3.2 Soil and change

- **Explain the causes of soil degradation**

What is soil?
What is soil degradation?

Soil degradation

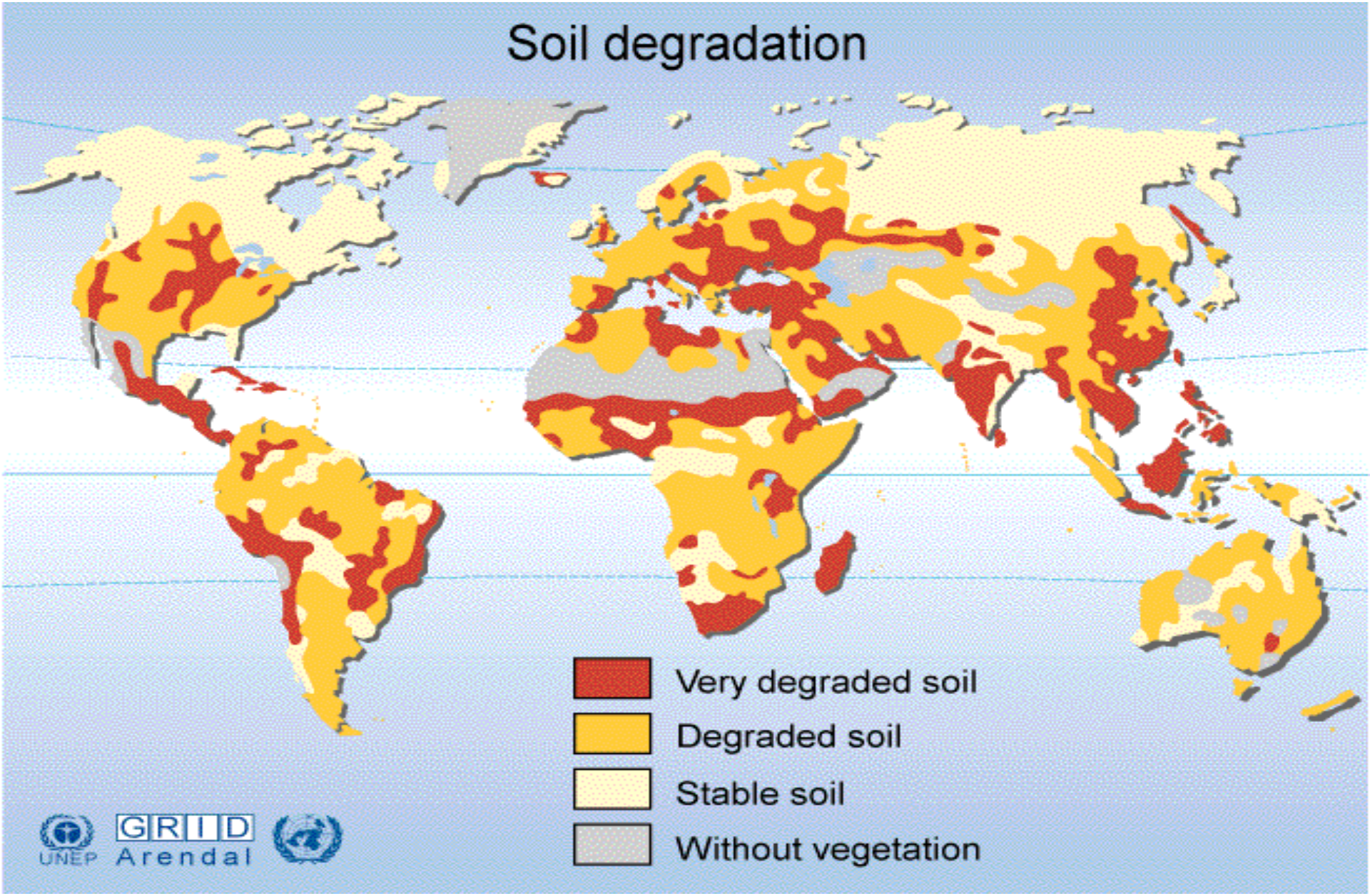
Syllabus terminology –

- a severe reduction in the quality of soils. The term includes soil erosion, salinization and soil exhaustion (loss of fertility).

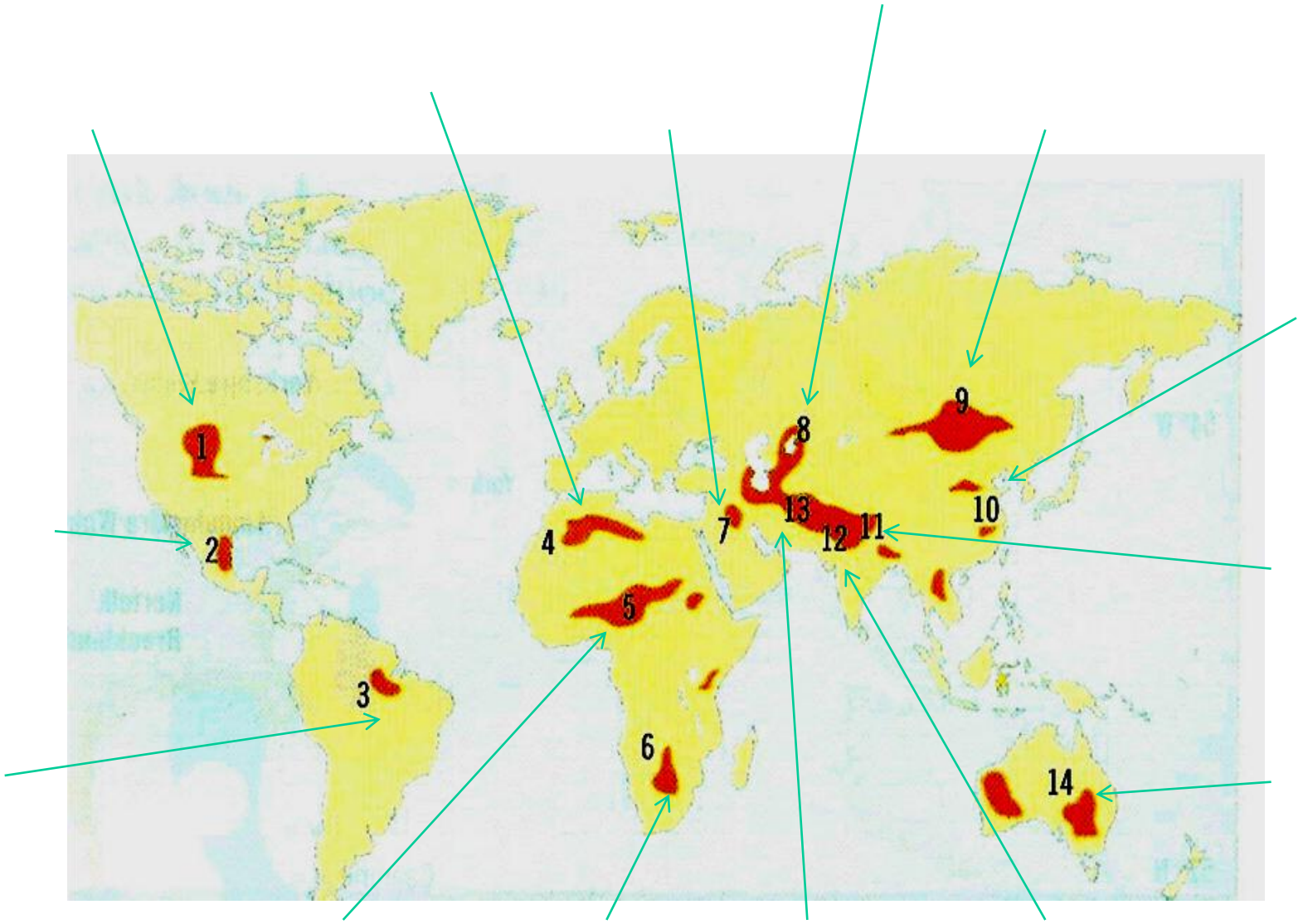
What is soil erosion?
What is soil salinization?
What is soil exhaustion?

- **Soil erosion**: wearing away and loss of soil nutrients due to action of running water and winds – often accelerated by human activity such as farming

Soil degradation



Title: major global regions with highly degraded soils



Middle East:

Yangtze:

Mongolia:

USA:

North-east Brazil:

North Africa:

Baluchistan:

Central Asia:

Botswana–Namibia:

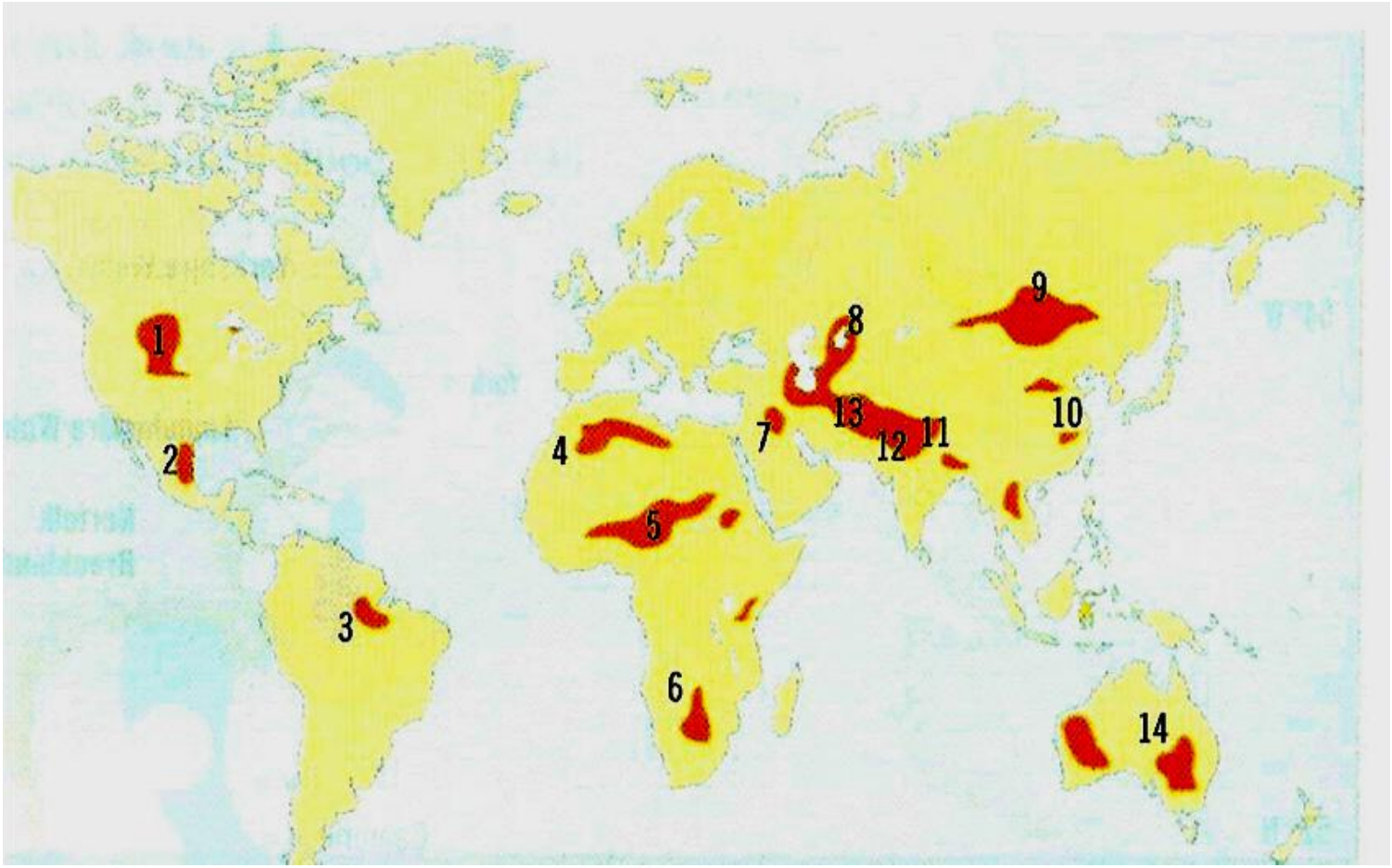
Rajasthan:

Sahel:

Mexico:

Himalayan foothills:

Australia:



Key

1 **USA**: pressure on soils in the grain areas
2 **Mexico**: erosion and droughts
3 **North-east Brazil**: over 40 million population demanding food
4 **North Africa**: tree belts not very successful
5 **Sahel**: probably worst wind erosion area in the world
6 **Botswana–Namibia**: livestock accelerate erosion
7 **Middle East**: erosion spreading at an increasing rate
8 **Central Asia**: too many livestock, too little careful management
9 **Mongolia**: increasing numbers of herds and people
10 **Yangtze**: China loses over 5 billion tonnes of 'loess' annually
11 **Himalayan foothills**: more than quarter of a million tonnes of topsoil are lost from deforested slopes in Nepal
12 **Baluchistan**: traditional stock-raising and large herds do the damage
13 **Rajasthan**: droughts are becoming a permanent phenomenon
14 **Australia**: long droughts are aggravated by excessive stock

Key

1 **USA**: pressure on soils in the grain areas
2 **Mexico**: erosion and droughts
3 **North-east Brazil**: over 40 million population demanding food
4 **North Africa**: tree belts not very successful
5 **Sahel**: probably worst wind erosion area in the world
6 **Botswana–Namibia**: livestock accelerate erosion
7 **Middle East**: erosion spreading at an increasing rate

8 **Central Asia**: too many livestock, too little careful management

9 **Mongolia**: increasing numbers of herds and people

10 **Yangtze**: China loses over 5 billion tonnes of 'loess' annually

11 **Himalayan foothills**: more than quarter of a million tonnes of topsoil are lost from deforested slopes in Nepal

12 **Baluchistan**: traditional stock-raising and large herds do the damage

13 **Rajasthan**: droughts are becoming a permanent phenomenon

14 **Australia**: long droughts are aggravated by excessive stock

Why is soil important?

- Soil is an important resource because we depend on it to feed a growing population
- The soil's capacity to produce enough food is being stretched.

Task: Loess Plateau Case Study

- Explain:
  - the causes of soil degradation in the Loess region
  - the environmental consequences of soil degradation in the Loess region
  - the socio-economic consequences of soil degradation in the Loess region
- Explain + Evaluate the management strategies that have been used to control the soil degradation.

CHINA - Loess Plateau

CHINA - Loess Plateau Rehabilitation Project

- http://www.youtube.com/watch?feature=player_embedded&v=QX1ex9PeFpY
- The development objective of the Project is to contribute to a sustainable development in the Loess Plateau, increasing agricultural production and incomes, as well as improving the ecological conditions in tributary watersheds of the Yellow River.

Some sources to get you *started*…

- http://sites.asiasociety.org/chinagreen/lessons-of-loess-plateau/

中国绿坛 CHINA GREEN

- http://www.new-ag.info/en/focus/focusItem.php?a=388

New Agriculturist

The Loess Plateau: from China's sorrow to Earth's hope

- http://www.un.org/esa/dsd/dsd_aofw_mg/mg_success_stories/csd8/SARD-15.htm

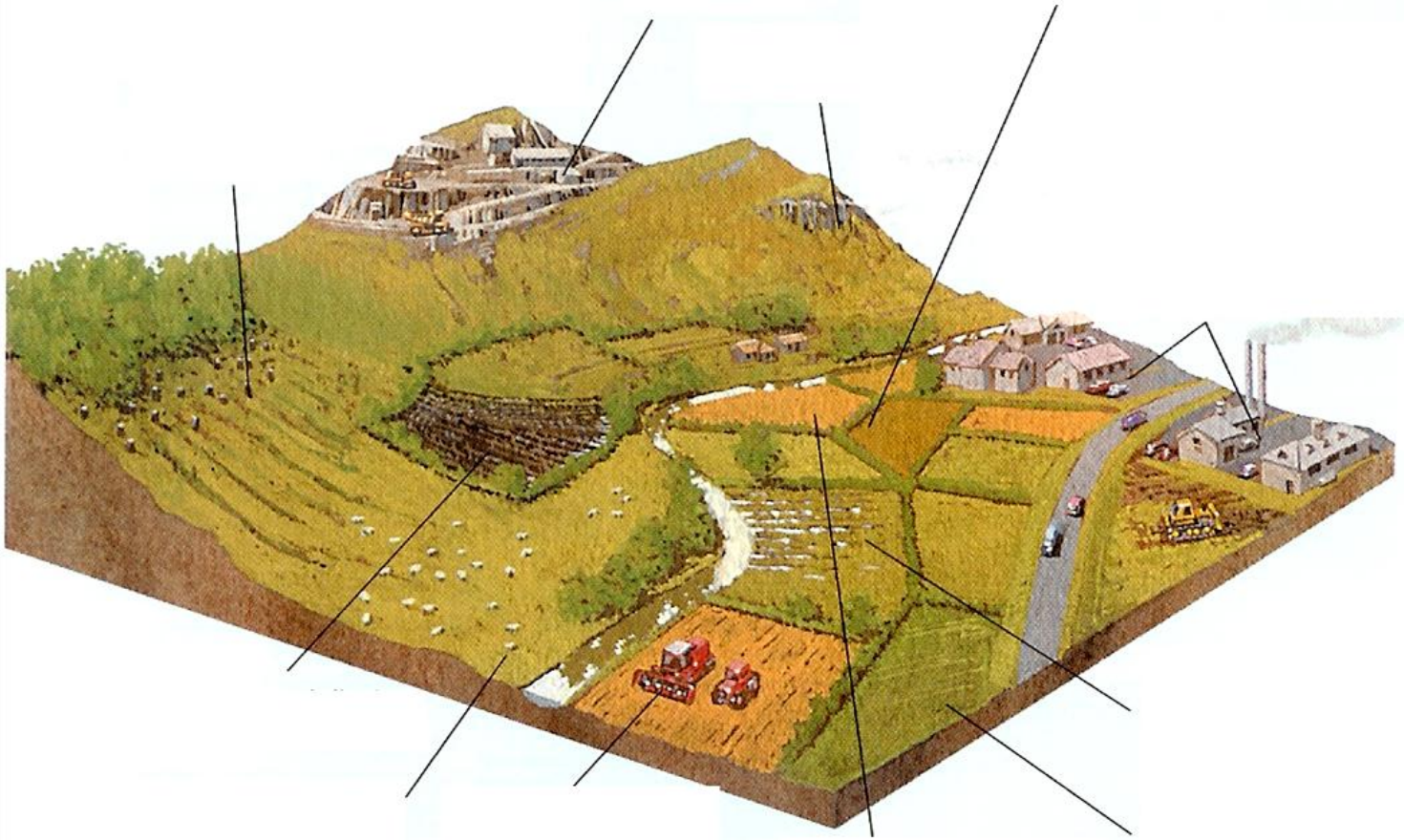
CSD Major Groups

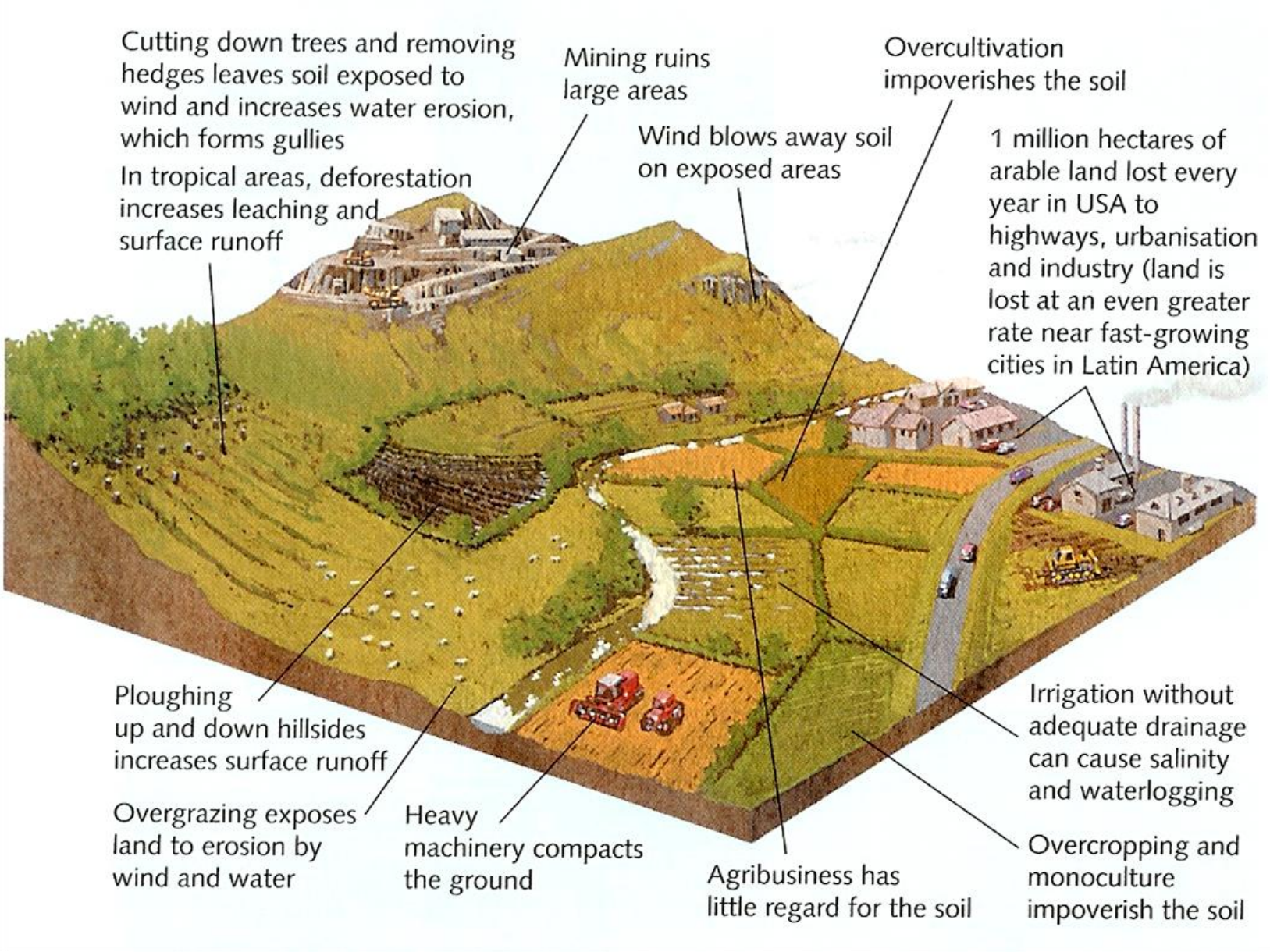
"One of the fundamental prerequisites for the achievement of sustainable development is broad public participation in decision-making."
Agenda 21, Chapter 23

Core: Patterns & Change	3. Environmental Quality and Sustainability	3.2 Soil and change

By the end of this task, students will be able to…

- Explain the causes of soil degradation.





Soil erosion/degradation: Causes & Effects

3.4.4 Outline Soil Conservation Measures

Figure 2 **Contour ploughing, where the farmer ploughs across slopes rather than along them**

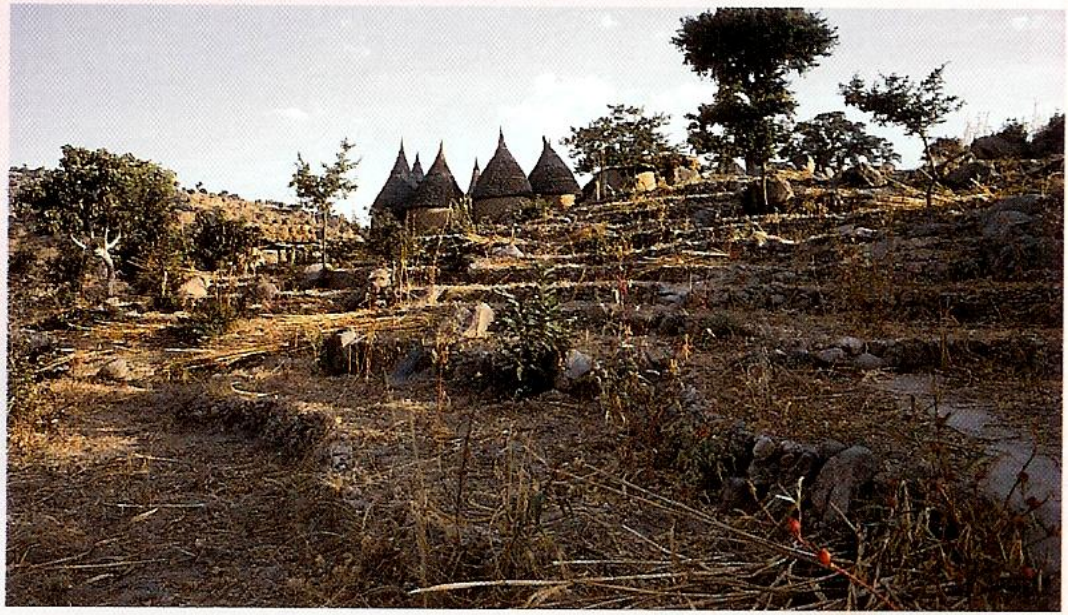
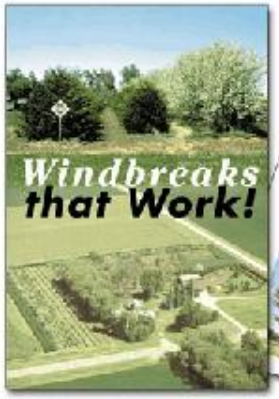


Figure 3 **Bund-like embankments help retain soil wash**

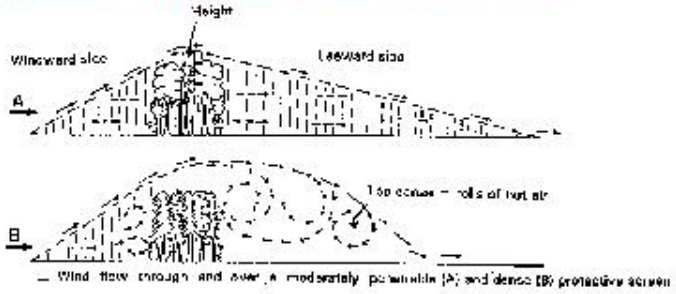
Figure 4 **A shelter belt, such as a line of trees, slows down wind speed and helps protect the land from wind erosion**

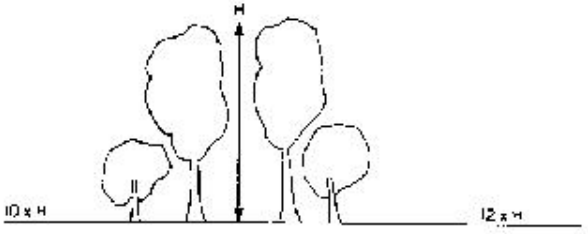
Figure 5 **The building of terraces across slopes help to hold the soil on the land** Eventually the terrace becomes level as the soil is caught when it washes down. The major disadvantage of this solution is that it can take up to 10% of the farmland out of production.



wind reduction techniques
(wind breaks, shelter belts, strip cultivation)

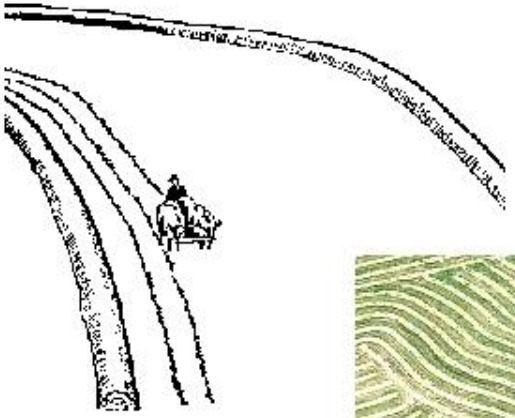
Influence of a wind-break on the wind:





Strip Cultivation

- **Cultivation techniques**
  (terracing, contour plowing)



Use of more sustainable farming techniques:

No-tillage (Conservation) techniques: methods which focus on keeping the soil undisturbed and the practice of high residue farming
- often rely on pesticides to control weeds and insects during the 4 or 5 years that it may take for the residue or mulch to decompose
- need for specialized equipment for seeding as to not disturb soil

crop residue: materials left in the field after crops have been harvested such as stalks, stubble (stems) and leaves.

mulch: general term for organic materials that could provide protective ground cover such as manure, wood chips, straw... (is an example of no-tillage technique)

Soil Conservation:
Soil Conditioners Technique