermal mass is a property of a material to store heat. The more mass, the more heat it can store."

5. Appendix 5: T-Shirt Design



6. Appendix 6: Bibliography

NOTE: At the time of preparation this was the knowledge at hand. The document preparer inserted the references to the best of his knowledge.

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