

ENVIRONMENTAL GEOLOGY



Introduction to Environmental Geology

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Flood



Tornado



Landslides



Avalanche



Forest Fire



Hurricane



Tsunami



Drought



**Volcanic
Eruption**



Material Covered
Introduction to Environmental Geology
geologic principles and geologic time
Plate Tectonics
Earthquakes
World Distribution of Earthquakes and seismic belts
Volcanoes
Mid-term Exam
Mass Movements
Streams and Flooding
Drought and desertification
geochemical environments
Basic Concepts of Geochemical Exploration
Methods of geochemical survey
Geochemical Anomalies and Mineral Deposits
Mineral and Rock Resources

References

Environmental geology, (2020),
Carla W. Montgomery.—11th ed.

Environmental geology, (2016),
ghazi et al.

This lecture is an introduction to environmental geology and will include:

- 1. What is Environmental Geology?**
- 2. Why Study Environmental Geology?**
- 3. Geology and Human Impact**
- 4. The Science of Environmental Geology**
- 5. Geological Time and Its Importance**
- 6. The Rise of Environmental Geology**

1. What is Environmental Geology?

Environmental geology is a field of study that focuses on the relationship between geological processes and human activities. It examines how Earth's natural processes—such as plate tectonics, volcanism, earthquakes, and erosion—affect human populations, and how human activities—such as urbanization, mining, and pollution—alter geological processes and the environment.

- **Geology:** the study of the earth, its materials and their properties, its internal and external physical, chemical, and biological properties, and its history.
- **Environment:** anything, living or nonliving, that surrounds and influences living organisms.
- **Environmental geology:** the study of the interactions between human activities and geological processes, including their impact on the Earth, environment, and human life.

Why Study Environmental Geology?

There are several reasons why it's crucial to study environmental geology:

1- Understanding Natural Hazards: Natural events like earthquakes, volcanic eruptions, floods, and landslides are geological processes that can pose serious risks to human life and property. By studying these processes, we can predict when and where they might occur and mitigate their impact.

2- Managing Earth's Resources: Earth provides us with essential resources like water, minerals, and fossil fuels. Understanding the geological processes that form these resources helps in managing them sustainably to avoid depletion and environmental degradation.

Why Study Environmental Geology?

There are several reasons why it's crucial to study environmental geology:

3- Protecting the Environment: Human activities, such as deforestation, mining, and construction, can lead to significant environmental damage, including pollution and habitat loss. Environmental geology allows us to understand these impacts and find ways to reduce the damage through better land-use planning and resource management.

4- Sustainable Development: Environmental geology helps us make informed decisions that balance the needs of human societies with the long-term health of the planet. By understanding the geological risks and benefits of different locations, we can guide development to be more sustainable and less destructive to ecosystems.

3. Geology and Human Impact

Geological Hazards are natural events that become problematic when human societies are exposed to them. These hazards can be devastating, but they are often not problematic in their natural state. When humans build homes, cities, or infrastructure in areas vulnerable to geological hazards, such as flood plains, fault lines, or volcanic zones, we increase the risk of disaster.

Some common geological hazards include:

Earthquakes: Caused by the movement of tectonic plates, earthquakes can have devastating effects if they occur in populated areas. Building infrastructure that is resilient to seismic activity is essential for minimizing damage.

Landslides: These occur when gravity causes rock and soil to slide down a slope. Human activities such as construction on steep hillsides, deforestation, and mining can increase the likelihood of landslides.

Floods: Flooding is caused by excessive rainfall or the overflow of rivers, and it can be exacerbated by poor urban planning, deforestation, and the blocking of natural water channels.

Volcanic Eruptions: Volcanic activity can destroy property and cause loss of life. Understanding the locations of active volcanoes and the behavior of volcanic eruptions can help mitigate risks.

4. The Science of Environmental Geology

Environmental geology is based on the **scientific method**, a systematic process for investigating and understanding natural phenomena. The scientific method involves the following steps:

Observation: Identifying and observing a natural phenomenon or a problem that needs investigation. In geology, this could mean noticing a pattern in earthquakes, soil erosion, or the formation of new landforms.

Formulating a Hypothesis: Based on observations, scientists propose a hypothesis—a testable explanation or prediction about how the observed phenomenon works. For example, if deforestation is occurring in a region, a hypothesis might be that it leads to increased flooding.

Testing the Hypothesis: Scientists test hypotheses by collecting data through experiments, field studies, and observations. This step may include conducting surveys of geological formations or monitoring environmental changes.

Analysis and Conclusion: After testing, scientists analyze the data and decide whether the hypothesis is supported or refuted. If supported, the hypothesis may become part of a scientific theory. If not, a new hypothesis is formed.

Through the scientific method, scientists develop **theories** like **Plate Tectonics**, which explains the movement of the Earth's lithospheric plates and how these movements shape the Earth's surface, causing earthquakes, volcanoes, and mountain ranges.

5. Geological Time and Its Importance

Geological time refers to the vast time scale over which geological processes occur. Earth's history spans 4.5 billion years, and geological events, such as mountain formation, erosion, and the shifting of continents, occur over millions of years.

Understanding geological time is crucial for:

Understanding the rate of change: Geological processes happen over time scales that are vastly different from human life spans. For instance, the formation of mountains can take tens of millions of years, while a human lifetime is much shorter.

Predicting future events: By studying geological history, we can make more accurate predictions about future geological events, such as the likelihood of earthquakes or the formation of natural resources.

6- The Rise of Environmental Geology

The modern field of environmental geology emerged in the 1970s, driven by a combination of factors:

Population Growth and Industrialization: With the rapid expansion of human populations and industries, environmental challenges such as pollution, deforestation, and resource depletion became more pronounced.

Conflicting Land Uses: The increasing conflict between the need for industrial development (mining, deforestation, agriculture) and the desire to preserve natural areas (parks, forests, and wildlife habitats) highlighted the need for better environmental management.

Environmental Degradation: Many areas of natural beauty and biodiversity were being replaced by urbanization and industrialization, leading to environmental damage. This led to a greater focus on how to minimize such impacts.

Public Awareness and Activism: Key events like the publication of *Silent Spring* by Rachel Carson in 1962, which exposed the dangers of pesticides, and the rise of the environmental movement, brought public attention to the importance of protecting the environment.

Environmental Laws and Regulations: As a response to growing public concern, governments began passing laws to protect the environment, such as air and water quality standards, conservation laws, and regulations on land use.

Key Points to Remember:

Environmental geology focuses on the relationship between geological processes and human activities.

Geological hazards (earthquakes, landslides, floods) become dangerous when humans build in vulnerable areas without considering natural risks.

The **scientific method** is essential in studying and understanding geological processes.

Geological time is a critical concept for understanding the long-term nature of Earth's changes and predicting future events.

The field of environmental geology emerged in response to **population growth**, **industrialization**, and **environmental degradation** in the 1970s.

Understanding **geological hazards** and **resource management** is essential for sustainable development and environmental protection.

Thank You for Listening



Any Questions?