

Ecosystems: ecological succession and climatic climax

[Environment](#), [Ecology](#)



Ecosystems: Change and Challenge The Structure of Ecosystems Ecosystem: a dynamic, stable system characterised by the interaction of plants and animals with each other and with the non-living components of the environment The components of an ecosystem are categorised as either biotic and abiotic Biotic means the living environment, components include: i). Vegetation (living and decomposing) ii).

Mammals, insects, birds and microorganisms Biomass-the mass of material in the bodies of animals and plants (total mass of living matter) Abiotic means the non-living, chemical and physical components of the ecosystem and includes: i). Climate- in particular the seasonal pattern of temperature and precipitation ii). Soil characteristics iii). Underlying parent rock iv). Relief of the land v). Drainage characteristics

Ecosystems are open systems because energy and living matter can both enter and leave the system: * Inputs-Energy from the sun, which drives photosynthesis-enabling the plants to grow, water transported into the ecosystem from precipitation and animals that arrive from elsewhere * Outputs-nutrients are transferred out of the system by: animals can physically move out, water can leave through evapotranspiration, groundwater flow and throughflow * Flows-nutrients can be transferred from one store to another e. g. apillary uptake * Stores- stores of nutrients: vegetation, plant litter and soils Energy Flows and nutrient cycling Energy flows- is the flow of energy through a food chain * Energy flows flow through an ecosystem from one stage to another. * Through photosynthesis plants are able to capture light energy from the sun to make carbohydrates from

carbon dioxide and water to grow and increase their biomass * Within all ecosystems, nutrients are required for plant growth and are recycled from one store to another e. g. leaves fall from tree-> when they decompose nutrients are returned to the soil

Gersmehl diagram- shows the cycling of nutrients within the main stores of biome * Circles of proportionate size represent the stores of nutrients with the biomass, litter and soil * Nutrient transfers, inputs and outputs are represented by arrows of varying thickness Inputs- include nutrients(carbon and nitrogen) and minerals(from weathered parent rock) Outputs-loss of nutrients from the soil by; leaching and surface runoff Flows-leaf fall from biomass to litter, decomposition of litter, flow of nutrients to soil, uptake of nutrients by plants and trees

The movement of energy up the trophic levels shows the food chain as each trophic level occupies a different position. However food chains, in reality, are often more complicated than this. Some species can occupy more than one position in every food web - may be prey to more than one animal etc. Nutrient cycles in an ecosystem take place between the biotic and abiotic components of the ecosystem. This can be shown through the Gersmehl diagram. * Nutrients have three stores - the soil, litter and biomass. Nutrients are transferred through the three stores through fall of dead tissue, absorption through plant roots and decomposition etc. Inputs of nutrients include precipitation and the weathering of parent rock Outputs include loss from runoff and leaching Flows include leaf fall (from the biomass to the litter), decomposition of litter(flow of nutrients to the soil) Trophic levels,

food chains and webs Energy transfer within an ecosystem, represented by a pyramid diagram * At each trophic level, some energy is available as food for the next level * Each level decreases in size, 90% of energy lost through life processes-respiration, movement and excretion * Only 10% available as food, number of living organisms decreases as trophic levels increase Producers/autotrophs- first layer, produce their own food through photosynthesis(green plants) Primary consumers-eat the producers(herbivores) Secondary consumers-consume the herbivores(carnivores) Tertiary consumers-top predators that eat secondary consumers Detrivores and decomposers operate at each trophic level: i). Detrivore-feeds on dead material or waste products ii).

Decomposer-an organism that breaks down dead plants, animals and waste matter e. g. fungi and bacteria * There are normally 4 links in a food chain, each link feeds on and obtains energy from the previous link and is consumed by and provides energy for the proceeding link * There are a large number of food chains that operate in ecosystems, it is also made even more complicated as animals have varied diets, this can be shown in a food web Ecosystems in the British Isles Over Time Succession and Climax Succession-a series of changes that take place in the plant community over time

Climatic climax-the final stage of the plant succession, where the vegetation is in balance with the environmental conditions. Providing the environmental conditions remain unchanged there will be no change in the vegetation once the stage is reached * If allowed to continue undisturbed , the succession will reach its climatic climax- where the plant species live in perfect balance with

the current environmental conditions * Climate is the major influence of vegetation on a global scale * On a local scale-drainage, geology and relief affect plant growth

There are two basic types of succession: 1. Primary succession-occurs on surfaces that have had no previous vegetation There are two main types of primary succession: * Xeroseres are formed on dry land, this group can be divided into lithoseres on bare rock and psammoseres on sand dunes * Hydroseres are formed in water, haloseres in salt water and hydroseres in fresh water 2. Secondary succession occurs on land that was formerly vegetated but has undergone a loss of vegetation E. g. Deforestation
Development of a succession

As the succession develops it passes through a series of stages called seres(individual stages in the plant succession) where the processes of invasion, colonisation, competition, domination and decline operate to influence the composition of the vegetation i). Plants first invade bare ground through the processes of dispersal and migration ii). Pioneer species are adapted to surviving harsh conditions (e. g. long-rooted salt-tolerant marram grass), they compete for available space, light, water and nutrients, when they die they help modify the environment by adding organic matter iii).

The addition of organic matter to the developing soil improves its structure and water retention qualities iv). A period of relative stability is eventually reached where the vegetation has reached its climax, the climax is dominated by the tallest species v). The saturation point has been reached

with all potential niches occupied- climatic climax community, where the natural vegetation has reached a stable balance with the climate and soils of the area Polyclimax theory- the theory that local factors (drainage, geology, relief and microclimates) can create variations in the climatic climax community

Plagioclimax- the plant community that exists when human interference prevents the climatic climax being reached Lithosere Is a succession that begins life on newly exposed rock surface e. g. eruption of a volcano i). The bare rock is initially colonised by bacteria and algae ii). The pioneers begin to colonise, starting with lichens, they begin to break down the rock and assist water retention iii). As water retention improves, mosses begin to grow, water retention improves and weathering to produce the beginning of a soil where advanced plants can grow iv).

Ferns, herbs and flowering plants appear and die back, bacteria converts their remains into humus, helps to recycle nutrients and improve soil fertility v). Shrubs start to grow vi). Pioneer trees become established, normally fast growing e. g. willow, birch vii). Slower growing tree species begin to develop (e. g. ash and oak), they are the dominants of the climatic climax community- temperate deciduous woodland Hydrosere A hydrosere develops as follows: i). In a freshwater environment, submerged aquatics are the first plants to develop, they help to trap sediment which enables other species to move in i). The next seral stage is the growth of reed beds and swamp conditions iii). Colonisation by alder and fern begins, they further modify the environmental conditions, improving drainage and mineral

content of the immature soil, allowing the entry of willow and ash iv). The climatic climax vegetation of deciduous oak or beech woodland is reached, throughout the succession there are progressive changes to the soil conditions, ground-level microclimate and animal activity

Temperate Deciduous Woodland

A biome is a global-scale ecosystem and is a naturally occurring organic community of plants and animals in the climatic climax stage of succession *

Tropical rainforests and temperate deciduous woodland are both examples of high energy biomes *

Low energy biomes are the tundra in the high latitudes and the hot deserts in the low latitudes, the vegetation is scarce and net primary productivity is low *

Temperate deciduous woodland is a high energy biome which has a relatively high productivity. It is found in mid latitudes on the borders of continents where there is adequate moisture.

Climate: *

- Temperature ranges from 5 - 17 in Winter and Summer *
- 500-2,000mm of rain per year, varies seasonally *
- Low pressure systems *
- Westerly winds

Vegetation: *

- Broadleaved deciduous trees are the dominant species, oak are the tallest *
- Trees develop large crowns and broad but thin leaves *
- Shed their leaves in the winter, reduces transpiration when less water is available *
- Net primary production-1, 200g dry organic matter per M² per year *
- Most woodlands show some stratification *
- Below the canopy is the shrub layer *
- Just above the forest floor is the herb layer *
- Epiphytes e. g. lichens and mosses grow on the trunks and branches of trees *
- A thick layer of leaf litter is readily broken down by soil microbes and animals

Soil: *

- Brown Earth soil 1. 5m deep *
- Leaf litter makes the soil more fertile in Autumn *
- Well mixed with decomposers so it becomes fertile quickly *

Leaching occurs when there is snowmelt or intense rain, which is not uncommon
Arresting factors

Plant successions can be stopped from reaching climatic climax or deflected to a different climax, by human interference The resulting vegetation is called a plagioclimax, this can be caused by: * deforestation or afforestation * animal grazing or trampling * fire clearance A secondary succession is one that develops on land that has previously been vegetated The stages of secondary succession may be more rapid than those of primary succession because organic matter is already present in the soil, the pioneer stage may be short or absent- climatic climax is reached in a much shorter time

Plagioclimax: heather moorland 1. As the soils deteriorated without the deciduous vegetation, hardy plants such as heather come to dominate the uplands. 2. Sheep grazing became the major form of agriculture and the sheep prevented the regeneration of climax woodland by destroying young saplings 3. Many of these uplands have been controlled by managed burning to encourage new heather shoots 4. Burning has eliminated the less fire-resistant species, leading to the dominance of heather 5.

One of the aims of burning heather is to ensure as much as possible of the available nutrient is conserved in the ecosystem 6. Burnt on average every 15 years, If the time elapses more then there is too much woody tissue and nutrients are lost in smoke Tropical biomes In a tropical rainforest biome due to the constant high temperature and rainfall, vegetation grows more quickly, large amounts of net primary production Biodiversity- the variety of species within an ecosystem Leaching-soluble bases are removed from a soil

by downward-percolating water in environments where precipitation exceeds evaporation

Net primary production-the amount of energy fixed in photosynthesis minus the energy lost by respiration in plants The tropical equatorial rainforest biome The tropical rainforest biomes are between latitudes 10°N and 10°S of the equator Climate * The equatorial climate has little variation, temperatures remain high throughout the year * High diurnal temperature range, high during day and low during the night- due to no insulating clouds to keep the heat in * Annual precipitation is high, often in excess of 2000mm, rain falls all year round at the equator because of the inter-tropical convergence zone dominates the atmospheric conditions Evapotranspiration is rapid, due to sun heats the humid forest * low pressure conditions allow air to be rapidly uplifted * As the air rises it cools and water vapour condenses into clouds, the clouds continue to build into the afternoon- leading to heavy rain and thunder, returning the previously uplifted moisture back to ground level

Humidity is high throughout the year, continuous evapotranspiration adds water vapour to the air On the forest floor there is little breeze as the trade winds converge here Soils Underlying soil will have developed naturally over a long period of time and be in balance with its environment, this is known as zonal soil The zonal soil associated with the tropical rainforest is a latosol Characteristic features * A latosol can be more than 40m deep The constant hot wet climate provides perfect conditions for chemical weathering of the bedrock * Ferrallitisation is the process where bedrock is broken down

by chemical weathering into clay minerals and sesquioxides * Red colour due to the presence of iron and aluminium minerals * As there is a moisture surplus in the equatorial climate (rainfall exceeds evapotranspiration), there is a downward movement of water through the soil * Silica materials are washed out of the A horizon and transported downwards by water by a process called leaching * Iron and aluminium compounds are less soluble and are left behind * The latosol is nutrient poor, plant uptake of nutrients is roughly equal to the input from decomposed litter * Soil moisture utilisation occurs throughout this period, as evaporation and transpiration exceed precipitation

Vegetation Rainforests are the most diverse and productive biome, also the most fragile The vegetation is in harmony with its environment and is a climatic climax community where the dominant species are the hardwood trees * The net primary production of the rainforest is 2,200g M² yr⁻¹ the figure is high because the growing season lasts all year and the litter is rapidly decomposed, replacing nutrients taken up by the vegetation * There can be up to 300 species of trees in every Km² * The forest has a layered appearance, with the tallest trees (emergent's), standing up to 45m, above the canopy, the canopy absorbs most of the sunlight and intercepts most of the precipitation * When a tree dies it brings down others as it falls, new trees grow quickly taking advantage of the light, it decomposes quickly assisted by detritivores and the hot and humid conditions * Fungi that grows on trees and has an important role in decomposing litter

The vegetation has developed and adapted to physical conditions of the rainforest: * The trees grow rapidly, the leaves at the tops of the trees absorb light and photosynthesise, the bark is thin as the trees don't need

protection from harsh winter conditions * The top layer of soil contains the minerals the trees need, there is also an abundant supply of water, roots do not need to be deep e. g. buttress roots, also help to stabilise the trees * The leaves have adapted to the regular heavy rainfall by developing drip-tips, which allows excess water to be easily shed, the leaves are also thick and leathery to withstand strong sunlight and reduces the loss of water from the plant * Epiphytes grow on the trees, as the forest floor is dark * Rainforests form the habitat for a huge number of species The effects of human activity on plant succession Deforestation is the deliberate clearance of woodland by cutting, burning or the application of a defoliant * Climatic climax vegetation has been destroyed, this has resulted in both secondary succession and plagioclimax * The vegetation that replaces the original rainforest tends to be smaller in height and less diverse, with a reduction in the general biomass Causes of deforestation * Demand for hardwood, e. g. teak, its demand for building and furniture is increasing * Many developing countries rely on export earnings from timber to help pay their debts and financemajor development projects * To provide land for rubber plantations, cattle ranches for beef farming, soya plantations, mining, roads and railways * Population pressure has also led to an increase in the clearance of rainforests Impacts of deforestation * As habitats shrink, plant species become endangered and the food chain within the forest is disrupted * Some animal species are threatened by extinction The vegetation protects the latosol soils from the regular heavy tropical downpours * Once the trees are removed the topsoil is open to erosion and to leaching of nutrients and minerals * Runoff causes sediment to block river channels and increases flooding * The microclimate

of the forest is disturbed by deforestation-the daily water cycle of rapid evapotranspiration followed by afternoon precipitation cannot occur, there is less cloud cover and a greater temperature range * The use of burning leads to local air pollution and contributes to climate change * Economic benefits in terms of income from mining, farming and exports from hardwood * Culture of the indigenous people is destroyed and they may be forced to move from their land People are one of the arresting factors that interfere with plants succession. They can often stop a plant succession from growing and then when this is maintained it is known as a plagioclimax. Sheep grazing on moorland is an example. A secondary succession is a plant succession that takes place on land that has already been colonised.

Secondary succession can follow a natural disaster such as a volcanic eruption or a period of human intervention such as colonising a former quarry site. Much of the British Isles was covered in deciduous woodland with the climax species being either Oak or Ash depending on the soil and the underlying parent rock. This was largely cleared for agriculture and settlement which has started a plagioclimax in most areas of Britain. Tropical Biome - Savannah Grassland Climate: * Wet and dry seasons * 500-1000mm of rain per year * Hot throughout the year * High pressure and strong trade winds in the dry season * Wet season dominated by the ITCZ * Fires may occur caused by heat and lightning Vegetation: Trees dominate over grasses where the wet season is longer - dense rainforest towards the equator * Grasses may be up to 2m tall - long roots * Deciduous * Adaptations include fire resistant bark, water storage etc. Soil: * Deep red lateric soils * Influenced by climate * Silica is leached downwards in the wet season * Crust

formed in the dry season Biodiversity: * Greater towards the equator * Acacia, Baobab, Umbrella Thorn, Elephant Grass * Great animal migrations occur meaning that biodiversity drops at certain times * 40% of the land in Tanzania has been designated as a National Park to help conserve biodiversity * African Elephant, Black Rhino, Zebra and Cheetah are endangered The Savanna grassland biome Climate

The tropical wet and dry climate of Africa shows seasonal variation in wind direction, precipitation and temperature Variations occur with increasing latitude from the equator Precipitation varies: * Equatorial rainforest margins more than 1, 000mm per year, rain season lasts 10-11months * Desert/semi-arid margins are less than 500mm per year, away from the equator the reliability of the rainfall decreases, only 1-2 months rainy season Temperature varies: * The equatorial rainforest margin temperature range is 22°C in the wet season and 28°C in the dry season * On the desert margins the temperature range from 18°C in the wet season to 34°C in the dry season

During the dry season, the subtropical anticyclone moves over the desert margins, the subsiding air of the high pressure suppresses convection, giving rise to clear skies and high daytime temperatures The trade winds blow from the high pressure towards the ITCZ, moves towards the coast. The air has a low moisture content, known as harmattan In the wet season, the ITCZ migrates polewards, it brings rainfall because uplift and convection are fed by moist, unstable, tropical maritime air, the poles have a short rainy season so have low annual rainfall Ecological responses soil moisture budgets e. g.

Northern Ghana Soil moisture recharge-July to early August precipitation becomes greater than evapotranspiration, rainwater fills the empty pores in the soil, reaches field capacity

Soil moisture surplus- August-September, at field capacity, soil is saturated, rainwater has difficulty infiltrating ground leads to surface runoff, leads to high river levels Soil moisture utilisation-October, evapotranspiration begins to exceed precipitation, more water evaporating and being transpired by plants than falling as rain Soil moisture deficit- December, when soil moisture is used up, water deficit, plants can only survive if drought resistant, period continues until precipitation becomes greater than evapotranspiration Northern Ghana characteristics: * lengthy period of moisture deficit * Short period of moisture surplus * Total annual potential evapotranspiration greater than total potential precipitation

Adaptations by vegetation * Vegetation in wetter areas consist of tall coarse grasses, with many deciduous trees- Tree savanna * Shorter tussock grass becomes dominant in desert margins, accompanied by drought-resistant trees e. g. acacia and baobab, known as grassland and shrub savannas * Trees are deciduous, have hard leathery leaves to reduce transpiration losses, other plants are microphyllous (small leaves) for the same reason * In the tree savanna, isolated trees have low umbrella shaped crowns that shade root areas and reduce soil moisture evaporation Xerophytic characteristics, adaptations to dry surroundings: * dense cell fluids hard waxy leaves Reduce water loss * thorns and protected stomata Two main types of trees: i). Acacia-has a crown structure, often flattened by trade

winds, loses leaves in the dry season ii). Baobab-thick spongy trunk, long tap roots, baobab is pyrophytic, withstand fire due to insulating bark Grassland savanna- grasses are tussocky, enables them to retain some moisture shrub or scrub savanna- there are many acacia trees, thorn bushes and short tufted grasses, fewer leaves so retain more water, turn blades away from sun to reduce water loss Impact of human activity Two main effects on the vegetation: i).

Grass is burnt off, better growth of young grass next season for grazing, regular burning makes it difficult for young trees and bushes to become established, dominated by herbaceous plants and indigenous woody plants that can survive fire e. g. acacia and baobab ii). Woody plants, killed by cattle eating their foliage, thorny animal-repellent trees and shrubs such as acacia, therefore become numerous The tropical monsoon forest biome Climate * High temperatures throughout the year, small annual range(19°C-30°C) because of the location within the tropics * Annual precipitation is high * Winds blow in from the ocean with very moist air and heavy rainfall during May-October, the rest of the year the air is drier

Ecological responses Soil moisture budgets * Precipitation is much higher than potential evapotranspiration during the wet season * High rainfall totals result in saturation of the soil, some of the moisture can be utilised by vegetation * A soil moisture deficits occurs by January, deciduous trees lose their leaves in response to drought conditions * The period of moisture deficit is shorter than that experienced in the tropical savanna biome * The months of surplus during the wet monsoon season result in the leaching of

bases and silica and very little humus is allowed to develop in the top layers

Adaptations by vegetation and animals The canopy is not continuous, tallest trees are smaller, provide an incomplete cover * This means there is less competition for light, allowing greater development of vegetation at lower levels * Fewer species of trees, common species are sal, pyinkado and teak all of which are economically valuable * Trees do not possess buttress roots and they develop large round crowns * The bark is often thick, to protect them from the harsh climate of the dry season, leaves are thin * Deciduous trees shed their leaves in response to a lack of moisture, to reduce transpiration during the dry season, this allows the light to reach the forest floor, leads to the development of dense undergrowth Impact of human activity * Tropical monsoon forests are fragile ecosystems, following deforestation almost impossible for existing food webs to continue, all trophic levels are affected, results in massive decrease in natural vegetation * Removal of monsoon forests due to increasing population pressure * Deforestation due to agricultural land and fuel wood due to rapidly increasing population * Teak has been exploited for export to developed countries, many indigenous species are endangered Development issues in the three biomes Brazil has the greatest species diversity, a smaller proportion of its land is protected than in Tanzania, in Tanzania 39.6% of the land is designated National Parkland Species diversity is of crucial importance because: * Plants photosynthesise * Trees act as a carbon sink * Some species purify water, fixing nitrogen, recycling nutrients and waste * Insects pollinate crops

In all three biomes the natural environments are threatened by population growth and economic development. Ecosystem issues on a local scale: Conservation-preservation of the natural environment. Ecology-the study of the relationships between living things and their environment. Sustainable development-The management of resources in such a way that the ability of the system to replace itself is greater than the level of exploitation. In urban areas they contain a wide variety of habitats e. g. industrial sites, derelict land and parks- thus difficult to make generalisations about urban ecology- all these habitats contain different mixes of flora and fauna.

This means there are opportunities for secondary succession, particularly where land becomes derelict. Urban niches. Many urban habitats are specialised, within one site a number of different niches or microhabitats might be available for plants and animals to colonise. e. g. bare tarmac, stone walls, Mosses taking root on high buildings. Colonisation of wasteland. Plant succession-the change on a community of species over time, is brought about by changes in the microenvironment due to e. g. supply of new species, competition between species and changes in habitat. The types of plants that can initially colonise are influenced by: i). Slope- horizontal surfaces debris accumulates, eventually develops into soil ii).

Moisture availability-gentle slopes, rainwater accumulates and steep slopes-faster runoffs iii). Aspect-south facing slopes are warmer and drier iv). Porosity-(ability to hold water), the greater porosity the quicker the colonisation v). Surface roughness-allowing plants to get a hold vi). Pollutionlevels-substances that are toxic to plants e. g. lead, contaminates

the ground Succession-e. g. Industrial site Stage 1: Pioneers- * Mosses and lichens are the first plants to develop on bare surfaces * Able to exist in areas with little water, obtaining nutrients through photosynthesis * When the plants die they provide a thin mat of organic matter, produces a protosoil that other species can root into Stage 2: Oxford ragwort- Cracks in the surface provide sheltered places for seeds to germinate and retain moisture * Oxford ragwort, wind-blown seeds, has a long flowering season 180-190 days, enables it to produce millions of seeds * At this stage, succession is usually rapid Stage 3: Tall herbs- * As these plants die they produce a thicker and more nutrient-rich soil * Taller plants that are more demanding of good growth conditions can become established e. g. Willowherb Stage 4: Grassland- * As soil enrichment continues, the amount of grass in the vegetation increases * Japanese knotweed, grow up to 3m in height, their dense canopies shade out most species beneath them Stage 5: Scrub woodland- Processes of soil enrichment and competition continues, taller herbaceous plants replaced by shrubs and eventually trees * As herbaceous plants thicken it becomes difficult for these small-seeded plants to establish As plant succession develops, there are changes to the fauna: * Soil fauna-increase in number of earthworms as soil improves and increase in the number and diversity of the insect population * Sub-stratum variations-caused by differences in the nature of the surface being colonised Ecologies along route ways * Routeways are distinctive habitats because exotic species of plants and insects may be brought in by traffic, provide wildlife corridors for e. g. oxes * Railway lines- during days of steam trains there were frequent fires which burnt of tall species (allowing light through)

encouraging light-demanding species to establish * Windborne seeds can be sucked along by trains and a lack of human interference encourages wildlife e. g. badgers * The nitrogen-rich exhaust fumes boost the growth of some wild flowers and increase the presence of insects and animals further up the food chain * Canals act like long ponds providing a habitat for a variety of aquatic plants e. g. ducks Introduction of new species Cities are centres for the establishment and spread of foreign species, species: * Europe-e. g. Sycamore * Japan-e. g. Japanese Knotweed

Such species can be introduced by windblown seeds, seeds carriers by animals and forms of transport e. g. trains Urban areas are attractive because of the variety of habitats, the constant creation of new habitats and the reduced level of competition Gardens and parks Are areas where the vegetation is managed: * Species are introduced from overseas and others are removed or controlled by mowing, weeding or the use of pesticides/herbicides * Sports fields reduce the diversity of plant species by maintaining grass pitches * Altruistic motives- to give a dull urban area some colour and improving the aesthetic value of the area * Improving the visual outlook-hiding eyesores (e. g. factories) encourage businesses or residents to move in * Schools produce a diverse environment for study purposes * Local businesses may want a pleasant site to attract customers * Local authorities provide the public with an arboretum * Birdwatchers wish for a diverse environment to attract new species * Act as noise and pollution inhibitors * Provide shade in hot urban environments * Reduce soil erosion on embankments Changes in the rural urban fringe * Although much of the land on the rural/urban fringe is a green belt area meaning that it's protected

from development, there will be increasing pressure to do so as plans for 50,000 houses over the next few years. The rural urban fringe is under pressure from development, In the UK are designated green belt, with regulations that strictly control new development * Farmers face problems from illegal encampments, trespassing and vandalism * Secondary succession may begin on unintended fields with the growth of weeds * Despite a lack of investment, land prices are often high, due to speculation of future development, derelict land has an advantage in gaining planning permission * Recent government policy is in favour of sustainable development of the rural-urban fringe and the recycling of derelict/degraded land e. g. planting of woodland * Country parks are relatively unmanaged and harbour more natural plant communities, providing potential breeding sites for bird species. e. g. skylark Ecological conservation areas Conservation areas are developed for: * Encouraging wildlife back into cities * Making cheap use of an otherwise derelict area Reducing maintenance costs in an area * Maintaining a diverse species base and reintroducing locally extinct species Such work includes: * Planting of trees, planting of native species, dredging of ponds and soil improvements * Group organisations behind such conservation include: The National Trust Different groups have different priorities, local authorities have planning needs and have to balance the desire to make use of derelict land against the potential cost to local taxpayers E. g. conservation groups want to create environments where traditional species can establish and local people want a safe environment for leisure Dulwich Upper Wood conservation area This was once a wooded area and the site of Crystal Palace however now it has been turned in to an

ecological conservation area which is open and attempt to accommodate everyone. * Is open at all times * Has a network of trails, some are suitable for wheelchairs Species in the wood * Trees e. g. Oak and ash, ground in the wood is deeply shaded, only a few shrubs e. g. Laurel and a few plants from the ancient woodland e. g. bluebell * Over 250 types of fungi e. g. mushrooms, they live on dead wood or leaf litter helping to break down these materials and return nutrients to the soil * Many mammals e. g. foxes and over 40 species of birds e. g. woodpeckers Why the site is interesting? Conservation of both abandoned Victorian gardens and ancient woodland * A number of preserved and re-created habitats e. g. wet areas and herb gardens * The site is both managed and allowed to grow wild in some areas, a range of different habitats * Plenty of wildlife, over 40 species of birds * Original habitats preserved, enabling native species of plants and animals to survive * A good example of how habitats can be preserved and created and still allow public access through a network of trails * The site has an educational value with a posted nature trail Ecosystem issues on a global scale Human activity, biodiversity and sustainability * World's population continues to grow, increasing the stress upon resources and environmental systems e. g. water, land * Population and growth and economic development resulted in spiralling demand for natural resources and reduction in natural ecosystems and biodiversity * 2005, Millennium Ecosystem Assessment stated that humans have changed ecosystems extensively, resulting in a substantial loss of the diversity of life on Earth * 1/3 of plant species are threatened globally and that climate change could result in the extinction of up to 1 million of the world's species by 2050 * United Nations and the World

Wide Fund for Nature are working to educate people to protect ecosystems and to support sustainable development * 1997 Kyoto conference on the environment resulted in the most industrialised countries agreeing to cut their carbon dioxide emissions by 30% by 2010 * UK government created the UK biodiversity Action Plan in 1994, setting aims for the next 20 years: * Protecting the best sites for wildlife-10% of the UK designated Site of Special Scientific Interest (SSSI's) * Targeting action on priority species and habitats-2007 UK diversity Partnership published list of 1, 149 priority species and 65 habitats * Embedding consideration of biodiversity and ecosystem services in all sections of policy * Encouraging people to change their behaviour, to environmental issues Management of fragile environments A fragile environment lacks resilience to a change in conditions, many ecosystems are vulnerable to change e. g. introduction of foreign species

CASE STUDY: Central Amazon Conservation Complex (tropical rainforests) The destruction of the Amazon rainforest has been particularly harmful to the biodiversity there. To prevent this some places have been protected by law meaning that they are undisturbed.

There are three separate reserves which are linked and is known as the Central Amazon Conservation Complex. The total size of these three areas is bigger than Switzerland. 1. Jau National Park 2, 272, 000 ha 2. Mamiraua Sustainable Development Reserve 260, 000 ha 3. Amana Sustainable Development Reserve 2, 230, 000 ha This is a UNESCO world heritage site is the second largest protected area of tropical rainforest in the world. The area is sparsely populated and there are no transport links other than boats. There are no major projects such as hydroelectric dams and some incidences

of hunting and poaching by outsiders for commercial gain This area has one of the most diverse flora and fauna in the world.

These include: * 200+ species of mammals * 500+ species of birds e. g. parrots * 300+ species of fish * Reptiles and amphibians e. g. coral snake Some of these are endangered which means that the area requires extra protection. e. g. spider monkey and puma Management The management has three main functions: * To protect the land and to minimise the impact of human activity * To research, catalogue and protect biodiversity * To manage specific activities, such as tourism They have drawn up a zoning plan which shows how much activity has been going on in each area. 1. Primitive Zone - Minimal human intervention as this is land of great natural beauty 2.

Extensive Use Zone - There has been a small amount of activity 3. Intensive Use Zone - Environment has been significantly altered due to human intervention 4. Special Use Zone - where services operate to monitor and protect the rainforest A management strategy was developed by local communities and with other representatives resulted in: * Hunting and logging for commercial gain is prohibited * Inhabitants receive environmental education and improved healthcare * Increased economic production from natural resources, ensure a sustainable future for those in the rainforest * Zoning and protection, resulted in an increase in the productivity of the forest and aquatic resources

CASE STUDY: Serengeti National Park and Ngorongoro Conservation Area, Tanzania (savanna grasslands) * The parkland occupies 2, 305, 100 ha,

known for herds of wildebeest, 1, 300, 000 * Endangered species, African elephant, perhaps only 2, 000 left * More than 500 species of birds e. g. flamingo * Populated by the Masai Mara, who have an extensive system of land management which requires large areas for the grazing of cattle and Mara's cultural code forbids the eating of wild animals, so biodiversity is protected History * Today over 52, 000 Masai Mara * 1980's, economic situation improved, tourism increased which allowed the park authorities to rebuild the infrastructure and to re-establish anti-poaching units * 90, 000 visitors a year, although tourism is managed sustainably-200, 000 animals are still illegally killed by poachers each year Management Buffer zones called community Wildlife Management Areas * Local people are encouraged and have legal rights to make decisions regarding the management of wildlife, hoping to curb illegal poaching * 36% of the population live below the poverty line has resulted in ever increasing pressure on existing resources * A new threat to the natural grasslands is the invasion of the non-native Mexican prickly poppy, rapidly takes over an overgrazed land crowding out native species * Tanzania is committed to protecting 42, 000km² of land, UK has 1/10 of the land protected The main aim is to preserve the country's rich natural heritage and to provide securing breeding grounds for its flora and fauna , safe from the conflicting interests of a growing human population The Sundarbans Reserved Forest, Bangladesh (tropical monsoon forest) Population pressure in Bangladesh is severe, large areas of the forest have been cleared to provide more space for agriculture and settlement e. g. 1000 inhabit every km² Threats A number of risks threaten the Sundarbans: * Climate change- sea levels are rising at 3mm a year, cause flooding of low

lying delta land * Abstraction of water-40% reduction in flow leading to increased salinity of the land and water * Deforestation-e. g. in the Himalayas leading to greater volumes of silt being deposited by rivers * 3 million people live in small villages * Fishing camps are a major disturbance in the area, with some illegal hunting and trapping of species e. g. turtles *Water pollutione. g. Khulna aquatic wildlife badly affected * Natural disasters e. g. 2007 a cyclone killed 3, 000 people and most of the larger trees were uprooted Flora and fauna

The Sundarbans consists of a vast network of rivers, mudflats and islands which are vegetated by mangroves(salt tolerant trees), act as natural buffers against storm surges and protect the land from tropical cyclones which occur during the summer monsoon season Endangered predators in this eco-region e. g. Royal Bengal tiger estimated at 350 Management * There are seven conservation areas, including three wildlife sanctuaries * Under the wildlife act of 1974 it is illegal to cultivate the land within the conservation areas or to introduce domestic animals * There is not enough staff or structures in place to enforce the law * The threats to the area require more cross border cooperation with India as well as financial support * Plans must include a high degree of local community involvement to allow sustainable use of the forest