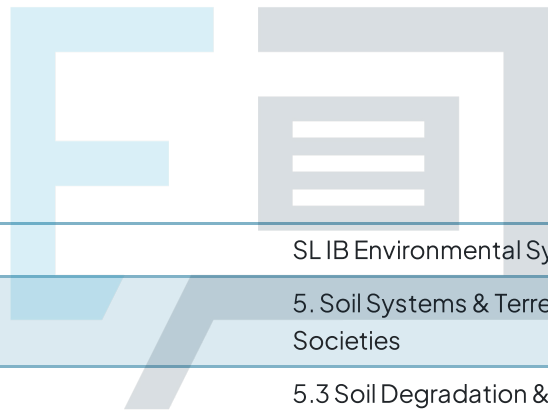




5.3 Soil Degradation & Conservation

Mark Schemes



Course	SL IB Environmental Systems & Societies (ESS)
Section	5. Soil Systems & Terrestrial Food Production Systems & Societies
Topic	5.3 Soil Degradation & Conservation
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for
SL IB Environmental Systems & Societies (ESS)
Students of other boards may also find this useful

Indicative Content	Commentary
<p>Deforestation contributes to soil degradation in the following ways:</p> <p>Any three from the following:</p> <ul style="list-style-type: none"> • Tree root systems hold soil particles together, preventing erosion SO losing these root systems leads to increased soil erosion; [1 mark] • Trees reduce wind speed/velocity SO without them top soil is blown away / soil is eroded by wind; [1 mark] • Trees intercept rainfall / reduces impact of rain(water) on soil SO deforestation increases soil erosion / surface runoff / overland flow / risk of flooding; [1 mark] • Forests (and the species they provide habitat for) contribute organic matter, enriching the soil SO deforestation decreases the organic matter content of soil / makes soil less fertile; [1 mark] • Forests (and the species they provide habitat for) recycle nutrients SO deforestation disrupts nutrient cycling / makes soil nutrient-poor; [1 mark] • Deforestation is for conversion of land to intensive/unsustainable agriculture/overgrazing SO can lead to soil degradation; [1 mark] • Deforestation exposes soil to direct sunlight / higher temperatures SO increases evaporation / reducing water retention / dries out soil making it vulnerable to erosion e.g. by wind; [1 mark] 	<p>Deforestation is the process of clearing or removing large expanses of forests, woodlands, or trees, typically for the purpose of converting the land to other uses, such as agriculture, urban development, mining, or infrastructure projects</p> <p>Soil degradation is the deterioration of soil quality, productivity, and its ability to support plant and animal life. It is typically caused by various human activities and natural processes, which lead to the degradation of soil resources</p> <p>Soil degradation can have serious environmental, agricultural, and socioeconomic consequences.</p>



- Forests stabilise slopes / prevent landslides
SO deforestation increases the risk of landslides during heavy rainfall; [1 mark]

2a

Indicative Content

In addition to deforestation, soil degradation can be caused by the following human activities:

Any **three** from the following:

- Overgrazing can lead to (soil) compaction leading to greater/faster soil erosion; [1 mark]
- Overcultivation / intensive/unsustainable use of land can lead to nutrient depletion / loss of soil structure; [1 mark]
- Overgrazing can lead to loss of vegetation which exposes soil to direct sunlight / higher temperatures, increasing evaporation / reducing water retention / dries out soil making it vulnerable to erosion e.g. by wind; [1 mark]
- Overgrazing/overcultivation can lead to desertification; [1 mark]
- Excessive irrigation can lead to salinisation (of soil) / (excessive) accumulation of salts in the soil; [1 mark]
- Overpopulation can lead to people farming marginal land / unsuitable areas; [1 mark]
- Removal of hedgerows / windbreaks can expose soil to erosion; [1 mark]
- Toxification of soil can occur when (certain) chemicals/pollutants e.g. heavy metals / pesticides / industrial waste accumulate in the soil, harming soil organisms / disrupting nutrient cycling **OR** mining activities can disturb soil layers, exposing minerals that can lead to acidification / other forms of soil degradation; [1 mark]
- Urbanisation / construction projects can lead to soil compaction, reducing water infiltration / increasing surface runoff / erosion; [1 mark]

2b

Indicative Content

Allowing arable farmland to remain fallow (unused) between growing seasons might contribute to soil degradation because:

Any **two** from the following:

- The absence of plant roots results in reduced soil stabilisation **OR** deterioration/degradation of soil structure due to lack of root activity / root growth; [1 mark]
- Exposed soil surface is vulnerable to erosion by wind/water; [1 mark]
- Uninterrupted rainfall/percolation can increase/enhance mineral leaching; [1 mark]
- Increased evaporation due to lack of vegetation cover could lead to (soil) salinisation; [1 mark]
- Lack of soil fauna/animals/invertebrates/microbes affects soil health / reduces oxygenation/aeration of soil / recycling of nutrients within soil; [1 mark]
- Loss of soil structure, affecting water holding capacity / aeration; [1 mark]
- Lack of vegetation cover intensifies evaporation, causing soil to dry out (further increasing vulnerability to wind/water erosion); [1 mark]
- Accumulation of weed growth, competing for soil nutrients; [1 mark]
- Decreased organic matter input from decaying plant material; [1 mark]
- Reduced water infiltration capacity, leading to increased surface runoff (further increasing vulnerability to wind/water erosion); [1 mark]

3a

Indicative Content	Commentary
<p>The distribution of the areas in Northern Africa where the risk of desertification is very high can be described as follows:</p> <p>Any three from the following:</p> <ul style="list-style-type: none"> • Uneven; [1 mark] • Linear; [1 mark] • Edges of/around (Sahara) desert; [1 mark] • 0–35 N OR a smaller correct band (e.g. 10–20 N) OR single latitude (e.g. 15 N); [1 mark] • Close to Mediterranean Sea/northern coast; [1 mark] 	<p>Remember - when describing geographical distributions do not use words such as 'above' or 'below' but use compass directions instead</p> <p>You should refer to other landmarks / features and coastlines to make your descriptions clearer and more specific</p>

3b

Impacts of desertification on local people include:

Any **five** from the following:

- Lack of drinking water / difficulties in supplying drinking water / dehydration; [1 mark]
- People have to travel further / take longer / spend more time to get water; [1 mark]
- Lack of water for crops / crops cannot grow; [1 mark]
- Lack of water for livestock / farm animals die / cattle rearing becomes impossible; [1 mark]
- Low yields; [1 mark]
- Malnutrition / starvation / lack of food; [1 mark]
- Increased competition for limited resources/water/food can lead to conflicts / social tensions among local communities; [1 mark]
- The need to produce more food leads to overcultivation / overgrazing (and further soil degradation); [1 mark]
- Loss of vegetation/trees due to desertification may lead to a diminishing wood fuel source for people; [1 mark]
- Loss of biodiversity can impact traditional medicinal plant availability / cultural practices; [1 mark]
- Migration away from area / emigration / need to travel to find food/work; [1 mark]
- Sandstorms reduce visibility/ cause particle pollution; [1 mark]
- Desertification may force communities to rely on external aid / support, reducing their self-sufficiency / independence; [1 mark]

4

Indicative Content	Commentary
<p>Methods for mitigating soil erosion on hillsides include:</p> <p>Any one from the following sets of answers:</p> <ul style="list-style-type: none">• <i>Method 1</i>: Terracing; [1 mark] <p>And two from:</p> <ul style="list-style-type: none">• Constructing flat steps on steep slopes to decelerate surface runoff; [1 mark]	<p><i>You would gain one mark for naming the method and two marks for outlining how it reduces soil erosion</i></p>

- Increases infiltration (rates); [1 mark]
- Flat terraced areas enhance stability of the hillside and reduce soil sliding / less sediment washed down slope/hillside; [1 mark]

OR

- *Method 2:* Planting trees / agroforestry / intercropping with trees; [1 mark]

And **two** from:

- Trees intercept rainfall, reducing surface runoff; [1 mark]
- Tree root systems absorb water so soil takes longer to become saturated, reducing surface runoff; [1 mark]
- Roots stabilise and secure the soil, minimising nutrient and topsoil loss / less sediment washed down slope/hillside; [1 mark]

OR

- *Method 3:* Contour ploughing; [1 mark]

And **two** from:

- Conducting ploughing along the contour lines of the land; [1 mark]
- Slows down / reduces speed of overland flow / surface runoff; [1 mark]
- Increases infiltration (rates), reducing sediment washed down slope/hillside; [1 mark]

OR

- *Method 4:* Mulching; [1 mark]

And **two** from:

- Applying residue on the soil's surface to moderate the impact of rainfall (on soil); [1 mark]



- Residue helps retain water, reducing surface runoff; [1 mark]
- Less sediment washed down slope/hillside; [1 mark]

OR

- *Method 5*: Stone lines; [1 mark]

And **two** from:

- Creating lines of stones to decelerate / slow down / reduce speed of surface runoff; [1 mark]
- Allows infiltration to take place / increases infiltration (rates); [1 mark]
- Less sediment washed down slope/hillside; [1 mark]

Exam Papers Practice