Unit 3 : Humans and the Environment

Content Area: **Science**
Course(s): **Environmental & Earth Science**
Time Period: **Second Marking period**
Length: **7 Week**
Status: **Published**

Unit Overview

Unit three focuses on human population and its continuous interaction with the environment. It addresses the ongoing growth of the human population and raises concerns about approaching carrying capacity. Unit three also addresses, in details, the human impact on the environment throughout managing natural resources and using alternative techniques to harvest more resources sustainably. The last topic of the unit, urbanization, addresses both the exponential growth and the logistic growth of the human population in the past 100 years.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
SCI.9-12.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
SCI.9-12.HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
SCI.9-12.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.9-12.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
SCI.9-12.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
SCI.9-12.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Physical Sciences

- PS1A: Structure and Properties of Matter
- PS1B: Chemical Reactions
- PS1C: Nuclear Processes
- PS2A: Forces and Motion
- PS2B: Types of Interaction
- PS3A: Definitions of Energy
- PS3B: Conservation of Energy and Energy Transfer
- PS3C: Relationship Between Energy and Forces
- PS3D: Energy in Chemical Processes and Everyday Life

- PS4A: Wave Properties
- PS4B: Electromagnetic Radiation
- PS4C: Information Technologies and Instrumentation

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS1D: Information Processing
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems
- LS2C: Ecosystems Dynamics, Functioning, and Resilience
- LS2D: Social Interactions and Group Behavior
- LS3A: Inheritance of Traits
- LS3B: Variation of traits
- LS4A: Evidence of Common Ancestry and Diversity
- LS4B: Natural Selection
- LS4C: Adaptation
- LS4D: Biodiversity and Humans

Earth and Space Sciences

- ESS1A: The Universe and its Stars
- ESS1B: Earth and the Solar System
- ESS1C: The History of Planet Earth
- ESS2A: Earth Materials and Systems
- ESS2B: Plate Tectonics and Large-Scale Systems
- ESS2C: The Role of Water in Earth's Surface Processes
- ESS2D: Weather and Climate
- ESS2E: Biogeology
- ESS3A: Natural Resources
- ESS3B: Natural Hazards
- ESS3C: Human Impacts on Earth Systems
- ESS3D: Global Climate Change

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

- How does the human population affect the environment?
- Why do we study human populations?
- How might the human population growth rate change in the future?
- What factors influence the impact a population has on its environment?
- What is environmental health?
- What is the relationship between the environmental health and our own health?
- How do biological and social factors in the environment affect human health?
- How do chemicals in our environment affect our health?
- How can we balance our needs for housing and jobs with the needs of the environment?
- How do we use the land we live on?
- How can the effects of urbanization lead to sprawl?
- What are the characteristics of a sustainable city?

Standards	Students will know	Students will do	Suggested Activities/ Strategies
HS-LS4-3	• Technological advances, especially in agriculture and industry, changed the ways people lived and triggered remarkable increases in population size.	• Describe how technological advances have contributed to human population growth.	• Video: Agriculture and Industrial Revolution.
HS-LS4-3	• In recent years the human population growth rate has decreased, but the population still continues to grow.	• Explain recent trends in population growth.	• Real Data: Population Growth Rate, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*230).*
HS-LS4-3	• Demographers study the size, density, and distribution of human populations.	• Identify characteristics of human populations that are studied by demographers.	• Explore human population densities throughout the world. • Connect population distribution to available resources.
HS-LS4-3	• Fertility rate helps demographers predict the rates at which populations will grow in the future.	• Describe total fertility rates and replacement fertility.	• Students to explore the work of demographers. • Figure 8: Trend in China's Population: *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*235).*
HS-LS4-3	• Age structure and sex ratios define a population's	• Explain how the age structure and sex ratio of a population define its	• Lab: Build an Age Structure Diagram, *(Pearson*

	potential for growth.	potential for growth.	*Environmental Science: Your World, Your Turn,* 2011, p.*237).*
HS-LS4-3	• The demographic transition may explain the reason that some industrialized nations have experienced a large drop in birthrates and death rates.	• Describe the demographic transition.	• Analyze data in demographic transition diagram. • Compare Japan to India in terms of demographic transition.
HS-LS4-3	• Social factors, such as wealth and education, affect a nation's population growth and its resource use.	• Discuss social factors that affect population growth.	• Lab: Human Population Growth Rate.
HS-LS4-3	• Humans have an enormous impact on their environment.	• Describe how humans impact their environments.	• Debate ecological footprints of affluent societies and poor societies. • Figure 16: Wealth Gap, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*244).*
HS-ETS1-3	• Technology can have both negative and positive impacts on the environment.	• Discuss the negative and positive impacts of technology.	• Debate the effect of technology on the environment. • Students to describe the effect of

			technology and wealth on their local environment.
HS-ESS3-1	• Environmental health hazards can be biological, social, chemical, or physical.	• List the types of environmental health hazards.	• Classify environmental hazards in three major categories.
HS-ESS3-1	• Epidemiology is the study of disease in human populations while toxicology is the study of how poisonous substances affect organisms' health.	• Compare and contrast epidemiology and toxicology.	• Career Search: Epidemiology and Toxicology • Lab: Dose-Response Curve.
HS-ESS3-3	• People respond differently to environmental hazards due to individual differences such as age, sex, weight, health issues, and genetic makeup.	• Describe the reasons why individuals respond differently to the same environmental hazards.	• Activity: Breast Cancer Awareness. • Activity: Discuss recent trends in U.S. breast cancer mortality rate compared with trends in other nations. • Search available local and national agencies that deal with environmental hazards.
HS-ESS3-3	• Risk assessment is the process of measuring the chance that an environmental hazard will	• Discuss risk assessment.	• Students to search the risk assessment for many hazardous materials in their local

	cause harm.		community.
HS-ESS3-3	• Infectious diseases are spread by direct human contact, through contaminated food and water, and by animals.	• Describe how infectious diseases spread.	• Lab: How do Diseases Spread?, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p*. 263).* • Infectious Diseases: - Malaria - AIDS - Tuberculosis - Cholera
HS-ESS3-3	• Since new diseases are continually emerging, it is important to know how, where, and to what extent they are spreading.	• Explain why emerging diseases are important to monitor and control.	• Related video. • Emerging Diseases: - Ebola - H1N1 - SARS - Zika Virus • Students to search strategies used by governments and scientists to deal with emerging diseases.
HS-ESS3-1	• Some social hazards result from lifestyle choices a person makes while other social hazards cannot be controlled.	• Differentiate between social hazards that are lifestyle choices and those that cannot be controlled.	• Students to search the following topics: - Smoking - Fast Food Diet - Teenager Diabetes

HS-ESS3-1	• All chemicals can be hazardous in large enough quantities.	• Explain what makes chemicals hazardous.	• Activity: Students to create a list of commonly used chemical hazards, and explain their toxicity dose-response.
HS-ESS3-1	• Chemical hazards can cause cancer, birth defects, and improper functioning of human body systems.	• Discuss how chemical hazards affect human health.	• Students to classify the hazardous chemical list collected from the previous activity into the six major types of chemical hazards. *(Pearson Environmental Science: Your World, Your Turn,* 2011, p*. 269).*
HS-ESS3-1	• Our homes and buildings may contain chemical hazards including asbestos, radon, volatile organic compounds, carbon monoxide, and lead.	• List some indoor chemical hazards.	• Figure 15: Indoor Chemical Hazards, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*270).* • Search local, state and national laws that regulate the use of the following chemical: - Asbestos - Radon - Lead - Carbon Monoxide
HS-ESS3-1	• There are chemical hazards in the air, on land, and in the	• Discuss where chemical hazards can be found in	• Search local reports and news regarding outdoors hazardous

	water.	the environment.	chemicals.
HS-ESS3-1	• Toxic chemicals accumulate in organisms as they feed on one another.	• Describe bio-magnification.	• Search the history of using DDT in U.S.
HS-ESS3-1	• The shaking that occurs during an earthquake can destroy natural landforms as well as human-made structures.	• Discuss how earthquakes affect structures on Earth's surface.	• Video: Earthquakes • Search the Richter Scale and how it is used to measure earthquakes.
HS-ESS3-1	• The molten rock, gas, ash, and cinders released during a volcanic eruption can cause significant damage and loss of life in nearby cities and towns.	• Discuss how volcanoes affect human lives and property.	• Video: Volcanoes.
HS-ESS3-1	• Tornadoes, hurricanes, and thunderstorms are powerful weather events that can damage property and threaten human lives.	• Describe tornadoes, hurricanes, and thunderstorms.	• Activity: Search the following hurricanes: -Hurricane Katrina, 2005. -Hurricane Sandy, 2012.
HS-ESS3-1	• An avalanche is a mass of sliding snow that can bury	• Discuss the dangers of avalanches.	• Video: Avalanches.

	people and places in its path.		
HS-ESS3-4	• Land cover influences land use, and humans change both when they build urban areas.	• Differentiate between land cover and land use, and describe how people affect both.	• Figure 1: Land Use, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*292).*
HS-ESS3-4	• Urbanization occurs when people move out of rural areas toward areas with more or better jobs.	• Explain how and where urbanization occurs.	• Activity: Search urbanization in local cities.
HS-ESS3-4	• Cities have both negative and positive impacts on the environment.	• Describe the environmental impacts of urbanization.	• Students to debate the negative and positive impact of cities on the environment.
HS-ESS3-4	• As people move from cities to suburbs, population growth and increased land consumption per capita contribute to sprawl.	• Describe the contributors to sprawl and its patterns.	• Figure 11: Sprawling Development, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.*301).*
HS-ESS3-4	• Sprawl affects the transportation, pollution, public health, land use, and	• Explain the impacts sprawl has on an area.	• Real Data: Population Densities and Carbon Emission, *(Pearson Environmental Science:*

	economics of an area.		*Your World, Your Turn,* 2011, p. *302).*
HS-ESS3-4	• City Planners use many tools in the attempt to make urban areas more livable.	• Describe four different components of city planning.	• Activity: Use Google Maps to search development and planning of cities in your state.
HS-ESS3-4	• Transportation options are vital to livable cities.	• Explain the importance of mass transit options to a city and its residents.	• Students to describe public transportation options, available to them, and explain how efficient they are.
HS-ESS3-4	• Parks and open space are key elements of livable cities.	• Explain the importance of open space to a livable city.	• Outdoors Activity.
HS-ESS3-4	• The goal of a green building is to save energy and other resources without sacrificing people's comfort.	• Differentiate green buildings from conventional buildings.	• Students to discuss the economics of green buildings and the cost-benefits analysis, (CBA).
HS-ESS3-4	• There has been promising progress toward urban sustainability.	• Discuss the progress toward sustainability some cities have made and its importance to the world.	• Case Study: The Urban Sustainability of Curitiba Brazil vs. NY City.

Predictable Misconceptions
• Developing countries must go through the same processes, steps, or trends that developed countries have gone through. • Population problems of developing countries are not a problem for the United States. • The world's worst population problem is found in developing countries. • The notion that all growth is good. • In U.S., cancer rates are soaring. • Changing environmental laws and regulation is an effective way to improve public health. • Developed countries are not responsible for the majority of Earth's population. • Urbanization is inherently bad. • Most urban growth occurs in mega-cities. • Urban growth comes mainly from migration to cities. • Rural-Urban migration can and should be stopped. • The poor are a marginal minority in cities. • Cities occupy a huge amount of land area. • Urbanization inevitably harms the environment.
Modification
• IEP guideline and modification for classified students. • Extended time for struggling students. • When available, assignments are to be sent electronically to online accounts and MacBook Air. • Special accommodations for students with physical or visual impairments. • Differentiated instruction.

Suggested Case Studies
• Love Canal: Poisoned Promises. • Saving the Siberian Tigers. • China's One Child Policy. • The Rise and Fall--and Rise? ---of DDT • Growing Pains in Portland, Oregon.

Enduring Understanding

- Humans affect the global environment more than any other species alive today.
- Human activity has changed the Earth's biomes and threatens biodiversity.
- Humans have developed adaptations that allow them to live on every continent of the world.
- The major five types of infectious diseases are: respiratory infections, AIDS, diarrheal diseases, tuberculosis, and malaria.
- Chemicals are all around us, and all of them can be harmful to our health in large enough amounts.
- Although we cannot prevent most natural disasters, there are steps that scientists, engineers, governments, and citizens can take to resist damage and deal with the aftermath.

Students will be able to...

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- Analogy Prompt
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Index Card Summaries
- Journal Entry

- Misconception Check
- Observation
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Web or Concept Map

Authentic Assessments

- Chapter 8 Assessment, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p. 251-252).
- Chapter 9 Assessment, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.287-288).
- Chapter 10 Assessment, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.318-319).
- E-Text: Chapter 8, 9, 6,10 Tests A, B.
- E-Text: Unit 3 Review and Assessment.
- Teacher–prepared Case Study Project Assessment.
- Students Workbook: Chapter 8, 9, 10, *(Pearson Environmental Science: Your World, Your Turn,* 2011, p.131: 182).

Benchmark Assessments

- Unit One: Final Test
- Unit One: Project Assessment
- Final Exam

STAGE 3- LEARNING PLAN

Instructional Map

Unit	Time Frame	Date	Marking Period
3	**7 Weeks:** • **5 Weeks Instruction** • **2 Weeks Formative and Summative Assessment**	**January** and **February**	**2nd and 3rd**

- Assess students' prior knowledge of the related topics in the unit, (Pre-Assessment).
- Unit Case Study:

- Preview the case study.

- Read the case study.

- Assimilate the facts.

- Gather additional information.

- Map the contents.

- Make local connection.

- Create a project.

- Teacher to use formative assessment and feedback to improve students' learning.
- Students to use the textbook, or E-text, for reading and definitions.
- Teacher to use PowerPoint and multi-sensory media to introduce concepts and main points.
- Teacher to use the suggested activities, in the table above, for teaching each concept in the unit.
- Students to connect and relate unit topics to their local communities and environment, when possible.
- Students to use study guides, homework, and students' workbook for reference and feedback.
- Apply labs and outside activities as indicated in the table above.
- Teacher to guide students through authentic resources during their conduction of research and inquiries.
- Students to use graphs, charts, data table, and maps throughout the unit as indicated in the table above.
- At the end of the unit, students should present scientifically sound projects supported by evidence, data, charts, and maps.
- Unit summative assessment.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"

- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding

- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

<u>Differentiation Strategies for At Risk Students</u>

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Interactive Notebook
- Modified Test
- Oral Directions
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes

- Use of Additional Reference Materials
- Use of Audio Resources

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

- **Middle School**

- 6th Grade: Diversity of Life and Weather and Water

- 7th Grade: Populations and Ecosystems and Planetary Science

- 8th Grade: Earth History, Human Systems Interactions, and Heredity and Adaptations

- **High School**

- Biology

- Anatomy and Physiology

- Chemistry

- Physics

- Forensic Science

- Zoology

- Human Impact on the Environment

Additional Materials

- ***Lab Manual and Equipment***
- ***Safety Rules and Equipment***
- ***Pearson: Environmental Science, Your World, Your Turn, 2011***
- ***Textbook, Students' Workbook, and Lab Manual***

- ***E-texts, Teacher Resources, and Students Resources***
- ***Environmental Protection Agency http://www.epa.gov***
- ***Food and Drug Administration, http://www.fda.gov***
- ***National Oceanographic and Atmospheric Administration (NOAA)***
- ***National Oceanographic and Atmospheric Administration (NOAA)***
- ***National Environmental Satellite, Data and Information Service (NESDIS)***
- ***National Marine Fisheries Service (NMFS)***
- ***National Ocean Service (NOS)***
- ***National Weather Service (NWS)***
- ***Office of Oceanic and Atmospheric Research (OAR)***
- ***Department of Health and Human Services (HHS)***
- ***Agency for Toxic Substances and Disease Registry (ATSDR)***
- ***Centers for Disease Control and Prevention (CDCP)***
- ***National Institutes of Health (NIH)***
- ***New Jersey Department of Environmental Protection***
- ***New Jersey Division of Fish, Game and Wildlife***
- ***US Fish and Wildlife Service Offices in New Jersey***
- ***Nature, http://www.nature.com/nature/index.html***
- ***Conservation Fund, http://www.conservationfund.org***
- ***Conservation International, http://www.conservation.org***
- ***Earth Justice, http://earthjustice.org***
- ***Environmental Defense Fund, https://www.edf.org***
- ***Natural Resources Defense Council, http://www.nrdc.org***
- ***Oceana, http://oceana.org***
- ***Rainforest Alliance, http://www.rainforest-alliance.org***
- ***Sierra Club Foundation, http://www.sierraclubfoundation.org***
- ***Union of Concerned Scientists, http://www.ucsusa.org***
- ***World Resources Institute, http://www.wri.org***
- ***Discovery: http://www.discovery.com***