Sustainability Merit Badge

Scouts BSA

- Safety
  - Follow your family's rules for going online
  - Protect your privacy
  - Do not open emails or files from people you do not know or trust
  - If you receive/discover information that makes you uncomfortable, leave it and tell your parents
  - Do not believe everything you see or read online
  - NEVER agree to get together with someone you "meet" online
  - NEVER give personal information like email, phone number, address
  - NEVER share your Internet passwords with anyone
  - NEVER shop online unless you have your parent's permission to do so
  - Be a good online citizen

Requirement 1

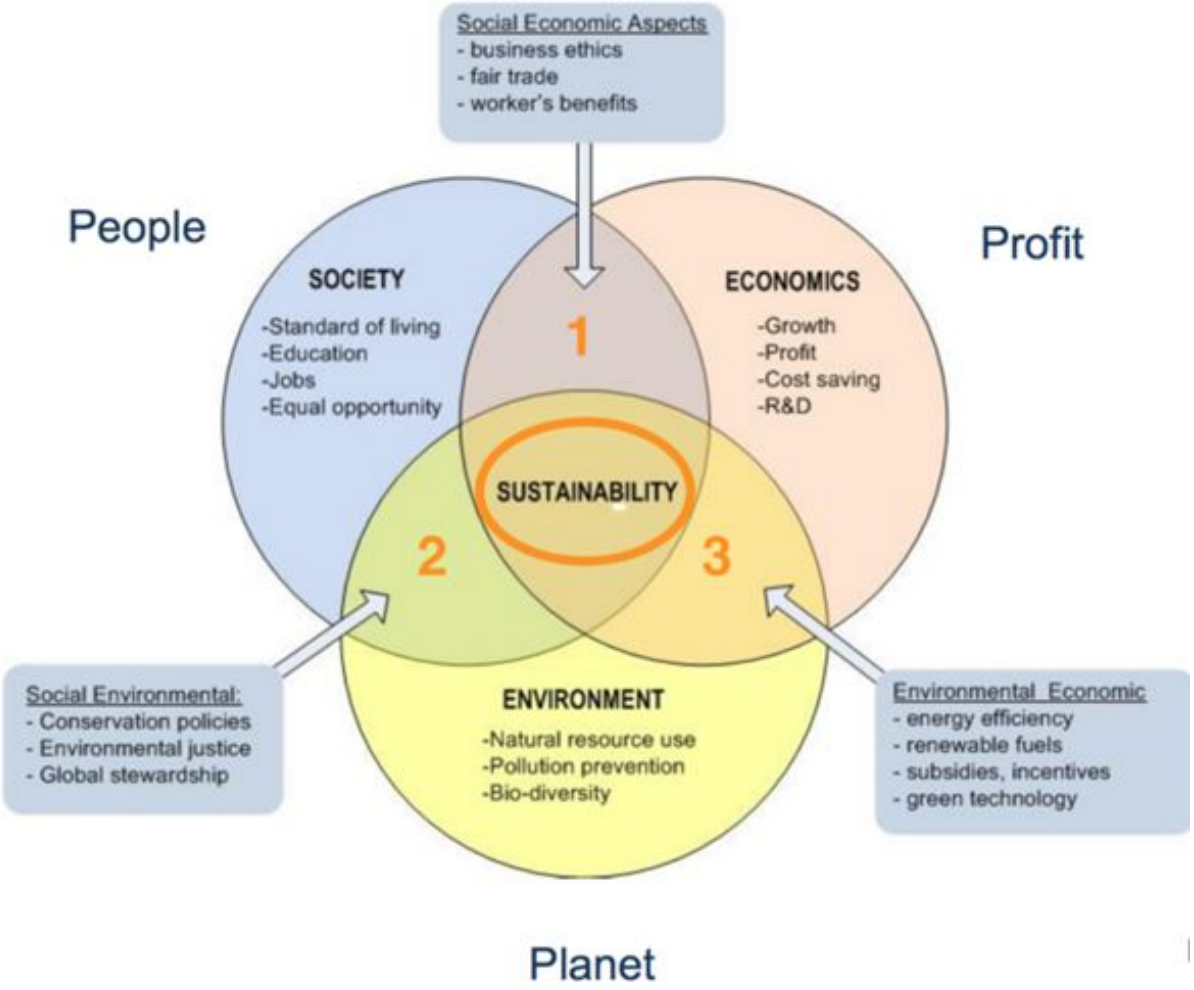
★ Before starting work on any other requirements for this merit badge, write in your own words the meaning of SUSTAINABILITY. Explain how you think conservation and stewardship of our natural resources relate to sustainability. Have a family meeting, and ask family members to write down what they think sustainability means. Be sure to take notes. You will need this information again for requirement 5.

Sustainability Definition

- ★ The methods of harvesting or using resources in ways that do not squander or permanently damage them.
- ★ Meeting today's needs without depleting resources for future generations.
- ★ Interdepence of people, environment, and economics
- ★ https://www.youtube.com/watch?v=gTamnlXbgqc

Three Pillars

- ★ People
  - Our family and neighbors are the engine of the economy. Long-term health and welfare of people are interwoven with the other pillars.
- ★ Economics
  - The flow of money and growth are important to business and can benefit our quality of life. Continued job growth, shareholder value, and employee wages are important.
- ★ Environment
  - Natural systems support the life of all things. Bees pollinating crops, forests filtering pollutants from the air, and wetlands purifying water are forms of valuable resources.
- ★ https://www.youtube.com/watch?v=_5r4loXPyx8


Social Economic Aspects
- business ethics
- fair trade
- worker's benefits
People
Profit
SOCIETY
-Standard of living
-Education
-Jobs
-Equal opportunity
ECONOMICS
-Growth
-Profit
-Cost saving
-R&D
1
SUSTAINABILITY
2
3
ENVIRONMENT
-Natural resource use
-Pollution prevention
-Bio-diversity
Social Environmental:
- Conservation policies
- Environmental justice
- Global stewardship
Environmental Economic
- energy efficiency
- renewable fuels
- subsidies, incentives
- green technology
Planet

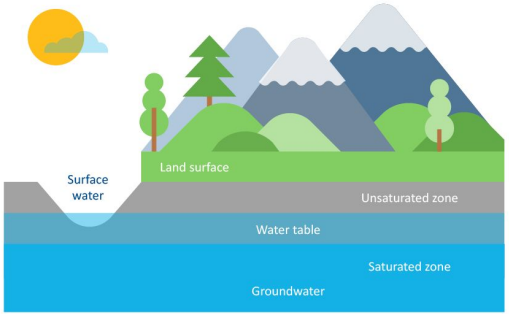
Requirement 2: Water

- ★ Average American uses 400 gallons of water daily at home.
  - Approximately 146,000 gallons per year per family
- ★ Less than 1% of the water on Earth can be used by humans
  - Everything else is salt water or water permanently frozen
- ★ Surface water vs Ground water
  - River, Lake, or Reservoir vs Underground Aquifer

Requirement 2: Water

Drinking Water Sources

Where do freshwater supplies come from?



Surface water

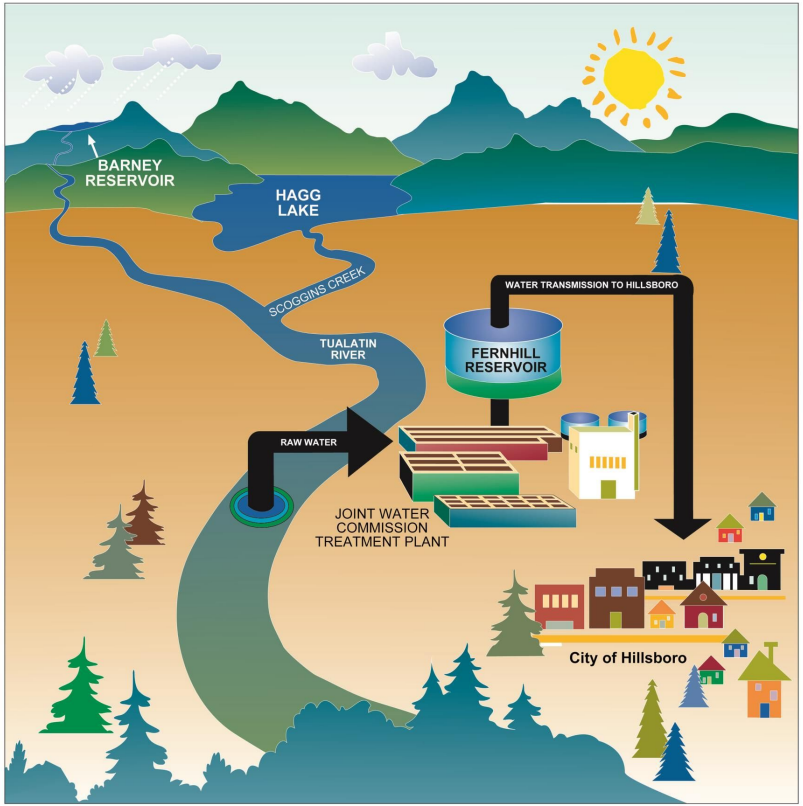
- Supplies 64% of public water systems
- Comes from rain and snow
- Accumulates in rivers, streams, and lakes
- Piped and pumped to water treatment centers

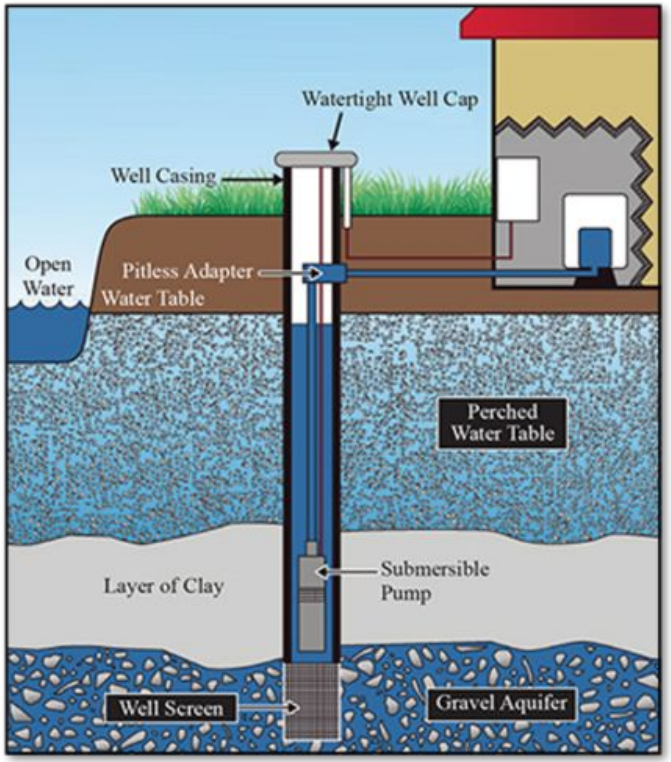
Groundwater

- Supplies 36% of public water systems
- Comes from rain and snow
- Seeps into the ground and is then stored in natural aquifers
- Must be accessed at a natural spring or pumped out of the ground with a well

sources: chargerwater.com dep.pa.gov epa.gov

Requirement 2: Water

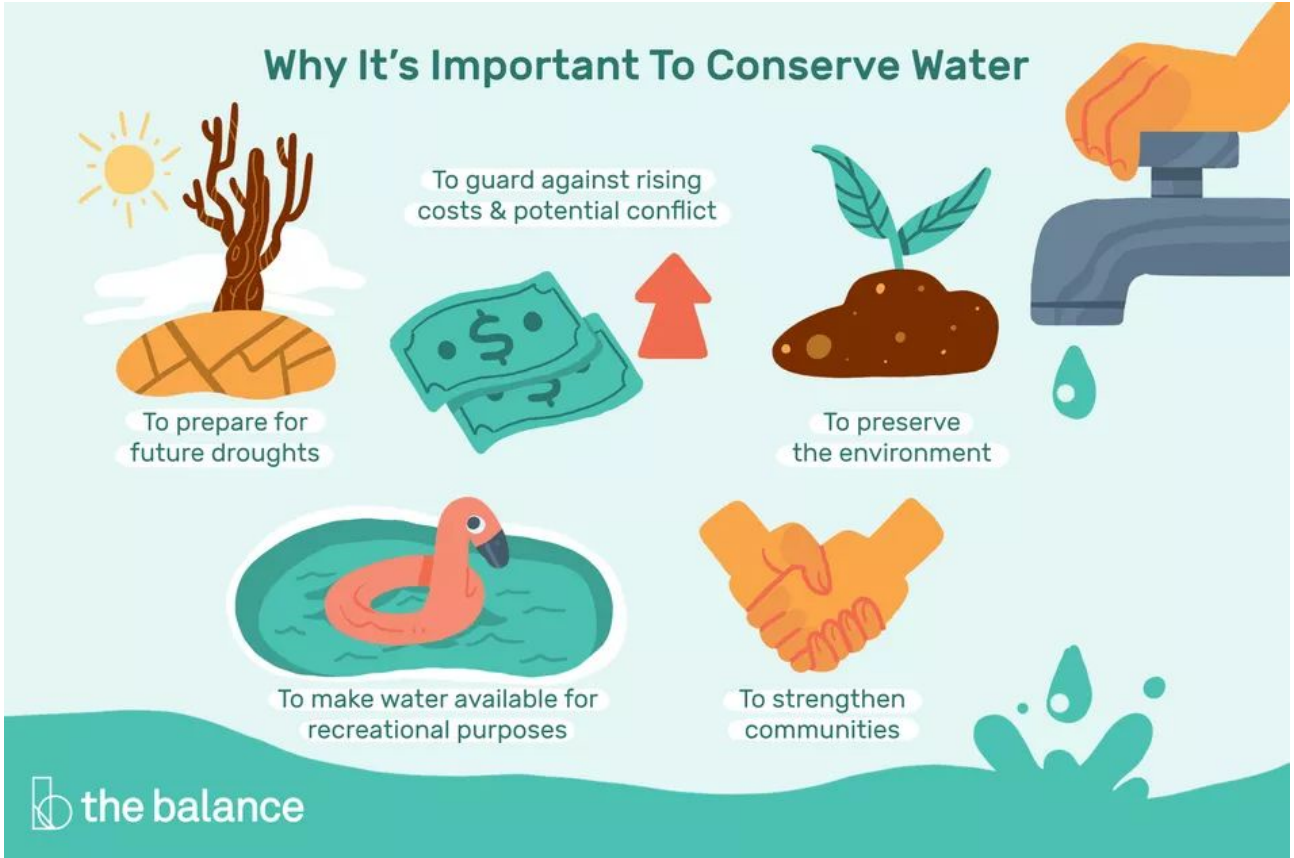




Requirement 2: Water

- ★ Public Water Systems
  - https://www.epa.gov/sites/production/files/2017-10/documents/epa-ogwdw-publicwatersystems-final508.pdf
- ★ Well
  - Private source of drinking water and can be expensive to dig
  - Aquifers can run dry or become contaminated with pollutants like fertilizers and chemical waste
  - Contaminated by seawater, if near an ocean
  - Costs money to maintain or replace the pumps/pipes/hot water heater
- ★ Septic Tank
  - Wastewater from toilets, showers, sinks, and laundry
  - More people in house means more waste: needs to be cleaned out more often
  - Company hired to pump out the tank and take it to a treatment facility- can cost a lot of money

Requirement 2: Water



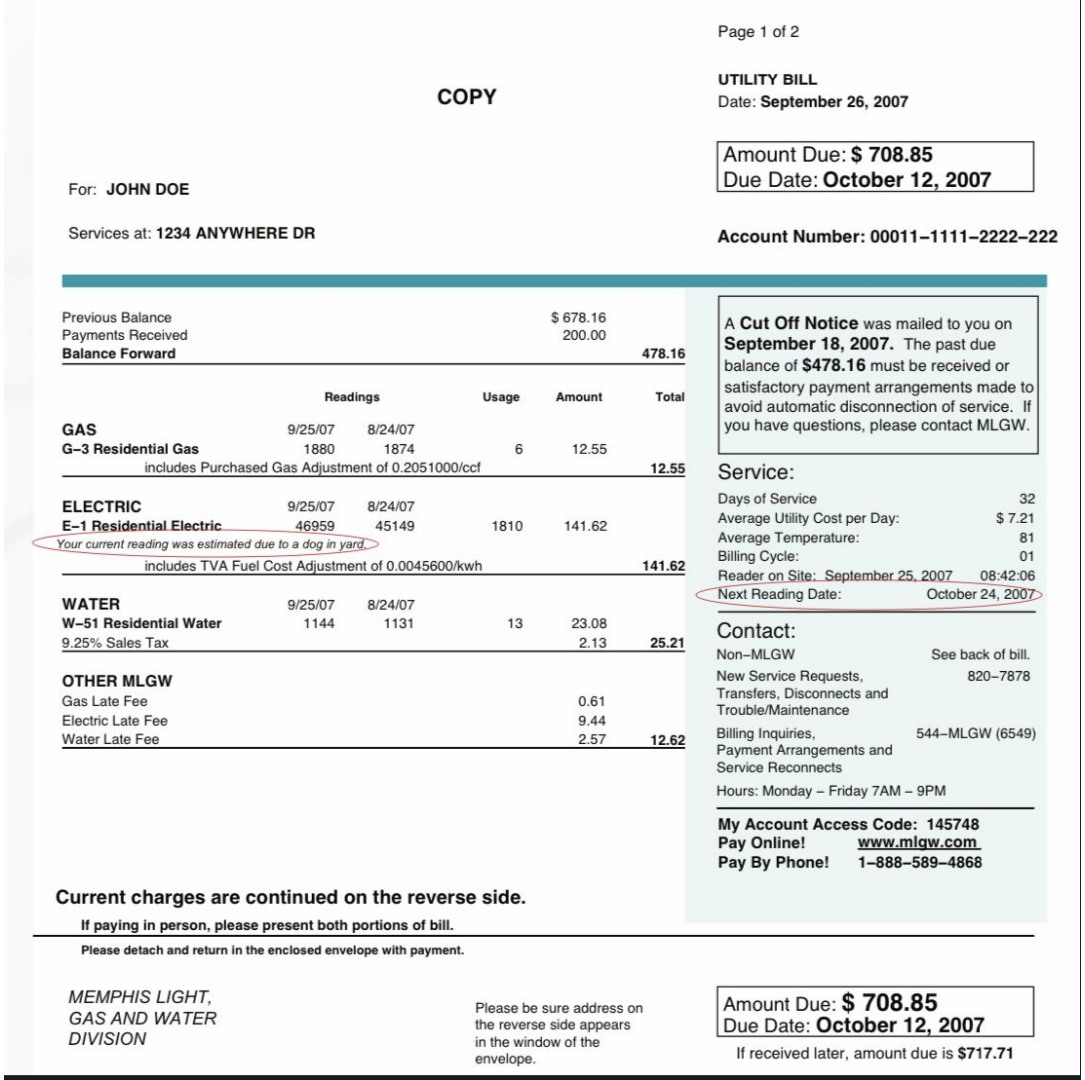
Requirement 2: Water

a. Develop and implement a plan that attempts to reduce your family's water usage. As a family, discuss water usage. To aid in your discussion, compare a few months of past water bills. As a family, choose 3 ways to reduce water consumption. Implement those ideas for one month. Share what you learned with your counselor, and tell how you think your plan affected your family's water usage.

Requirement 2: Water

- ★ MLGW: Memphis Light Gas and Water
  - http://www.mlgw.com/images/content/files/pdf/ReadingYourMeter.pdf

Requirement 2: Water



Page 1 of 2

COPY

UTILITY BILL
Date: **September 26, 2007**

Amount Due: **$ 708.85**
Due Date: **October 12, 2007**

For: **JOHN DOE**

Services at: **1234 ANYWHERE DR**

Account Number: 00011–1111–2222–222

Previous Balance				$ 678.16	
Payments Received				200.00	
Balance Forward					478.16
	Readings		**Usage**	**Amount**	**Total**
GAS	9/25/07	8/24/07			
G–3 Residential Gas	1880	1874	6	12.55	
includes Purchased Gas Adjustment of 0.2051000/ccf					**12.55**
ELECTRIC	9/25/07	8/24/07			
E–1 Residential Electric	46959	45149	1810	141.62	
Your current reading was estimated due to a dog in yard.					
includes TVA Fuel Cost Adjustment of 0.0045600/kwh					**141.62**
WATER	9/25/07	8/24/07			
W–51 Residential Water	1144	1131	13	23.08	
9.25% Sales Tax				2.13	**25.21**
OTHER MLGW					
Gas Late Fee				0.61	
Electric Late Fee				9.44	
Water Late Fee				2.57	**12.62**

A **Cut Off Notice** was mailed to you on **September 18, 2007.** The past due balance of **$478.16** must be received or satisfactory payment arrangements made to avoid automatic disconnection of service. If you have questions, please contact MLGW.

Service:

Days of Service	32
Average Utility Cost per Day:	$ 7.21
Average Temperature:	81
Billing Cycle:	01
Reader on Site: September 25, 2007	08:42:06
Next Reading Date:	October 24, 2007

Contact:

Non–MLGW	See back of bill.
New Service Requests, Transfers, Disconnects and Trouble/Maintenance	820–7878
Billing Inquiries, Payment Arrangements and Service Reconnects	544–MLGW (6549)

Hours: Monday – Friday 7AM – 9PM

My Account Access Code: 145748
Pay Online! www.mlgw.com
Pay By Phone! 1–888–589–4868

Current charges are continued on the reverse side.

If paying in person, please present both portions of bill.

Please detach and return in the enclosed envelope with payment.

MEMPHIS LIGHT, GAS AND WATER DIVISION

Please be sure address on the reverse side appears in the window of the envelope.

Amount Due: **$ 708.85**
Due Date: **October 12, 2007**

If received later, amount due is **$717.71**

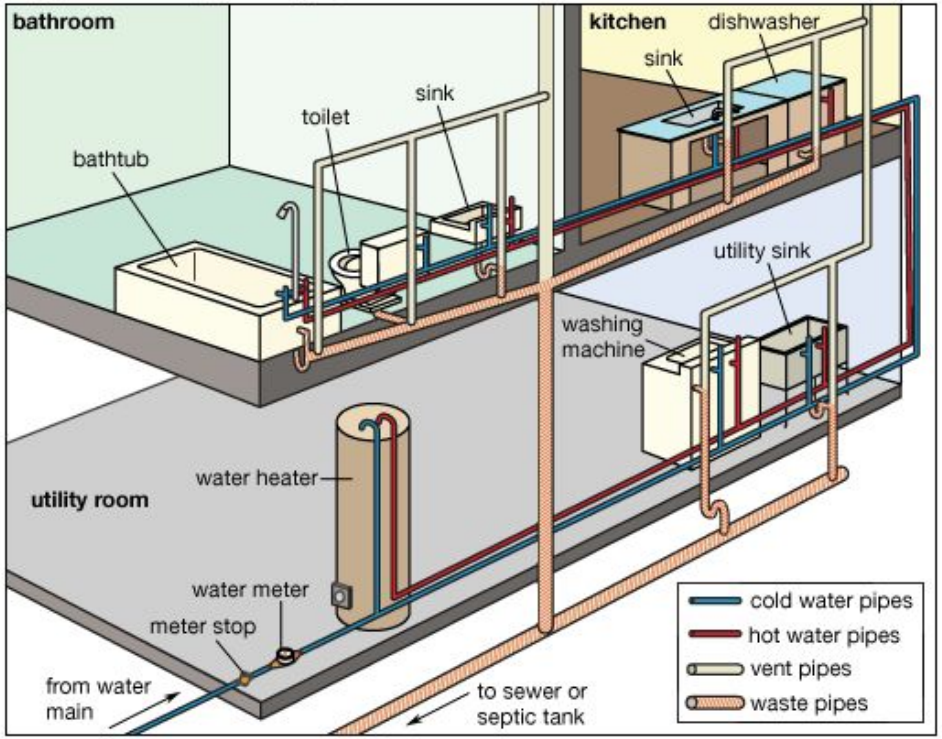
Requirement 2: Water

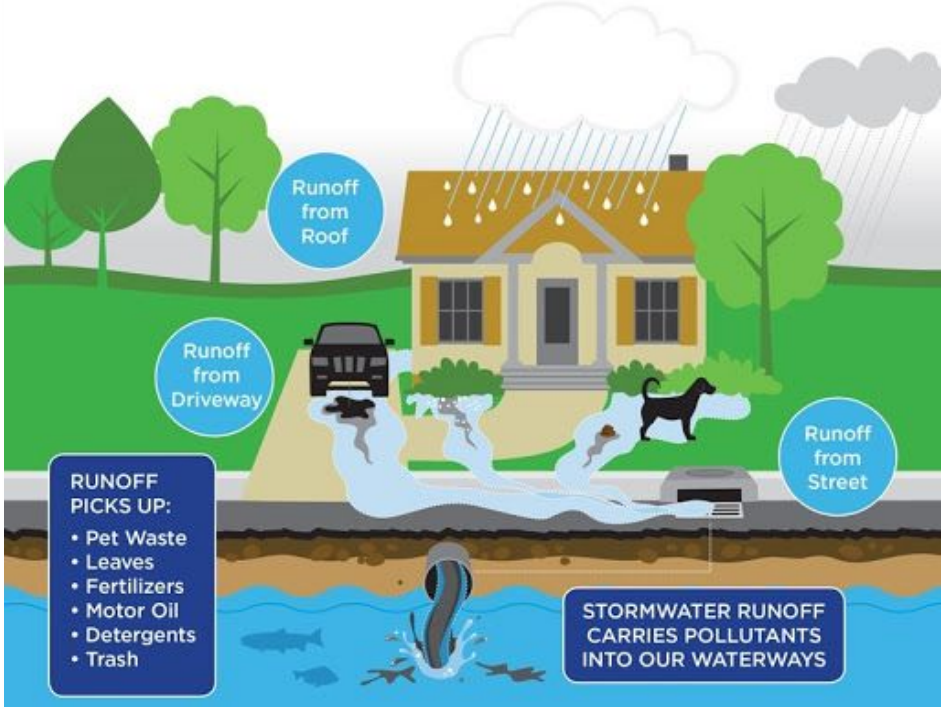
- https://wateruseitwisely.com/100-ways-to-conserve/?view=list
- Keep showers under 5 mins
- Turn off water while brushing teeth
- Run dishwasher only when full
- Run washing machine only when full
- Fix any leaks in the house: toilet, sinks
- Install rain barrels
- Industrial recycling of “gray water” - waste water that has been treated
- Businesses recycling or repurposing water

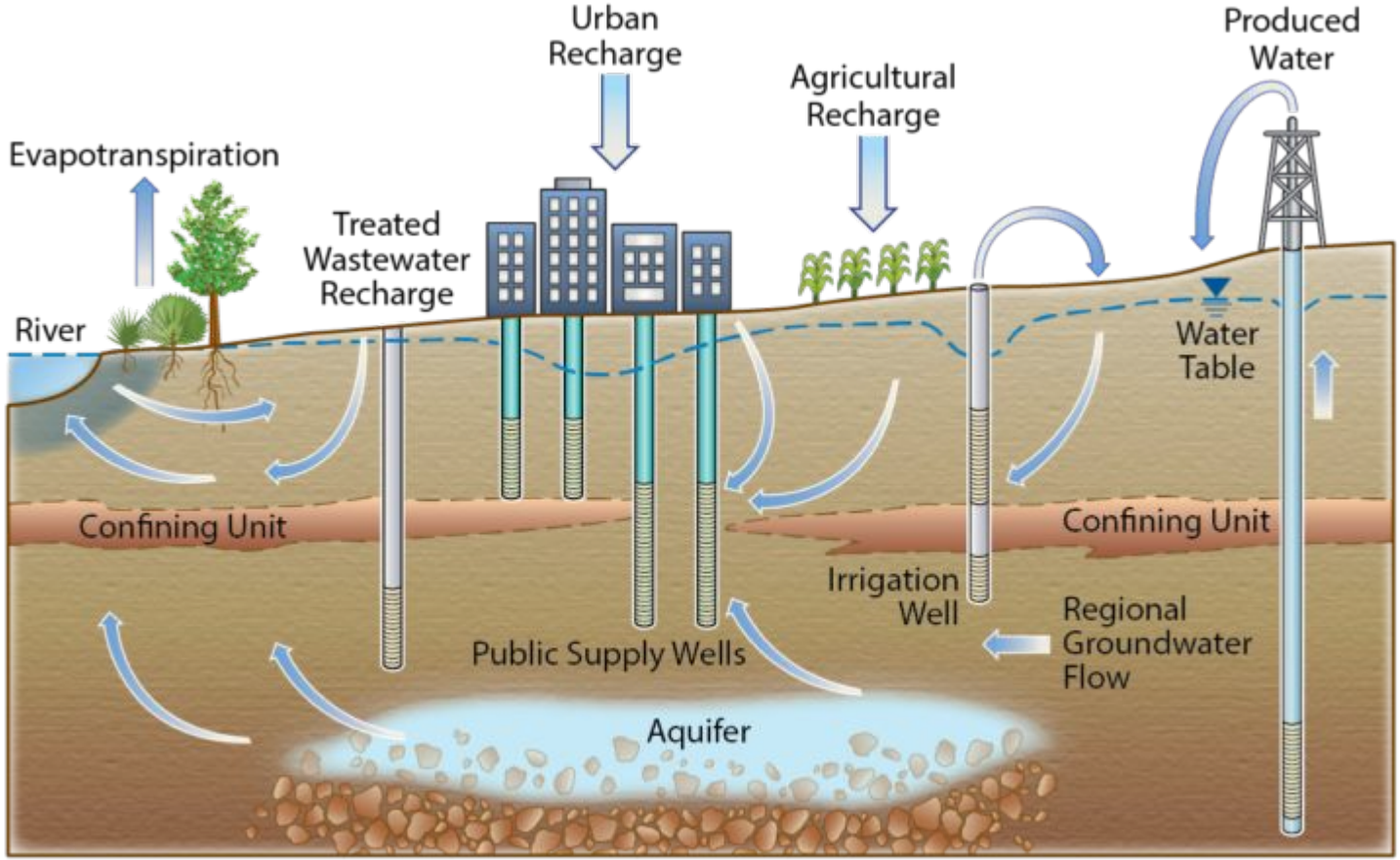
Requirement 2: Water

b. Using a diagram you have created, explain to your counselor how your household gets its clean water from a natural sources and what happens with the water after you use it. Include water that goes down the kitchen, bathroom, and laundry drains, and any runoff from watering the yard or washing the car. Tell 2 ways to preserve your family’s access to clean water in the future.

A typical house plumbing system






Urban
Recharge
Agricultural
Recharge
Produced
Water
Evapotranspiration
Treated
Wastewater
Recharge
River
Water
Table
Confining Unit
Confining Unit
Irrigation
Well
Regional
Groundwater
Flow
Public Supply Wells
Aquifer

Requirement 2: Water

★ 4 sand aquifers under Shelby County: Memphis Aquifer, Fort Pillow Sand Aquifer, 2500 Foot Aquifer, Coffee Sand Aquifer. MLGW operates 175 wells throughout Shelby County, making it one of the most extensive artesian well systems in the world.

Requirement 2: Water

- ★ Water Source Protections
  - Check Consumer Confidence Report
    - https://www.epa.gov/ccr/ccr-information-consumers
  - Use/Dispose of Harmful Materials Properly
    - Don’t pour hazardous waste down the drain, on the ground, into storm sewers
      - Motor oil, pesticides, leftover paint/paint cans, mothballs, flea collars, household cleaners
  - Limit lawn fertilizers and pesticides
  - Dispose of medications properly
  - Develop working partnerships with businesses: agricultural and manufacturing, and communities to prevent pollution

Requirement 2: Water

c. Discuss with your counselor 2 areas in the world that have been affected by drought over the last 3 years. For each area, identify a water conservation practice (successful or unsuccessful) that has been used. Tell whether the practice was effective and why. Discuss what water conservation practice you would have tried and why.

Requirement 2: Water

- https://www.drought.gov/drought/
- https://gis.ncdc.noaa.gov/maps/ncei/drought/global
- https://www.ready.gov/drought

Requirement 2: Food

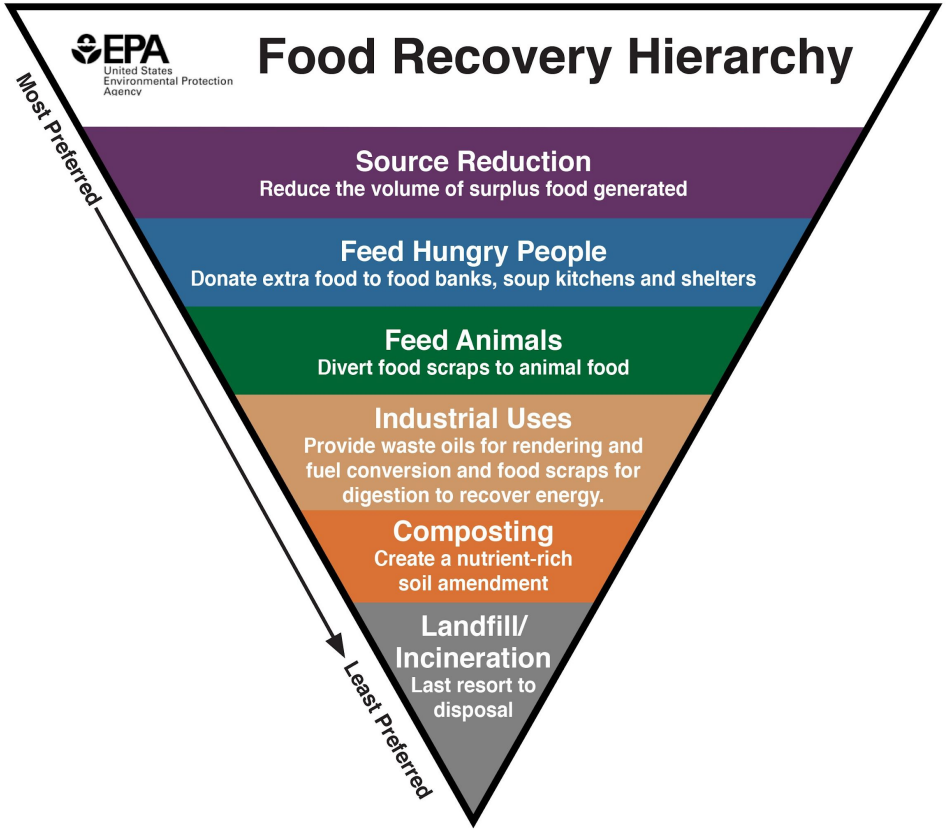
- ★ Americans waste more than 65 BILLION pounds of food each year
  - Approx $2,200 per year thrown away by each household
- ★ Food waste is the single largest component of municipal solid waste that ends up in landfills and incinerators
- ★ More than 60% of the waste can be avoided
- ★ https://www.youtube.com/watch?v=6RlxySFrkIM
- ★ WASTE NOT, WANT NOT.

Requirement 2: Food

- ★ Food waste concerns
  - Wasting money
  - Wasting food that could go to people in need
  - Contributing to methane production: a greenhouse gas that is a big concern for the planet that is produced by food breaking down at the landfill
  - Wastes the energy, water, labor, and other costs that go into growing, processing, and transporting food from farmers and factories to consumers

Requirement 2: Food

- ★ Waste prevention
  - Source reduction/Prevention
    - Prevent waste before it is created
  - Feeding people
    - Donating fresh, nutritious food to those in need
  - Feeding animals
    - Feeding safe, fresh food scraps to animals (like pig farms)
  - Industrial uses
    - Rendering fat, oil, and grease and turning into products or biofuel
  - Composting
    - Turning food waste into valuable soil amendment
    - Key ingredient in Organic Farming



Requirement 2: Food

- ★ Source reduction
  - Plan family meals, pay attention to portion size, and check to see what ingredients you already have
  - Make a shopping list and stick to it
  - Check refrigerator temperature. Food should be stored between 33.8-41 degrees F.
  - Put new food behind the old food in storage.
  - Try not to throw away fresh food. Freeze it, add it to other meals, get creative with leftovers for lunch
  - Serve small portions. People can get seconds.
  - Buy the precise amount of fresh vegetables and fruit you need for your meals. Same for deli meats and cheeses.
  - If buying in bulk, food and prepared meals can be frozen in portions that are sized for a single meal for your family
  - Set up a compost bin

Requirement 2: Food

a. Develop and implement a plan that attempts to reduce your household food waste. Establish a baseline and then track and record your results for 2 weeks. Report your results to your family and counselor.

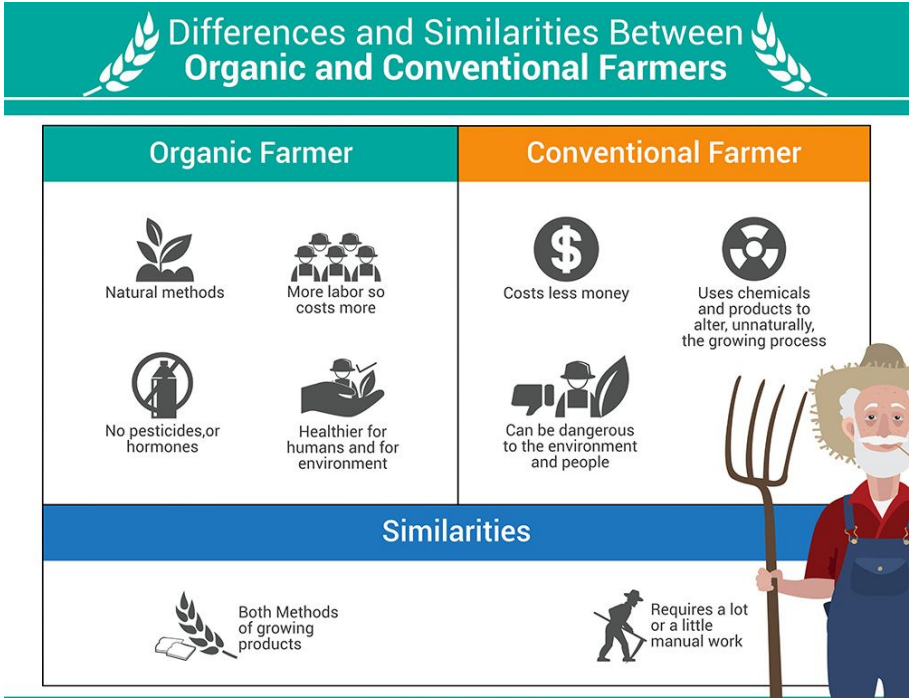
https://www.epa.gov/sites/production/files/2015-08/documents/food-waste-log.pdf

Requirement 2: Food

b. Discuss with your counselor the ways individuals, families, and communities can create their own food sources (potted plants, family garden, rooftop garden, neighborhood/community garden). Tell how this plan might contribute to a more sustainable way of life if practiced globally.

Requirement 2: Food

- ★ Conventional Farming is unsustainable
  - Monoculture
  - No crop rotation
  - Habitat loss
  - Water use
  - Over-fertilizing
  - Over-pesticide use
  - Destruction of soil
  - Feedlots: environmental hazard



Requirement 2: Food

“Think Globally, Act Locally”

Sustainable gardening: a garden that be used productively over and over without the need for excessive restarting costs and without damaging the environment.

- ★ Garden pots
- ★ Backyard vegetable garden
- ★ Fruit trees at your home
- ★ Raise chickens for eggs
- ★ Community gardens
- ★ Rooftop gardens
- ★ Organic gardens

Requirement 2: Food

c. Discuss with your counselor factors that limit the availability of food and food production in different regions of the world. Tell 3 ways these factors influence the sustainability of worldwide food supplies.

Requirement 2: Food

- ★ 1960’s most countries were self-sufficient
- ★ Now only 2 of 183 nations are major grain exporters: US and Canada
- ★ For most people, grain is a primary source of nutrition
- ★ Food security is access by all to sufficient food for an active, healthy life.
- ★ Factors that affect food security
  - Literacy rates
  - Levels of farmer education
  - Agricultural research and extension capacity
  - Transport infrastructure
  - Non-agricultural income opportunities
  - Social support systems
  - International security and confidence in international trade
  - Domestic civil strife
  - International capital movements

Requirement 2: Food

★ “Green Revolution”
- 1960’s Energy-intensive farming- unsustainable
- Heavy use of fossil fuels for fertilizer, pesticides, irrigation
- Led to soil erosion and contamination and water pollution, and sped up the depletion of groundwater and surface water resources
- Limited land suitable to agriculture

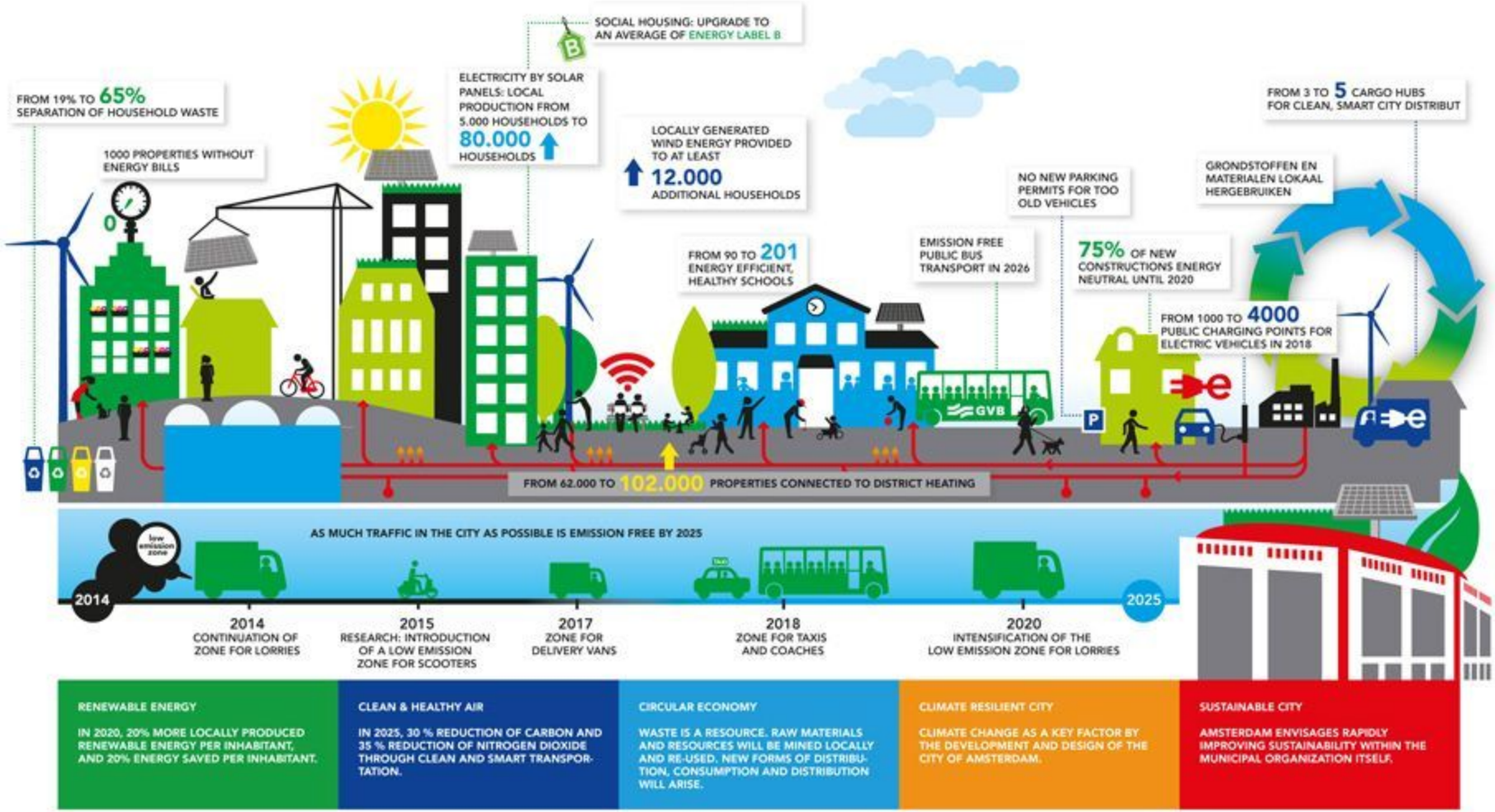
Requirement 2: Community

★ Sustainable community
- Economically, environmentally, and socially healthy and resilient
- Meets challenges through integrated solutions, not fragmented approaches that meet one goal at the expense of others
- It takes a long-term perspective
- Can walk to work/school, community focused
- Less pollution
- Natural habitat areas
- Fewer miles of roads/pipes
- https://sustain.org/

★ Cities consume 2/3rds of the world's energy and produce 70% of global CO2 emissions
- As urbanization increases with an expected 70% of the world's population to live in cities by 2050, it is essential to identify and implement green approaches to development

Requirement 2: Community

a. Draw a rough sketch depicting how you would design a sustainable community. Share your sketch with your counselor, and explain how the housing, work locations, shops, schools, and transportation systems affect energy, pollution, natural resources, and the economy of the community.


SOCIAL HOUSING: UPGRADE TO AN AVERAGE OF ENERGY LABEL B
FROM 19% TO 65% SEPARATION OF HOUSEHOLD WASTE
ELECTRICITY BY SOLAR PANELS: LOCAL PRODUCTION FROM 5.000 HOUSEHOLDS TO 80.000 HOUSEHOLDS
1000 PROPERTIES WITHOUT ENERGY BILLS
LOCALLY GENERATED WIND ENERGY PROVIDED TO AT LEAST 12.000 ADDITIONAL HOUSEHOLDS
FROM 3 TO 5 CARGO HUBS FOR CLEAN, SMART CITY DISTRIBUT
NO NEW PARKING PERMITS FOR TOO OLD VEHICLES
GRONDSTOFFEN EN MATERIALEN LOKAAL HERGEBRUIKEN
FROM 90 TO 201 ENERGY EFFICIENT, HEALTHY SCHOOLS
EMISSION FREE PUBLIC BUS TRANSPORT IN 2026
75% OF NEW CONSTRUCTIONS ENERGY NEUTRAL UNTIL 2020
FROM 1000 TO 4000 PUBLIC CHARGING POINTS FOR ELECTRIC VEHICLES IN 2018
GVB
FROM 62.000 TO 102.000 PROPERTIES CONNECTED TO DISTRICT HEATING
AS MUCH TRAFFIC IN THE CITY AS POSSIBLE IS EMISSION FREE BY 2025
low emission zone
2014
2025
2014 CONTINUATION OF ZONE FOR LORRIES
2015 RESEARCH: INTRODUCTION OF A LOW EMISSION ZONE FOR SCOOTERS
2017 ZONE FOR DELIVERY VANS
2018 ZONE FOR TAXIS AND COACHES
2020 INTENSIFICATION OF THE LOW EMISSION ZONE FOR LORRIES
RENEWABLE ENERGY
IN 2020, 20% MORE LOCALLY PRODUCED RENEWABLE ENERGY PER INHABITANT, AND 20% ENERGY SAVED PER INHABITANT.
CLEAN & HEALTHY AIR
IN 2025, 30 % REDUCTION OF CARBON AND 35 % REDUCTION OF NITROGEN DIOXIDE THROUGH CLEAN AND SMART TRANSPORTATION.
CIRCULAR ECONOMY
WASTE IS A RESOURCE. RAW MATERIALS AND RESOURCES WILL BE MINED LOCALLY AND RE-USED. NEW FORMS OF DISTRIBUTION, CONSUMPTION AND DISTRIBUTION WILL ARISE.
CLIMATE RESILIENT CITY
CLIMATE CHANGE AS A KEY FACTOR BY THE DEVELOPMENT AND DESIGN OF THE CITY OF AMSTERDAM.
SUSTAINABLE CITY
AMSTERDAM ENVISAGES RAPIDLY IMPROVING SUSTAINABILITY WITHIN THE MUNICIPAL ORGANIZATION ITSELF.

Requirement 2: Community

- https://www.youtube.com/watch?v=fcDDUSUbq9A
- https://www.youtube.com/watch?v=0GwINxSlMFs
- 6 sustainable cities
  - Copenhagen, Denmark
  - San Francisco, California, US
  - Vancouver, Canada
  - Stockholm, Sweden
  - Singapore
  - Reykjavik, Iceland

Requirement 2: Community

b. With your parent's permission and your counselor's approval, interview a local architect, engineer, contractor, or building material supplier. Find out the factors that are considered when using sustainable materials in renovating or building a home. Share what you learn with your counselor.

★ https://www.slideshare.net/donaldsimon/Engineered-Wood-Sustainability-and-Green-Building-Practices

SUSTAINABLE FORESTRY INITIATIVE

X%

Certified Chain of Custody

X% Certified Forest Content,
X% Certified Sourcing, and
X% Recycled Content

www.sfiprogram.org

SFI-00001

What to know about LEED Certifications

Leadership in Energy and Environmental Design

What is LEED?

The LEED (Leadership in Energy and Environmental Design) certification program was developed by the U.S. Green Building Council (USGBC) and provides a standard for environmentally-conscious building codes to "create healthy, highly efficient, and cost-saving green buildings". It focuses on environmental components such as energy and water use, as well as internal air quality.

Why choose LEED standards?

LEED-certified buildings are more environmentally responsible, as they use less resources with less human impact on the environment, but also cost less to operate because of their high efficiency.

What kind of buildings can be certified?

There are LEED certification standards for every kind of building, including community and home projects.

How does a building meet LEED certification?

There are four LEED certification levels: Certified, Silver, Gold, and Platinum. Buildings are given their certification level from the number of points earned in several categories, including energy use, air quality and water quality.

For more information, visit: new.usgbc.org/leed

Requirement 2: Community

Categories	Major Practices	Specific Benefits
Sustainable Site	• Sustainable site planning and landscaping • Solar orientation of building • Public transportation • Stormwater management	• Reduce environmental impacts • Efficiency of site use • Heat island effect • Reduction of civil infrastructures
Energy Efficiency	• Solar orientation • High efficiency envelopes (efficient windows and high R-value insulation) • High efficiency HVAC system • Building automation systems • Daylighting and high efficiency lighting • Onsite renewable energy sources (photovoltaics)	• Energy saving • Reduction in greenhouse gases • Lower operating costs
Water Efficiency	• Water saving fixtures and technologies • Rainwater harvesting system	• Water saving • Lower operating costs
Materials & Resources	• Green supplies and materials • Construction waste management • Recycled content materials • Regional materials, locally sourced • Rapidly renewable materials	• Resource saving • Reduce environmental impacts
Indoor Environment Quality	• Daylighting & high efficiency lighting • Adequate air filtration • Low VOC materials • Mold prevention • Enhanced acoustical performance	• Productive and healthy indoor spaces • Provide optimal indoor • environment to building users • Improved occupant health and wellbeing
Building Operation & Maintenance	• Green cleaning supplies • Indoor pest prevention and control • Waste reduction and recycling • Energy and water conservation • Green grounds keeping • Electronic versus paper communication • Guest education/communication program	• Reduced environmental impacts • Reduced operational and maintenance costs
Demolition	• Exposed ceiling • Nylon 6 recycled carpet	• Reduce construction waste

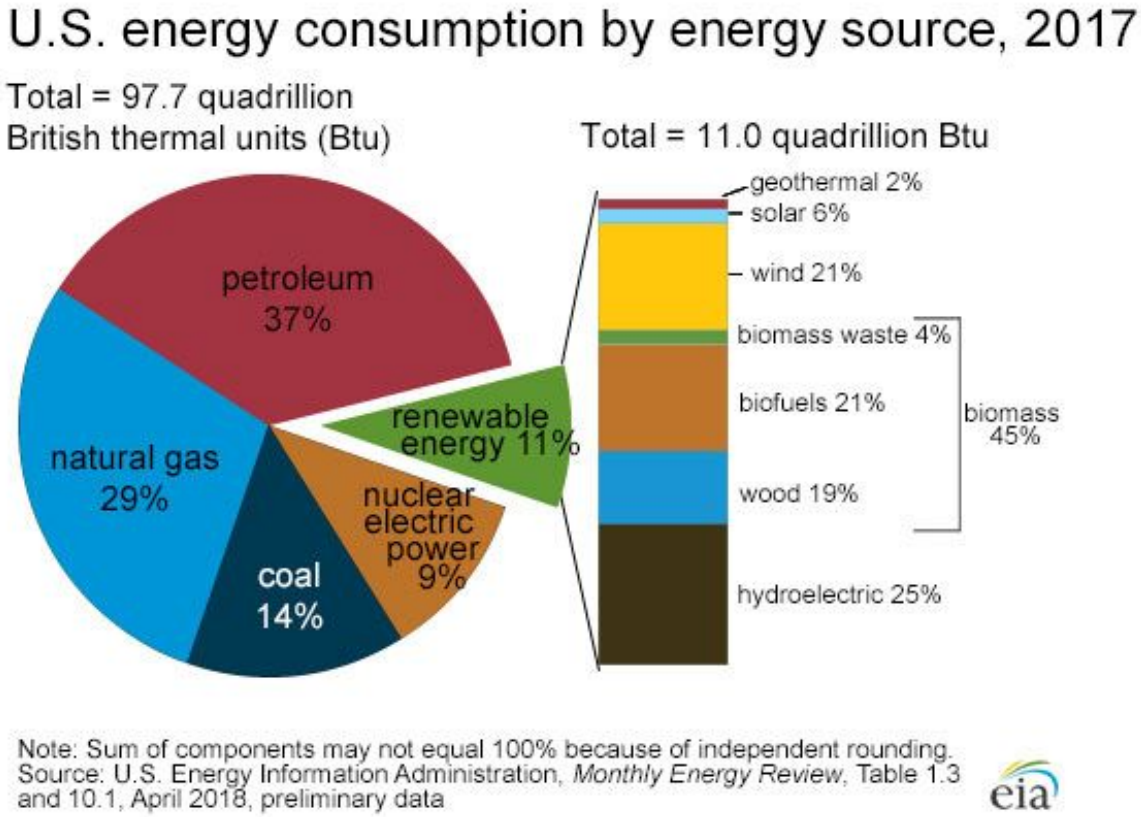
Requirement 2: Community

c. Review a current housing needs assessment for your town, city, county, or state. Discuss with your counselor how birth and death rates affect sufficient housing, and how a lack of housing - or too much housing- can influence sustainability of a local or global area.

Requirement 2: Community

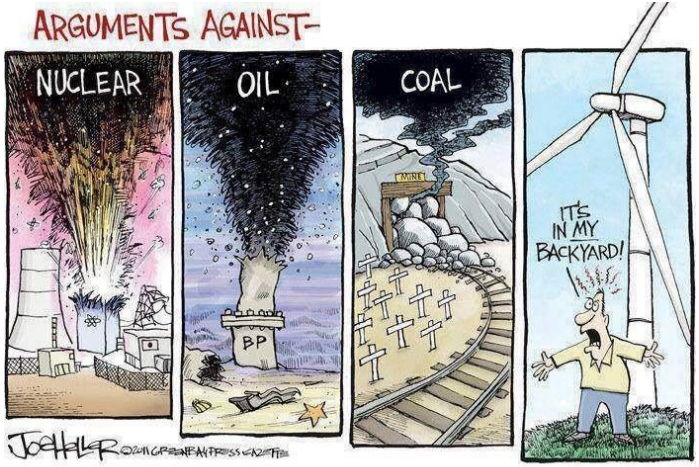
- ★ Shelby County, TN
  - https://shelbycountytn.gov/DocumentCenter/View/34339/Stategic-Plan-for-FY20-24--AP1-for-FY20_FINAL-Spanish-Version
- ★ Understanding of needs: special housing/senior housing/affordable homes
- ★ Identify issues: urban blight, foreclosure
- ★ Set priorities, resource identification, strategy development
- ★ Questions
  - Who can afford it? Can essential employees afford to live here?
  - Diversity and inclusion?
  - Can children remain in community as they start their own households? Promote job growth?
  - Special needs have adequate housing?
  - Housing trends: absent landlords, foreclosures, increasing house prices, decreasing home values, substandard/overcrowded/other undesirable living conditions?

Requirement 2: Energy



Requirement 2: Energy

a. Learn about the sustainability of different energy sources, including fossil fuels, solar, wind, nuclear, hydropower, and geothermal. Find out how the production and consumption of each of these energy sources affects the environment and what the term “carbon footprint” means. Discuss what you learn with your counselor, and explain how you think your family can reduce its carbon footprint.



Requirement 2: Energy

- ★ Energies explained
  - https://www.youtube.com/watch?v=KEeH4EniM3E
- ★ Fossil Fuels
  - Petroleum, coal, natural gas comes from the remains of ancient plants/animals.
  - Burning them releases CO2 and other greenhouse gases, which are considered by many to be a primary cause of global climate change
  - Dirty and non-renewable
- ★ Wind
  - Conversion of wind energy into usable forms through windmills for mechanical power, wind pumps for water pumping and drainage, and wind turbines to make electrical power
  - Renewable and clean and produces no greenhouse gas emissions
  - But some find them unsightly or noisy

Requirement 2: Energy

- ★ Solar
  - Received by Earth from the sun: solar radiation
  - Renewable and clean
- ★ Nuclear
  - Produced by a fission reaction that splits the uranium nucleus, creating heat
  - Heat then used to turn water to steam, which drives a turbine, spinning a generator to produce electricity
  - Carbon free
  - Toxic waste created by used or depleted uranium is hard to dispose of safely
- ★ Hydropower
  - Water power comes from the energy of falling/running water
  - Used for operating textile mills, other mechanical devices, and generating electricity
  - Renewable energy source

Requirement 2: Energy

- ★ Geothermal
  - Heat of the Earth's core
  - Hot spring water brought to Earth's surface and used to heat homes/buildings
  - Clean, renewable electricity
  - Sources mainly concentrated in the "Ring of Fire", volcanic region with large reservoirs around the Pacific Ocean
  - Cost effective, sustainable, though it does emit small quantities of greenhouse gases
- ★ Bioenergy
  - Generated from biomass: trees, crops, algae, animal dung, plant material left over from agricultural or forestry operations
  - Clean and renewable
- ★ Pros/Cons Alternative Energy Options
  - https://www.youtube.com/watch?v=sWfWPbL0Q-g

Requirement 2: Energy

- ★ Carbon Footprint
  - Total amount of CO2 that you create.
  - The bigger the footprint, the less green your lifestyle is
  - Electricity in your home creates the biggest part of your footprint
    - Thermostat adjustments and type of fuel makes a difference in CO2 produced
  - Transportation also produces CO2
  - Household garbage also contributes
- ★ https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/

Carbon Footprint

Causes

- Population growth and increase in consumption levels
- Increase in living standards
- Increase in energy consumption
- Deforestation
- Industrial processes
- Agriculture
- Vehicles
- Airplanes
- Ships
- Waste disposal
- Lobbying problem
- Lack of education

Effects

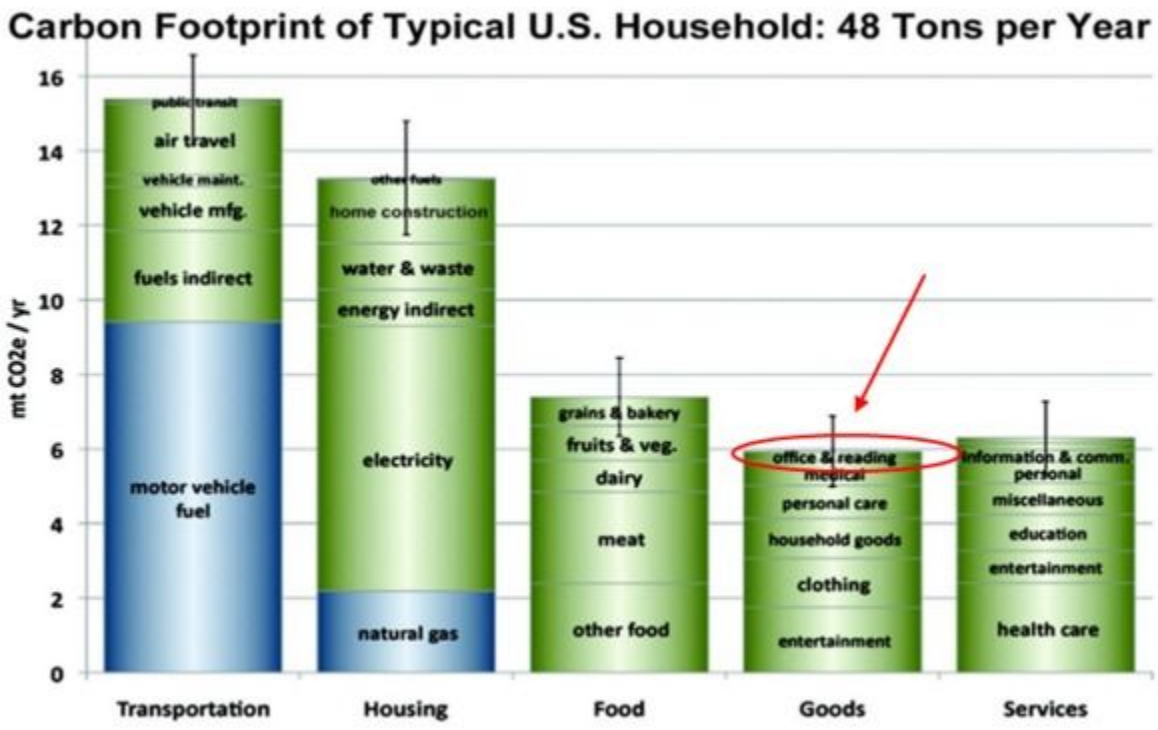
- Global warming
- Air pollution
- Acid rain
- Effects on humans
- Effects on animals
- Effects on plants
- Effects on aquatic life
- Effects on the whole environmental system

Requirement 2: Energy

- ★ Shrink your carbon footprint
  - Turn off computers, tvs, lights when not in use
  - Unplug small appliances and chargers
  - Lower temp to 68 in winter and raise temp to 78 in summer
  - Buy local and buy organic
  - Keep packaging to a minimum
  - Don’t buy bottled water
  - Increase home efficiency
    - Insulated attic, closed windows, maintained HVAC, switch from incandescent to compact fluorescent or LED light bulbs, use ceiling fans, air dry laundry
  - Switch to native plants- landscaping, xeriscaping
  - Be thrifty

Requirement 2: Energy

- ★ Shrink your carbon footprint
  - Choose fresh over frozen
  - Use cold water to wash clothes
  - Combine errands to save trips in the car
  - Three R’s
    - Recycle, Reuse, Reduce
  - Upcycle
  - Keep your car as long as it runs well
  - Use eco-friendly forms of transport: buses, light rail, bicycle, walk, or carpool
  - Use right grade of gasoline, make sure gas cap is on tight
  - Drive with window down when it is nice
  - Don’t idle


Carbon Footprint of Typical U.S. Household: 48 Tons per Year
mt CO2e / yr
16
14
12
10
8
6
4
2
0
public transit
air travel
vehicle maint.
vehicle mfg.
fuels indirect
motor vehicle fuel
other fuels
home construction
water & waste
energy indirect
electricity
natural gas
grains & bakery
fruits & veg.
dairy
meat
other food
office & reading
medical
personal care
household goods
clothing
entertainment
information & comm.
personal
miscellaneous
education
entertainment
health care
Transportation
Housing
Food
Goods
Services

Requirement 2: Energy

b. Develop and implement a plan to reduce the consumption of one of your family's household utilities that consumes energy, such as gas appliances, electricity, heating systems, or cooling systems. Examine your family's bills for that utility reflecting usage for 3 months (past or current). As a family, choose 3 ways to help reduce consumption and be a better steward if this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's usage.

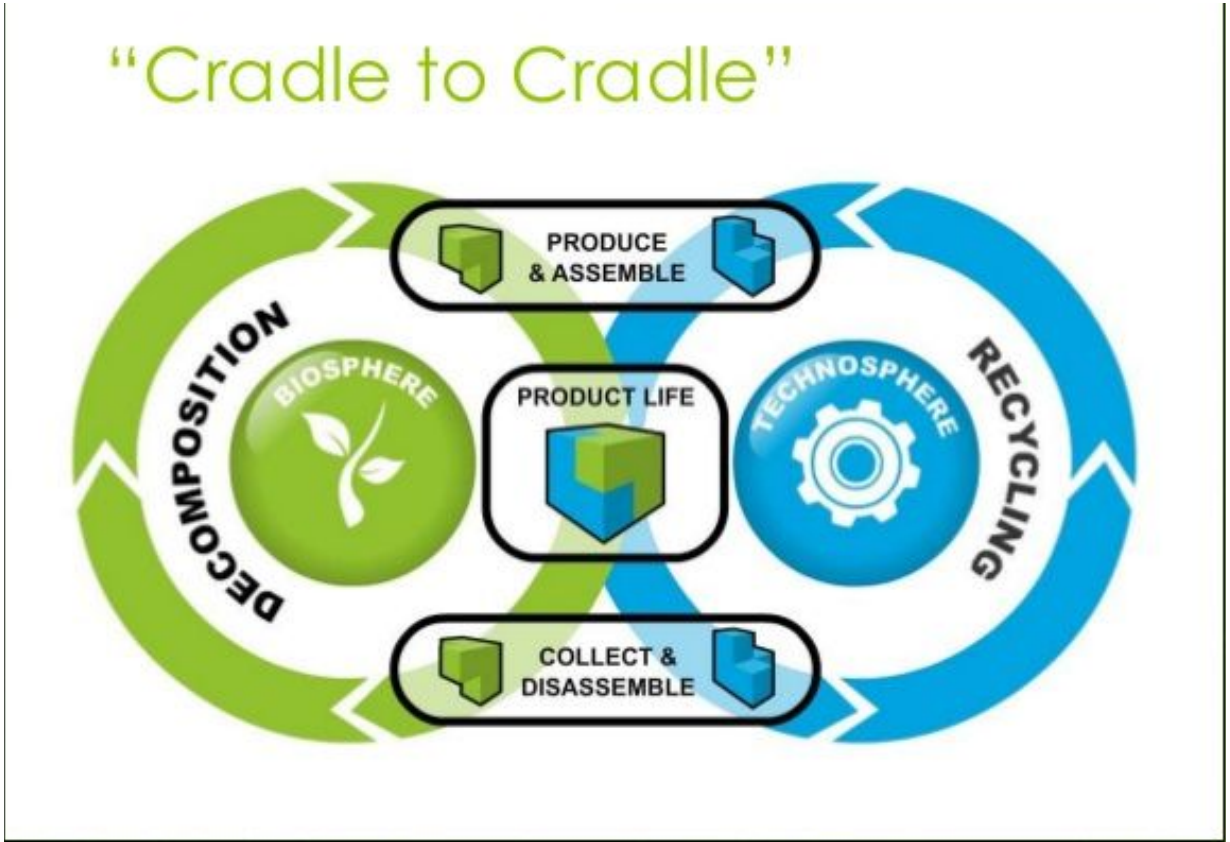
Requirement 2: Energy

c. Evaluate your family's fuel and transportation usage. Review your family's transportation-related bills (gas, diesel, electric, public transportation, etc.) reflecting usage for 3 months (past or current). As a family, choose 3 ways to help reduce consumption and be a better steward of this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's transportation habits.

Requirement 2: Stuff

Requirement 2: Stuff

Requirement 2: Stuff



Requirement 2: Stuff

- ★ Buy durable, long-lasting things rather than cheaper, poorly made things
- ★ Repair things that break instead of replacing them
- ★ Use reusable (cotton hand towel) instead of disposable (paper towel)
- ★ Don’t take things you don’t need (extra paper napkins at a restaurant)
- ★ Buy in bulk to reduce packaging
- ★ Consider life cycle of products (recyclable vs non-recyclable)
- ★ Sparking Joy/Minimalism/Purge
  - https://www.youtube.com/watch?v=PczdGSHDppU
- ★ The Story of Stuff
  - https://www.youtube.com/watch?v=9GorqroigqM#action=share

Requirement 2: Stuff

- ★ Donating
  - Thrift store
  - Non-profit
  - Consignment
  - Online
- ★ Repurpose
- ★ Recycle
  - Hazardous waste, appliances, electronics
  - Scrap metal, paper

Requirement 2: Stuff

a. Keep a log of the “stuff” your family purchases (excluding food items) for 2 weeks. In your log, categorize each purchase as an essential need (such as soap) or a desirable want (such as a DVD). Share what you learn with your counselor.

Requirement 2: Stuff

b. Plan a project that involves the participation of your family to identify the “stuff” your family no longer needs. Complete your project by donating, repurposing, or recycling these items.

Requirement 2: Stuff

c. Discuss with your counselor how having too much “stuff” affects you, your family, and your community. Include the following: the financial impact, time spent, maintenance, health, storage, and waste. Include in your discussion the practices that can be used to avoid accumulating too much “stuff”.

Requirement 3

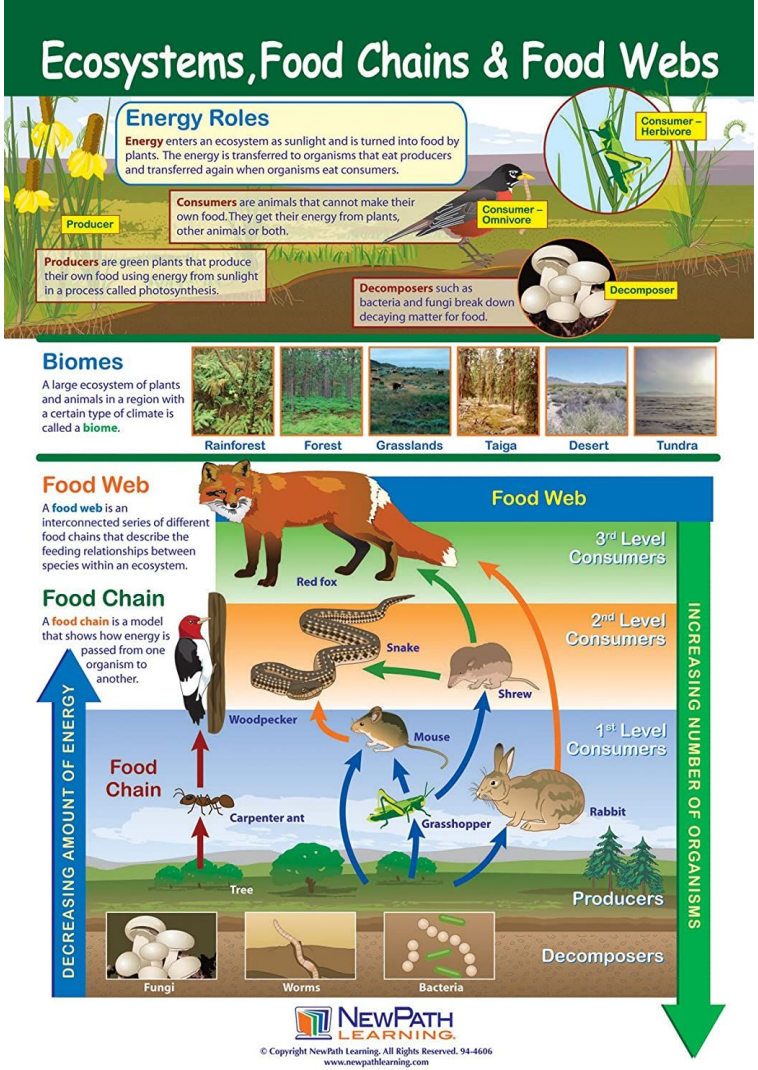
- ★ How planetary life-support systems (soil, climate, freshwater, atmospheric, nutrient, oceanic, ecosystems, and species) support life on Earth and interact with one another
- ★ How the harvesting or production of raw materials (by extraction or recycling), along with the distribution of the resulting products, consumption, and disposal/repurposing, influences current and future sustainability thinking and planning

Requirement 3

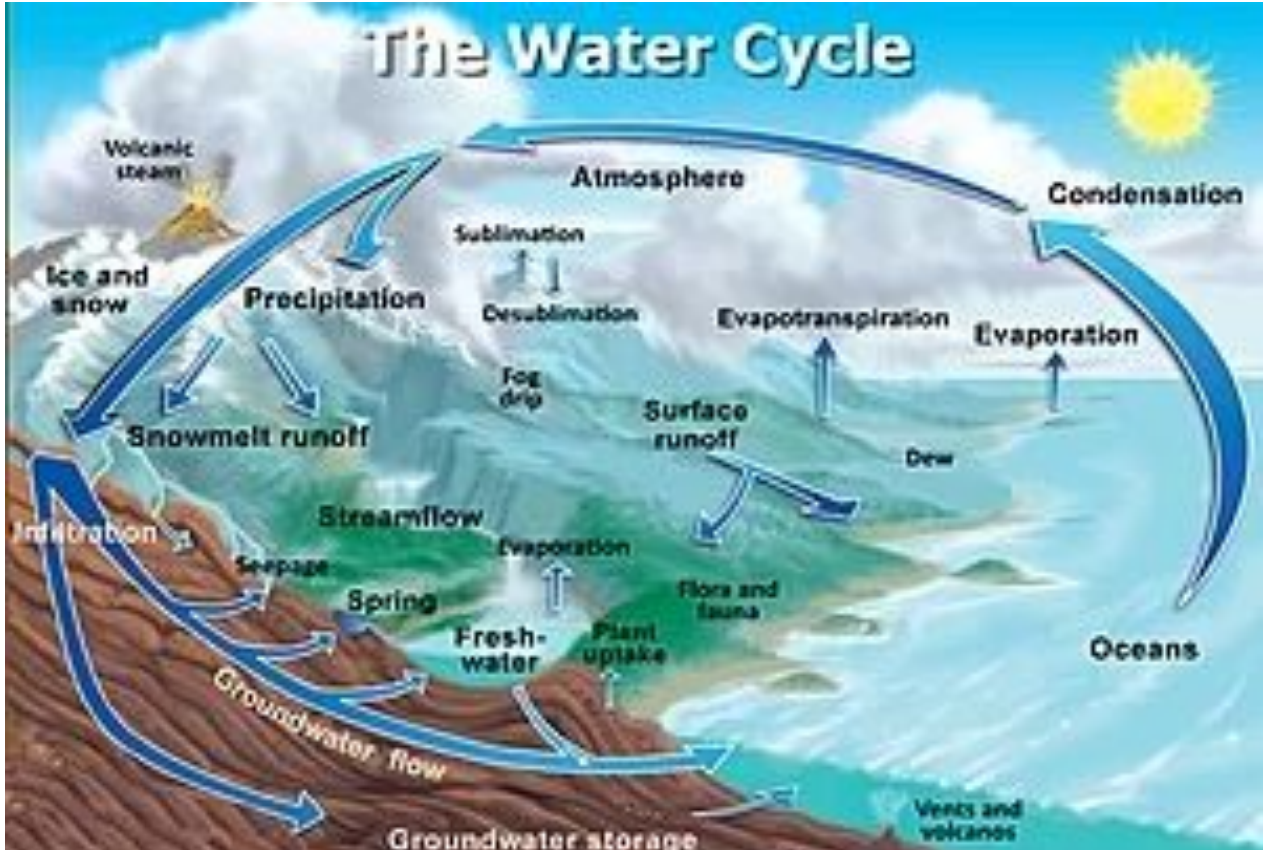
Requirement 3

- ★ Interconnected Systems
  - https://www.youtube.com/watch?v=beidaN3SNdA&t=1m46s
- ★ “A life support system...furthers the life of the biosphere in a sustainable fashion. The fundamental attribute of life support systems is that together they provide all of the sustainable needs required for continuance of life. These needs go far beyond biological requirements. Life support systems encompass natural environmental systems as well as...social systems required to foster societal harmony, safety, nutrition, medical care, economic standards, and the development of new technology. The one common thread in all of these systems is that they operate in partnership with the conservation of global natural resources.”

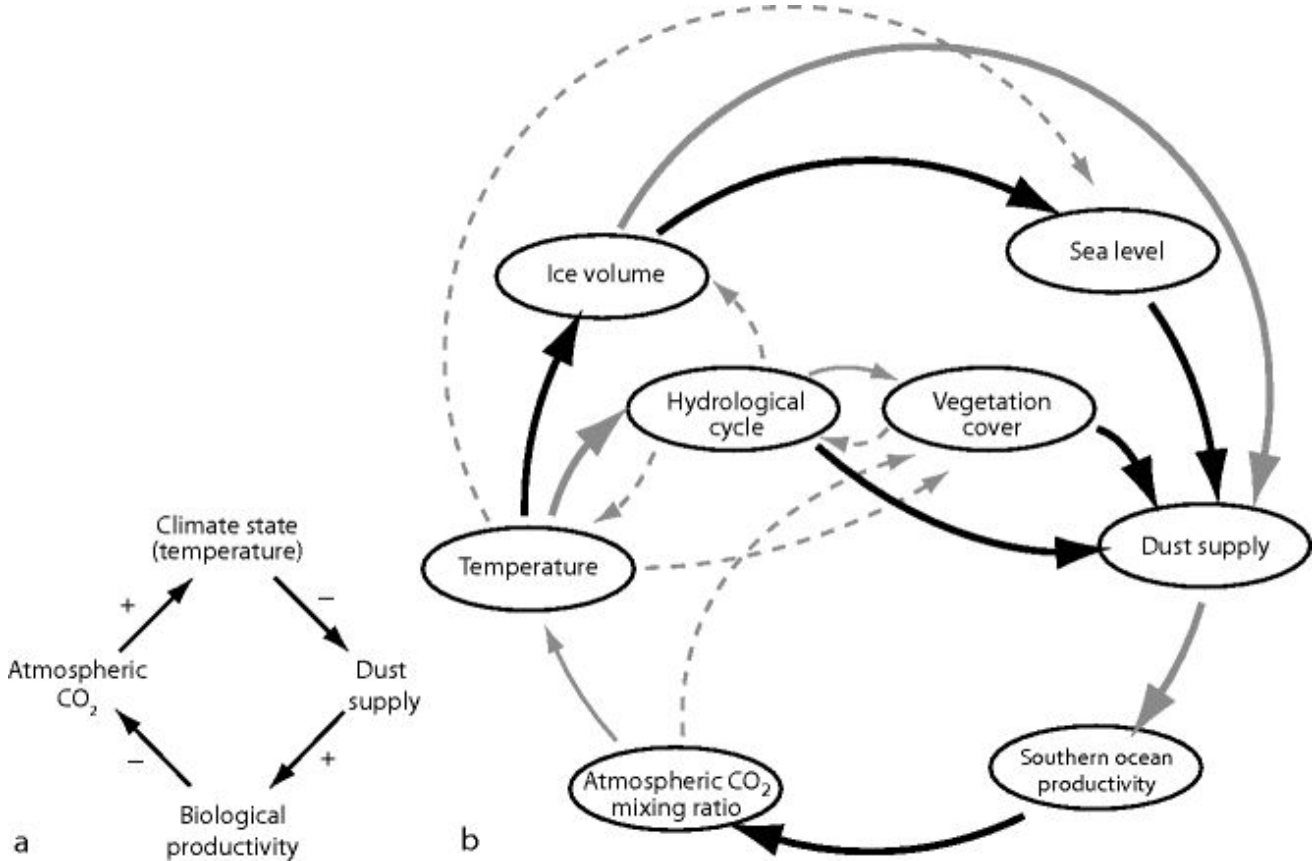
Requirement 3



Requirement 3

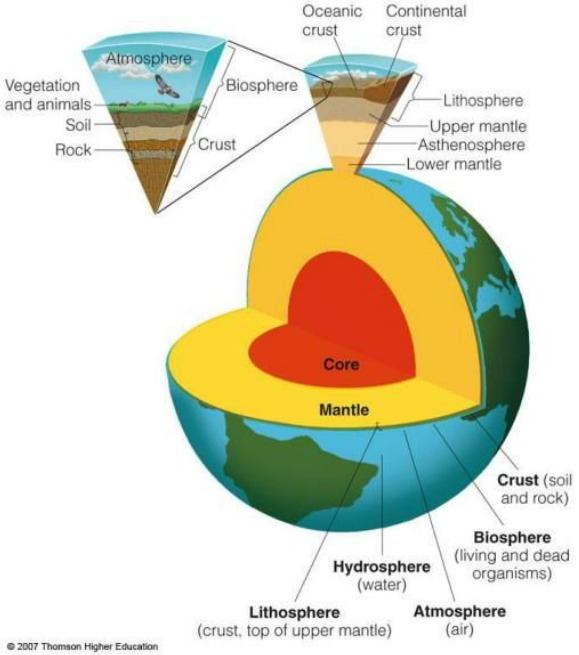


Requirement 3



Requirement 3

THE EARTH'S LIFE SUPPORT SYSTEMS



- The biosphere consists of several physical layers that contain:
  - Air
  - Water
  - Soil
  - Minerals
  - Life

Figure 3-6

Requirement 3: Use of Raw Materials

- ★ Pros
  - Create Jobs, Economic Growth
  - Harvesting at the right time, replanting for the future, restoring the land creates sustainability
  - Fair Trade policies to protect the quality of life
  - Certification standards to ensure material sustainability
- ★ Cons
  - Affect people's health
  - Disrupt/ displace communities
  - Conflict/violence
  - Corruption
  - Wealth inequality
  - Gender discrimination
  - Cause environmental damage
    - Deforestation
    - Water scarcity
    - Air/Water/Soil pollution
    - Problems with waste disposal

Requirement 4: Plastic Waste

★ Discuss the impact plastic waste has on the environment (land, water, air). Learn about the number of system for plastic recyclables, and determine which plastics are more commonly recycled. Find out what the trash vortex is and how it was formed.

Requirement 4: Plastic Waste

Plastic Waste

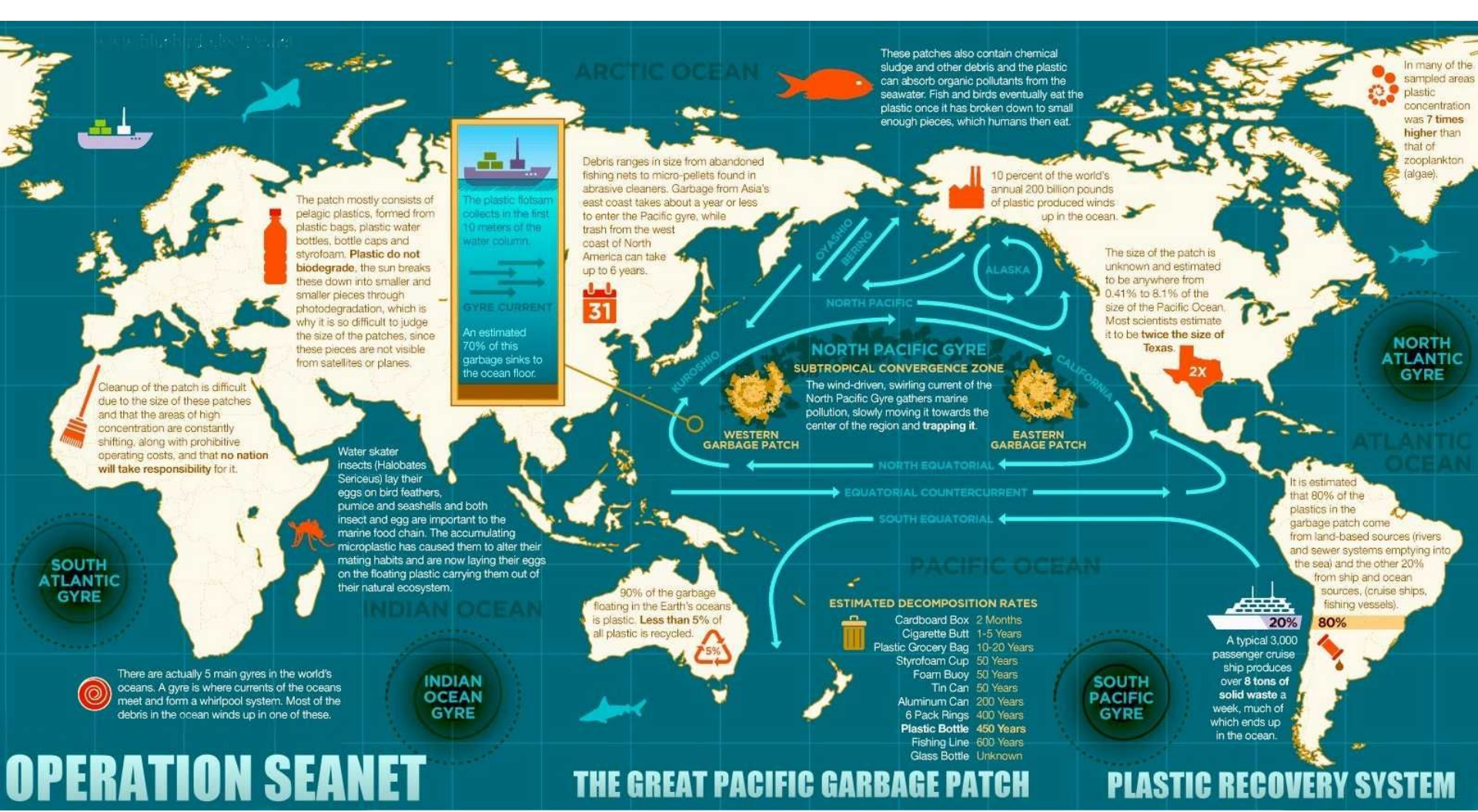
Plastic	Packaging types	Recycling number and examples
Polyethylene terephthalate: PET	Water and soft drink bottles, salad domes, biscuit trays, salad dressing and peanut butter containers	
High-density polyethylene: HDPE	Milk bottles, freezer bags, dip tubs, crinkly shopping bags, ice cream containers, juice bottles, shampoo, Chemical and detergent bottles	
Polyvinyl chloride: PVC	Cosmetic containers, commercial cling wrap	
Low-density polyethylene: LDPE	Squeeze bottles, cling wrap, shrink wrap, rubbish bags	
Polypropylene: PP	Microwave dishes, ice cream tubs, potato chip bags, and dip tubs	
Polystyrene: PS	Cd cases, water station cups, plastic cutlery, imitation 'crystal glassware', video cases	
Expanded polystyrene: EPS	Foamed polystyrene hot drink cups, hamburger take-away clamshells, foamed meat trays, protective packaging for fragile items	
Mixed	Water cooler bottles, flexible films, multi-material packaging	

Adapted from (World Economic Forum et al. 2016).

Most commonly recycled and considered the safest plastic

Plastic Waste: Trash Vortex

- https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/
- https://science.howstuffworks.com/environmental/conservation/issues/great-pacific-garbage-patch-explained.htm


ARCTIC OCEAN
These patches also contain chemical sludge and other debris and the plastic can absorb organic pollutants from the seawater. Fish and birds eventually eat the plastic once it has broken down to small enough pieces, which humans then eat.
In many of the sampled areas plastic concentration was 7 times higher than that of zooplankton (algae).
The patch mostly consists of pelagic plastics, formed from plastic bags, plastic water bottles, bottle caps and styrofoam. Plastic do not biodegrade, the sun breaks these down into smaller and smaller pieces through photodegradation, which is why it is so difficult to judge the size of the patches, since these pieces are not visible from satellites or planes.
The plastic flotsam collects in the first 10 meters of the water column.
GYRE CURRENT
An estimated 70% of this garbage sinks to the ocean floor.
Debris ranges in size from abandoned fishing nets to micro-pellets found in abrasive cleaners. Garbage from Asia's east coast takes about a year or less to enter the Pacific gyre, while trash from the west coast of North America can take up to 6 years.
31
10 percent of the world's annual 200 billion pounds of plastic produced winds up in the ocean.
OYASHIO
BERING
ALASKA
NORTH PACIFIC
The size of the patch is unknown and estimated to be anywhere from 0.41% to 8.1% of the size of the Pacific Ocean. Most scientists estimate it to be twice the size of Texas.
2X
NORTH ATLANTIC GYRE
KUROSHIO
CALIFORNIA
NORTH PACIFIC GYRE
SUBTROPICAL CONVERGENCE ZONE
The wind-driven, swirling current of the North Pacific Gyre gathers marine pollution, slowly moving it towards the center of the region and trapping it.
WESTERN GARBAGE PATCH
EASTERN GARBAGE PATCH
Cleanup of the patch is difficult due to the size of these patches and that the areas of high concentration are constantly shifting, along with prohibitive operating costs, and that no nation will take responsibility for it.
NORTH EQUATORIAL
EQUATORIAL COUNTERCURRENT
SOUTH EQUATORIAL
ATLANTIC OCEAN
Water skater insects (Halobates Sericeus) lay their eggs on bird feathers, pumice and seashells and both insect and egg are important to the marine food chain. The accumulating microplastic has caused them to alter their mating habits and are now laying their eggs on the floating plastic carrying them out of their natural ecosystem.
SOUTH ATLANTIC GYRE
PACIFIC OCEAN
INDIAN OCEAN
90% of the garbage floating in the Earth's oceans is plastic. Less than 5% of all plastic is recycled.
5%
ESTIMATED DECOMPOSITION RATES
Cardboard Box 2 Months
Cigarette Butt 1-5 Years
Plastic Grocery Bag 10-20 Years
Styrofoam Cup 50 Years
Foam Buoy 50 Years
Tin Can 50 Years
Aluminum Can 200 Years
6 Pack Rings 400 Years
Plastic Bottle 450 Years
Fishing Line 600 Years
Glass Bottle Unknown
It is estimated that 80% of the plastics in the garbage patch come from land-based sources (rivers and sewer systems emptying into the sea) and the other 20% from ship and ocean sources, (cruise ships, fishing vessels).
20%
80%
A typical 3,000 passenger cruise ship produces over 8 tons of solid waste a week, much of which ends up in the ocean.
There are actually 5 main gyres in the world's oceans. A gyre is where currents of the oceans meet and form a whirlpool system. Most of the debris in the ocean winds up in one of these.
INDIAN OCEAN GYRE
SOUTH PACIFIC GYRE
OPERATION SEANET
THE GREAT PACIFIC GARBAGE PATCH
PLASTIC RECOVERY SYSTEM

Requirement 4: Electronic Waste

- ★ On average Americans own 24 electronic gadgets per household
- ★ Contaminants: lead, cadmium, beryllium
  - They can leak into landfills or enter the air from incinerators
- ★ Metals: gold, silver, platinum, palladium, copper, tin, zinc
  - Used in jewelry, plating, electronics, automotive, art
- ★ Plastic
  - Used in electronics and plastic products: lawn furniture, non food containers, license plate frames, auto parts
- ★ Battery
  - Recycled into other rechargeable battery products

Requirement 4: Electronic Waste

- ★ Electronics make up 1-2% of all solid waste
  - Takes a lot of energy and resources to make, so it is better to recycle as much as possible
- ★ 20 million people in 20 countries collecting waste send e-waste to national recycling systems to divert BILLIONS of units of waste and create > 1,500 products to be sold
- ★ https://www.youtube.com/watch?v=FmJFVmtWf-I
- ★ https://www.youtube.com/watch?v=Czu3BC7SrFQ
- ★ https://www.youtube.com/watch?v=fyuxWDkLdcI

Requirement 4: Electronic Waste

★ Choose 3 electronic devices in your household. Find out the average lifespan of each, what happens to these devices once they pass their useful life, and whether they can be recycled in whole or part. Discuss the impact of electronic waste on the environment.

Requirement 4: Food Waste

★ Learn about the value of composting and how to start a compost pile. Start a compost pile appropriate to your living situation. Tell what can be done with the compost when it is ready for use.

Requirement 4: Food Waste

- Composting at home
  - https://www.epa.gov/recycle/composting-home#basics
- Vermicomposting: Worm Bin
  - https://makezine.com/projects/make-your-own-worm-bin/
- Compost Fairy
  - https://compostfairy.com/

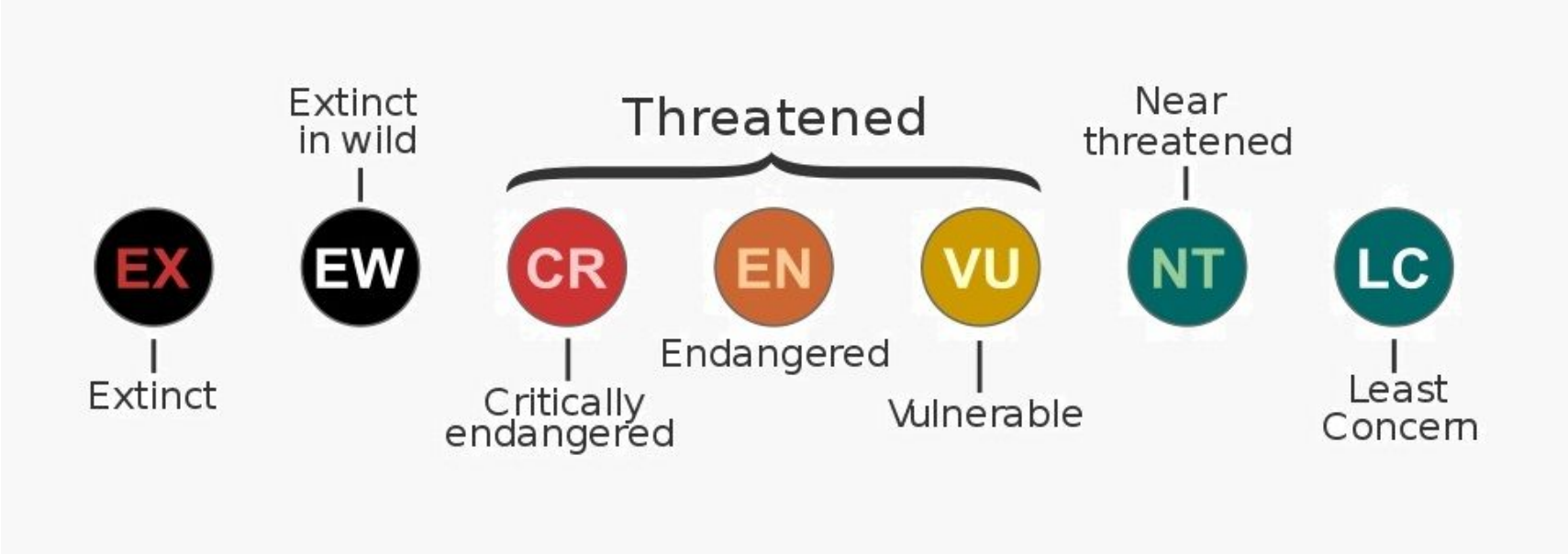
Requirement 4: Food Waste

- ★ I'll take Compostables for $500, Alex
  - Table scraps
  - Fruit and vegetable scraps
  - Eggshells
  - Leaves
  - Grass clippings
  - Garden plants
  - Flowers
  - Lawn and garden weeds
  - Shrub prunings
  - Hay
  - Pine needles
  - Chicken manure

- ★ I'll take Compostables for $500, Alex
  - Coffee grounds and filters
  - Tea leaves
  - Newspaper
  - Shredded paper
  - Shredded cardboard
  - Corn cobs
  - Dryer lint
  - Sawdust pellets
  - Wood chips
  - Seaweed
  - Wood ash

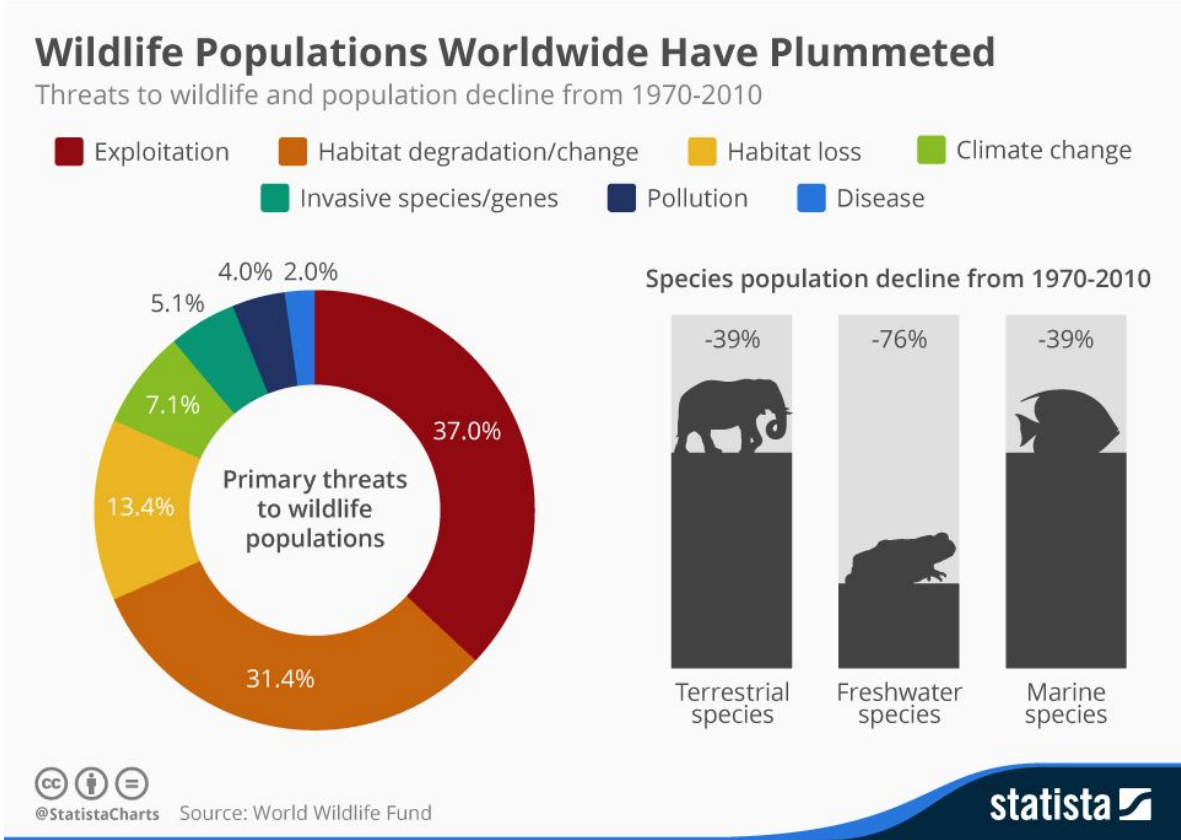
Requirement 4: Species Decline

★ Explain the term species decline (animal or plant). Discuss the human activities that contribute to species decline, what can be done to help reverse the decline, and its impact on a sustainable environment.



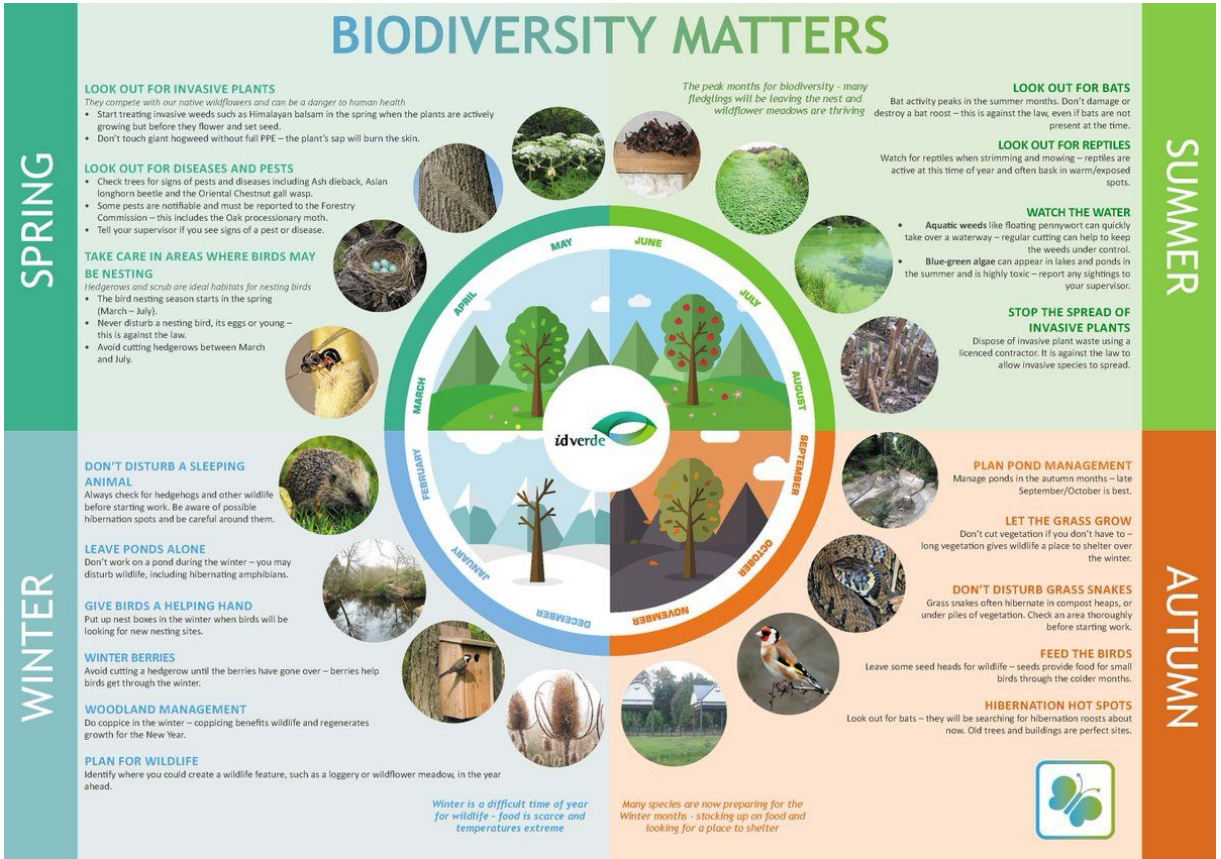
Requirement 4: Species Decline

- ★ Loss of habitat or living space.
- ★ Loss of biodiversity



Requirement 4: Species Decline

Requirement 4: Species Decline

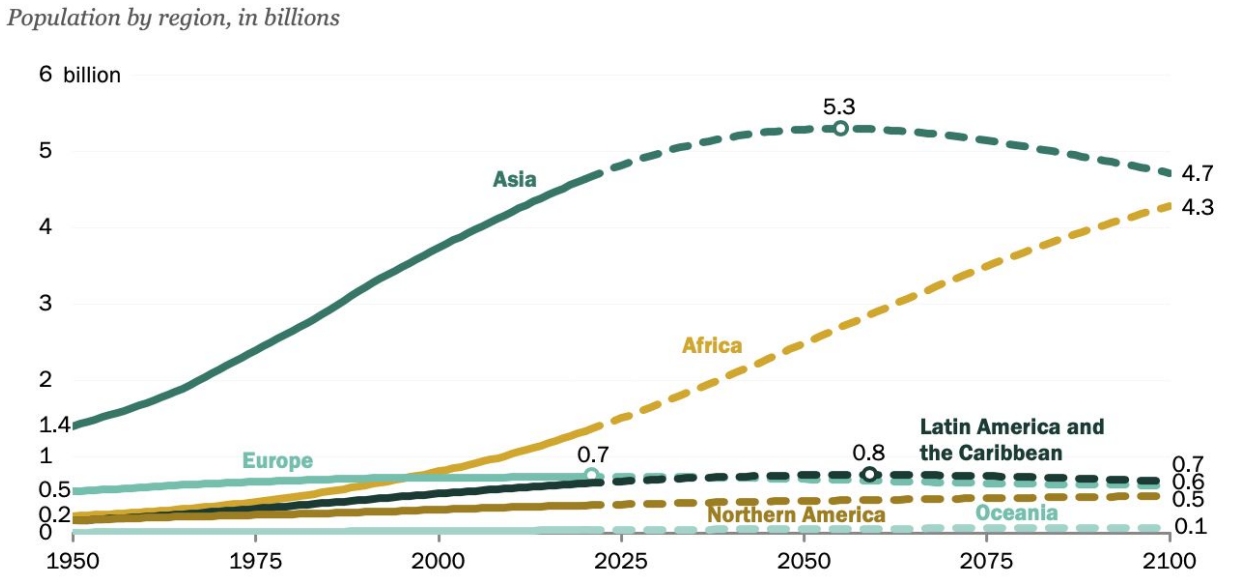


Requirement 4: World Population

★ Learn how the world's population affects the sustainability of Earth. Discuss 3 human activities that contribute to putting Earth at risk, now and in the future.

★ Increasing world population puts a strain on biodiversity and amount of natural resources: plants and animals

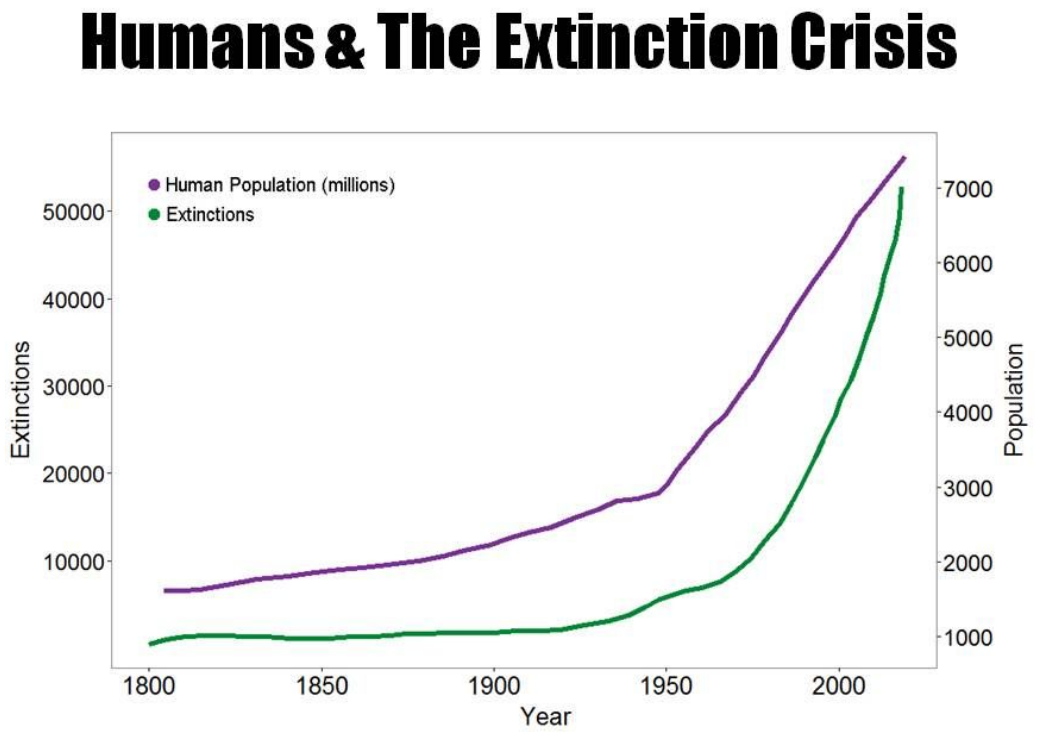
Requirement 4: World Population



Note: Data labels show projected peak population for each region: Europe (2021), Asia (2055) and Latin America and the Caribbean (2058). Regions follow United Nations definitions and may differ from other Pew Research Center reports.
Source: United Nations Department of Economic and Social Affairs, Population Division, "World Population Prospects 2019."

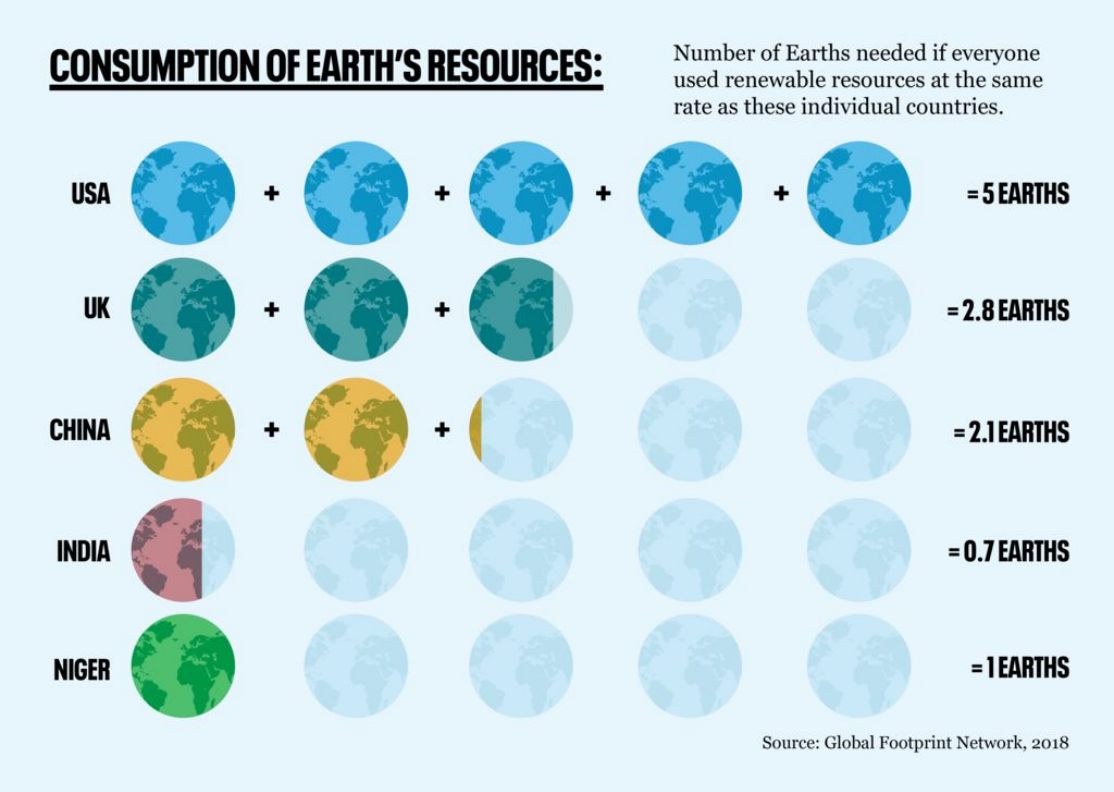
PEW RESEARCH CENTER

Requirement 4: World Population

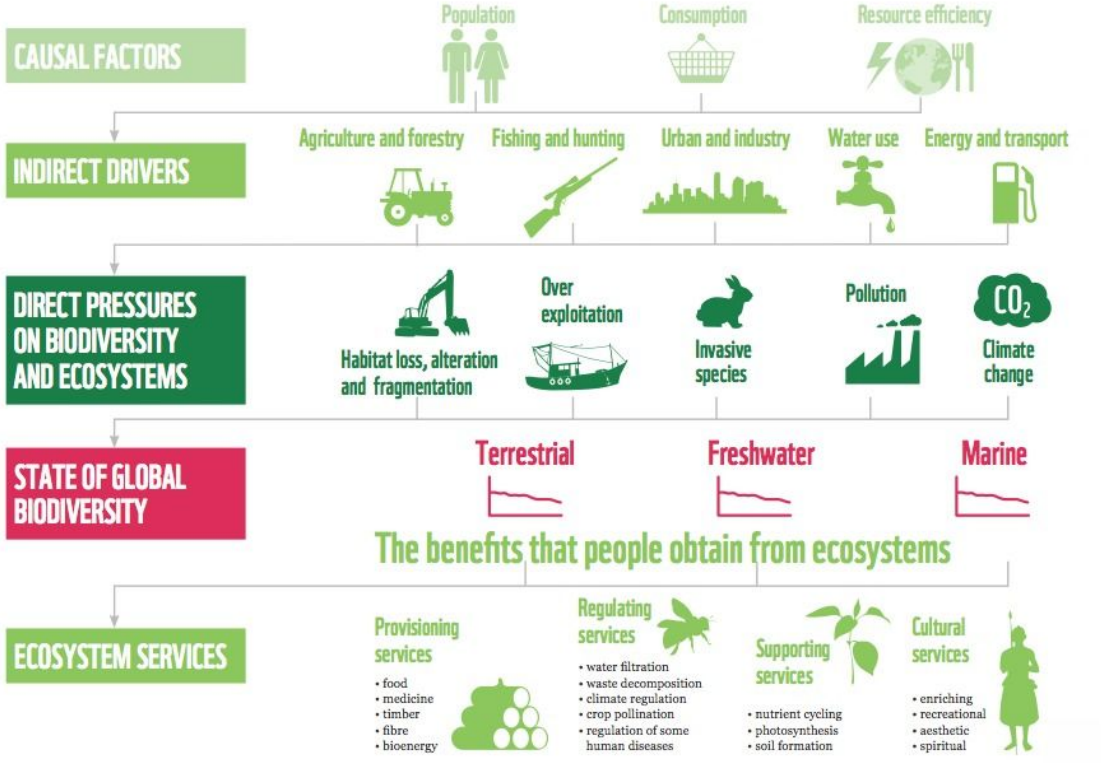


Data source: Scott, J.M. 2008. *Threats to Biological Diversity: Global, Continental, Local*. U.S. Geological Survey, Idaho Cooperative Fish and Wildlife, Research Unit, University Of Idaho.

Requirement 4: World Population



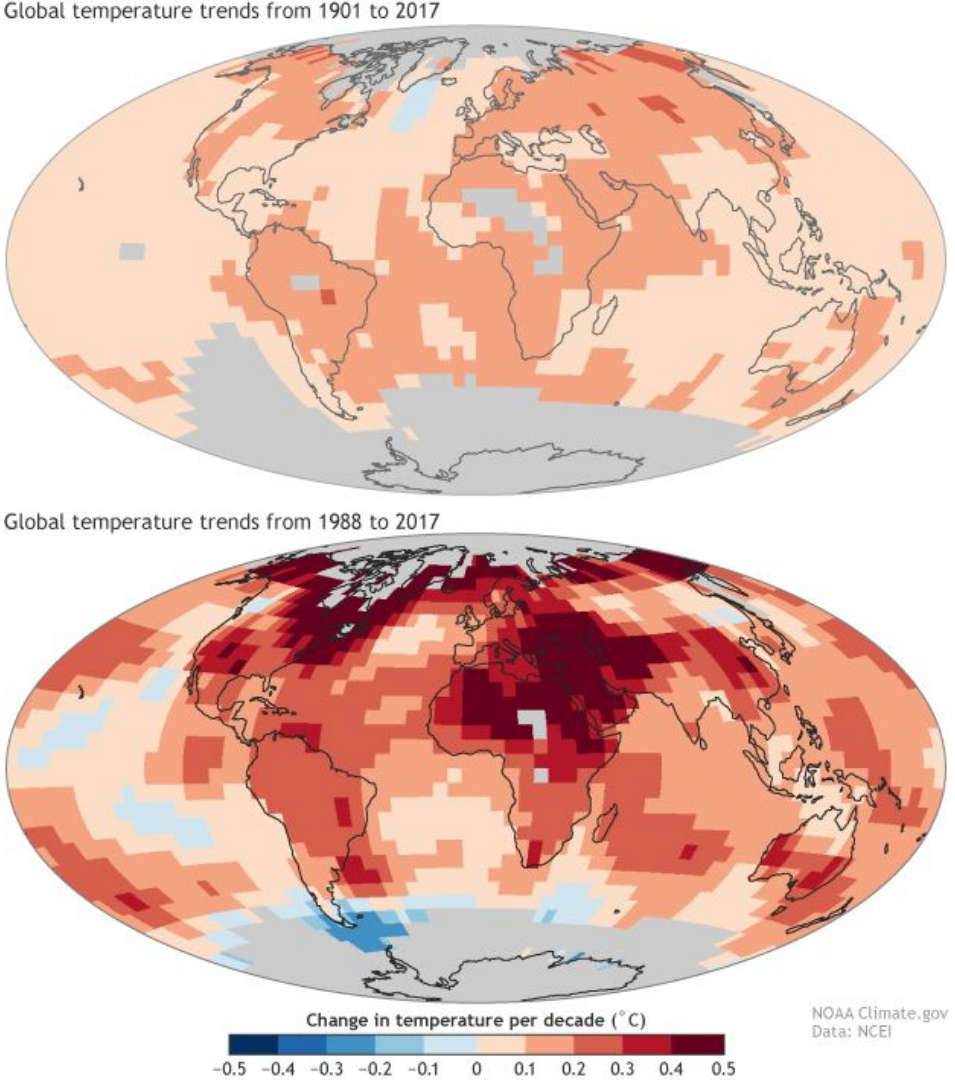
Requirement 4: World Population



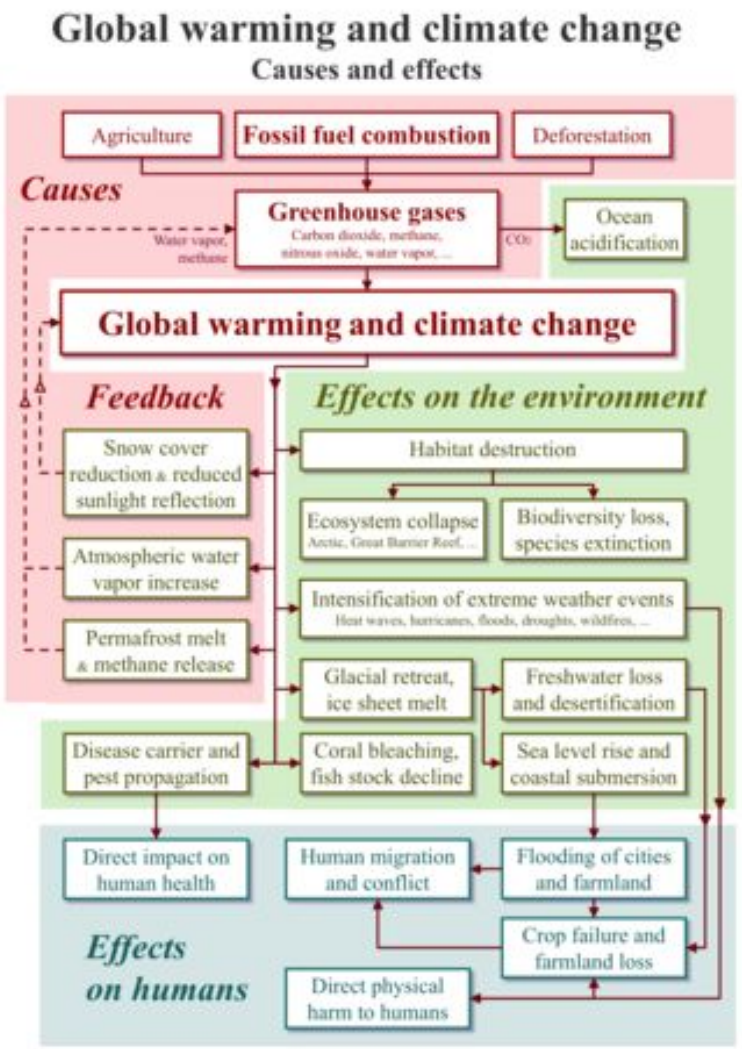
Requirement 4: Climate Change

★ Find a world map that shows the pattern of temperature change for a period of at least 100 years. Share this map with your counselor, and discuss 3 factors that scientists believe affect the global weather and temperature. Discuss with your counselor 3 impacts of climate change and how these changes could impact sustainability of food, water, or other resources.

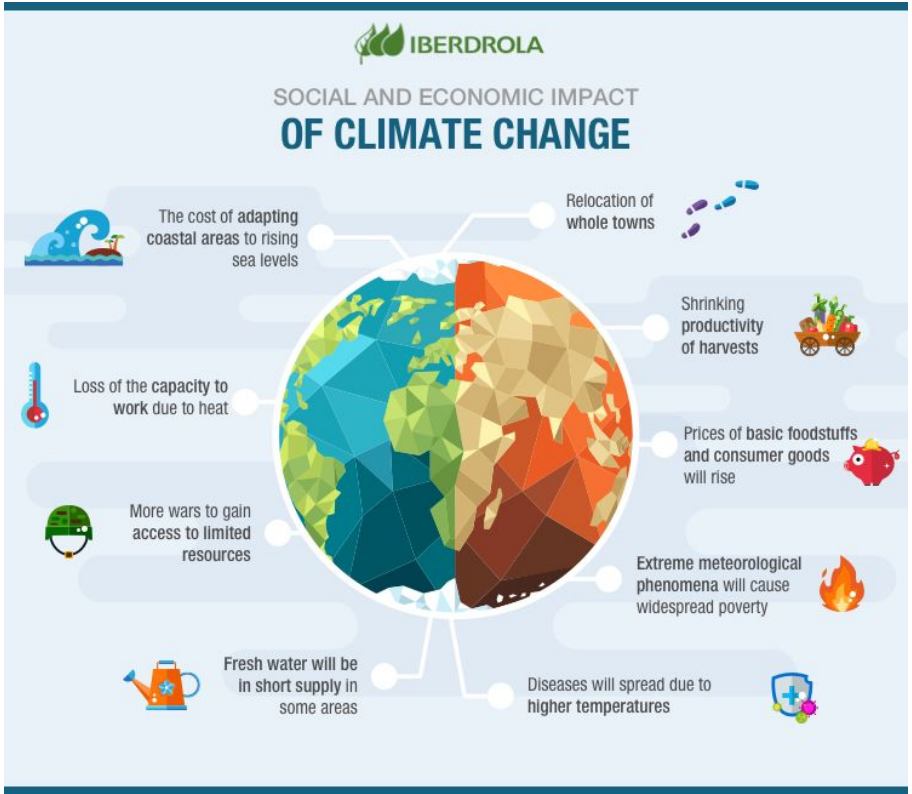
Requirement 4: Climate Change



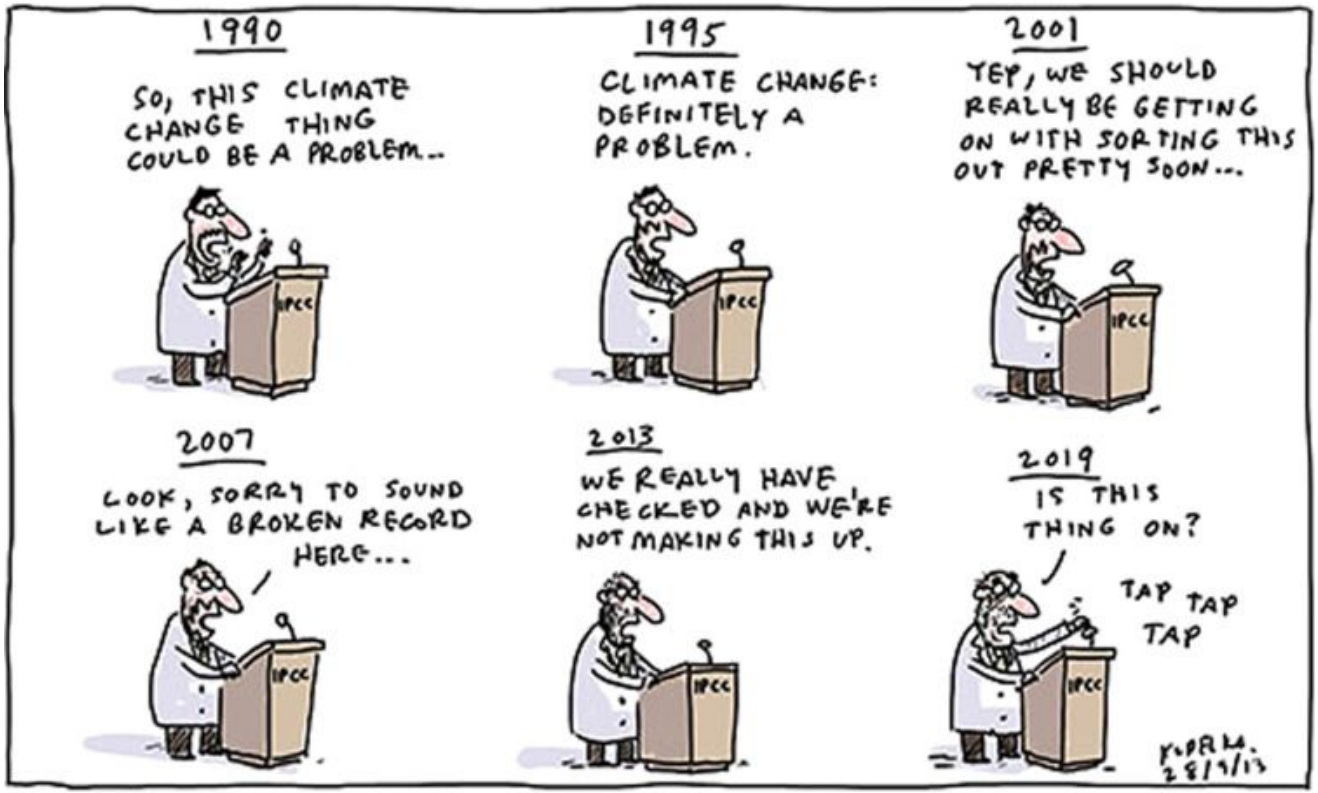
Requirement 4: Climate Change



Requirement 4: Climate Change



Requirement 4: Climate Change



Requirement 5a

- ★ Have a family meeting
  - Discuss what your family learned about what it means to be a sustainable citizen
  - Talk about the behavioral changes and life choices your family can make to live more sustainably
  - Share with your counselor

Requirement 5b

- ★ Scouting principles that promote sustainability
  - Be thrifty and resourceful in the use of resources
  - Apply outdoor ethics and leave no trace
  - Be good stewards of human and natural communities for future generations
  - Demonstrate brave leadership by measuring our efforts and improving upon them
- ★ What do you all think?

Requirement 5b

- ★ Trustworthy: Sustainability starts with you, and helps you stand out as a young leader. You can help by recycling, and advocating green solutions to everyday issues.
- ★ Loyal: Demonstrate sustainability by being the voice of reason and reminding others we all share limited resources.
- ★ Helpful: You can make a difference in your family and in your community- and help our world - by using only what you need. Take time to share with others what you are doing.
- ★ Friendly: Volunteer in your community at a community garden, recycling center, or other sustainable activity and encourage others to do the same. This can be a fun and exciting way to see firsthand how, when we all are working together, we can make a difference.

Requirement 5b

- ★ Courteous: Always thank people for their help and understanding because we all benefit from sustainability and thinking about how our actions, no matter how small, affect others.
- ★ Kind: Treat this world with respect, save valuable resources and set an example for others to follow. Take time to smile; it does make a difference.
- ★ Obedient: To protect the world's resources you need to be true to yourself and believe in sustainability
- ★ Cheerful: Tell your stories of sustainability activities and projects with a smile, know you are making a difference, and others just might take action based on how you tell your story.

Requirement 5b

- ★ Thrifty: Track your savings at home or in your troop on solid sustainability actions.
- ★ Brave: You can be a leader at home or in your community when taking the appropriate actions. Stand up for what is right; start with your actions so you and your family can lead others to engage in sustainable living.
- ★ Clean: Respect our world and the valuable resources we are consuming every day. You can always help by understanding what is really needed and talking with others to protect the air we breathe and water we drink.
- ★ Reverent: Always consider other points of view and be true to Earth, as we all live here together.

Requirement 6: Careers

- ★ Agroforester
- ★ Air Quality Forecaster
- ★ Aquarist
- ★ Aquatic Biologist
- ★ Biofuel Production Operator
- ★ Chemical Engineer
- ★ Climate Change Analyst
- ★ Director of Sustainability
- ★ Ecotourism Guide
- ★ Energy Manager
- ★ Environmental Public Relations Specialist
- ★ Forestry
- ★ Geophysical Engineer
- ★ Geoscientist
- ★ Hydrographic Surveyor
- ★ Landscape Architect
- ★ Mathematicians
- ★ Nuclear Engineer
- ★ Petroleum Engineer
- ★ Petrologist
- ★ Soil Conservation Technician
- ★ Solar Engineer
- ★ Statistician
- ★ Sustainability Program Coordinator
- ★ Sustainability Specialist
- ★ Turf Scientist
- ★ Water Resource Engineer
- ★ Watershed Manager
- ★ Watershed Science Technician
- ★ Wetland Specialist
- ★ Wind Energy Engineer
- ★ Zoning Technician

Requirement 6

- ★ Urban Planning Engineer
  - Education
    - Bachelor, Master, Doctorate
      - Urban, city, or regional planning
      - Usually program within another department: Architecture, Geography, Public Policy
      - Land use, environmental planning, housing, community development, economic development, historical development, urban design, transportation planning, geographic information systems
  - Training
    - American Institute of Certified Planners (AICP) board exam
    - Internships and College Coursework
  - Experience
    - Broad field of applicability

Requirement 6