

PENANG SANGAM HIGH SCHOOL
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LESSON NOTES

School: Penang Sangam High School

Year/Level: 13C

Subject: Geography

Strand	Physical Geography
Sub Strand	Soil
Content Learning Outcome	Highlight soil conservation measures Describe the impact of climate change on soil

Case Study : Soil Erosion and Soil Management

Week:12

Loess Plateau of North China

More than 2.5 or ¼ of the UK experiences the most rapid soil loss in the world. During and following the ice age, Arctic winds transported large amounts of losses and deposited this fine yellow material to a depth of 200m in the Huang He Basin. Following the removal of the vegetation cover of trees and grasses to allow cereal farming (under the directions or orders of Chairman Mao) the loose unconsolidated material are exposed and washed away by the heavy summer monsoon rains or blown by yellow dust storms at the rate of 1cm per year. It is estimated that 1.6bn tonnes of soil reach the Huang He River during each annual summer flood. This material, the most carried by any river in the world, has given the Huang He its name ‘the Yellow River’. Due to higher rate of siltation settling annually on the river’s bed annually of about 6cm making the river shallow gradually of about 10m above its floodplain. So there is an alarming rate of flooding in the area causing widespread destruction to thousands of people (over 1 million in the 1039 flood) and ruin all crops.

Ploughing can have adverse effects on soils. Deep ploughing destroys the soil structure by breaking up peds and burying organic material too deep for plant use. It also loosens the topsoil for future wind and water erosion. In addition ploughing up and down hill creates furrows which increase the rate of surface runoff and the process of gullying.

The weight of farm machinery can compact the soil surface or product platy peds both of which reduce infiltrating capacity and inhibit air circulation in the soil.

Overgrazing especially on the African Savannas also accelerates soil erosion. There is a tendency for Africans to keep more livestock rather than the quality ones only. In this case given the fast growing population so to the number of animals they keep therefore huge land is being utilised for overgrazing. Overgrazing hinders grass cover. When new shoots appear after the rains, they are eaten immediately by cattle, sheep, goats and camels. The arrival of the rain results in animal death due to flooding.

Where there is rapid population growth land that is being left aside for fallowing now has to be cultivated each year and other areas not favoured for planting. Monoculture – the cultivation of the same piece of land repeatedly used up the same soil nutrients.

Burkina Faso

The already dry scrub savannah vegetation on the Southern fringes of the Sahara, herders are forced to move Southwards into the moister environments where they compete for land with sedentary farmers who have already struggling to produce sufficient food for their own increasing numbers. The continuous increase in the size of the cattle and goat herds disrupts the equilibrium that further reduces the land carrying capacity i.e the number of people that the soil and climate of an area can permanently support when the land is planted with staple crops. Subsequently these farmers understand that the land should be left idle for eight years after three consecutive years of planting for it to fallow. However this tends to be impossible due to shortage of land and the rapid growth of population that demands a source of food and income to support themselves in these harsh conditions. The overcropping problem and the arrival of the herders has hugely impacted the soil. Soil is depleted and terribly exposed to the sun vulnerable to erosion.

UK Soil Degradation

Soil degradation involves both the physical loss (erosion) and the reduction in quality of topsoil. Currently, 2.2 million tonnes of topsoil is eroded annually in the UK and over 47 per cent of arable land shows signs of erosion. Degradation can result from or more of several factors:

- Physical degradation is when soil erosion results from the action of the wind or water. It is a natural process, accelerated by human activity. Erosion by wind is less widespread and less frequent than erosion by water but when it does occur, it is often more severe. Estimates suggest that 44 percent of arable land is at risk of being eroded by physical processes.
- Chemicals carried by water can cause diffuse pollution, while biological degradation is when organic matter, in the form of plant remains or organic manure, is washed out of the soil.
- Climate change suggests that Britain will experience more seasonal extremes with wetter, stormier winters and warmer, drier summers. Wetter winters may mean waterlogged soils and an increase in water erosion, while drier soils are more likely to be susceptible to wind erosion.
- Land use can affect the soil, for example when grass is removed to expose the soil and without roots to bind it together, the soil becomes unstable.

Soil Degradation

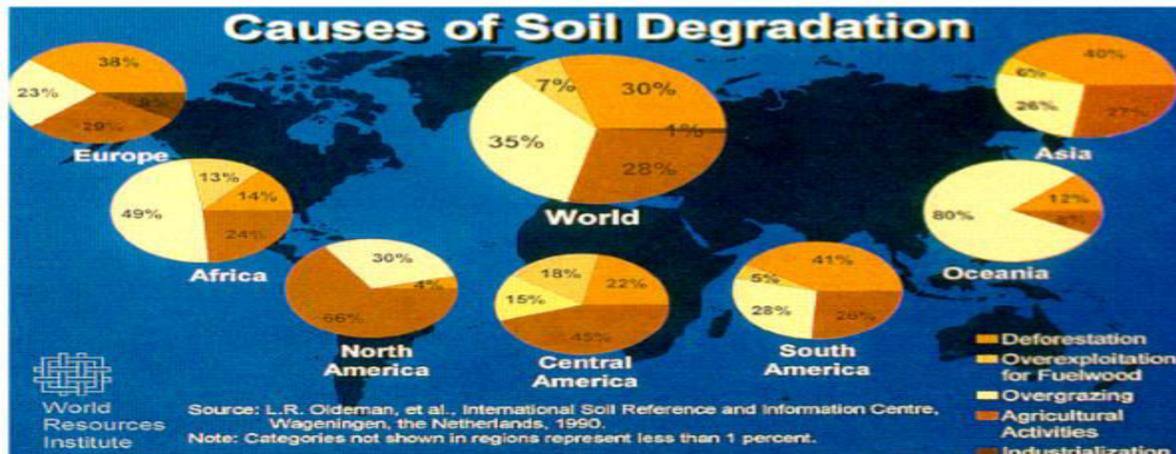
Degradation is the result of human failures to understand and manage the soil. The major cause of soil erosion is the removal of natural vegetation cover, leaving the ground exposed to the elements.

The most serious cause of such removal is deforestation, in countries such as Ethiopia, the loss of trees resulting from population growth and the extra need for farmland and fuelwood means that the heavy rains, when they do occur, are no longer intercepted by the vegetation. Rainsplash (the direct impact of rain drops) loosens the top soil and prepares it for removal by sheetwash (overland flow). Water flowing over the surface has little time to infiltrate into the soil or recharge the soil moisture store. More topsoil tends to be carried away where there are neither

plant roots nor organic matter to bind it together. Small channels or rills may be formed which, in time may develop into larger gully's, making the land useless for agriculture.

Heavy rain may accelerate leaching and remove nutrients and organic matter at a rate faster than that at which they can be replaced by weathering of bedrock and parent material and the decomposition of vegetation. The loss of trees also reduces the rate of transpiration and therefore the amount of moisture in the air. There are fears that large-scale deforestation will turn areas at present under rainforest into deserts.

Although the North American Prairies and the African savannas were grassland when the European settlers first arrived, it is now believed that these areas too were once forested and were cleared by fire mainly natural due to lightning, but partly by the local people. The burning of vegetation initially provides nutrients for the soil, but once these have been leached by the rain or utilized by crops there is little replacement of nutrients. Where the grassland has been ploughed up for cereal cropping, the breakdown of soil structure (peds) have often led to their drying out and becoming easy prey to wind erosion. Large quantities of topsoil were blown away to create the American Dust Bowl in the 1930s while a similar fate has more recently been experienced by many of the Sahel countries. In Britain, the removal of hedges to create larger fields, easier for modern machinery has led to accelerated soil erosion by wind.



Soil Erosion and Soil Management

The Soil Protection Review is carried out by Britain's farmers as part of cross-compliance. It involves identifying soil issues, deciding on measures to manage and protect soils, and then reviewing the results. The 2006 review concluded with the following recommended options to protect the soil from physical decline and erosion:

- i. Reducing mechanical operations on wet ground
- ii. Planting crops early in autumn to protect the soil during the winter from water erosion
- iii. Ploughing across slopes where it is safe to do so
- iv. Using low ground-pressure set-ups on machinery
- v. Shepherding livestock and rotating forage areas
- vi. Planting and/or maintaining hedges or shelter belts to reduce wind erosion and measure to protect the soil organic matter
- vii. Leaving straw and other crop residues on the land after a crop has been harvested
- viii. Including grass crop rotation □ Applying animal manure, compost and sewage sludge

ix. Using reduced or shallow cultivation to maintain or increase near-surface organic matter

Activities

1. Describe some major causes of environmental degradation in China.

2. Explain the name 'Yellow River' came into being?

3. Explain some challenges associated with the reforestation push?

4. State the purpose of 'Great Green Wall'?

5. Explain how successful this project was?

6. Define Monoculture and state its advantages and disadvantages.

7. Explain what 'going native' implies with regards to soil conservation.
