

# THE EARTH AROUND US

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## 1. LANDFORMS

1.1. All of you come from different parts of the island, such as the lowlands, the hill country, the coastal regions the Dry Zone, the Wet Zone (Fig.1.1). Each of these areas is characterised by different landforms, or physical features. We look at some of these now.

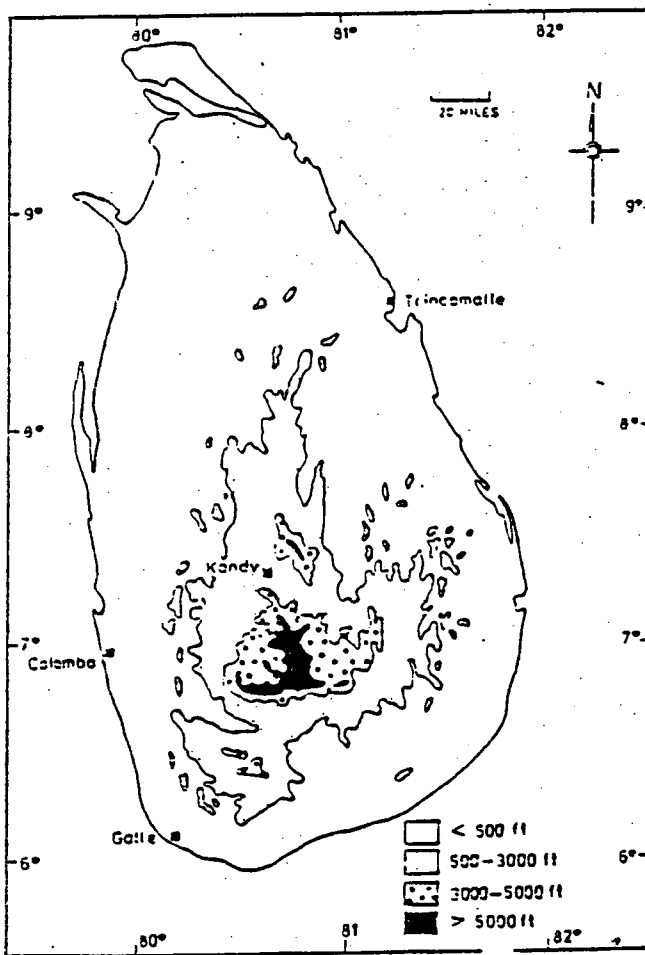


Fig. 1.1. Sketch map of relief of Sri Lanka

### 1.2. Lowlands

- wide, alluvial flood plains, e.g. Bentota Ganga.
- erosional, undulating plains of north and east.
- flat country of Jaffna region.
- inselbergs or erosion remnants, e.g. Sigiriya.

1.3. Hill Country- strike ridges and valleys.

- plateaus, e.g. Horton Plains, Hatton Plateau (Fig. 1.2).
- escarpments e.g. Southern Wall of Hill Country (Fig.1.2).
- waterfalls, e.g. Devon, St. Clair, Ramboda
- mountains and scree slopes - Mt. Peacock

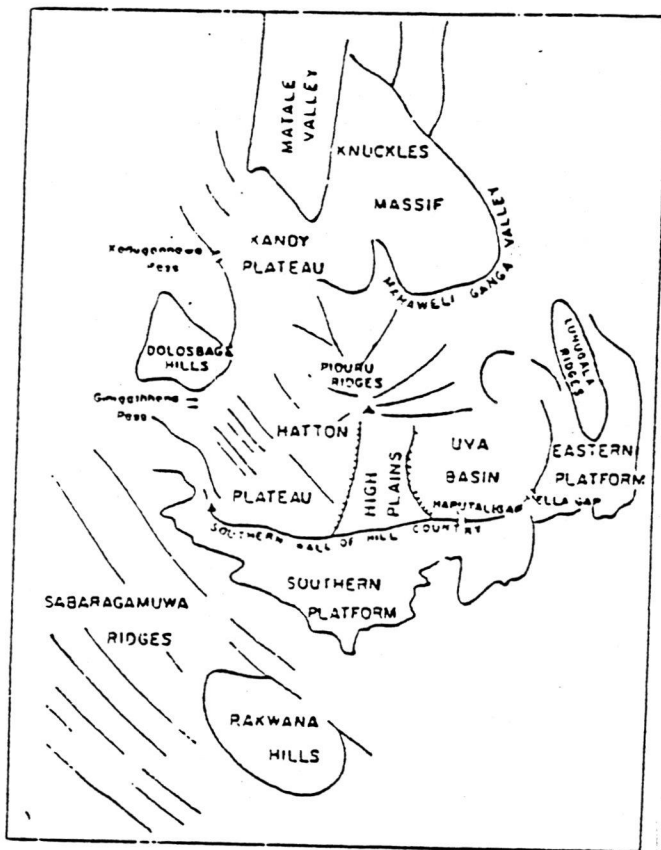


Fig.1.2 Physiographic regions of the Hill Country

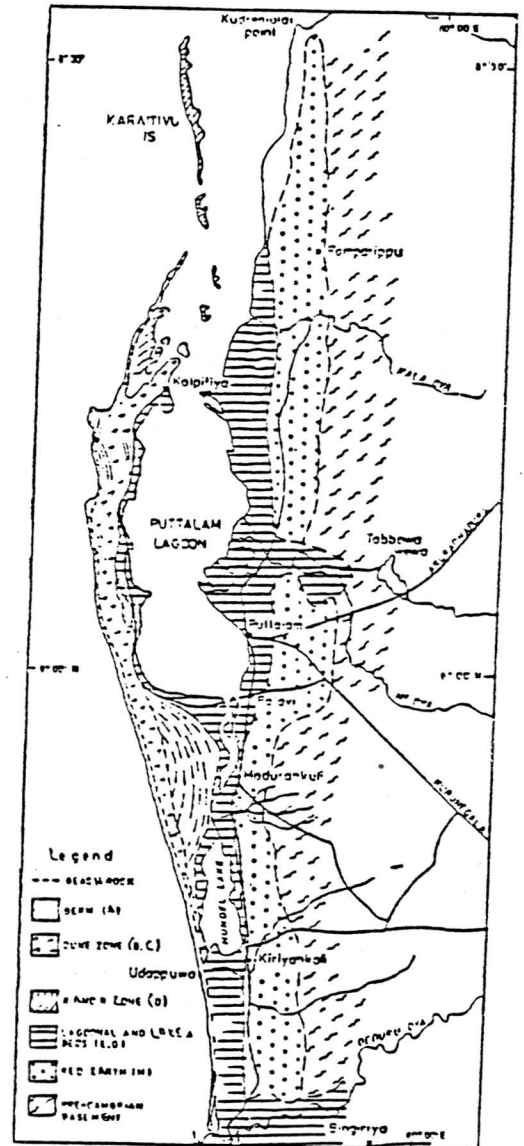


Fig.1.3 Geomorphic zones, north-west coastal region of Sri Lanka.

1.4. Coastal regions

- rocky headlands and intervening bays.
- cliffs
- sand bars, sand spits and sand dunes
- lagoons and lagoonal flats (Fig.1-3)

1.5. All these different landforms are the result of many factors, such as situation, rock formations, climate and weathering, winds, waves, currents. The evolution of landforms is an important branch of geoscience. If you understand why these landforms are found where they are, and how they came to be there, then you will appreciate better the beautiful scenery of this island of ours.

## 2. ROCKS

2.1 As you travelled to Kandy from your different homes, you would have come past many road and railway cuttings through solid rock or weathered rock ("kabook") or combinations of both. The lithosphere is made up of many different kinds of solid rocks which are classified into three groups, depending on their origin and composition. These classes are Igneous, Sedimentary and Metamorphic. All rocks are made up of minerals known as the rock-forming minerals, the main ones being quartz, feldspars, micas, amphiboles, pyroxenes and carbonates, and minor amounts of minerals like garnet and iron ores.

2.2.I GNEOUS ROCKS- crystalline rocks with interlocking minerals formed from magmas, which originate in the mantle. They are fine-grained to coarse-grained in texture and acid (70% SiO<sub>2</sub>) to basic (7% SiO<sub>2</sub>) in chemical composition.

- Eruptive - those poured on earth's surface - volcanic lavas, basalt floods (Fig.2.1).  
Intrusive - those that form sheets and large bodies within the earth's crust.  
SRI LANKA - a few granites (Tonigala, Ambagaspitiya, Arangala)  
- small bodies of serpentinite  
- dolerite dykes ("Kalubamma" at Gallodai)  
- pegmatites, large and small)

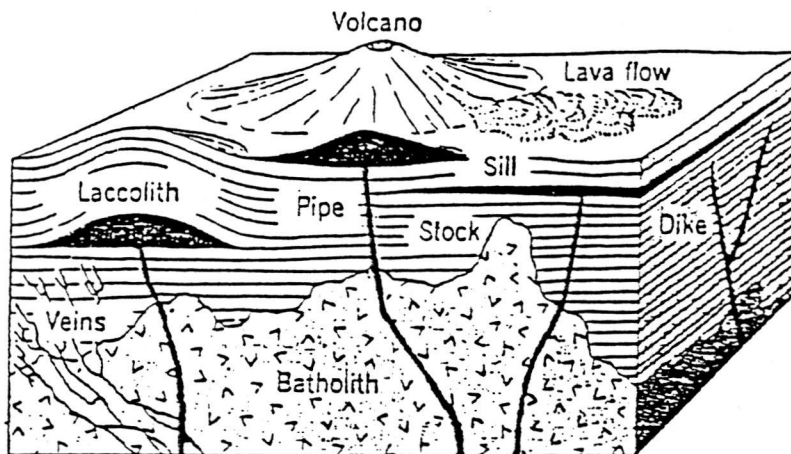


Fig. 2.1 Igneous rock bodies.

2.3 SEDIMENTARY ROCKS- both crystalline and non-crystalline. when rocks are exposed at the surface, they are acted on by heat and cold, wind and rain, snow and ice, and are subjected to weathering (Fig. 2. 2). This means they are broken down into fragments and finally into the minerals of which they are formed or they are altered chemically.

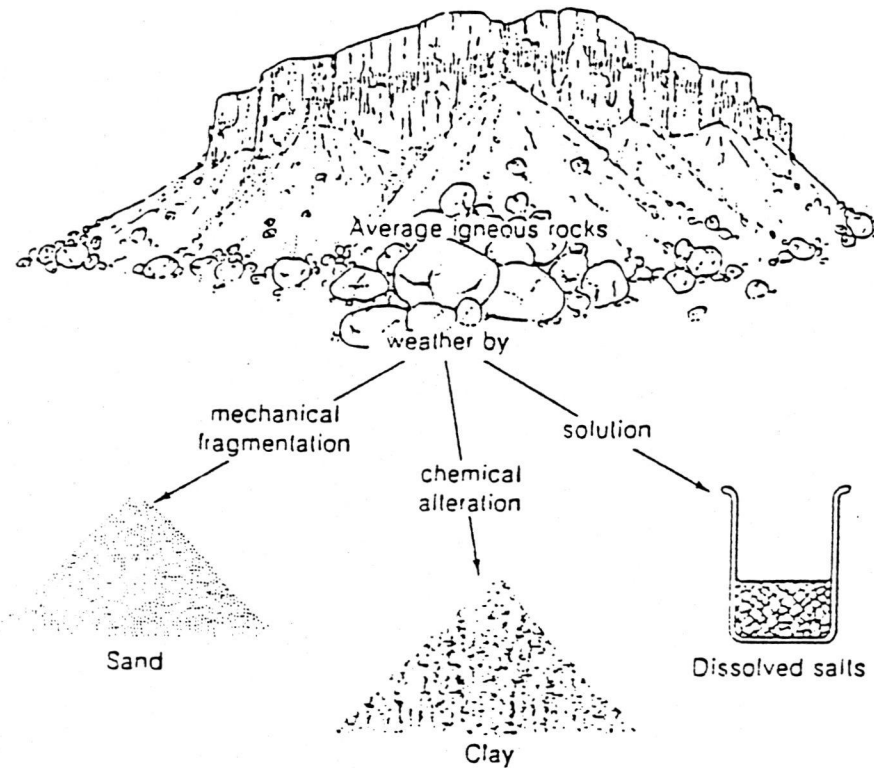


Fig. 2.2 Processes of weathering.

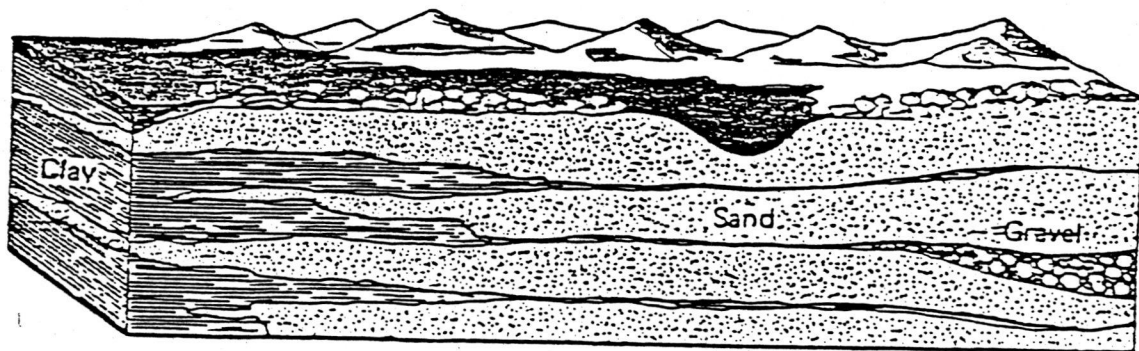


Fig. 2.3 Horizontal layers of sediments laid down on the sea floor.

The weathered materials -- mostly sand and clay, are carried down by gravity, running water and wind and deposited in lakes, lagoons, deltas, and flood plains on land and on the ocean floors as horizontal layers (Fig. 2.3). Here they are buried under later sediments or carried down to depths where they are compacted into solid rocks such as sandstones, mudstones, shales. Limestones are a special class - made up of shell fragments or chemically precipitated.

Nearly all sedimentary rocks have parallel planes (called bedding) which separate layers (called bed s) of clay and sand and mixtures of the two.

- SRI LANKA
- Jaffna Limestone in the north and north-west
  - Tabbowa Beds (150 m.y)
  - Red Beds, gravels, sands and clays of the coastal areas (2-3 m.y.)

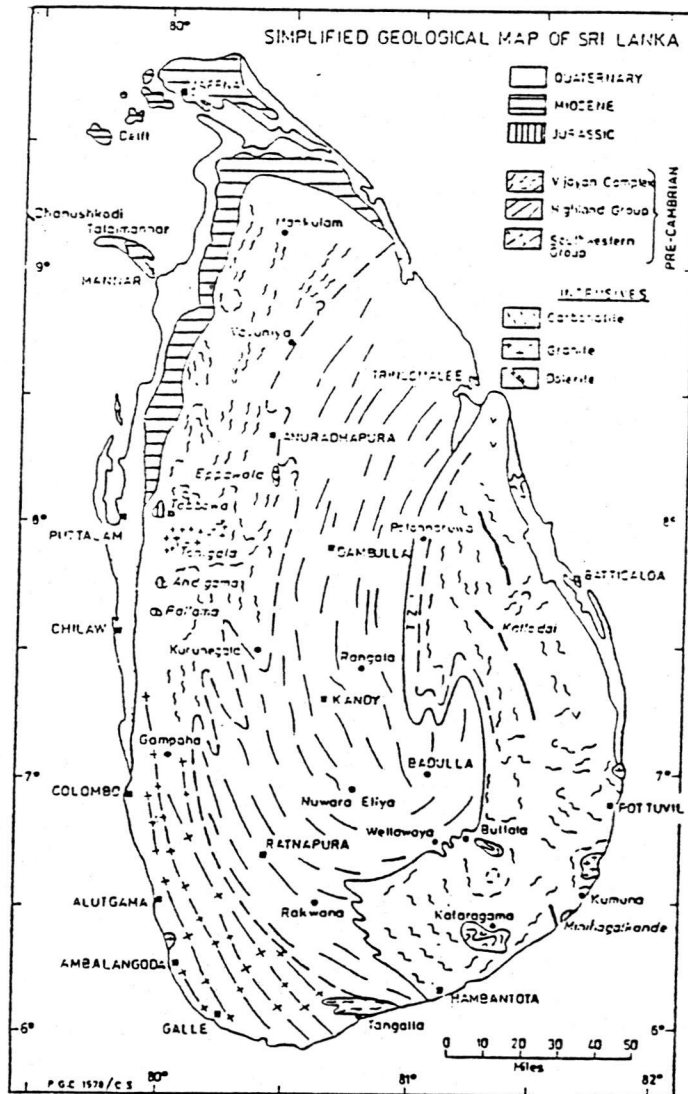


Fig. 2.4 Simplified geological map of Sri Lanka.

2.4 METAMORPHIC ROCKS- crystalline rocks with interlocking minerals. Sedimentary and igneous rocks, when they become buried under hundreds and thousands of overlying rocks, are subject to great heat and pressures. This causes changes in the mineral composition and arrangement of minerals - called recrystallisation -- giving rise to metamorphic rocks. The commonest metamorphic rocks are slates, schists, gneisses and granulites. All these, except the last group, have the common property of their minerals being arranged in parallel fashion - gives rise to textures called schistosity or gneissosity.

2.5 SRI LANKA- about four-fifths of the island is made up of metamorphic rocks which have been formed at high temperatures (600°-800°C) and high pressures (6-7 atmospheres) (Fig.2.4). They are also very old, most being more than 1000 million years old.

The commonest types are:

Quartzite and quartz schist - Trinco, Polonnaruwa

Marble - Talatu Oya, Digana, Matale

Garnetiferous quartz-feldspar gneisses - very common

Charnockitic gneisses - dark greyish rocks ("kalu gal"), also very common

Basic granulites and amphibolites - scattered, Kadugannawa

Granitic and migmatic gneisses - in most of the Dry Zone.

### 3. MINERAL RESOURCES

3.1 Sri Lanka is rich in industrial rocks and minerals, and we are making good use of many of them. Clays - bricks, tiles, crockery, porcelainware

Sands - glassware building

Limestone - cement, building lime

Beach sands - ilmenite, monazite, zircon, rutile

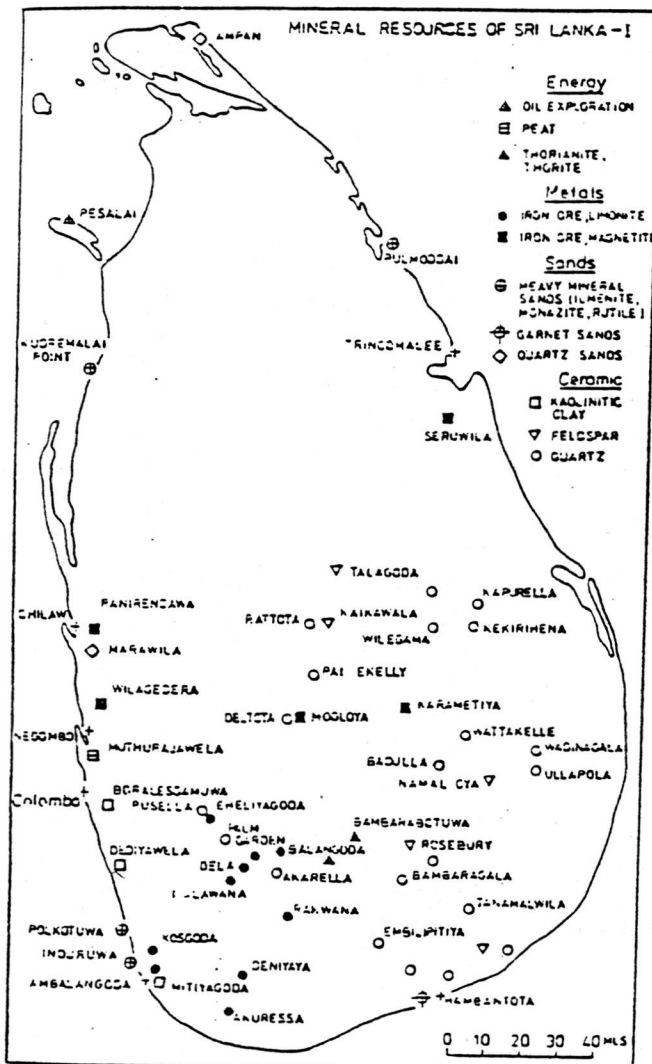
Marbles - building lime, ornamental, fertilizer

Apatite - fertilizer

Graphite, Mica, Gemstones

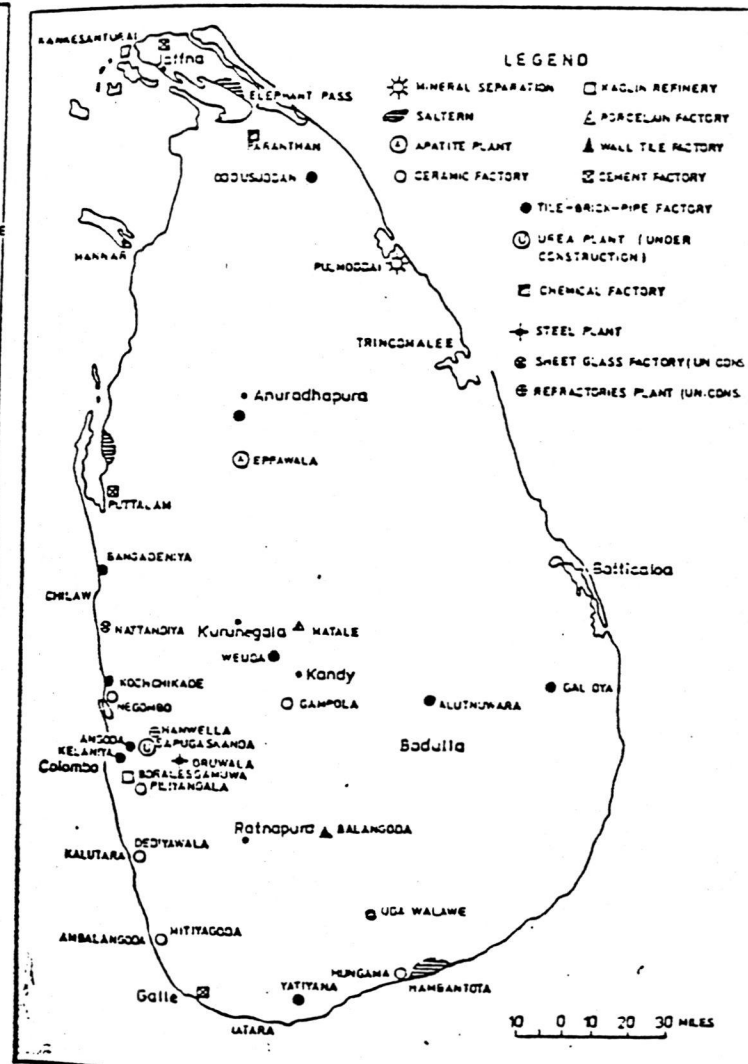
Crystalline rock - building and ornamental stone, road metal

Jaffna Limestone, 'kabook' - building stone



Map of Mineral Resources of Sri Lanka: I—Energy Minerals, Metals, Mineral Sands, Ceramic Materials.

Fig. 3.1



Locations of factories using local mineral raw materials. (After Herath, 1977)

Fig. 3.2

## 4. GROUNDWATER

4.1 Groundwater is also a mineral but of a special kind. It is essential for life, and the search for water, especially groundwater, and its exploitation, are a major human activity.

Wet Zone -- groundwater appears in the form of springs.

Dry Zone -- springs in some places, but mostly it has to be

located below the surface. In recent years, the location of groundwater resources using different tools has led to an extensive tube-well drilling programme which has been of great benefit to people living in the Dry Zone of Sri Lanka.

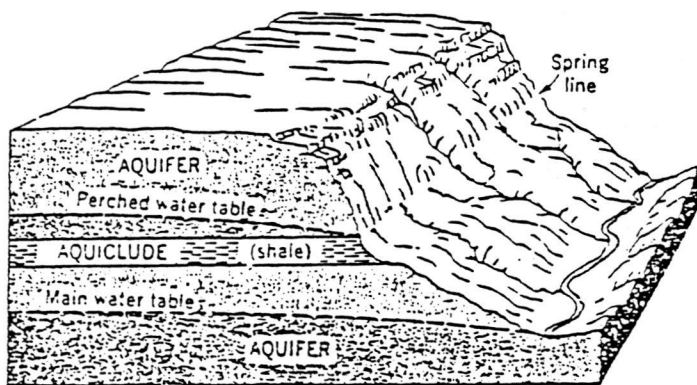


Fig. 4.1 A perched water table.

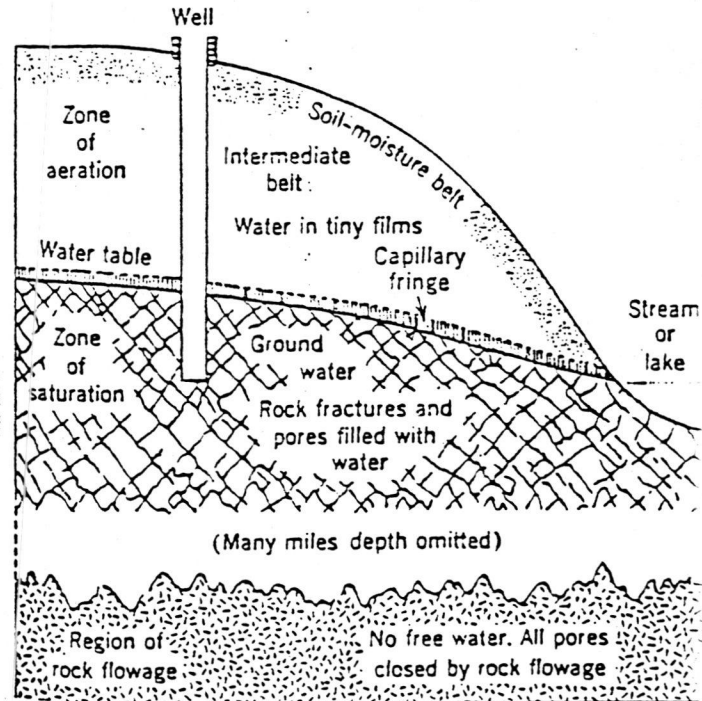


Fig. 4.2 Schematic diagram of zones of subsurface water. (After Ackerman, Colman, and Ogrosky.)

4.2 However, groundwater is easily polluted by the infiltration of human, animal and industrial waste; that is why about 65% of the rural population of the island suffers from bowel diseases -- by drinking contaminated water from wells.

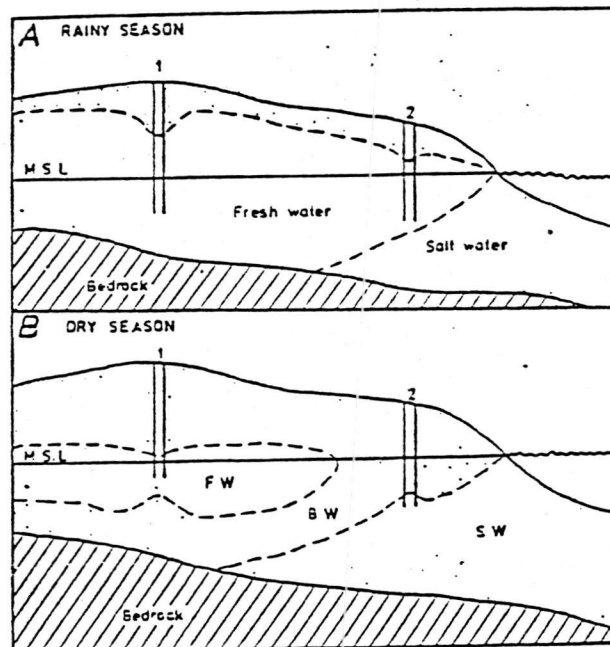


Fig. 4.3 Groundwater conditions in coastal sands.  
1, fresh water well; 2, brackish water well; BW, brackish water zone.

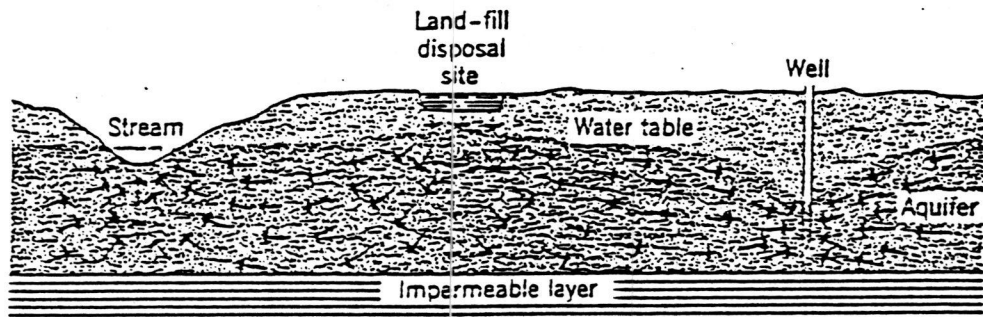


Fig.4.4 Contamination of stream and well from waste disposal site

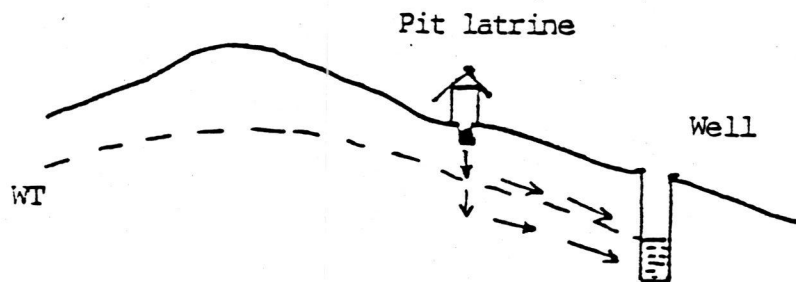
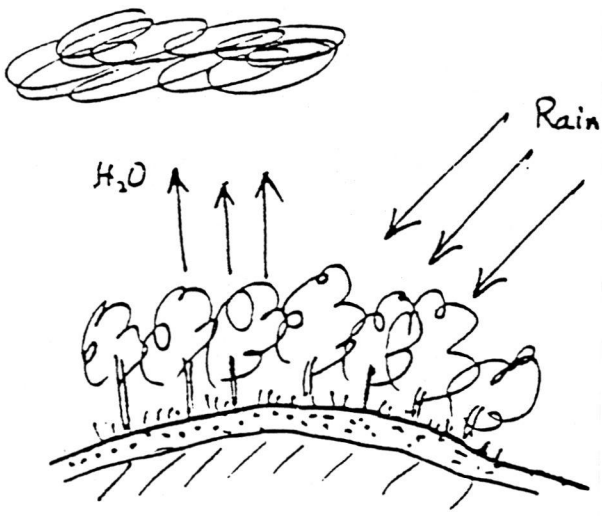


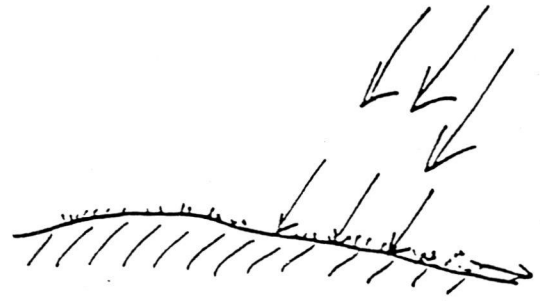
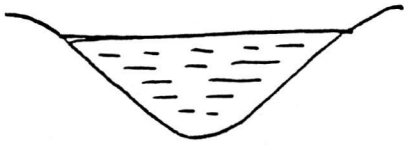
Fig.4.5 Contamination of well water from an up-slope pit latrine.

## 5. ENVIRONMENTAL CARE AND PROTECTION

- 5.1 We have seen that geoscience teaches us about the earth around us -- of the environment in which we live. it is up to us to see that this environment is protected and well looked after, because it provides us with our living conditions and our livelihood. if we use our environment badly, then we can destroy it, and ultimately we will be the losers. But if we look after it, protect it from misuse and destruction by others, and use it sensibly and carefully, then it will continue to provide us and those who come after us with the necessities for living.
- 5.2 Misuse of the environment
- cutting down of the forests - reduction of rainfall - drying up of springs, rivers, streams - lowering of water levels in reservoirs and loss of electric power (Fig. 5.1).
  - overcultivation and destruction of vegetation cover e.g. Nuwara Eliya area - soil erosion and loss of fertile top soil. Silting up of lakes and reservoirs (Fig.5.2)
  - cultivation of steep slopes, inadequate drainage, absence of terracing of slopes -- landslides (Fig. 5.3).
  - Excessive use of chemical fertilisers, insecticides, pesticides -- increase of nitrate in the soil, damage to health.



Reservoir Full



Reservoir Empty



Fig. 5.1 Results of deforestation



Fig. 5.2 Results of overcultivation

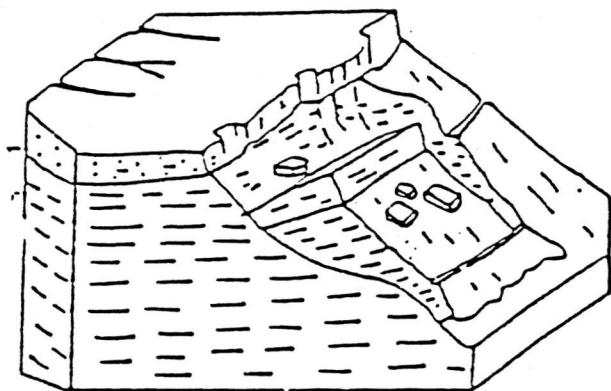
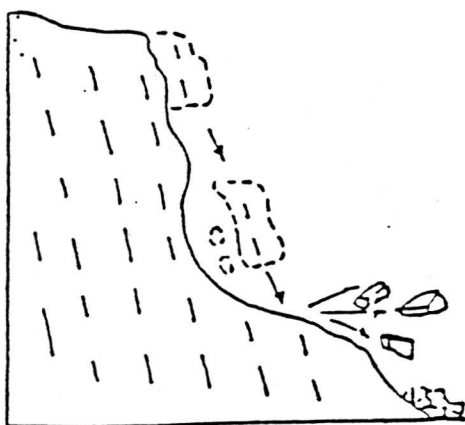


Fig. 5.3 Types of Landslides