

# Learning Unit 4: Soil degradation

GGH2604



## Sources to consult

- **Atlas:** Nepal, China, UK (United Kingdom), US (United States) and Canada
- **Map 4:** Land degradation in Africa
- **Prescribed book:** Chapter 4, "Soil: The political ecology of soil degradation", on pages 65-80 in Whitehead (2014)
- **Case Studies:** 4.1 and 4.2
- **Additional Resources on myUnisa:** YouTube videos and Podcast 4.7

# Learning Outcomes

- Discuss the relationship between population growth and soil degradation
- Identify the causes, extent and consequences of soil pollution
- Assess the possible impacts of human activities on soil resources and their consequences
- Formulate appropriate strategies to reduce or prevent soil degradation

# Getting under the planet's skin

- The flat relief and fertile soils of the Great Plains of North America are very beneficial to a range of agricultural activities.
- During the 1930s a vast dust bowl developed in the southern section of the plains. In the pursuit of the great profits that could be made from wheat cultivation, farmers engaged in ploughing up vast swathes of the natural grasslands found in the Prairies. The so-called “Great Plow Up” left the soils of the southern Great Plains exposed to soil erosion.
- Soil erosion made it very difficult to produce agricultural crops, leading to poverty and famine. Big dust storms started blocking out sunlight and resulted in the migration of people away from the plains.

# Soil and environmental transformations

- During the Neolithic Revolution humans gradually moved away from a nomadic society that was based on hunting and gathering food and resources to an agricultural type of society. Agricultural techniques enabled humans to settle in specific regions. This resulted in population growth and an increased demand for food and thereby an increased demand for soil. The increasing demand for soil led to deforestation and the application of inorganic fertilizers after the Industrial Revolution.
- Between the 1950s and early years of the 2000s, it is claimed that inorganic fertilizer use rose 20-fold, with approximately 100 billion kilograms of nitrogen fertilizers being added to soils every year. The use of inorganic fertilizers has been associated with the rapid increase of crop yields and global food supply.
- The Haber-Bosch process enabled the production of ammonia from hydrogen and nitrogen. Various compounds of ammonia could then be added to soils in order to improve their fertility.

# Soil and environmental transformations

- Soil degradation involves a loss of organic matter, nutrients and water from land mostly due to overgrazing of pastures and overcultivation. Soil degradation leads to biodiversity loss, climate change and the onset of human poverty.
- Soil pollution occurs through the addition of toxic chemicals (such as lead, mercury and cyanide) or organic pesticides (such as DDT) to soil. Rachel Carson documented how dichlorodiphenyl-trichloroethane (DDT) was rapidly absorbed through soils into plants and animals. Carson's work would ultimately lead to tighter regulations on the use of pesticides throughout the world.
- **Watch** the YouTube video titled "Systems thinking: a cautionary tale (cats in Borneo)" from the link:

<https://www.youtube.com/watch?v=17BP9n6g1F0>

# Interpreting the transformation of soil: A political ecology perspective

- Before the emergence of political ecology, soil erosion was predominantly understood in three broad ways.
  - First, soil erosion was interpreted as a natural phenomenon that – even when exacerbated by human activity – was largely driven by physical processes (drought and exposure to winds).
  - Second, from a Malthusian perspective, soil erosion was associated with the pressures of overpopulation that forced farmers and landholders to overwork their land in order to feed the growing population.
  - Third, soil erosion was seen as the product of bad decision-making on the part of farmers and landholders. Thus, soil degradation was interpreted as the outcome of farmers either being unaware of sustainable agricultural practices or deliberately overexploiting soil in the pursuit of profit.

# Interpreting the transformation of soil: A political ecology perspective

- The political ecology perspective developed by Blaikie and his colleagues challenged each of the established understandings of soil degradation.
  - Blaikie recognised that drought conditions did not always result in soil erosion. In societies that are more affluent, droughts are routinely endured without significant forms of soil erosion.
  - In terms of Malthusian arguments, political ecologists claimed that advances in agriculture had over time enabled farmers to produce more food from the land without the degradation of soil.
  - Blaikie's work in Nepal and Africa exposed a strong link between poverty and land degradation. It appeared that the poorest farmers often only had access to the lowest quality soils.

# Interpreting the transformation of soil: A political ecology perspective

- **Vote** in Poll 4.5 on myUnisa. The poll question is:
  - “In many ways, Blaikie was a pioneer of the types of analyses that mix human and physical geography, and enable us to better understand the nature of the changes we are experiencing within the Anthropocene” (Whitehead 2014:74). In your opinion, does a political ecology perspective offer a better understanding of environmental issues?

# Soil degradation and restoration in China

- Soil erosion is now affecting 17 per cent of China's total land cover. The eroded 4.5 billion tons of additional soil sediments are clogging up the country's 80 000 reservoirs, reducing water storage capacity and increasing the threat of water scarcity.
- China's expanding economy and population growth have placed pressure on the country's agricultural sector. These pressures have contributed to the overuse and mismanagement of soil resources. In addition, a significant part of China consists of sloping land. On sloping land, gravity accelerates soil erosion rates. The greater the angle of slope of land, the more severe soil erosion processes are. China's state-run farms were formed from the properties of wealthy landowners following the communist revolution in China. These farmers were tasked with increasing food production.

# Soil degradation and restoration in China

- Outside the state farm system, peasant farmers worked within communal farms. These communal farms were designed to help peasant farmers escape poverty and the yoke of unjust landowners.
- However, many of these communal farms are located on marginal, sloping land.
- Moreover, the Chinese government also sanctioned large-scale deforestation to increase timber exports. This enabled the freeing up of more land for agricultural food production.
- Deforestation increased the exposure of vulnerable soils to erosion and nutrient loss.

# Soil degradation and restoration in China

- The Loess Plateau Project has transformed the landscape of the Plateau into a complex network of terraces. These terraces slow the rates at which soil and nutrients are removed from the land, increase agricultural outputs, and facilitate the regeneration of the landscape when trees, grass and shrubs are planted.
- **Watch** the YouTube video titled “How to (literally) save Earth” from the link:

<https://www.youtube.com/watch?v=AOefA-bSduM>

# Soil degradation and restoration in Africa

- **Read** Case Studies 4.1: Soil degradation in Africa and 4.2: Soil restoration in Africa.
- **Listen** to Podcast 4.7 titled “Soil degradation in Africa” on myUnisa.
- **Watch** the YouTube video titled “Regreening Ethiopia's highlands: A new hope for Africa” from the link:
- <https://www.youtube.com/watch?v=nak-UUZnvPI>
- **Participate** in the Discussion Forum Topic 4 on myUnisa:
  - Study the severity of land degradation in South Africa, Namibia, Botswana and Madagascar in Case Study 4.1 and on Map 4. Do you think the land degradation in these four countries is a consequence of natural processes, overpopulation, or poor farming methods? Motivate your answer.

# Thank you

Acknowledgement: This document was compiled by Mr DS Boshoff

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