

CLIMATE: Major climate zones

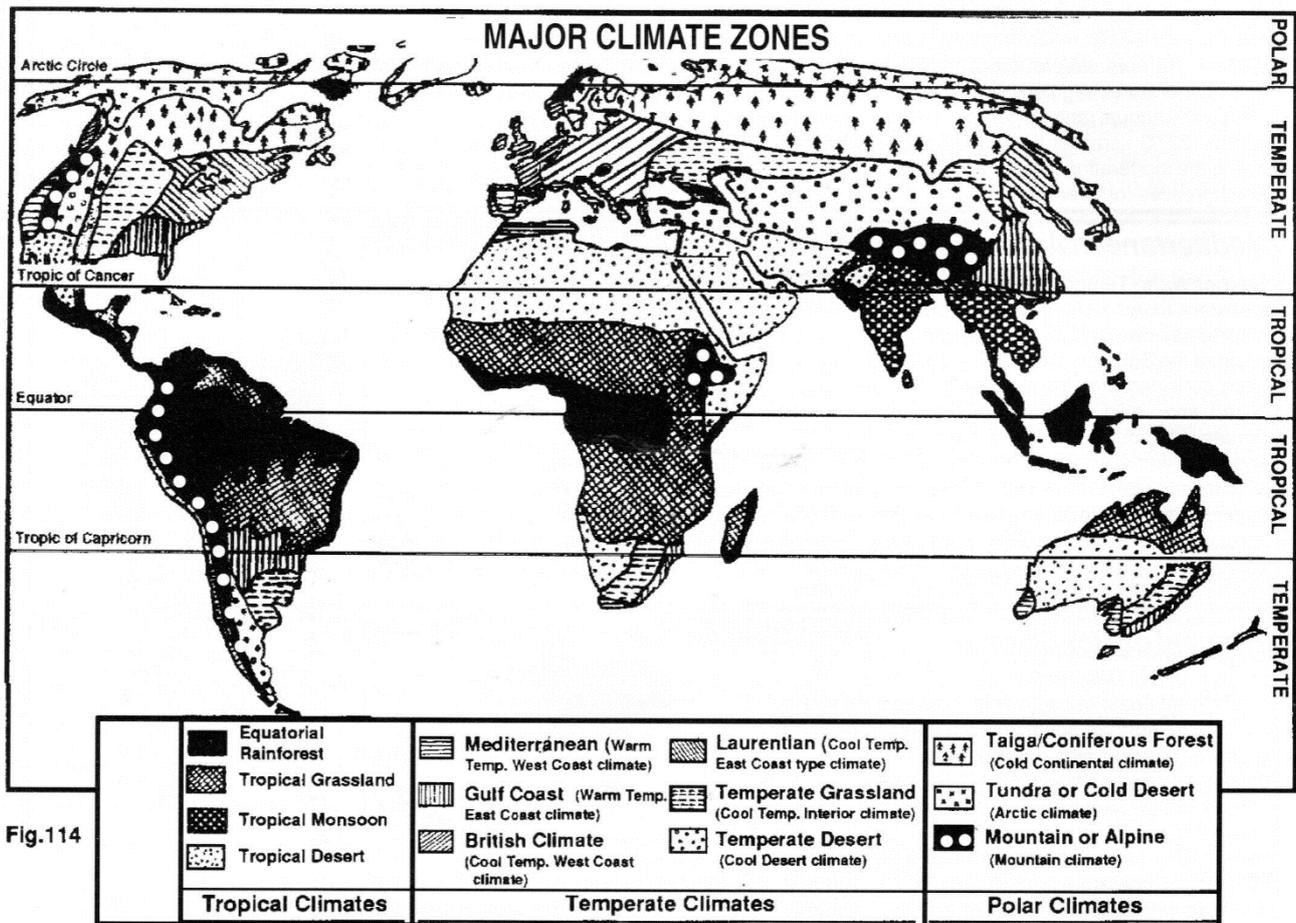


Fig.114

The major climatic zones shown in figure 114 represent large areas of the Earth which have broadly similar climate characteristics. The climate of each area strongly influences the natural vegetation and therefore the formation of soils.

The world's climates may themselves be classified into three main sectors:-

- Polar climates** Climates of areas located roughly above latitude 60 North
- Temperate climates** Climates of areas located roughly between latitude 60 and the Tropics of Cancer and Capricorn
- Tropical climates** Climates of areas located within the Tropics, centred around the Equator.

Each climatic zone, for example, the Tundra area can be referred to by its climatic name, in this case, Arctic, and by its natural vegetation name, Tundra or Cold Desert (sometimes known as the **biome**).

The climate of an area may be influenced by a range of factors which may interlink. The most important of these factors are:

Latitude - increasing distance from the Equator and therefore from the most direct rays of the sun affect the

average annual temperatures of an area. In general the further from the Equator, the colder the area. The growing season decreases with latitude.

Altitude - increasing height above sea-level has the same general effect as increasing latitude.

Marine influence - because the sea cools the land adjoining it in the hot season and warms it slightly during the cool/cold season, the overall effect is to reduce the annual range of temperature and increase annual precipitation. Marine climates are therefore generally wetter and more **equable** (having a small range of temperature).

Continentality - Away from the moderating influence of the sea, the land overheats in the hot season and cools quickly during the cool/cold season. The overall effect is to increase the range of temperature and decrease the annual precipitation. Continental climates are therefore more **extreme** (having larger ranges and low precipitation).

Ocean Currents - warm ocean currents, e.g. the North Atlantic Drift, warm affected coastlines, even in high latitudes such as Norway (ice-free coasts all year). Cold ocean currents cool affected coastlines and can make them drier, e.g. the Canaries current off the Saharan coast in Africa.

The areas examined in figure 115 illustrate a variety of influences on their climate and therefore on their natural vegetation and human use.

Tundra or Cold Deserts

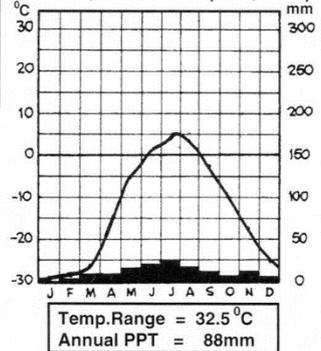
Tundra areas are located in the extreme north of Alaska, Canada and Siberia as well as coastal Greenland and Iceland. These areas experience an Arctic climate. The short, summers may have continuous periods of sunlight but monthly temperatures do not easily reach freezing point. Winters are very severe, long and dark with temperatures regularly falling below -35°C . The annual range of temperature is approx. 32°C - smaller than areas inland due to the moderating influence of the sea which freezes for over 8 months.

DISTRIBUTION OF TUNDRA AREAS



Precipitation is very low and well under the desert limit. Most precipitation falls as winter snow with rain during the brief summer. Tundra areas are cold, almost barren treeless plains with continuous permafrost. White-out conditions are common during severe winters. Summer temperatures are only high enough to thaw a thin top layer of soil which is known as 'muskeg' - a marshy plain or swamp.

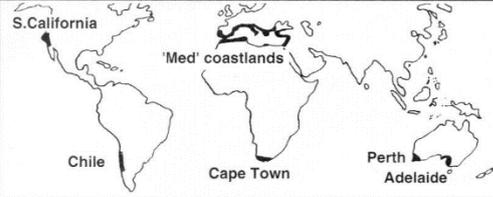
THULE, Greenland (77N, 69W)



Mediterranean Areas

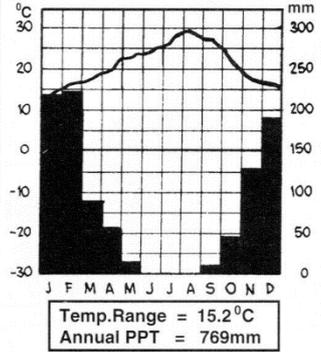
'Med' or Warm Temperate Western Coast areas are found along the west coasts of continents between 30° and 40° north and south of the Equator. The 'Med' climate is often considered to be a mixture of hot desert and mild, marine climates. The climate is famous for its hot, dry summers and mild, wet winters. Summers are hot with the sun high in the sky and little cloud cover. Winters are mild due to the moderating influence of the sea. 'Med' areas with cold offshore ocean currents often have coastal fogs, for example in California.

DISTRIBUTION OF MEDITERRANEAN AREAS



Precipitation is unevenly distributed with a summer drought and winter maximum. The annual precipitation often exceeds 750mm and is mainly rainfall. The highest temperatures, and evaporation rates occur during the time of minimum ppt and can cause problems for plant survival & agriculture.

ATHENS, Greece (38N, 23E)

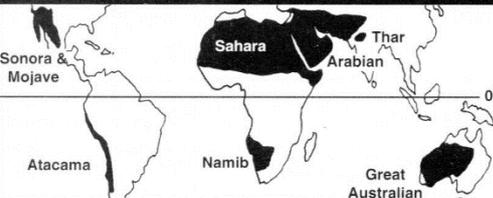


Tropical or Hot Deserts

Tropical or Hot Deserts are usually found on the west coast of continents, between 15° and 30° north or south of the Equator, in the trade wind belt. Hot deserts are defined as areas with less than 250mm of annual precipitation which have no month below 6°C .

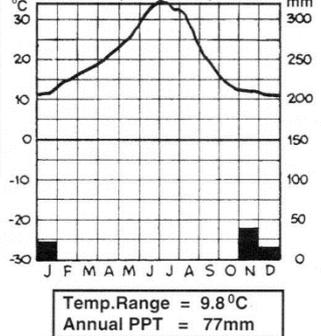
Hot Deserts have extreme climates with very high temperatures (often over 35°C) and a temperature range of over 25°C . Daytime temperatures are high due to overhead sun, lack of cloud cover and high insolation from bare ground, rock or sand.

DISTRIBUTION OF HOT DESERT AREAS



Nights can be cold with temperatures often below freezing. Precipitation is both extremely low (often less than 90mm) and unpredictable. Many hot deserts receive rainfall in one major downpour but rapid surface run-off, low infiltration rates and high evaporation minimise the effectiveness of the rain for plants.

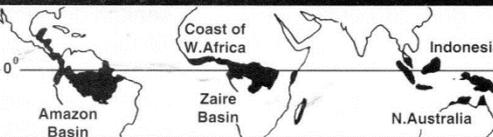
JAZA IR FARAZAN, Saudi Arabia (45N, 10E)



Equatorial Rainforest

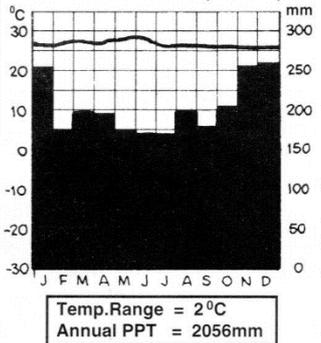
Equatorial Rainforests are located in low-land areas along the Equator. They are found in humid areas, extending roughly 6 degrees north and south of the Equator. Although rainforests account for only 8% of the land area of the Earth, they host 50% of all the growing wood and at least two-fifths of the flora and fauna of the planet. The climate of the Equatorial Rainforest is uniform. Temperatures remain high and constant all year round because the sun is always high in the sky. The temperature range is very low ($2-3^{\circ}\text{C}$) and there is often

DISTRIBUTION OF EQUATORIAL RAINFOREST AREAS



a slight increase in temperature during 'drier' spells. Annual precipitation falls as convectional rain and is both high and evenly distributed throughout the year. The high temperatures in combination with heavy precipitation give the rainforests a very humid climate where evapotranspiration is rapid. Daily, there are about 12 hours of daylight and 12 hours of darkness, a minimum temp of 22°C and a maximum of 32°C .

MANAUS, Brazil (3S, 0W)



Assignment

- 1 Make brief notes on each of the following influences on climatic zones:-
latitude, altitude, continentality, the seas and oceans.
- 2 Using fig. 114, copy and then complete a larger version of the table below:-

Sector	Continental Climates	Marine Climates
Polar		
Temperate		
Tropical		

- 3 Give the meaning of each of the following terms:-
biome, equable, extreme, desert, humid, tundra.
- 4 Using fig. 115, explain
 - i. the distribution of Rainforests and Hot Deserts
 - ii. the large range of temperature in Thule
 - iii. the low precipitation experienced in Jaza
- 5 Compare the desert climates experienced in Jaza and Thule.
- 6 Which climatic zone (fig. 115) would be easiest to live in? Explain your answer.

CLIMATE: Tundra - cold deserts

The Tundra or Cold Desert landscape is a variety of very cold, high mountains, intensely glaciated areas and low coastal plains (Fig.116). The word 'tundra' means 'barren treeless plain' and is a landscape with a very low rate of plant growth. Tundra areas have long, severe winters, short growing seasons and limited precipitation. The ground lies permanently frozen apart from the top 50-80cm which thaws in summer, forming 'muskeg' or marshy areas (Fig.117).

All tundra vegetation has adapted to the harsh conditions and lack of moisture. The tundra has fewer species of plant than any other climatic area and all are low growing to gain protection from strong wind. The main species include lichen mosses, grasses, some shrubs and flowers such as saxifrage and poppies. Most plants have small leaves to reduce transpiration and short roots to avoid permafrost. Mosses and cotton grasses survive in marshy areas. On south facing slopes and in areas of better drainage, flowers survive. On north facing slopes and in peaty, poorly drained areas, heathers grow.

Adjacent to seasonal rivers, dwarf trees such as stunted birch may grow but only to about 25cm high. In turn the tundra soils suffer from a lack of organic materials and consequently are poor, shallow and lacking in plant nutrients. Plants survive the harsh winter under deep snow but suffer from a lack of photosynthesis due to lack of sunlight.

The fragile tundra vegetation and soil can be disrupted by human activity such as tourism or mineral extraction (Fig. 118). Caterpillar vehicle tracks may scar the tundra surface for over 35 years in some areas. The difficulties of the harsh climate and isolation of tundra areas such as Siberia and Northern Canada have so far limited the extent and amount of major human activity in tundra areas. However many experts believe that the tundra areas still hold untapped, natural resources such as oil, gas and metals and as such, offer major opportunities for their development as the technology to combat the harsh conditions and remoteness is improved. The oilfields of North Slope Alaska offer one such example.

Fig.116

A Tundra landscape

Summer Tundra

Very short, cool summers, sunlight for up to 3 months, landscape thaws, muskeg and marshy hollows.

Winter Tundra

Very long, severe winters, darkness for up to 3 months; landscape completely frozen and snow-covered.

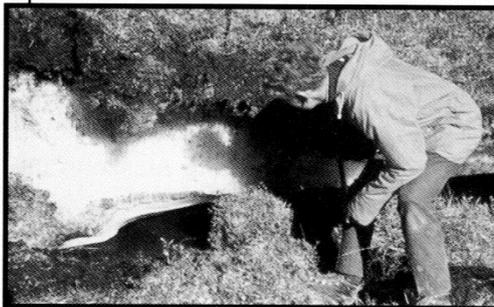
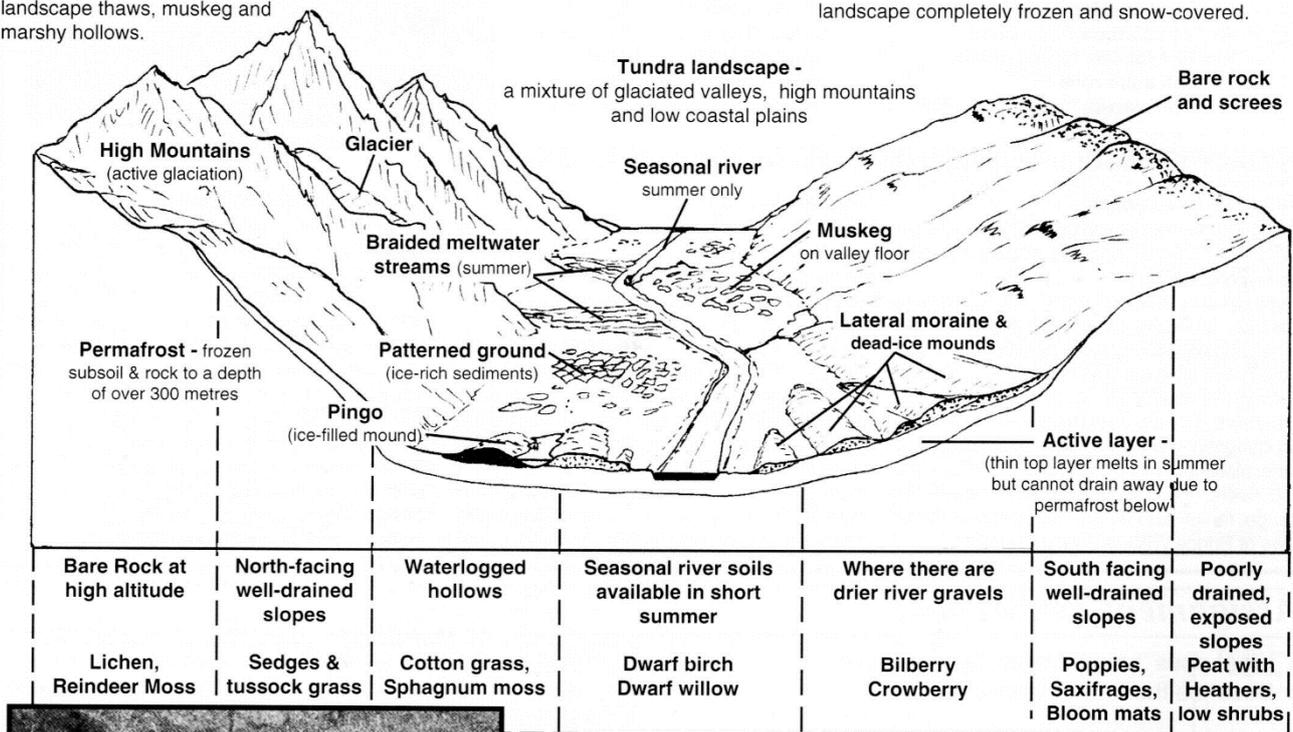
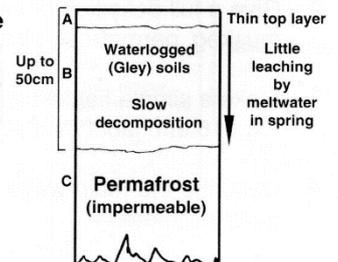


Fig.117 Permafrost in Alaska

Tundra Soil Profile

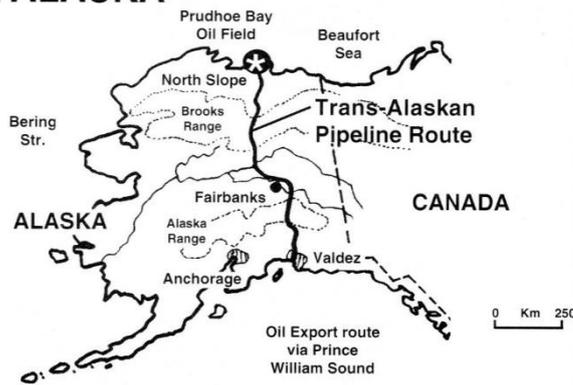
A soil profile is a section down through the topsoil, subsoil and bedrock of the area under study. Each Soil Profile can be divided into 3 main layers or Horizons, e.g. A Horizon - Top soil B Horizon - Subsoil C Horizon - Bedrock (or original material known as Parent Material)



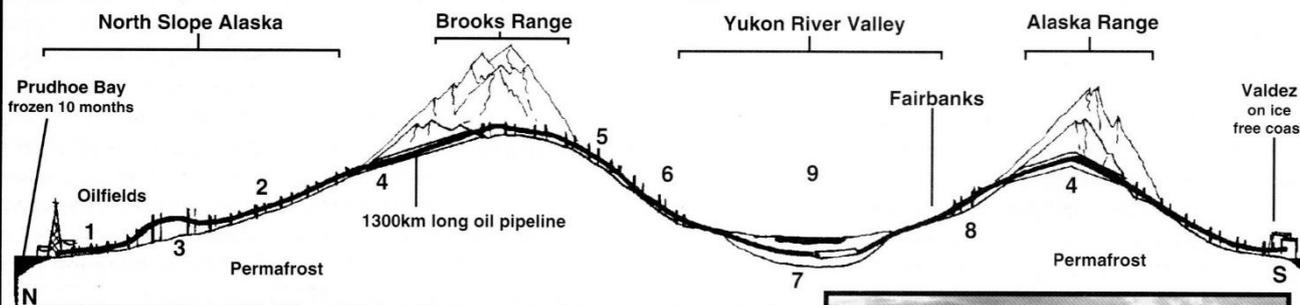
OIL DEVELOPMENTS ON NORTH SLOPE ALASKA

Fig.118

Oil was discovered on Alaska's North Slope in 1968 - a wilderness previously undeveloped due to its remoteness and the severity of its climate and landscape. The rapidly expanding petro-economy (oil dependent) of the USA made the development of Alaska's oilfields an important priority. Oil companies such as Shell, Esso and Texaco in partnership with the US Government invested billions of dollars in overcoming the physical, human and environmental problems in developing the oilfields. A 1300km pipeline was constructed despite great difficulties across Alaska to the ice-free port of Valdez. Oil was, and still is, exported from there to Seattle via supertanker. Over the last 50 years, oil developers have had face many challenges including those posed by the landscape, harsh climate, traditional Inuit peoples and conservationists concerned about the environmental effect of oil development.

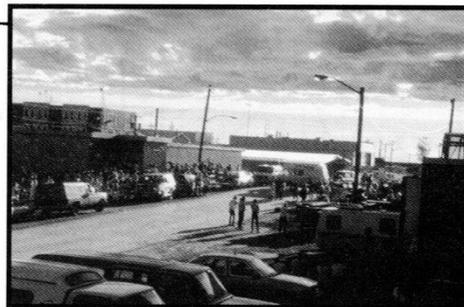


THE ROUTE OF THE TRANS-ALASKAN PIPELINE SYSTEM (TAPS)



KEY TO PIPELINE DIAGRAM

- | | |
|---|---|
| 1 Oil pumped 1300km through pipeline at 80°C. | 6 2 million barrels of oil & natural gas are pumped through the pipe line per day. Oil takes 5 days to travel the length of the pipeline. |
| 2 Pipeline built on stilts to stop the heat of the oil melting the permafrost and causing leakages. | 7 Pipeline laid under the Yukon River in special concrete casing |
| 3 3m high caribou underpass. | 8 Pipeline is flexible in order to counteract earthquakes |
| 4 Pipeline follows tunnel drilled through solid rock | 9 Pipeline crosses 350 rivers. |
| 5 Anti-leak valves fitted every 100m | |



Oilfield settlement in mid-summer near midnight

PROBLEMS ASSOCIATED WITH OIL DEVELOPMENTS IN ALASKA

Physical Problems

The long, severe winter lasts over 8 months and there can be up to 22 hours of total darkness each winter day. Temperatures drop to below -50°C causing frostbite, snapping steel tools like twigs and necessitating the 24 hours per day running of diesel engines in order to stop them seizing up. Permafrost makes all construction difficult & expensive. The top layer melts in summer making quagmires and buildings collapse upon it. Other pipeline difficulties arise from earthquakes, 350 rivers, the 1460m rise over the Brooks Range, tanker accidents in and around the narrows of Prince William Sound (Valdez).

Human Problems

The traditional way of life of the Inuits has been changed. Modern Inuits welcome the modern developments brought by oil to the tundra. Inuits live in centrally heated wooden houses; buy food at local shops, own personal possessions such as TV, vehicles, rifles, CD players, etc; children go to school and adults have the opportunity of oil related work. Other traditionalists are less happy. They say that the community spirit has gone forever; traditional skills (hunting & fishing) are being lost; many young people leave the tundra for Los Angeles & New York; the language is being lost. Alcoholism, AIDS, divorce and violence are more common today.

Environmental Problems

Large vehicles destroy tundra soils & vegetation (which takes up to 35 years to regenerate). The migration routes of caribou are interrupted by pipeline developments. The habitats of various wildlife are disturbed including arctic foxes, wolves, brown bears, moose and dall sheep. Unsightly scars on an area classified as 'wildscape' are common on the North Slope. Oil spillages affect wildlife and vegetation around the oilfields. Major tanker accidents, e.g. the Exxon Valdez accident in Prince William Sound near Valdez, threaten coastlines & wildlife. Land once the domain of traditional Inuit peoples and wildlife is now industrialised.

Assignment

- 1a What does 'tundra' mean ?
- 1b Describe the tundra landscape.
- 2 Give a full definition of each of the following terms:- muskeg, permafrost, pingo, active layer.
- 3 Make a simple fieldsketch of the photograph in Fig.116 and label its main features.
- 4 Describe the main ways in which plants adapt to the tundra climate.
- 5 Describe the relationship between vegetation and tundra landscape.
- 6a Make your own copy of the Route diagram of the Trans Alaskan Pipeline and key (Fig.118)
- 6b Explain why the pipeline is built on stilts.
- 6c Describe the problems the tundra area creates for the export of oil from North Slope Alaska.
- 6d "Oil has brought great benefits to Alaska in the last 50 years". How far would each of the following people agree with this statement ? Fully explain your answers. Oil worker, Old Inuit, Young Inuit, Environmentalist.

CLIMATE: Mediterranean coasts

The landscape of many Mediterranean areas consists of a variety of high mountains, wide river valleys and narrow, sandy coastal plains (Fig.119). These areas have undergone long periods of change, both to their natural landscape and in their traditional land uses.

Mediterranean areas have long, hot, dry summers and short, mild, moist winters. Many areas experience severe summer droughts necessitating large-scale irrigation schemes where agriculture services tourist and urban areas.

The Mediterranean vegetation consists of a mixture of open broad-leaved evergreen forest, evergreen coniferous woodland and scrub. At one time these areas were extensively forested. In some areas these persist and are dominated by evergreen oaks such as Cork Oak, and conifers such as Corsican Pine. Many areas, however, have been deforested and a secondary-scrub (maquis or garigue) has developed. Plants adapt to the Mediterranean climate by growing small, waxy, shiny leaves to reduce transpiration; having long tap roots which reach groundwater; storing water in thick bark (such as the Cork Oak) and through completing their life-cycles before the onset of the summer drought. Lack of vegetation cover, especially on steep slopes, leads to erosion of soil and mudslides in winter.

Brown Mediterranean soils are reasonably fertile when there is sufficient moisture for plant growth. Traditional agricultural crops from Mediterranean areas include olives, citrus fruits (such as oranges, grapefruits & lemons) and vines (grapes). In many tourist areas, farms tend to be small and intensively-cultivated and operated on a market gardening basis, supplying, through summer irrigation, fruit, vegetables and flowers to tourist resorts.

The area presents many problems for human activity. The long summer drought can limit agriculture. There are often water shortages especially in rapidly expanding tourist areas. The summer heat and drought can produce very serious forest and scrubland fires - especially common in the south of France and California. The large areas of mountainous land have thin, unproductive soils. The Mediterranean Sea has little tide or current and as such can suffer from algal raft pollution as well as sewage and oil pollution from tourism and tanker traffic. But the same area also presents the ideal climate for tourism. Europe's most important summer tourist areas are located around the Spanish Costas and Balearic Islands (such as Majorca) - bringing both advantages and disadvantages to these areas (Fig.121-122).

Fig.119

A Mediterranean Landscape

Summer

Long, hot summers with very little precipitation and many daily hours of sunshine. Cloudless summer skies and severe droughts are common.

Winter

Short, mild winters, temperatures average around 8°C in December. A winter maximum of rainfall - over 500mm received from onshore winds from sea areas.

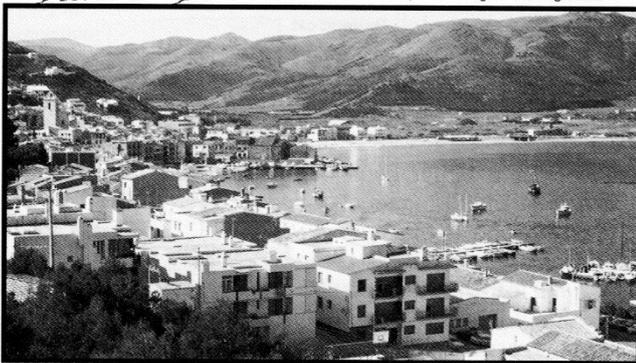
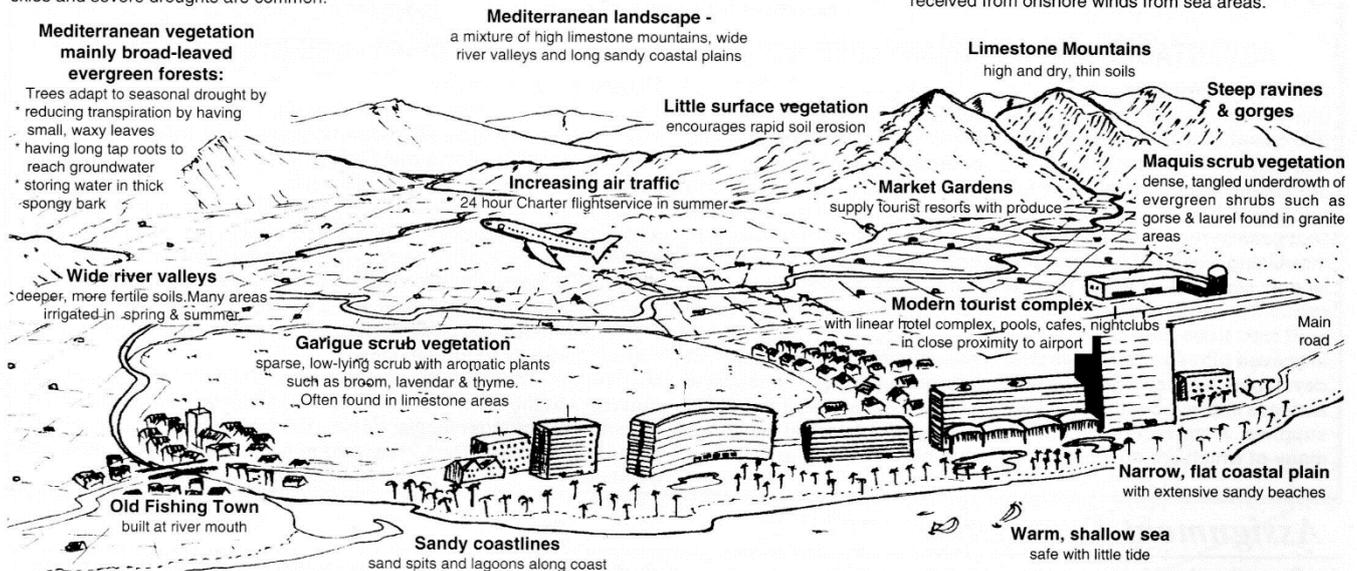
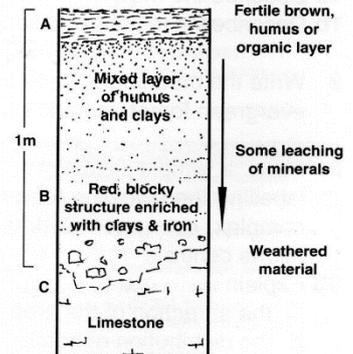


Fig.121 A Tourist Complex in Majorca

A Mediterranean Brown Soil Profile



TOURIST DEVELOPMENT IN MAJORCA

The warm, dry climate of Mediterranean areas, together with major improvements to communication networks across Europe have attracted over 12 million visitors to the island of Majorca.

Indeed, Spain continues to be the most popular tourist destination with an annual 43 million visitors in total. The country, and islands such as Majorca, are economically dependent on tourism for their livelihood.

Tourist developments bring both advantages and disadvantages to any area but the popularity of Majorca (often referred to as a 'tourist-factory') brings its own special problems. The 'Med' in which the island is set is fragile and in many coastal areas there are constant problems of pollution. Many formerly poor rural areas have benefitted from tourism but conservationists remain concerned about the environmental impact of the industry.

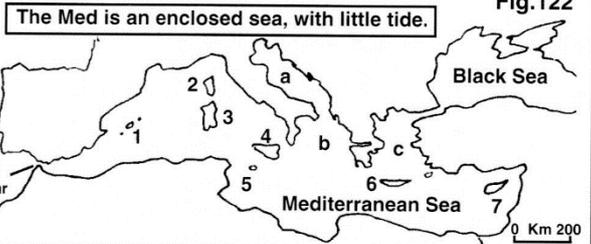
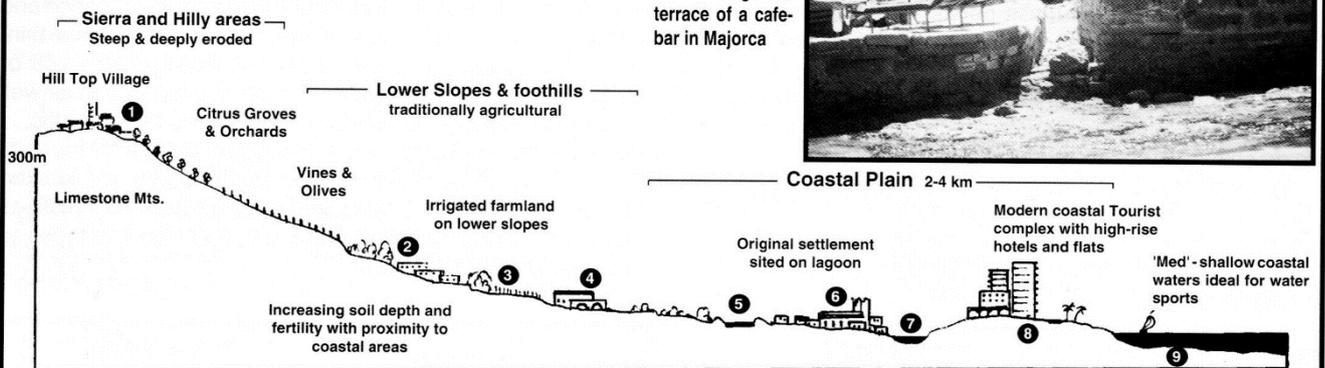
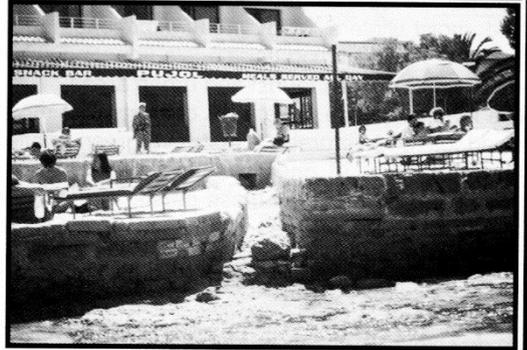


Fig.122
The Med is an enclosed sea, with little tide.
Water entering the sea from the Straits of Gibraltar circulates in an anti-clockwise direction around the Mediterranean. This circulation can take between 30 and 50 years.

TRANSECT OF A MAJORCAN COASTAL AREA



An open sewer runs through the terrace of a cafe-bar in Majorca



KEY TO TRANSECT DIAGRAM

- 1 New villas and second homes in village
- 2 New Timeshare Complex built in rural surroundings
- 3 Luxury villas and leisure facilities (e.g. tennis clubs)
- 4 Farmland used for leisure projects, e.g. Water Parks, Golf courses, etc.
- 5 New motorways & by-passes link tourist coast to airports
- 6 Commercial land uses abandon Old town for new tourist complex. Old town by-passed by new road.
- 7 Lagoon partially drained and developed for water sport.
- 8 Unplanned ribbon development along coast. Problems from tourist congestion, e.g. sewage
- 9 Pollution problems along coast including sewage, oil and algae (in dry summers).

ADVANTAGES AND DISADVANTAGES ASSOCIATED WITH TOURIST DEVELOPMENTS IN MAJORCA

Advantages include

Improving national balance of payments as tourists bring money into the country as a whole. Improved links with other countries. More cultural exchange. Business contacts & links improved. Increasing local employment in cafes, bars, souvenir shops and boutiques, hotels, marinas and leisure centres, catering, servicing. Decrease in rural depopulation as young people gain employment. Increasing wealth of formerly poor rural areas; higher land values. Higher standard of living for tourist areas and a stimulated local economy. Farmers sell produce directly to tourist industry. Local craft industries develop. Improved infrastructure of tourist areas. Communication networks developed, e.g. new roads, airports, telecommunication links. Local services improved with better sewage disposal, water and electricity supplies. More entertainment and interest in historical buildings many of which are now preserved using new wealth of area.

Disadvantages include

Tourist areas are congested, especially beaches, cafes, airports, main roads; coastal 'strips' are particularly overcrowded in summer. Adverse visual impact in areas where tower block hotels, car parks, airports and 'building sites' spoil views. Increasing environmental disruption from tourist-related development, including water pollution along coasts from sewage, noise pollution from airports, nightclubs and heavy traffic, air pollution from traffic jams, etc. Farmland lost to tourist developments. German nationals now own large areas of Majorca. Threat to traditional 'way of life' of areas; traditional crafts and culture give way to foreign ideas. Much employment is seasonal in nature and jobs may be taken by outsiders to the area. Tourists can create social problems such as resentment amongst locals, threats to local customs, violence and crime may increase. Damage to the habitat of wildlife, vegetation and buildings may occur. Property prices may increase.

Assignment

- 1a Describe the Mediterranean landscape.
- 1b Describe the relationship between landscape and vegetation
- 2 Write the meaning of each of the following terms:- evergreen forest, maquis scrub, tourist complex
- 3a Make a simple fieldsketch of the photograph in Fig.121 labelling the following features: limestone foothills, tourist complex, evergreen Cork Oaks, linear hotel layout, water sports centre.
- 3b Explain
 - i. the attraction of the area
 - ii. the distribution of hotels
- 4 Compare the summer and winter climates of Mediterranean areas .
- 5 Describe the relationship between land use and the physical landscape of 'Med' areas such as Majorca.
- 6a Complete a larger copy of the following table giving examples of the impact of tourism in areas such as Majorca.
- 6b To what extent do you agree with the following statement ?
"Tourism is not the saviour of poor Mediterranean coastal areas but their longterm downfall".

	Benefits	Losses
Local Economy		
Local Community		
Local Environment		

CLIMATE: Hot Deserts

Hot Desert landscapes (Fig.123) consist of a wide variety of landforms. The main agents of erosion shaping much of hot desert scenery are the weather, wind and water (Fig. 124). The great diurnal range of temperature combine to make desert rocks expand and contract. As a result, rocks peel in layers and eventually break down into grains of rock or sand. This process is known as **onion weathering**. The wind blasts sand at rocks, creating arches and pedestal rock formations. The wind also builds up sand into giant sand seas (ergs) which move slowly in sand storms. Although water is limited in desert areas, the lack of vegetation and the high intensity of rare desert rainstorms contribute to shaping the scenery. Desert river courses, often called wadis, can carry flash floods, leading to the formation of canyons, depositing alluvial fans in their wake.

The harsh hot desert environment limits much human activity to the areas around oases (waterholes). In recent years growing pressure for land around waterholes and along desert margins has led to the formation of 'new desert', formed by a process known as **desertification** in areas such as the southern Sahara (Fig.125).

Fig.123 A Stony desert area in Egypt



Fig.124

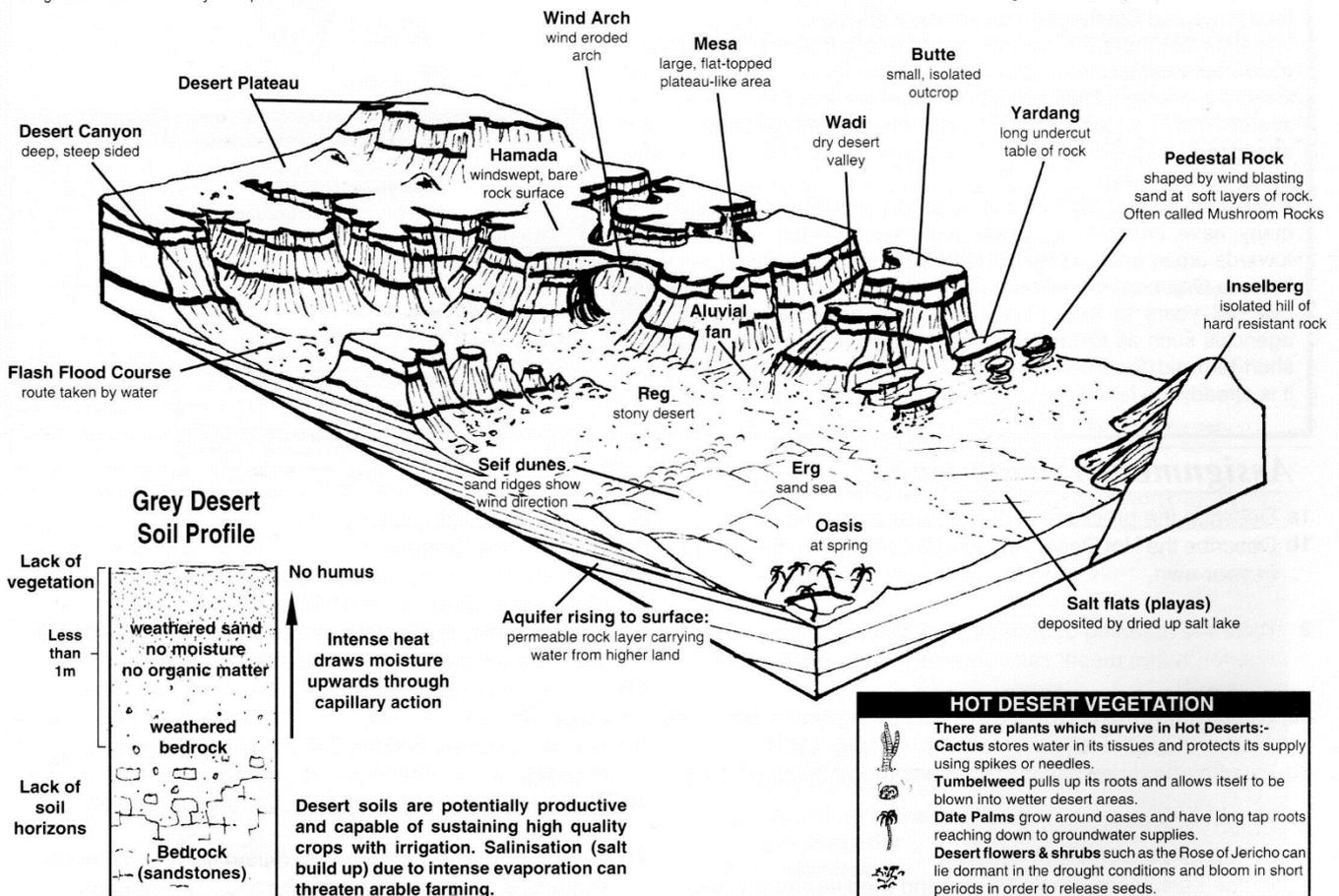
A Hot Desert Landscape

Summer or Hot Season

Intensely hot and dry conditions. High evaporation rates. Daytime temperatures can reach 50°C; nighttime temperatures often drop below 0°C. Occasional convection storms bring flash floods after heavy downpours.

Winter or Cool Season

Continental desert areas and those with high altitudes can experience a winter or cool season in which temperatures often drop to 10°C or less in day time. Cool winds may affect deserts during their 'winter' but precipitation rates remain low.





Trees cut down for fuel & shelter - roots no longer bind desert soils



Overused, overgrazed area around a desert oasis

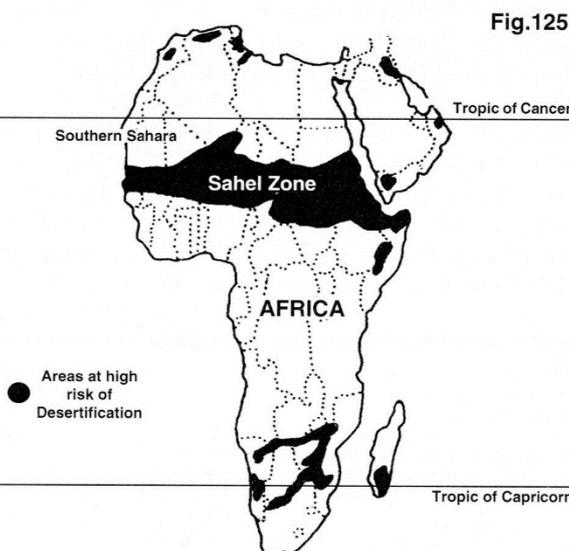
DESERTIFICATION - the advance of the Hot desert

"This is not just a famine we are looking at - its is severe environmental collapse. As the population has increased and the drought has continued, crop yields have fallen. People have cut down more trees to get the same size of crop yield from a larger area. Trees are used for fuel, for shelter and for fodder for animals. The soil is being stripped and the land wrecked. Animals are dying from lack of grass and others are being sold or eaten. Many people are leaving this area in search of food. This has been going on at an unprecedented rate in recent years - the people have been building a desert.." The Guardian 22.2.91

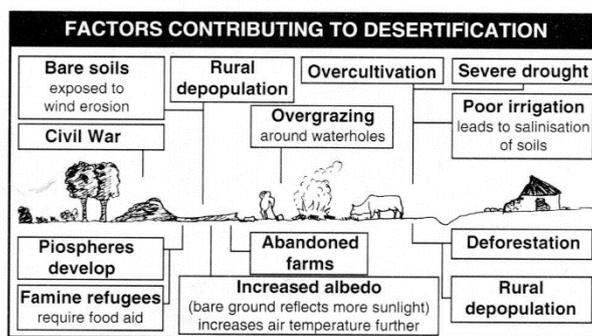
Each year over 120,000 sq.km of land is destroyed by desertification - a gradual process in which land dies and becomes desert. It is found in every continent except Europe and daily affects the lives, economies and environment of many areas worldwide. Desertification is perhaps most severe in Africa where the countries of the Sahel Zone (see map) and Southern Africa are most at risk.

Desertification spreads like land cancer and is the result of a range of factors combining to create dead-areas often referred to as **piospheres**. Once piospheres develop people and animals move to other areas in search of food, water and grazing for their animals. Farmland is often abandoned as patches of desertified land merge and become large areas of new desert.

It is estimated that over 30 million people in Africa are affected and many have become refugees, migrating between rural areas or towards urban areas in search of help, food and shelter. The United Nations Organisation believes it will take as much as \$35billion and over 25 years to help these desertified areas. Meanwhile relief agencies such as Oxfam continue to help the people by supplying short-term aid (food, blankets, medicine, seeds, tools and money). But it is already too late for many areas affected by desertification.



'SAHEL' means shore



Assignment

- 1a Describe the processes which shape desert scenery.
- 1b Describe the Hot Desert landscape using a suitable diagram of your own.
- 2 Write the meaning of each of the following terms:-
Aquifer, butte, mesa, seif, inselberg, erg, reg, hamada.
- 3a Explain the formation of **two** of the following desert landforms
wind arch, pedestal rock, yardang, salt flat, oasis
- 3b Explain the main plant adaptations to the desert climate.
- 4 Compare the following :-
i. Hot and Cold Desert climates
ii. The usefulness of Hot Desert and Mediterranean soils.
- 5 What is **desertification** ?
Illustrate your answer.
- 6a Describe the relationship between the distribution of Hot Desert and areas of desertification in Africa.
- 6b Make a simple fieldsketch of the photograph top-right of this page, labelling its main features.
- 6c Identify and explain the main causes of desertification in areas such as the Sahel Zone of Africa.
- 6d Use the diagram "Factors Contributing to Desertification" to design a flow-chart to illustrate the process.
- 7a To what extent do you agree that desertification is a problem caused by people ?
- 7b Research possible solutions to desertification. What can be done to alleviate the problems this process causes ?

CLIMATE: Equatorial Rainforests

Rainforests thrive in lowland areas, river valleys and coastal plains around the Equator (Fig.126). A small area may hold over 250 different species of hardwood tree and a great diversity of other plants (Fig.127). A multi-layered growth can be observed where tall emergent trees pierce the dense, main canopy; smaller trees and shrubs colonise an understory layer; lianas and tree creepers grow on the giant buttress roots of the hardwoods and lichen, moss and algae bedeck every surface; the forest floor is dark and damp and covered in all types of fungi. Ferns and orchids can be found on branches. This profuse plant life supports a great diversity of insect and animal life.

The overall appearance of plant and animal life thriving in constantly hot, wet conditions conceals the fact that without the protection afforded by the main forest canopy and its supply of nutrients (in the form of dead leaves & fruit), the tropical soils would quickly become infertile and incapable of supporting it. The rainforest in fact only survives by maintaining the supply of nutrients to the soil in which it grows. Where the canopy is removed on a large scale, the intense sunlight and heavy rain combine to remove soil nutrients (**leaching**), destroying soil fertility.

The natural vegetation of rainforests in recent years has been deliberately disturbed by a range of human activities including **slash & burn** (where population pressure leads to the destruction of rainforest), **industrial clearance** (for minerals such as oil, bauxite), **logging** (for timber & paper manufacture) and large scale **cattle ranching** (Fig.128). The rapid scale of forest destruction (over 10m hectares per year) is creating many serious global problems (Fig.129)

Fig.126 A clearing in a Brazilian Rainforest

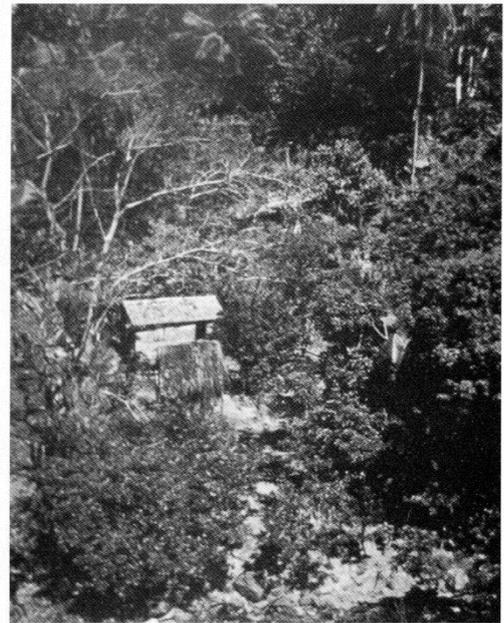


Fig.127

A Rainforest Landscape

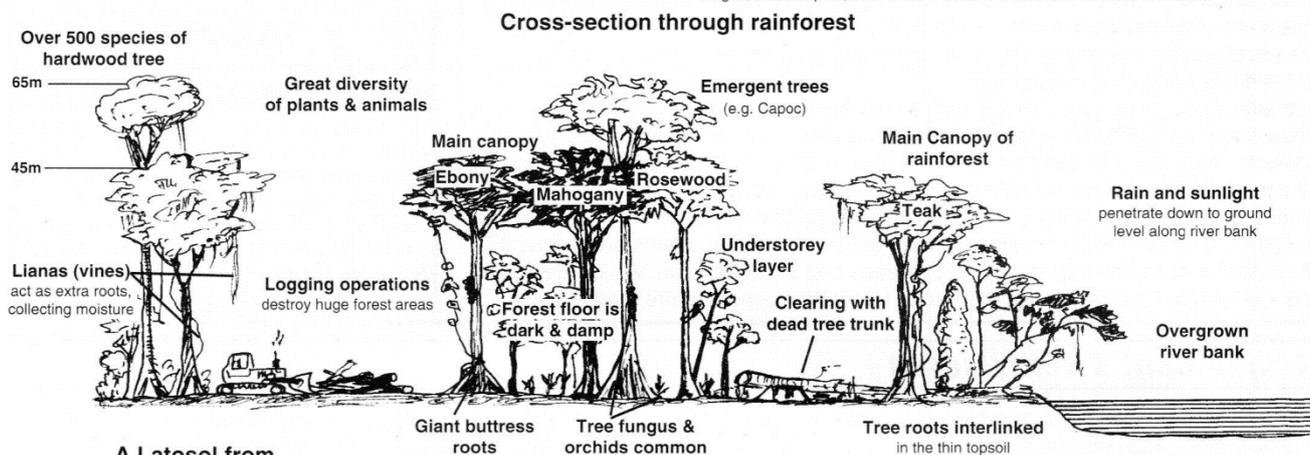
The importance of rainforests

Rainforests are home to over half of all the growing wood and at least two-fifths of all the plant & animal species on the Earth. The rainforests are thought to be one of the main methods by which the planet converts Carbon Dioxide (CO₂) into carbon (through photosynthesis for plant food) and oxygen released into the air.

One season: heavy precipitation all year round, high temperatures (> 20°C), very low range of temperature (2°C).

Features of rainforests:

Forest canopy blocks sunlight & rainfall from the forest floor. The forest floor is dark & very damp, littered with rotting leaves and tree fruits. "Jungle" (thick undergrowth) grows along river banks & in clearings. Tropical hardwood trees are the dominant plants. The tallest trees (or emergents) can grow to over 80m high. Thousands of other plants are found here, including orchids, ferns, fungus, tree creepers, etc. Rivers & streams criss-cross the rainforest areas.



A Latosol from a Rainforest

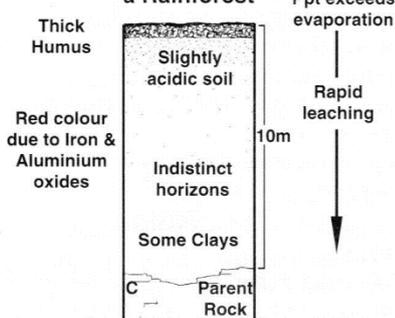
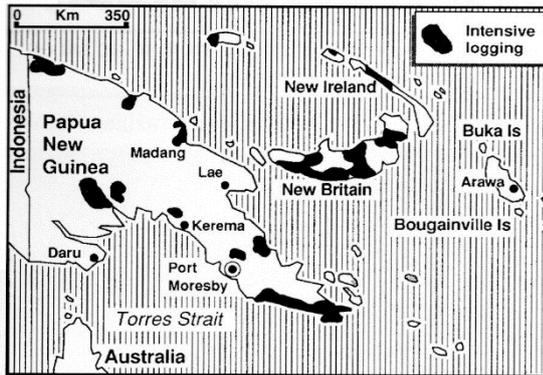


Fig.128
Burning the Brazilian rainforest to make way for cattle ranches



Fig.128 **DEFORESTATION IN EQUATORIAL RAINFORESTS**



DISAPPEARING FOREST IN PAPUA NEW GUINEA

15 million hectares of low-land forest remain (worth \$100 billion).
Half already allocated for logging developments

There are many reasons for the deforestation (clearance) of rainforests. In Indonesian rainforests, the expanding population of some areas is leading to the clearance of over 1 million hectares annually to create space for farm land. Large international logging companies are also clearing rainforest (e.g. on Papua New Guinea, New Ireland and New Britain). In other rainforest areas, such as the Amazon Basin (Brazil) new industrial developments and the construction of communication routes account for an annual clearance in excess of 2 million hectares. In Central American rainforests, huge areas are firebombed then seeded with grass from the air (which grows well in the conditions and in the remaining woodash). Large scale ranches are set up to fatten cattle quickly - the meat being sold to multinational hamburger and food processing companies.

DEFORESTATION IN RAINFOREST AREAS

There is worldwide concern over the destruction of rainforests, their flora and fauna and the effect deforestation is having on the traditional inhabitants of these areas. Some of the major problems associated with deforestation on a massive scale are listed opposite. But agreeing solutions to both the deforestation and associated problems is proving almost impossible. Many developing countries view their rainforest areas as a national resource, the development of which is thought to be their best hope of alleviating many serious economic and social problems. Developed countries often blame the developing nations for the environmental and social problems associated with deforestation. Most environmentalists consider these problems so serious that they merit immediate international co-operation and understanding, worldwide agreement is required now to reduce the rate of forest destruction before they are lost.

PROBLEMS ASSOCIATED WITH DEFORESTATION OF EQUATORIAL RAINFORESTS

SOIL EROSION & FLOODING

Where the forest floor is exposed to sunlight & heavy rain, tropical storms cause severe erosion of topsoil. Much of the topsoil is washed into rivers and streams causing flooding and silting up of lakes & reservoirs. The Panama Canal is slowly silting due to deforestation.

DESERTIFICATION

Scientists believe that the deforestation of the rainforest areas is linked to worldwide problems of desertification. Removing rainforest would eventually make their climate hotter & drier, destroying the soil, making new desert.

LOSS OF WATER & OXYGEN

Over 25% of the world's fresh water is stored in rainforest areas and over 30% of the world's oxygen comes from rainforests. These would be lost through deforestation and destruction of major rainforest areas.

GLOBAL ATMOSPHERIC PROBLEMS

Deforestation would lead to a major change in the global climate. The 'greenhouse effect' would steadily increase due to loss of the forest filter effect on CO₂. The result would be a worldwide rise in temperature (Global Warming), changes to climate (UK would become steadily milder and wetter, Europe drier and warmer), and the melting of the ice caps flooding crowded coastal areas across the world, e.g. E.China, Netherlands, Bangladesh, etc.

LOSS OF FLORA & FAUNA

Deforestation leading to the major loss of thousands of species of insect and animal. Perhaps the most serious loss would be that of the forest plants. Already they supply worldwide markets with coffee, nuts, fruits, hardwood timbers, rubber and chocolate. 40% of all medicines & drugs contain substances from rainforest plants. Some more recent discoveries include a drug for combatting leukemia (blood cancer).

EFFECT ON TRADITIONAL PEOPLES

Rainforest destruction directly affects the way of life of countless traditional peoples. They are often forced to move to other areas, infected by new diseases (such as influenza, HIV, etc) and lose their traditional knowledge & skills as they gain employment in logging camps or mines. Some are killed and young people often move to large settlements for a modern way of living.

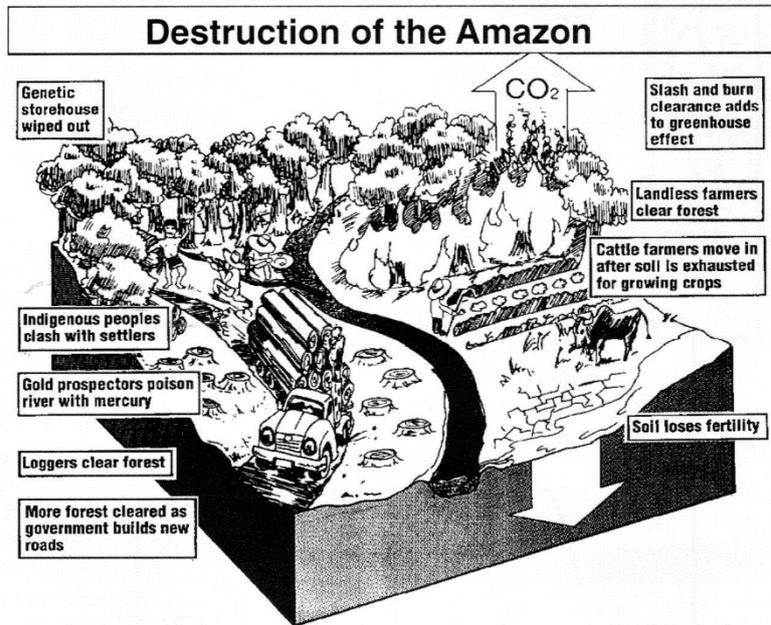
Assignment

- 1a Describe the main factors which influence the worldwide distribution of Equatorial Rainforest.
- 1b Describe a typical Equatorial Rainforest landscape. Illustrate your answer.
- 2 Write the meaning of each of the following terms:- emergent, canopy, humus, buttress root, leaching,
- 3a Compare the Equatorial Rainforest and Hot Desert climates
- 3b Why are Rainforests sometimes referred to as the "Lungs of the planet" ?
- 4 Describe the main plant adaptations to the rainforest climate.
- 5 Why are Rainforests considered delicate environments ?
- 6 What are the advantages and disadvantages of the Equatorial Rainforest for agriculture ?
- 7a Why are Rainforests considered very important ?
- 7b In which ways does the Rainforest protect
 - i. the soil
 - ii. water supplies
 - iii. wildlife ?
- 7c Describe the main reasons why Rainforest areas are being deforested.
- 7d What is the relationship between deforestation and climate change ?
- 8 "The problems created by rainforest clearance can only be solved on an International scale." To what extent do you agree with this statement ?

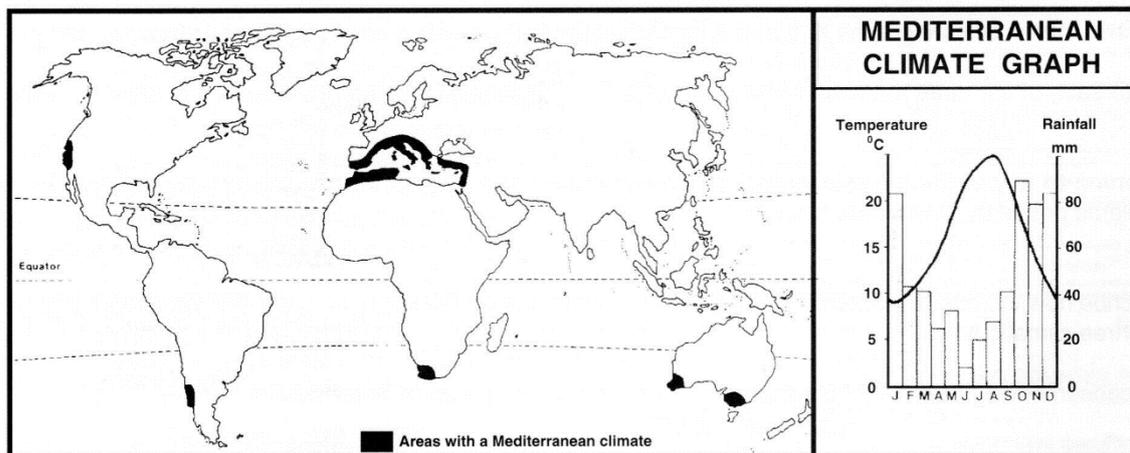
EXAM STYLE QUESTIONS

CLIMATE & PHYSICAL ENVIRONMENT

- 1 The diagram illustrates the impact of rapid exploitation of the Tropical Forests in the Amazon. Explain the differing views of the people who live in the Tropical forests, towards rapid exploitation and predict the possible consequences of developments continuing at this pace.



- 2 Explain why the world's Tropical Rainforests are disappearing so rapidly.
- 3 The spread of Tropical Deserts, for example the Sahara into the Sahel region, has caused suffering and misery to millions. Suggest some possible short-term and some long term measures to ease the problems that areas such as the Sahel have suffered.
- 4 Quoting examples you have studied describe how a national government has planned the development of a Tropical Forest.



- 5a Describe the characteristic features of a Mediterranean Climate as shown in the climate graph.
- 5b Describe the world distribution of areas which experience a Mediterranean type climate.
- 6 The Mediterranean Climate offers a range of possibilities for and limitations on farming and tourism. Quoting examples you have studied discuss the advantages and disadvantages of a Mediterranean climate.

Climate & Physical environment

