

Lesson Plan: Desertification and Sustainable Land Management

As an **Undergraduate Geography and Environmental Sciences** teacher, you can use this set of computer based tools to enable students to develop an understanding of **deserts** and **desertification**. Climate change and desertification are inextricably linked. Desertification contributes to climate change by **removing fertile soil and plants**. Soils store significant amounts of carbon, some of which may be released into the atmosphere due to desertification, having a significant impact on the global climate system.

Climate change's effects on desertification are complex, and current research on the subject is evolving. On the one hand, some dryland regions will receive less rainfall, while temperature increases may deplete soil moisture, impairing plant growth. On the other hand, if sufficient water and soil nutrients are available, a rise in CO₂ in the atmosphere can promote plant growth. This lesson plan discusses climate change's effect on desertification and sustainable land approaches that can be adopted to mitigate the same.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in **Geography and Environmental Sciences**.

Use this Lesson Plan to help the students to understand and find answers to:

1. What is desertification?
2. How does climate change cause desertification?
3. How can climate change-induced desertification be avoided, reduced, or reversed?
4. How can sustainable land management practices play a vital role in mitigating desertification due to climate change?

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About the Lesson Plan

Grade Level	High School, Undergraduate
Discipline	Geography, Environmental Sciences
Topic(s) in Discipline	Deserts, Ecosystems, Desert Ecosystems, Land Use Change, Desertification
Climate Topic	Climate and the Lithosphere; Climate Mitigation and Adaptation
Location	Global
Access	Online
Language(s)	English
Approximate Time Required	40-45 minutes

Contents

1.	Video/ Micro lecture (3 min)	A lecture video to introduce how human activities lead to an increase in greenhouse gas emissions, increase earth's temperature, and change the world around us. This can be accessed here .
2.	Reading (5 min)	An introductory reading on desertification - its definition, its process, impacts, future predictions, response and case studies. This can be accessed here .
3.	Video/ Micro lecture (8 min)	A video focusing on desertification in sub-Saharan Africa, its implication on food security and human migration, and a case study on possible countermeasures. This can be accessed here .
4.	Video/ Micro lecture (4 min)	A case study on Bangladesh's struggle with natural resource depletion, land degradation, and sustainable land management. This can be accessed here .

Step-by-step User Guide

(Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.)

1	Introduce climate change by playing a video micro-lecture	This introductory video titled “Causes and Effects of Climate Change” by National Geographic Channel, can be used to understand how human activities drive up the earth’s temperature and change the world around us. It also briefly explains how rapid increase in greenhouse gases in the atmosphere has warmed the planet at an alarming rate. It emphasizes how climate change can directly affect people’s health and food security. This can be accessed here .
2	Introduce the topic and demonstrate how it is related to Climate Change through this Reading	This reading titled “Desertification,” Chapter 3 of the Intergovernmental Panel on Climate Change (IPCC) Report from 2018, can be used to introduce and explain desertification. It illustrates the processes and causes of desertification in the context of climate change, while going into details of anthropogenic factors. This report also provides valuable insight into the knowledge gaps and significant uncertainties in this field. This can be accessed here .
3	Explain impacts of and mitigation practices through this video case study	This video titled, “The Great Green Wall of Africa: Will it help fight climate change?” by BBC Newsnight explains the impacts of desertification in sub-Saharan Africa and through the example of the ‘Great Green Wall of Africa’ project introduces ways to mitigate them. This can be accessed here .

4	Explain causes of and adaptation practices through another video case study	<p>This video titled, “Sustainable Land Management in Bangladesh” by the Food and Agriculture Organization of the United Nations, explains how the rising population places severe strain on natural resources, leading to an increase in degraded areas. Additionally, it provides insight into how to halt and reverse these trends through sustainable land management.</p> <p>This can be accessed here.</p>
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Learning Outcomes:

The tools in this lesson plan will enable students to:

- Understand the desertification
- Identify the impact of climate change on desertification.
- Ways to reduce the impact of climate change on desertification.
- Importance of sustainable land management practices.

Additional Resources

(If you or your students would like to explore the topic further, these additional resources will be useful.)

1.	Reading	<p>This reading states that the largest percentage of the arid lands in North America and Spain have been affected due to overgrazing and woodcutting. Urbanization, mining, and recreation also have adverse impacts on range, dry farming, and irrigated lands. It also states techniques for combating desertification..</p> <p>This can be accessed here.</p>
2.	Reading	<p>This reading states that between 1982 and 2015, 6% of the world's drylands underwent desertification driven by unsustainable land use practices compounded by anthropogenic climate change. Despite an average global greening, 12.6% (5.43 million km²) of drylands have been degraded, affecting 213 million people, 93% who live in developing economies. This is the first observation-based attribution study of desertification that accounts for climate change, climate variability, CO₂ fertilization and ecosystem changes caused by land use.</p> <p>This can be accessed here.</p>
3.	Activity	<p>This activity can be used to help students gain an understanding of the implications of climate, soil, terrain, and plant features on the potential of a piece of land. They are given an overview of the indicators and learn how to evaluate them in the field.</p> <p>This can be accessed here.</p>

Credits / Copyrights:

1.	Reading “Desertification”	A chapter from IPCC Report , page number: 258-259; 305-306
2.	Video “Causes and Effects of Climate Change”	By National Geographic

3.	Video “The Great Green Wall of Africa: Will it help fight climate change?”	By BBC news night .
4.	Video “Sustainable Land Management in Bangladesh”	By Food and Agriculture Organization of the United Nations
5.	Reading “Anthropogenic climate change has driven over 5 million km ² of drylands towards desertification”	By Nature Communications
6.	Activity “Sustainable Land Management Curriculum: A 3-Lesson Module”	By LandsPKS , Knowledge Hub.
7.	Reading “Desertification of arid lands”	By Dregne, H. E. 1986. Desertification of arid lands. In Physics of desertification , ed. F. El-Baz and M. H. A. Hassan. Dordrecht, The Netherlands: Martinus, Nijhoff.