Unit 4: Human Populations and Urbanization

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **4 weeks**
Status: **Published**

Summary

This unit consists of human demographics, the statistical analysis of human population growth and the environmental consequences of rapid human population growth. Students will better understand the factors that influence population growth, the differences between industrialized and developing countries and how overpopulation is the root cause of environmental problems. Emphasis will be placed on the effect that human populations have on habitat loss, air and water pollution, waste disposal, food supply, and energy consumption. Students will also analyze the trend of increasing urbanization and how this presents both environmental challenges such as climate change and opportunity to achieve sustainability and improve the quality of life.

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MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
MA.S-IC.B.6	Evaluate reports based on data.
LA.W.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.
SCI.HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

	A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
SCI.HS.LS3.B	Variation of Traits Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.
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SCI.HS-LS4	Biological Evolution: Unity and Diversity
SCI.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. Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
SCI.HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of

	minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
SCI.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.
CS.9-12.8.2.12.ETW.1	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
CS.9-12.8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
CS.9-12.8.2.12.ETW.3	Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
CS.9-12.8.2.12.ITH.2	Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.
CS.9-12.8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
WRK.9.2.12.CAP.13	Analyze how the economic, social, and political conditions of a time period can affect the labor market.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Essential Questions / Enduring Understandings

Essential Questions:

How does a growing global human population affect our environment?

How does a changing environment impact the growth of the human population?

In what ways does increased development impact human population change and quality of life?

Why is urbanization increasing and in what ways is this trend both positive and negative for the environment?

Enduring Understandings:

Human population growth and increased development are at the core of our planet's environmental problems

Population growth can be predicted or determined using specific demographic characteristics, and social and cultural influences can shape population growth in developing and developed nations.

Objectives

Students will know key terms including: population density, CBR, CDR, immigration, emigration, ZPG, doubling time, replacement level fertility, demographic transition, population profile, ecological footprint, density dependent an independent factors, infant mortality and demography.

Students will know the history of human population growth

Students will know the differences in populations between developed and industrialized nations including population growth and resource consumption.

Srudents will know the 4 phases of demographic transition.

Students will be skilled at analyzing demographic data to predict changes in populations on a local, national and global scale

Students will be skilled at calculating natural rates of population increase and doubling time.

Students will be skilled at interpreting age structure diagrams to assess population change and levels of development

Students will know ways that technology and population growth have enabled humans to increase both the rate and the scale of the impact on the environment

Students will know how global carrying capacity is determined by the overall population, coupled with rates of consumption and waste.

Students will know why urbanization is on the rise and how this trend can be both a positive and a negative thing for the environment

Students will know the concept of a sustainable city and methods to implement sustainability in urban areas

Learning Plan

Complete homework assignments that include research on population issues and personal statements and opinions on classroom topics and discussions.

Complete a written reflection on the video: “Island of the Flowers” and reflect on human ecology and the human race.

Use internet resource to determine individual “Ecological Footprint.”

Navigate an interactive website and game completing questions and learning about the present and future world in terms of population.

Complete questions from an interactive PowerPoint as well as interpret various population profiles.

Complete a case study on a selected country profile to determine population growth trends using data from the World Census Bureau.

Class discussion: Examine the causes and consequences of human population growth on the earth and natural resources.

Examine and answer analysis questions on three country’s policies on population growth

Calculate future human population based on current estimates and growth rates.

Research and compare population profiles for countries of varying stages of development.

Stage by stage PPT discussion of the Demographic Transition Model.

Assessment

Formative Assessments:

- Worksheets
- Do Nows
- Exit Tickets
- Class Discussions

Quizzes:

- Population growth and top 10 populated countries
- Demography, Population Profiles and population statistics

Bench Marks:

Midterm and Final Exam

Alternative:

- Video worksheet: population growth over time
- Demographic stats poster research assignment
- Developed vs Developing countries discussion

- Demography Study guide
- Debate: controlling human population growth
- Populations and Dempgraphy Review
- Population Profiles research assignment and analysis

Summative:

Unit Tests:

- Populations, Demography and Urbanization

Materials

Raven & Berg Evnironment Textbooks (ISBN: 978-1-119-39341-2)

Guided note packets (teacher developed)

Technology (student & teacher laptops, SmartBoard)

PowerPoints

Workshets/notes

Youtube/Netflix

Simulation of population growth video

World of 7 billion video

Demographic statistics poster spreadsheet

Population Clock Website

Suggested Strategies for Modification

https://docs.google.com/spreadsheets/d/1P8BzKodtBsbWi4rQ0tunGWhZkCOg52IvbNO7yy-TFJI/edit?usp=sharing