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APES & Gender Equality

Unit 3 - Populations

- Topic 3.6 - Age Structure Diagrams
    - EIN-1.A.1 Population growth rates can be interpreted from age structure diagrams by the shape of the structure.
    - EIN-1.A.2 A rapidly growing population will, as a rule, have a higher proportion of younger people compared to stable or declining populations.

- Topic 3.7 - Total Fertility Rate
    - EIN-1.B.1 Total fertility rate (TFR) is affected by the age at which females have their first child, educational opportunities for females, access to family planning, and government acts and policies.
    - EIN-1.B.2 If fertility rate is at replacement levels, a population is considered relatively stable.
    - EIN-1.B.3 Factors associated with infant mortality rates include whether mothers have access to good healthcare and nutrition. Changes in these factors can lead to changes in infant mortality rates over time.

- Topic 3.8 - Human Population Dynamics
    - EIN-1.C.1 Birth rates, infant mortality rates, and overall death rates, access to family planning, access to good nutrition, access to education, and postponement of marriage all affect whether a human population is growing or declining.
    - EIN-1.C.2 Factors limiting global human population include the Earth's carrying capacity and the basic factors that limit human population growth as set forth by Malthusian theory.
    - EIN-1.C.3 Population growth can be affected by both density-independent factors, such as major storms, fires, heat waves, or droughts, and density-dependent factors, such as access to clean water and air, food availability, disease transmission, or territory size.
    - EIN-1.C.4 The rule of 70 states that dividing the number 70 by the percentage population growth rate approximates the population's doubling time

- Topic 3.9 - Demographic Transition
    - EIN-1.D.1 The demographic transition refers to the transition from high to lower birth and death rates in a country or region as development occurs and that country moves from a preindustrial to an industrialized economic system. This transition is typically demonstrated through a four-stage demographic transition model (DTM).
    - EIN-1.D.2 Characteristics of developing countries include higher infant mortality rates and more children in the workforce than developed countries.

APES & Waste

Unit 5 - Land & Water Use

- Topic 5.7 Meat Production Methods
    - EIN-2.I.2 Concentrated animal feeding operation (CAFOs) are used as a way to quickly get livestock ready for slaughter. They tend to be crowded, and animals are fed grains or feed that are not as suitable as grass. Additionally, feedlots generate a large amount of organic waste, which can contaminate ground and surface water. The use of feedlots are less expensive than other methods, which can keep costs to consumers down.

- Topic 5.9 Impacts of Mining
    - EIN-2.K.1 As the more accessible ores are mined to depletion, mining operations are forced to access lower grade ores. Accessing these ores requires increased use of resources that can cause increased waste and pollution.
    - EIN-2.L.1 Mining wastes include the soil and rocks that are moved to gain access to the ore and the waste, called slag and tailings that remain when the minerals have been removed from the ore. Mining helps to provide low cost energy and material necessary to make products. The mining of coal can destroy habitats, contaminate groundwater, and release dust particles and methane.

- Topic 5.11 Ecological Footprints
    - EIN-2.N.1 Ecological footprints compare resource demands and waste production required for an individual or a society.

Unit 8 - Solid Waste Disposal

- Topic 8.9 - Solid Waste Disposal
    - STB-3.K.1 Solid waste is any discarded material that is not a liquid or gas. It is generated in domestic, industrial, business, and agricultural sectors.
    - STB-3.K.2 Solid waste is most often disposed of in landfills. Landfills can contaminate groundwater and release harmful gases.

- ○ STB-3.K.3 Electronic waste, or e-waste, is composed of discarded electronic devices including televisions, cell phones, and computers.
- ○ STB-3.K.4 A sanitary municipal landfill consists of a bottom liner (plastic or clay), a storm water collection system, a leachate collection system, a cap, and a methane collection system.
- ○ STB-3.L.1 Factors in landfill decomposition include the composition of the trash and conditions needed for microbial decomposition of the waste.
- ○ STB-3.L.2 Solid waste can also be disposed of through incineration, where waste is burned at high temperatures. This method significantly reduces the volume of solid waste but releases air pollutants.
- ○ STB-3.L.3 Some items are not accepted in sanitary landfills and may be disposed of illegally, leading to environmental problems. One example is used rubber tires, which when left in piles can become breeding grounds for mosquitoes that can spread disease.
- ○ STB-3.L.4 Some countries dispose of their waste by dumping it in the ocean. This practice, along with other sources of plastic, has led to large floating islands of trash in the oceans. Additionally, wildlife can become entangled in the waste, as well as ingest it.

- ● Topic 8.10 Waste Reduction Methods
  - ○ STB-3.M Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks.
  - ○ STB-3.M.1 Recycling is a process by which certain solid waste materials are processed and converted into new products.
  - ○ STB-3.M.3 Composting is the process of organic matter such as food scraps, paper, and yard waste decomposing. The product of this decomposition can be used as fertilizer. Drawbacks to composting include odor and rodents.
  - ○ STB-3.M.4 E-waste can be reduced by recycling and reuse. E-wastes may contain hazardous chemicals, including heavy metals such as lead and mercury, which can leach from landfills into groundwater if they are not disposed of properly.
  - ○ STB-3.M.5 Landfill mitigation strategies range from burning waste for energy to restoring habitat on former landfills for use as parks.
  - ○ STB-3.M.6 The combustion of gases produced from decomposition of organic material in landfills can be used to turn turbines and generate electricity. This process reduces landfill volume.

- ● Topic 8.11 - Sewage Treatment
  - ○ STB-3.N.1 Primary treatment of sewage is the physical removal of large objects, often through the use of screens and grates, followed by the settling of solid waste in the bottom of a tank.
  - ○ EIN-3.D.4 Poverty-stricken, low-income areas often lack sanitary waste disposal and have contaminated drinking water supplies, leading to havens and

opportunities for the spread of infectious diseases.

APES & Climate Change

Unit 1 - The Living World: Ecosystems

- Topic 1.2 - Terrestrial Biomes
  - ERT-1.B.4 The worldwide distribution of biomes is dynamic; the distribution has changed in the past and may again shift as a result of global climate changes.

Unit 5 - Land & Water Use

- Topic 5.2 - Clearcutting
  - EIN-2.B.2 Forests contain trees that absorb pollutants and store carbon dioxide. The cutting and burning of trees releases carbon dioxide and contributes to climate change.

Unit 9 - Global Change

- Topic 9.3 - The Greenhouse Effect
  - STB-4.C.2 While water vapor is a greenhouse gas, it doesn't contribute significantly to global climate change because it has a short residence time in the atmosphere.
  - STB-4.D.1 Carbon dioxide, which has a global warming potential (GWP) of 1, is used as a reference point for the comparison of different greenhouse gases and their impacts on global climate change. Chlorofluorocarbons (CFCs) have the highest GWP, followed by nitrous oxide, then methane.

- Topic 9.4 - Increase in Greenhouse Gasses
  - STB-4.E.1 Global climate change, caused by excess greenhouse gasses in the atmosphere, can lead to a variety of environmental problems including rising sea levels resulting from melting ice sheets and ocean water expansion, and disease vectors spreading from the tropics toward the poles. These problems can lead to changes in population dynamics and population movements in response.

- Topic 9.5 - Global Climate Change
  - STB-4.F.1 The Earth has undergone climate change throughout geologic time, with major shifts in global temperatures causing periods of warming and cooling as recorded with CO2 data and ice cores.
  - STB-4.F.2 Effects of climate change include rising temperatures, melting permafrost and sea ice, rising sea levels, and displacement of coastal populations.

- ○ STB-4.F.3 Marine ecosystems are affected by changes in sea level, some positively, such as in newly created habitats on now-flooded continental shelves, and some negatively, such as deeper communities that may no longer be in the photic zone of seawater.
  - ○ STB-4.F.4 Winds generated by atmospheric circulation help transport heat throughout the Earth. Climate change may change circulation patterns, as temperature changes may impact Hadley cells and the jet stream.
  - ○ STB-4.F.5 Oceanic currents, or the ocean conveyor belt, carry heat throughout the world. When these currents change, it can have a big impact on global climate, especially in coastal regions.
  - ○ STB-4.F.6 Climate change can affect soil through changes in temperature and rainfall, which can impact soil's viability and potentially increase erosion.
  - ○ STB-4.F.7 Earth's polar regions are showing faster response times to global climate change because ice and snow in these regions reflect the most energy back out to space, leading to a positive feedback loop.
  - ○ STB-4.F.8 As the Earth warms, this ice and snow melts, meaning less solar energy is radiated back into space and instead is absorbed by the Earth's surface. This in turn causes more warming of the polar regions.
  - ○ STB-4.F.9 Global climate change response time in the Arctic is due to positive feedback loops involving melting sea ice and thawing tundra, and the subsequent release of greenhouse gases like methane.
  - ○ STB-4.F.10 One consequence of the loss of ice and snow in polar regions is the effect on species that depend on the ice for habitat and food.

- ● Topic 9.10 - Human Impacts on Biodiversity
  - ○ EIN-4.C.1 HIPPCO (habitat destruction, invasive species, population growth, pollution, climate change, and over exploitation) describes the main factors leading to a decrease in biodiversity
  - ○ Global climate change can cause habitat loss via changes in temperature, precipitation, and sea level rise.