# Environmental Issues: Land Use Change
## Grade 8 Interdisciplinary Science Unit

| Enduring Understandings | Essential Questions | Eligible Content (Pennsylvania Standards) |
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| Human activities influence environmental changes.<br><br>**AAAS Benchmarks:**<br>There are trade-offs that each person must consider in making choices—about personal popularity, health, family relations, and education, for example—that often have lifelong consequences. 7D/M1<br><br>One common aspect of all social trade-offs pits personal benefit and rights of the individual, on one side, against the general social good, on the other. 7D/M2<br><br>Trade-offs are not always between desirable possibilities. Sometimes social and personal trade-offs require accepting an unwanted outcome to avoid some other unwanted one. 7D/M3<br><br>**National Science Education Standards**<br>Science in personal and social perspectives. | How do we impact our ecosystem?<br><br>How do current building trends affect the local ecosystem?<br><br>What causes urban heat islands and to what extent do they occur in the Lehigh Valley? | **S8.B.3.2.**1 Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).<br><br>**S8.B.3.2.2** Use evidence to explain how diversity affects the ecological integrity of natural systems.<br><br>**S8.B.3.3.1** Explain how human activities may affect local, regional, and global environments.<br><br>**7.1.3.A** Identify geographic tools and their uses. |
| How to analyze the spatial organization of places, and environments on earth's surface.<br><br>**National Geography Standard 3** | How do geospatial information technologies enable us to view and understand patterns in our environment? | • Characteristics and purposes of different geographic representations<br> o Maps and basic map elements<br>• Geographic representations to display spatial information<br> o Thematic maps |
| How to apply earth and environmental science and geography to interpret the present and plan for the future. | How can I use environmental and geographic data to better understand my environment? | **7.1.6.A** Describe geographic tools and their uses. |

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| - Spatial understanding is developed through the use of spatial thinking skills, using data as evidence to formulate explanations, reasoning and critical thinking.<br><br>**AAAS Benchmarks:**<br>Scientific investigations usually involve the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected data. 1B/M1b<br><br>**National Science Education Standards**<br>Abilities necessary to do scientific inquiry.<br><br>**National Geography Standard 4**<br>The physical and human characteristics of places.<br><br>**National Geography Standard 7**<br>The physical processes that shape the patterns of Earth's surface.<br><br>**National Geography Standard 12**<br>The process, patterns, and functions of human settlement. | How can I analyze and interpret environmental and geographic data to plan for the future? | • Geographic representations to display<br>  o spatial information<br>  o Absolute location<br>  o Relative location<br>  o Topography<br>• Mental maps to organize an understanding of the human and physical features of Pennsylvania and the home county<br>• Basic spatial elements for depicting the patterns of physical and human features:<br>  o Point, line, area, location, distance, scale<br>  o Map grids<br>  o Alpha-numeric system<br>  o Cardinal and intermediate directions<br><br>**7.1.9.A** Explain geographic tools and their uses.<br>• Development and use of geographic tools<br>  o Geographic information systems [GIS]<br>  o Satellite-produced images<br>  o Access to computer-based geographic data (e.g., Internet, CD-ROMs)<br>• Construction of maps<br>  o Scale<br>  o Symbol systems<br>  o Level of generalization<br>  o Types and sources of data<br>• Geographic representations to track |

| | | spatial patterns: Weather, Migration, Environmental change (e.g., tropical forest reduction, sea-level changes) **7.1.12.A** Analyze data and issues from a spatial perspective using the appropriate geographic tools. <br>• Human and physical features of the world through mental maps <br><br>7.2.9.A Explain the physical characteristics of places and regions including spatial patterns of Earth's physical systems. <br>• Landform regions |
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**Topical questions:**

What are some environmental impacts caused by a shopping mall?
How do human activities influence the landscape?
How does urbanization affect surface temperatures on the landscape?
How does urban deforestation and urban sprawl lead to the formation of heat islands?
What are environmental consequences of land use change due to urbanization over time?
Why should green spaces be developed in urban areas?
Why do NASA scientists study environmental changes?
Where should a new Wal-Mart Supercenter be built in the greater metropolitan Lehigh Valley area that would have minimal impact on the environment?

**Topical enduring understandings for this unit (Are specific to the unit topic. Involve generalizations derived from the specific content knowledge and skills of the unit):**

Urban heat island are formed through absorption and resulting radiation of heat from materials commonly used in urban areas, such as concrete and asphalt, that make up buildings and pavement in urban landscapes.

Land use changes over time are based on human needs. To survive people are depend on the physical environment.
They adapt to it and modify it to suit their changing needs for things such as water, shelter, transportation, energy, and recreational facilities. Clearing land for settlement, mining, and agriculture provides homes and livelihoods for some but alters physical systems and transforms human populations, wildlife, and vegetation.

The changing landscape of the Lehigh Valley metropolitan area highlights a changing land use pattern of farmland loss to urbanization.

Most urban areas face the growing problems of sprawl that may result in a loss of natural vegetation, agricultural lands, and open space due to commercial, industrial, and residential development that often occurs due to population growth and expansion. Such growth is often accompanied by a general decline in the extent and connectivity of wildlife and wetland habitat.

Human activities on Earth's surface have intended and unintended consequences. For example, cutting portions of tropical rainforests to obtain valuable wood for export to other countries, clearing land for recreational uses such as golf courses, and settlements may result in creating wealth for lumber companies and business owners and in providing places to live for migrating people. Unintended consequences may include destroying species of wildlife dependent on the rainforest and altering Earth's climate. Unintended consequences may not be understood in time to repair the negative environmental changes.

Smart Growth encourages growth in ways that focus on wise resource use. This means taking advantage of existing structures, such as reusing abandoned industrial sites (brownfield redevelopment), building along rail lines and public transportation routes, and investing in existing communities.

**What key knowledge and skills will students acquire as a result of this unit? (Students will know….; Students will be able to….)**

Students will use Google Earth and other remotely sensed images to identify and examine human-built and natural features in the areas surrounding shopping malls.
Students will describe the environmental impacts a shopping mall has on a local landscape.
Students will use basic elements of aerial photo interpretation (including tone, size, texture, pattern, shadow, site, and association) to aid in identifying objects in aerial photographs.
Students will explain how urban heat islands are formed.
Students will explain how communities can use certain heat island reduction strategies to reduce the impact of an urban heat island effect.
Students will interpret land use maps to understand environmental issues that are typically associated with sprawl.
Students will examine and compare the land use around five mall areas in the Lehigh Valley.
Students will recognize that the earth's surface has different basic land surfaces that reflect/emit different radiation.
Students will use geospatial information technologies to investigate ground cover features in the greater Lehigh Valley metropolitan region.
Students will use geospatial information technologies to recognize land use patterns of diverse areas in our world.
Students will examine and interpret time-sequenced satellite data and aerial photographs of urban areas to interpret the rate of geographic growth patterns.
Students will explain how changes to different landscapes occur over time through analysis and interpretation of satellite data images and aerial photographs.
Students will recommend a plan for locating a new Wal-Mart Supercenter in the greater metropolitan Lehigh Valley area to have minimal impact on the environment.

## ACCEPTABLE EVIDENCE

**What evidence will show that students understand? (e.g. tests, quizzes, prompts, work samples, observations)**

Pretest and posttest assessment of environmental issues pertaining to land use change issues, urban heat island concepts, and spatial thinking skills aligned to objectives described above.

Completion of *Land Use Change* analysis activities.

**Performance Tasks: Through what authentic performance task will students demonstrate understanding?**

Analysis of time-sequenced satellite imagery to identify changes in the landscape.

Identification of man-made and natural features in remotely sensed images.

Developing a plan for locating a new Wal-Mart Supercenter the greater metropolitan Lehigh Valley area to have minimal impact on the environment.

**By what criteria will student products and performances be evaluated?**

Criterion-based rubrics for Wal-Mart Supercenter development plan.

Correct responses for identifying man-made and natural features and land use changes in remotely sensed images in learning activties.

## LEARNING ACTIVITIES

Students will examine the significance of the location of shopping malls. Huntsville, Alabama, is used as a case study example to illustrate that different human activities have different location requirements. Students will examine the land use around a mall area using Google Earth.  They will investigate human-built and natural features in the area surrounding the Madison Square Mall in Huntsville, Alabama.  They will use basic elements of aerial photo interpretation (including tone, size, texture, pattern, shadow, site, and association) to aid in identifying objects in aerial photographs.

Students will investigate how shopping malls change natural environments.  Students will study a mall and its immediate surroundings to understand concepts involved in the formation of urban heat islands.

Students will be introduced to the main reasons an urban heat island occurs.  They will explain how communities can use certain heat

island reduction strategies to reduce the impact of an urban heat island effect.

Students will investigate the formation of urban heat islands. Atlanta, Georgia will be used as a case study. Students will use satellite images of downtown Atlanta and its suburbs to examine temperature patterns of these areas.

Students will interpret land use maps of the greater Atlanta area to understand environmental issues that are typically associated with sprawl.

Students will interpret features in aerial photographs of the Lehigh Valley area. They will examine the significance of the location of shopping malls in the Lehigh Valley area. Students will examine and compare the land use around five mall areas in the Lehigh Valley using Google Earth.

Students will identify man-made and natural features in the Lehigh Valley. They will provide evidence (tone, size, shape, texture, pattern, shadow, site, and/or association) to support their identifications.

Students will understand how satellites use remote sensing to produce images using the Flash animations we have developed on the *Lehigh Earth System Science Education Remote Sensing Web site* - **http://www.ei.lehigh.edu/esse/rs/**. Students will recognize that the earth's surface has different basic land surfaces that reflect/emit different radiation. Students will identify and interpret features on Landsat images.

Students will use remotely sensed images to recognize land use patterns of diverse areas in our world. They will also examine and interpret time-sequenced satellite data and aerial photographs of urban areas to interpret geographic growth patterns. In addition, they will examine landscape changes over time through analysis and interpretation of satellite data images and aerial photographs.

Students will recommend a plan for locating a new Wal-Mart Supercenter in the greater metropolitan Lehigh Valley area to have minimal impact on the environment. Students will use Google Earth to analyze and evaluate features of different land areas for proposed development sites. They will develop a proposal to apply "smart growth" principles to their planning decisions and communicate their plan in a simulated planning commission meeting.