

**AP [ADVANCED PLACEMENT] ENVIRONMENTAL SCIENCE [GRADES 11-12]**

EWING PUBLIC SCHOOLS  
2099 Pennington Road  
Ewing, NJ 08618

Board Approval Date: August 31, 2015  
Produced by: Karen Benton, Supervisor

Michael Nitti  
Superintendent

In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.
---

## Table of Contents

	<u>Page</u>
Course Description	1
Unit 1: Humans and Sustainability: An Overview [Chapter 1]	2
Unit 2: The Living World [Chapters/Sections 2.2, 3.2-3.4, 4, 5.1-5.2 and 9]	3
Unit 3: Population [Chapters/Selections 5.3 and 6]	5
Unit 4: Earth's Systems [Chapters/Sections: 3.1, 4.2-4.3, 14.5 (General); 8, 11, 13.2-13.3, 20 (Water); 7.1-7.2, 18, 19 (Air); 10, 12, 14.1-14.4, 22.3-22.4 (Land)]	7
Unit 5: Energy Resources and Consumption [Chapters 2.3, 15, 16]	11
Unit 6: Impacts (Economic, Environmental and Human Health) [Chapters 17, 21 and 23]	13

## Course Description

This course provides an investigative approach to the interrelationships of the natural world through the study of the fundamental concepts, principles and methodologies of environmental science, with an emphasis on inquiry and critical thinking skills including problem solving and experimental investigations.

Environmental science is interdisciplinary, covering a wide variety of topics from different areas of study which will be covered in this course. These topics, as listed in the AP Environmental Science Course Outline (College Board) include:

- Earth Systems and Resources
- The Living World
- Population
- Land and Water Use
- Energy Resources and Consumption
- Pollution
- Global Change

The AP Environmental Science course is designed to be the equivalent of a one semester, introductory college course in environmental science. All students are expected to take the AP exam in May. College credits awarded to students are evaluated on an individual basis and may vary between institutions. Many institutions award credits to students who score a 3 or higher on the AP exam. Some institutions require a 4 or 5.

### Prerequisite:

Students taking this course should have received an 80% or higher in Honors Biology and Chemistry OR a 90% or higher in Level I Biology and Chemistry.

### Resources:

Text: Living in the Environment 18<sup>th</sup> Edition (Miller/Spoolman)  
Lab Manual: Lab Investigations AP Environmental Science (Molnar)

### Supplementary Resources:

Google Earth  
Environmental Science Earth as a Living Planet 9<sup>th</sup> Edition (Botkin/Keller)  
Environment: The Science Behind the Stories 5<sup>th</sup> Edition (Withgott/Laposata)  
Environmental Science 2<sup>nd</sup> Edition (Friedland and Relyea)

## **Unit 1: Humans and Sustainability: An Overview [Chapter 1]**

### **Enduring Understandings:**

- A more sustainable future will require that we rely more on energy from the sun and other renewable energy resources, protect biodiversity through the preservation of natural capital and avoid disrupting the earth's vitally important chemical cycles.
- A major goal for becoming more sustainable is full-cost pricing—the inclusion of harmful environmental and health costs in the market prices of goods and services.
- We will benefit ourselves and future generations if we commit ourselves to finding win-win-win solutions to our problems and to leaving the planet's life-support system in at least as good a shape as what we now enjoy.

### **Essential Questions:**

1. What are some principles of sustainability?
2. How are our ecological footprints affecting the earth?
3. Why do we have environmental problems?
4. What is an environmentally sustainable society?

### **Acquired Knowledge:**

- Distinguish among environmental science, ecology and environmentalism.
- Identify the three principles of sustainability.
- Explain how finding solutions to environmental problems involves making 'trade-offs'.
- Use the ecological footprint concept to explain how we are living unsustainably.
- Explain how we use the IPAT model to estimate the impact of human populations in less-developed and more developed countries.
- Explain how excluding the harmful environmental and health costs of production from goods and services affects the environmental problems we face.
- Distinguish among planetary management, stewardship and environmental wisdom worldviews.
- Explain how we can use the six principles of sustainability to move us closer to the vision of a more sustainable world.

### **Suggested Activities:**

1. Ecological footprint
2. Video: Secrets of the Lost Empires 2
3. Four Corners (Six Tables)
4. "Tragedy of the Commons"
5. Video: The Lorax
6. Wants and needs activity

### **Assessments:**

Summative: Tests, Quizzes, FRQs, Formal Lab Report  
Formative: Homework, FRQs, Labs, Do Nows

### **Standards: HS-ESS3-3**

## Unit 2: The Living World [Chapters/Sections 2.2, 3.2-3.4, 4, 5.1-5.2 and 9]

### Enduring Understandings:

- You cannot really throw anything away. According to the *law of the conservation of matter*, no atoms are created or destroyed whenever matter undergoes physical change. Thus we cannot do away with matter; we can only change it from one physical state or chemical form to another.
- Life is sustained by the flow of energy from the sun through the biosphere, the cycling of nutrients within the biosphere, and gravity.
- Some organisms produce the nutrients they need, others survive by consuming other organisms, and still others live on the wastes and remains of organisms while recycling nutrients that are used again by producer organisms.
- Human activities are altering the flow of energy through food chains and webs and the cycling of nutrients within ecosystems and the biosphere.
- Populations evolve when genes mutate and give some individuals genetic traits that enhance their abilities to survive and to produce offspring with these traits (natural selection).
- Human activities are degrading the Earth's vital biodiversity by hastening the extinction of species and by disrupting habitats needed for the development of new species.
- Each species plays a specific ecological role (its ecological niche) in the ecosystem where it is found.
- We are hastening the extinction of wild species and degrading the ecosystem services they provide by destroying and degrading their habitats, introducing harmful invasive species, and increasing human population growth, pollution, climate change, and overexploitation.
- We should avoid causing the extinction of wild species because of the ecosystem and economic services they provide and because their existence should not depend primarily on their usefulness to us.
- We can work to prevent the extinction of species and to protect overall biodiversity and ecosystem services by using laws and treaties, protecting wildlife sanctuaries, and making greater use of the precautionary principle.

### Essential Questions:

1. What is matter and what happens when it undergoes change?
2. What are systems and how do they respond to change?
3. How does the earth's life-support system work?
4. What are the major components of an ecosystem?
5. What happens to matter and energy in an ecosystem?
6. What is biodiversity and why is it important?
7. How does the earth's life change over time?
8. How do geological processes and climate change affect evolution?
9. How do speciation, extinction, and human activities affect biodiversity?
10. What is species diversity and why is it important?
11. What roles do species play in ecosystems?
12. What role do humans play in the loss of species and ecosystem services?
13. Why should we care about sustaining species and the ecosystems services they provide?

14. How do humans accelerate species extinction and degradation of ecosystem services?
15. How can we sustain wild species and their ecosystem services?

### **Acquired Knowledge:**

- Distinguish among tentative science (frontier science), reliable science, and unreliable science.
- Distinguish between a positive feedback loop and a negative feedback loop in a system and give an example of each.
- Explain what happens to energy as it flows through food chains and webs.
- Explain how human activities are affecting the biogeochemical cycles.
- Describe how geologic processes can affect natural selection.
- Distinguish between geographic isolation and reproductive isolation, and explain how they can lead to the formation of a new species.
- Explain why species-rich ecosystems tend to be productive and sustainable.
- Distinguish among native, nonnative, indicator, and keystone species and give an example of each.
- Distinguish between endangered and threatened species.
- Describe two economic and two ecological benefits of species diversity.
- Explain how saving other species and the ecosystem services they provide can help us save our own species and our cultures and economies.
- Describe the effects of nonnative species to an ecosystem.
- Summarize the roles and limitations of wildlife refuges, gene banks, botanical gardens, wildlife farms, zoos, and aquariums in protecting some species.

### **Suggested Activities:**

1. Cats in Borneo
2. Owl pellet biomass
3. Soil Analysis Lab
4. Biodiversity lab
5. Evolution and Adaptation: Using Woolly Worms and Other Creatures to Simulate Natural Selection
6. Video: Cane Toads
7. "Hotspot" Travel Brochure

### **Assessments:**

Summative: Tests, Quizzes, FRQs, Formal Lab Report

Formative: Homework, FRQs, Labs, Do Nows

**Standards: HS-LS2-1, HS-LS2-2, HS-LS2-4, HS-LS2-6, HS-LS2-7, HS-ESS3-3**

### **Unit 3: Population [Chapters/Selections 5.3 and 6]**

#### **Enduring Understandings:**

- Certain interactions among species affect their use of resources and their population sizes.
- Changes in environmental conditions cause communities and ecosystems to gradually alter their species composition and population sizes (ecological succession).
- There are always limits to population growth in nature. The human population is growing rapidly and may soon bump up against environmental limits.
- Even if population growth is not a problem, the increasing use of resources per person is expanding the overall human ecological footprint and putting a strain on the Earth's resources.
- We can slow human population growth by reducing poverty, elevating the status of women, and encouraging family planning.

#### **Essential Questions:**

1. How do species interact?
2. How do communities and ecosystems respond to changing environmental conditions?
3. What limits the growth of populations?
4. How do environmental scientists think about human population growth?
5. What factors influence the size of the human population?
6. How does a population's age structure affect its growth or decline?
7. How can we slow human population growth?

#### **Acquired Knowledge:**

- Explain how symbiotic relationships among species can affect the population sizes of species in ecosystems.
- Distinguish between primary and secondary succession.
- Explain why succession does not follow a predictable path.
- Explain how living systems achieve some degree of sustainability by undergoing constant change in response to changing environmental conditions.
- In terms of the stability of ecosystems, distinguish between persistence and resilience.
- Explain how some limiting factors can become more important as a population's density increases.
- Describe two different reproductive strategies that can enhance the long-term survival of a species.
- Explain why no population can grow indefinitely.
- Explain why humans are not exempt from nature's population controls.
- Summarize the debate over whether and how long the human population can keep growing.
- Identify three variables that affect the growth and decline of human populations.
- Explain how age structure affects population growth and economic growth.
- Explain how the reduction of poverty and empowerment of women can help countries slow their population growth.

**Suggested Activities:**

1. Reintroduction of the Lynx to a Rocky Mountain Forest: How Age Structure Diagrams Can Be Used to Determine Habitat Suitability
2. Keystone Species: Core Case Study
3. Population Pyramids
4. Case Study

**Assessments:**

Summative: Tests, Quizzes, FRQs, Formal Lab Report

Formative: Homework, FRQs, Labs, Do Nows

**Standards: HS-LS2-1, HS-LS2-2, HS-ESS3-3**



**Unit 4: Earth's Systems [Chapters/Sections: 3.1, 4.2-4.3, 14.5 (General); 8, 11, 13.2-13.3, 20 (Water); 7.1-7.2, 18, 19 (Air); 10, 12, 14.1-14.4, 22.3-22.4 (Land)]**

**Enduring Understandings:**

- Differences in climate, based mostly on long-term differences in average temperature and precipitation, largely determine the types and location of the Earth's deserts, grasslands and forests.
- The Earth's terrestrial ecosystems provide important ecosystem and economic services.
- Human activities are degrading and disrupting many of the ecosystem and economic services provided by the Earth's terrestrial ecosystems.
- About 1 billion people have health problems because they do not get enough to eat and 1.6 billion people face health problems from eating too much.
- Modern industrialized agriculture has a greater harmful impact on the environment than any other human activity.
- More sustainable forms of food production will greatly reduce the harmful environmental impacts of industrialized food production systems while likely increasing food security.
- Saltwater and freshwater aquatic life zones cover almost three-fourths of the Earth's surface and oceans dominate the planet.
- The Earth's aquatic ecosystems provide important ecosystem and economic services.
- Certain human activities threaten biodiversity and disrupt ecosystem and economic services provided by aquatic ecosystems.
- The economic values of the important ecosystem services provided by the world's ecosystems are far greater than the value of raw materials obtained from those systems.
- We can manage forests, grasslands, and nature reserves more effectively by protecting more land and by preventing overuse and degradation of these areas and the renewable resources they contain.
- We can sustain terrestrial biodiversity and ecosystem services by protecting biodiversity hotspots and ecosystem services, restoring damaged ecosystems, and sharing with other species much of the land we dominate.
- The world's aquatic systems provide important economic and ecosystem services and scientific investigation of these poorly-understood ecosystems could lead to immense ecological and economic benefits.
- Aquatic ecosystems and fisheries are being severely degraded by human activities that lead to aquatic habitat disruption and loss of biodiversity.
- We can sustain aquatic biodiversity by establishing protected sanctuaries, managing coastal development, reducing water pollution, and preventing overfishing.
- One of the major global environmental problems is the growing shortage of freshwater in many parts of the world.
- We can expand water supplies in water-short areas in a number of ways, but the most important ways are to reduce overall water use and to use water much more efficiently.
- We can use water more sustainably by cutting water losses, raising water prices, and protecting aquifers, forests, and other ecosystems that store and release water.
- Outdoor air pollution, in the form of industrial smog, photochemical smog, and acid deposition, and indoor air pollution are serious global problems.
- Each year, at least 2.4 million people die prematurely from the effects of air pollution; indoor air pollution, primarily in less-developed countries, causes about two-thirds of these deaths.
- We need to give top priority status to the prevention of outdoor and indoor air pollution throughout the world and the reduction of stratospheric ozone depletion.

- Considerable scientific evidence indicates that the earth's atmosphere is warming, mostly because of human activities, and that this is likely to lead to significant climate disruption during this century that could have severe and long-lasting harmful consequences.
- Reducing the projected harmful effects of rapid climate disruption during this century requires emergency action to increase energy efficiency, sharply reduce greenhouse gas emissions, and rely more on renewable energy resources.
- While we can prepare for some climate change that is now inevitable, we could realize important economic, ecological and health benefits by drastically reducing greenhouse gas emissions with the goal of slowing climate change.
- There are a number of ways to purify drinking water, but the most effective and least costly strategy is pollution prevention.
- The key to protecting the world's oceans is to reduce the flow of pollution from land and air, and from streams emptying into ocean waters.
- Reducing water pollution requires that we prevent it, work with nature in treating sewage, and use natural resources far more efficiently.

### **Essential Questions:**

1. What is food security and why is it difficult to attain?
2. How is food produced?
3. What environmental problems arise from industrialized food production?
4. How can we protect crops from pests more sustainably?
5. How can we improve food security?
6. How can we produce more food sustainably?
7. What factors influence climate?
8. How does climate affect the nature and location of biomes?
9. How have human activities affected the world's terrestrial ecosystems?
10. What is the general nature of aquatic ecosystems?
11. Why are marine aquatic systems important?
12. How have human activities affected marine ecosystems?
13. Why are freshwater ecosystems important?
14. How have human activities affected freshwater ecosystems?
15. What are the major threats to forest ecosystems?
16. How should we manage and sustain forests?
17. How should we manage and sustain grasslands?
18. How should we manage and sustain parks and nature reserves?
19. What is the ecosystem approach to sustaining biodiversity and ecosystem services?
20. What are the major threats to aquatic biodiversity and ecosystem services?
21. How can we protect and sustain marine biodiversity?
22. How should we manage and sustain marine fisheries?
23. How should we protect and sustain wetlands?
24. How should we protect and sustain freshwater lakes, rivers, and fisheries?
25. What should our priorities be for sustaining aquatic biodiversity?
26. Will we have enough usable water?
27. Is groundwater a sustainable resource?
28. Can surface water resources be expanded?
29. Can water transfers be used to expand water supplies?
30. Is desalination a useful way to expand water supplies?
31. How can we use fresh water more sustainably?

32. How can we reduce the threat of flooding?
33. What are the earth's major geological processes and what are mineral resources?
34. How long might supplies of nonrenewable mineral resources last?
35. What are the environmental effects of using nonrenewable mineral resources?
36. How can we use mineral resources more sustainably?
37. What are the earth's major geological hazards?
38. What is the structure of the atmosphere?
39. What are the major outdoor pollution problems?
40. What is acid deposition and why is it a problem?
41. What are the major indoor air pollution problems?
42. What are the health effects of air pollution?
43. How should we deal with air pollution?
44. How have we depleted ozone in the stratosphere and what can we do about it?
45. How is the earth's climate changing?
46. Why is the earth's climate changing?
47. What are the possible effects of a warmer atmosphere?
48. What can we do to slow projected climate disruption?
49. How can we adapt to climate change?
50. What are the causes and effects of water pollution?
51. What are the major water pollution problems in streams and lakes?
52. What are the major pollution problems affecting groundwater?
53. What are the major water pollution problems affecting oceans?
54. How can we deal with water pollution?

### **Acquired Knowledge:**

- Explain why industrialized food production requires large inputs of energy.
- Summarize industrialized agriculture's contribution to projected climate change.
- Explain how industrialized food production systems have caused losses in biodiversity.
- Explain three benefits of buying locally grown food.
- Summarize three important aspects of making a shift to more sustainable food production.
- Explain how the Green House effect is important to the earth's life and climate.
- Explain why biomes are not uniform.
- Summarize the ways in which human activities have affected the world's biomes.
- Explain the ecological importance of coastal marshes, mangrove forests, and sea-grass beds.
- Explain why the Chesapeake Bay is an estuary in trouble.
- Explain how the building of dams and other structures on rivers can affect the river deltas and associated wetlands.
- Describe the efforts of scientists and economists to put a price tag on the major ecosystem services provided by forests and other ecosystems.
- Explain how increased reliance on tree plantations can reduce the overall forest biodiversity and degrade forest topsoil.
- Describe the global fuel wood crisis.
- Summarize the controversy over protecting wilderness in the United States.
- Describe the threat to marine biodiversity.
- Explain how ocean acidification occurs and why it is a serious problem.
- Explain how consumer choices can help sustain fisheries and aquatic biodiversity and ecosystem services.

- Explain why access to water is a health issue, an economic issue, a national and global security issue, and an environmental issue.
- Explain the connection between water shortages and hunger.
- Summarize the problem of groundwater depletion in the world and in the United States.
- Explain how the supply of a nonrenewable mineral resource can be economically depleted and list the five choices we have when this occurs.
- Describe the conventional view of the relationship between the supply of a mineral resource and its market price.
- Describe the environmental effects of mining and processing rare earth.
- Describe the potential of using graphene as a new resource.
- Explain the benefits of recycling and reusing valuable metals.
- Describe the human body's defenses against air pollution, how they can be overwhelmed, and the illnesses that can result.
- Summarize the U.S. pollution laws and how they have worked to reduce pollution.
- Explain why weather and climate are not the same.
- Explain how a hotter sun, the oceans, cloud cover, and air pollution might contribute to projected atmospheric warming and resulting global climate disruption.
- Describe the possible effects of climate disruption on biodiversity, food production, and human health and economies.
- Summarize the argument for regulating greenhouse gases as pollutants.
- Distinguish between point sources and nonpoint sources of water pollution.
- Explain how certain efforts to clean up the air can contribute to water pollution.
- Explain how atmospheric warming will likely increase water pollution.
- Distinguish between primary sewage treatment and secondary sewage treatment.
- Explain how we can use wetland to treat sewage.

### **Suggested Activities:**

1. Lab: Investigating Soils
2. Solar Insulation of the Earth
3. Determining the Health of a pond Ecosystem
4. Elk and Vegetation Management Plan: Rocky Mountain National Park. CO
5. Measuring and Monitoring Aquatic Conditions
6. Desalinization Lab
7. Lab: Graham Cracker Approach to Plate Tectonics
8. Chocolate Chip Cookie Mining
9. Liquefaction Simulation
10. Video: Blue Gold
11. Lab: Sewage Treatment
12. Field Trip: Sewage Treatment Plant
13. Acid Deposition Activity
14. How Hot Is It Here on Earth?

### **Assessments:**

Summative: Tests, Quizzes, FRQs, Formal Lab Report  
 Formative: Homework, FRQs, Labs, Do Nows

**Standards: HS-ESS2-2, HS-ESS2-4, HS-ESS2-5, HS-ESS2-6, HS-ESS3-1, HS-ESS3-2**

## Unit 5: Energy Resources and Consumption [Chapters 2.3, 15, 16]

### Enduring Understandings:

- You cannot get something for nothing. According to the *first law of thermodynamics*, or the *law of conservation of energy*, whenever energy is converted from one form to another in a physical or chemical change, no energy is created or destroyed. This means that in causing such changes, we cannot get more energy out than what we put in.
- You cannot break even. According to the second law of thermodynamics, whenever energy is converted from one form to another in a physical or chemical change, we always end up with lower-quality or less usable energy than we started with.
- A key factor to consider in evaluating the long-term usefulness of any energy resource is its net energy yield.
- Conventional oil, natural gas, and coal are plentiful and have moderate to high net energy yields, but use of these fossil fuels, especially coal, has a high environmental impact.
- The nuclear power fuel cycle has a low environmental impact and a very low accident risk, but high costs, a low net energy yield, long-lived radioactive wastes, and its role in spreading nuclear weapons technology have limited its use.
- We should evaluate energy resources on the basis of their potential supplies, their net energy yields, and the environmental health impacts of using them.
- By using a mix of renewable energy sources—especially solar, wind, flowing water, sustainable biofuels, and geothermal energy—we could drastically reduce pollution, greenhouse gas emissions, and biodiversity losses.
- Making the transition to a more sustainable energy future will require sharply increasing energy efficiency, using a mix of environmentally friendly renewable energy resources, and including the harmful environmental and health costs of energy resources in their market prices.

### Essential Questions:

1. What is energy and what happens when it undergoes change?
2. What is net energy and why is it important?
3. What are the advantages and disadvantages of using oil, natural gas, coal, and nuclear power?
4. Why is energy efficiency an important energy resource?
5. What are the advantages and disadvantages of using solar energy?
6. What are the advantages and disadvantages of using hydropower?
7. What are the advantages and disadvantages of using wind power?
8. What are the advantages and disadvantages of using biomass as an energy resource?
9. What are the advantages and disadvantages of using geothermal energy?
10. What are the advantages and disadvantages of using hydrogen as an energy source?
11. How can we make the transition to a more sustainable energy future?

### Acquired Knowledge:

- Explain why some energy resources need help in the form of subsidies to compete in the marketplace.

- Describe U.S. dependence on oil and on imported oil.
- Describe the problems concerned with using fracking to obtain natural gas.
- Explain why there is no such thing as clean coal.
- Explain why nuclear power is not likely to reduce U.S. dependence on oil and why it is not likely to reduce projected climate disruptions.
- Explain why we can think of energy efficiency as an energy resource.
- Explain benefits of living roofs.
- Describe the advantages of relying more on a variety of renewable energy sources.

**Suggested Activities:**

1. Solar Cooker
2. Oil Spill Remediation Lab
3. Fracking Activity
4. Video: GasLand
5. Biodiesel Fuel Exercise Part I
6. Biodiesel Fuel Exercise Part II (If time allows)

**Standards: HS-ESS3-2**

## Unit 6: Impacts (Economic, Environmental and Human Health) [Chapters 17, 21 and 23]

### Enduring Understandings:

- Making a transition to more sustainable economies will require finding ways to estimate and include the harmful environmental and health costs of producing goods and services in their market prices.
- Making this economic transition will also mean phasing out environmentally harmful subsidies and tax breaks, and replacing them with environmentally beneficial subsidies and tax breaks.
- Another way to further this transition would be to tax pollution and wastes instead of wages and profits and to use most of the revenues from these taxes to promote environmental sustainability and reduce poverty.
- We face significant hazards from infectious diseases such as flu, AIDS, tuberculosis, diarrheal diseases, and malaria, and from exposure to chemicals that can cause cancers and birth defects, and to those that can disrupt the human immune, nervous, and endocrine systems.
- Because of the difficulty of evaluating the harm caused by exposure to chemicals, many health scientists call for much greater emphasis on pollution prevention.
- By becoming informed, thinking critically about risks, and making careful choices, we can reduce the major risks we face.
- The order of priorities for dealing with solid waste should be to produce less of it, reuse and recycle as much of it as possible, and safely burn or bury what is left.
- The order of priorities for dealing with hazardous waste should be to produce less of it, reuse or recycle it, convert it to less-hazardous material, and safely store what is left.
- We need to view solid wastes as wasted resources, and hazardous wastes as materials that we should not be producing in the first place
- Urbanization is increasing steadily and the numbers and sizes of urban areas are growing rapidly, especially in less-developed countries.
- Most urban areas are unsustainable with their large and growing ecological footprints and high levels of poverty.
- Urban areas can be made more sustainable and livable just as some cities and villages already are.

### Essential Questions:

1. How are economic systems related to the biosphere?
2. How can we estimate the values of natural capital, pollution control, and resource use?
3. How can we use economic tools to deal with economic problems?
4. How can reducing poverty help us deal with environmental problems?
5. How can we make the transition to more environmentally sustainable economies?
6. What major health hazards do we face?
7. What types of biological hazards do we face?
8. What types of chemical hazards do we face?
9. How can we evaluate chemical hazards?
10. How do we perceive risks and how can we avoid the worst of them?
11. What are solid waste and hazardous waste, and why are they problems?
12. How should we deal with solid waste?
13. Why are refusing, reducing, reusing, and recycling so important?

14. What are advantages and disadvantages of burning or burying solid waste?
15. How should we deal with hazardous waste?
16. How can we make the transition to a more sustainable low-waste society?
17. What are the major population trends in urban areas?
18. What are the major urban resource and environmental problems?
19. How does transportation affect urban environmental impacts?
20. How important is urban land-use planning?
21. How can cities become more sustainable and livable?

### **Acquired Knowledge:**

- Explain why a truly free-market economy rarely exists in today's capitalist market systems.
- Explain how economists can estimate the optimal levels for pollution control and resource use.
- Distinguish between internal and external costs of goods and services.
- Distinguish between command-and-control and incentive-based government regulations.
- Distinguish between risk, risk assessment, and risk management.
- Distinguish between an epidemic and a pandemic of an infectious disease.
- Summarize the controversy over the effects of trace levels of chemicals.
- Summarize the types and sources of solid waste in the U.S. and what happens to it.
- Distinguish between waste management, waste reduction, and integrated waste management.
- Distinguish between refusing, reducing, reusing and recycling in dealing with the solid wastes we produce.
- Distinguish between urbanization and urban growth.
- Explain why most urban areas are unsustainable systems and how these factors contribute to their unsustainability: lack of vegetation, water supply problems and flooding, pollution, health problems, the heat island effect, and light pollution.
- Describe the eco-city model and how it applies the principles of sustainability.

### **Suggested Activities:**

1. Ecotourism Survey
2. Video: No Impact Man
3. Risk Assessment Lab
4. Recycle City
5. Green City Design Project

### **Assessments:**

Summative: Tests, Quizzes, FRQs, Formal Lab Report

Formative: Homework, FRQs, Labs, Do Nows

**Standards: HS-LS4-5, HS-LS4-6, HS-ESS3-4, HS-ESS3-5, HS-ESS3-6, HS-ETS1-3**