



Pearson

International Advanced Level Geography

**Unit 3 Contested Planet
WGE03**

Topic A2: Biodiversity Under Threat

Topic Guide Booklet

Contents

Introduction.....	2
Topic A2: Biodiversity Under Threat	4
Enquiry question: What is the nature and value of biodiversity?	5
Enquiry question: What factors and processes threaten biodiversity?	10
Enquiry question: How can ecosystems and biodiversity be managed successfully?	18

Introduction

Unit 3: Contested Planet - Topic A2: Biodiversity Under Threat

This booklet has been written to support teachers and learners teaching and studying the International Advanced Level Geography qualification.

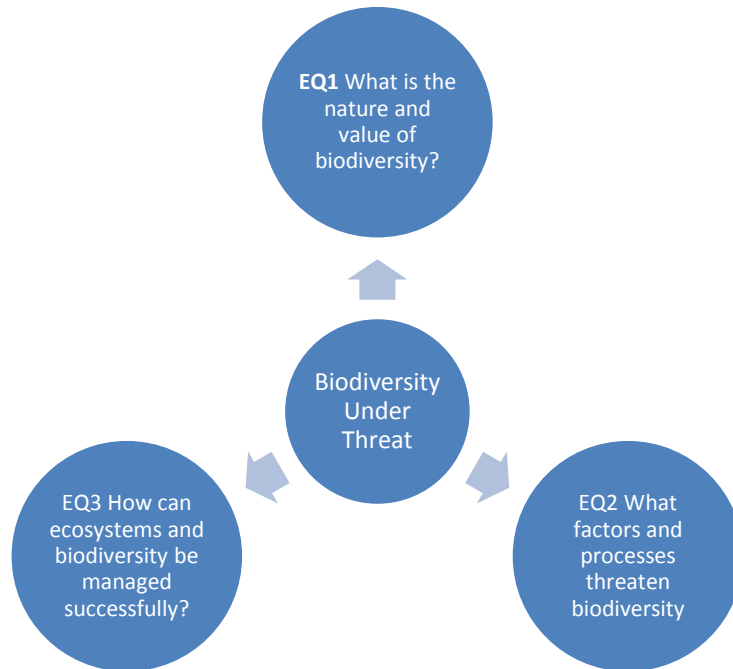
This guide should be used alongside other published teaching and learning materials available on the IAL Geography web page [here](#).

Videos / animations:

This Topic Booklet contains some links to videos and animations within YouTube. To view these without distracting comments and adverts being visible, copy and paste the URL into <http://viewpure.com/>

Big Picture Overview

The Biodiversity Under Threat topic consists of three Enquiry Questions which follow a logical sequence:



The focus progresses from a consideration of what biodiversity is, how it varies from place to place and why it should be valued, towards an understanding of the many threats that are degrading and destroying biodiversity – both at a global and local scale. Lastly detailed evaluation of different approaches to protecting, managing and conserving biodiversity is considered in Enquiry Question 3.

Assessment:

This Topic is assessed in Section A of Paper 3. In any given examination series there will always be:

- A 10 mark data stimulus question in Section A2.

There could also be:

- A 15 mark essay question on Biodiversity Under Threat in Section A2. This 15 mark essay is sometimes on the Biodiversity topic, but can also be on the Atmosphere and Weather Systems topic.

In addition:

- The Synoptic question, question 3, may have a Biodiversity focus. Remember that this 15 mark question can cover, and link together any of the topics from AS unit 1 and A2 unit 3 (topics A1 and A2) in any given examination series.

Topic A2: Biodiversity Under Threat

It may be worth discussing why biodiversity is a valid topic of study, as biomes and ecosystems may be unfamiliar to some students and young people's direct connection to them and experience of them is often limited.

Figure 1 shows the relationship over time between:

- **Ecological footprint:** the per capita demand for resources, measured in Global hectares (gha)
- **Biocapacity:** the ability of ecosystems to produce renewable resources.

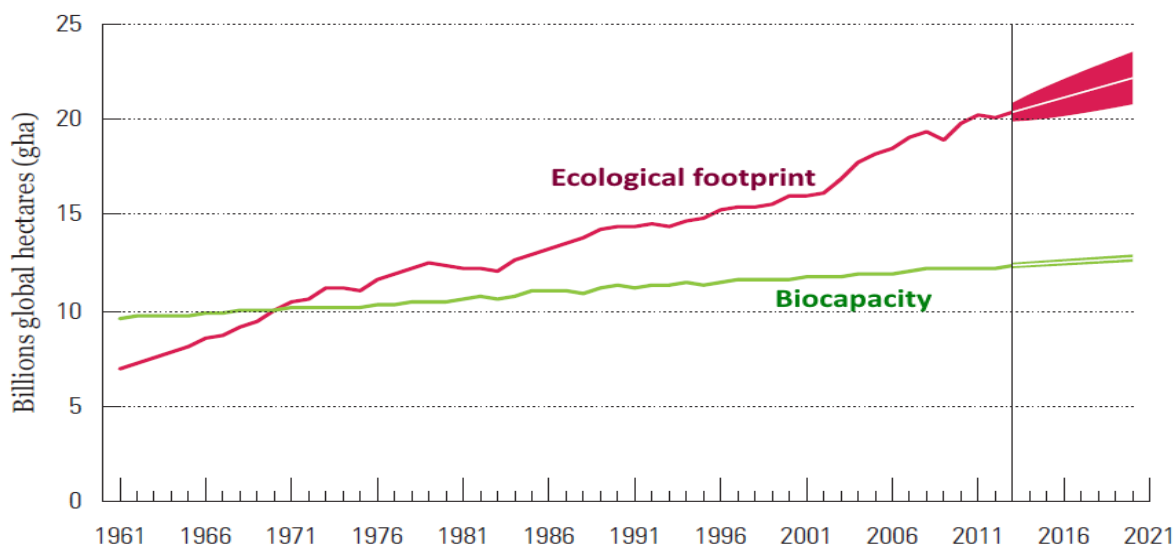


Figure 1: Biocapacity and ecological footprint

(http://awsassets.panda.org/downloads/lpr_living_planet_report_2016.pdf) © 2016 WWF)

Figure 1 suggests that biocapacity is rising slightly (due to modern farming's very high productivity; the biocapacity of biomes such as rainforests and coral reefs is declining). At the same time resource demand has risen (ecological footprint) rapidly. This suggests an increasingly 'unhealthy' planet. Around 1970, resource demand overtook biocapacity – a situation called 'ecological overshoot'. To get a clearer idea of what an ecological footprint is, use an online calculator with students: <http://footprint.wwf.org.uk/>

As the ecological footprint / biocapacity balance continues to decline the planet becomes less able to:

- Moderate the hydrological cycle by reducing flood risk and filtering water to provide a clean, reliable supply to humans.
- Balance the composition of the atmosphere, by absorbing carbon dioxide and releasing oxygen.
- Maintain healthy soils.
- Provide resources such as food – particularly true of fish from the oceans.
- Provide spiritual and cultural value, and places for recreation.

Humans are affected by declining ecosystem health and therefore the topic of biodiversity is an important one.

Biodiversity patterns

Enquiry question: What is the nature and value of biodiversity?

Defining biodiversity

Biodiversity refers to plant (flora) and animal (fauna) species found in ecosystems.

Ecosystems are:

- Communities of plants and animals (biotic) interacting with non-living (abiotic) components of their environment (air, water, soil) working as a natural system. The biotic and abiotic components are linked together through nutrient cycles and energy flows.

On a global scale, ecosystems are often referred to as **biomes**. Tropical rainforests in the Amazon, the Democratic Republic of the Congo (DRC) and Indonesia have similar abiotic components (soils, climate) and similar flora and fauna and therefore together constitute the 'tropical rainforest biome'.

Biodiversity can be defined in different ways (**Figure 2**).

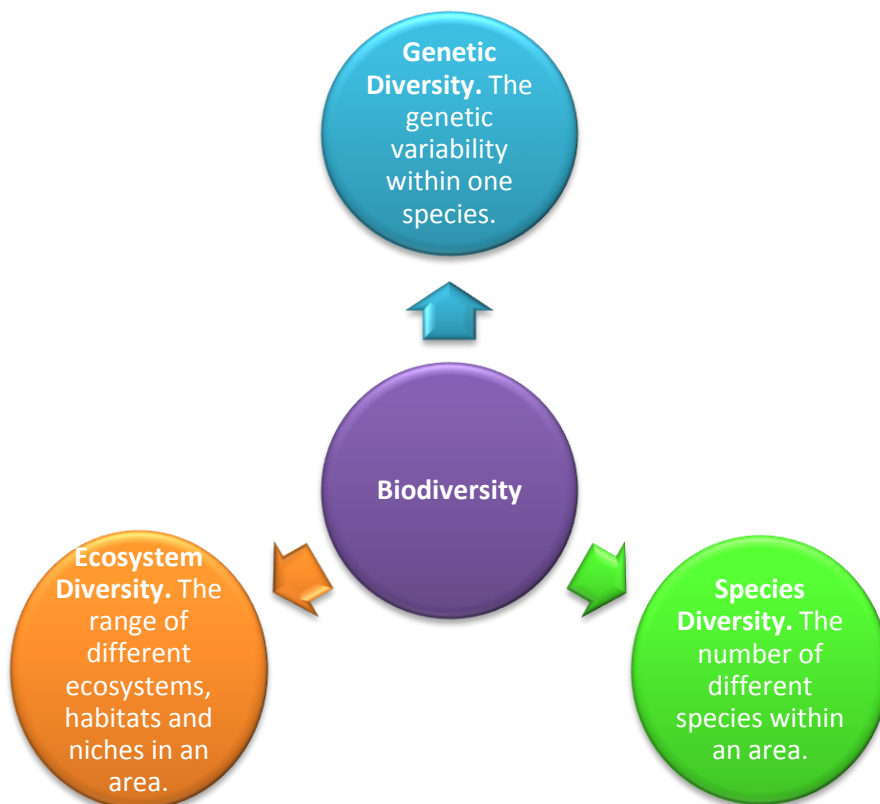


Figure 2: Three different definitions of biodiversity

Species diversity is the most common meaning of biodiversity. However, genetic diversity is an important concept. This is because species with a declining 'gene pool' can become dangerously unhealthy due to an inability to breed successfully, thus making extinction more likely.

High and low biodiversity

Levels of biodiversity, measured in terms of species diversity, vary enormously from place to place. Figure 3 shows this for part of the Asia-Pacific region.

In order to understand the *natural* pattern of biodiversity it is important to consider a world *before* significant human interference as shown on Figure 4. With this in mind:

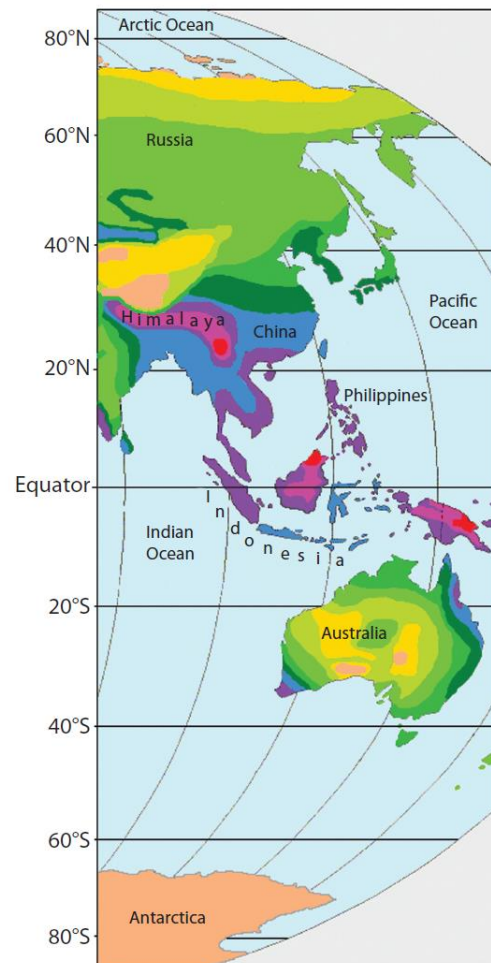
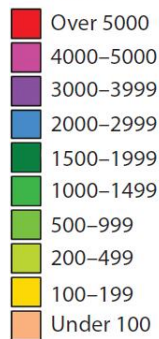
Climate limiting factors

Equatorial areas have high levels of warmth, sunlight and precipitation meaning year-round productivity, high levels of biomass and rapid plant and animal reproduction.

In tropical desert areas, lack of rainfall becomes a limiting factor in plant and animal growth so restricting biomass and biodiversity.

Towards the poles lack of sunshine and warmth are limiting factors, so biodiversity is low.

Number of plant species per 10,000 square kilometres:



(Source: Based on a map by W. Barthlott et al, University of Bonn)

Figure 3: Plant species per 10,000 square kilometers for part of the Asia-Pacific region

Isolation and endemism

Biodiversity is said to be high in 'highlands and islands'. Because islands are physically isolated, evolution often leads to new species and hence high (and unique or endemic) biodiversity. Mountainous, isolated areas can experience a similar process with the additional factor of altitudinal zonation: as temperatures, season length and precipitation levels change up a mountain side numerous different environments exist at different altitudes each with their own species types.

Area

Large areas, such as Australia, inevitably contain more species than small ones.

Age

Places that have remained relatively unchanged for millions of years, especially when physically isolated, will have experienced unique evolutionary processes and often have high biodiversity levels.

Today, **human interference** is an important factor. Urbanisation, expansion of farming, deforestation, pollution, tourism, mining and climate change can all destroy or degrade ecosystems and reduce biodiversity. These threats vary spatially. Humans can also protect biodiversity by conservation and preservation – but only very rarely can they restore lost biodiversity.

Biomes

Like biodiversity, the global pattern of biomes is determined by several factors, but latitude is the most important. Both temperature and rainfall vary according to latitude, and biomes types fall within temperature and precipitation zones as shown on **Figure 4**:

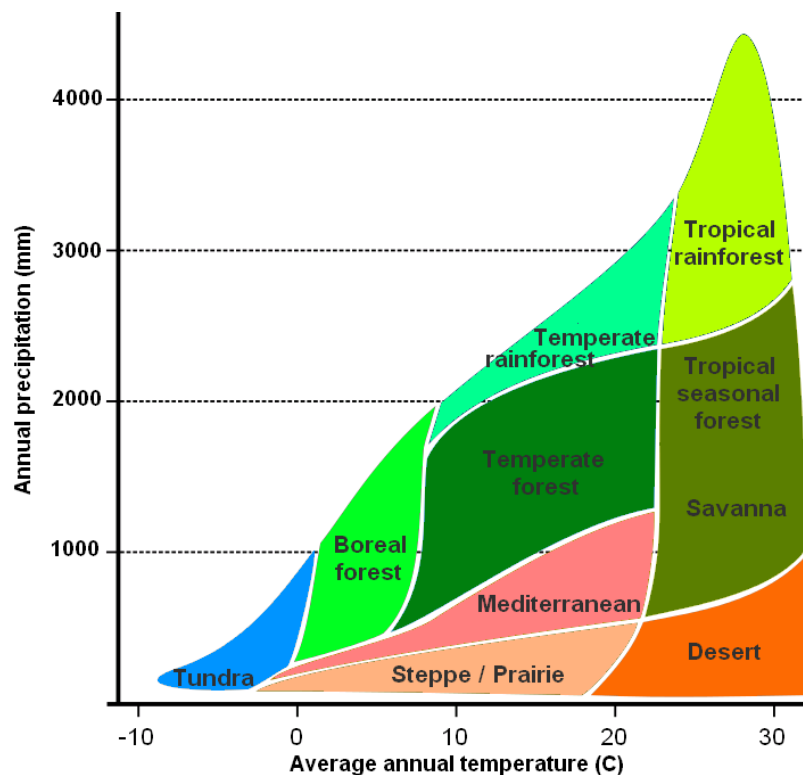


Figure 4: Biome temperature and precipitation zones

Biomes distribution conforms to latitudinal zones or belts north and south of the equator. This pattern is disrupted by local factors including altitude, soil type and local drainage (Figure 5) so that biomes are not found in all expected locations.

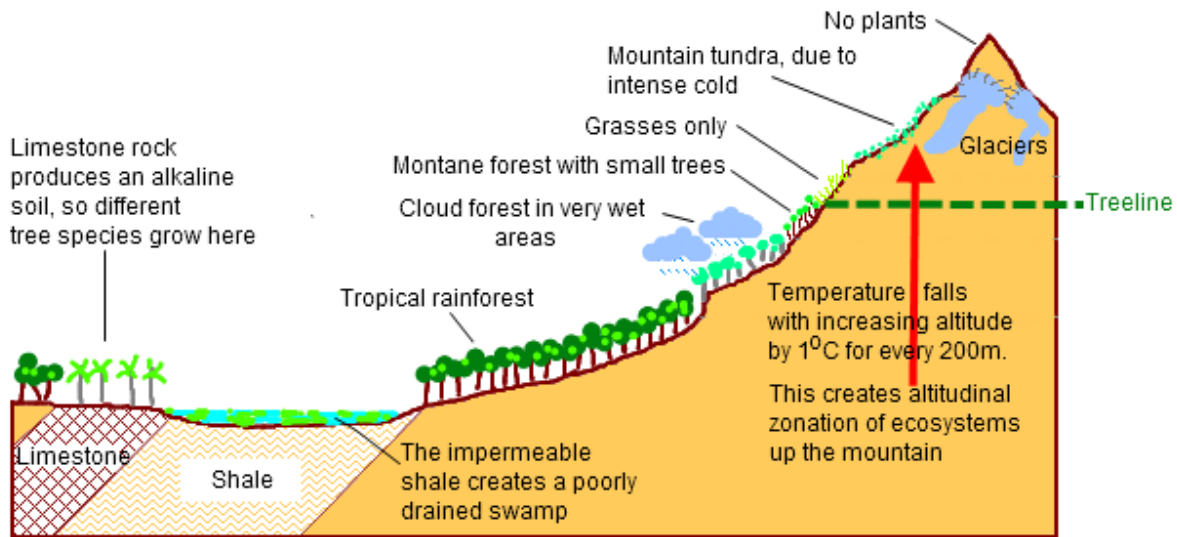


Figure 5: How local factors influence vegetation

Biodiversity hotspots

The concept of a biodiversity hotspot was originated by the ecologist Norman Myers in 1988. Biodiversity hotspots (**Figure 6**) are defined by two criteria:

- The area has to contain at least 0.5% or 1,500 endemic species of plants
- It has to be **threatened** by human activity and have lost 70% of its original vegetation.

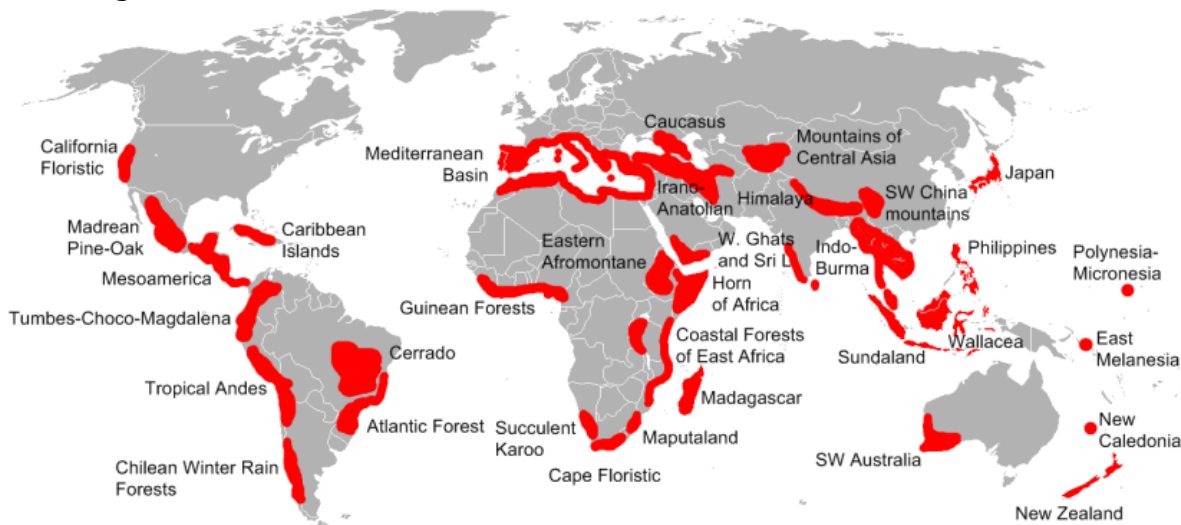


Figure 6: Biodiversity hotspots

It is important to note that not all areas with high biodiversity are 'hotspots' For instance, Amazonian is not one because the level of threat is not yet great enough. Hotspots are often found:

- In coastal areas, where there are high human populations and therefore numerous threats to biodiversity.
- Island locations, where the threat from alien species is high and endemic species are common due to evolutionary processes.

Over 50% of the world's plant species and 42% of all terrestrial vertebrate species are endemic to the biodiversity hotspots shown on Figure 5.

The value of ecosystem services

Several decades ago it was common to talk about ecosystem 'goods' and 'services', meaning:

- Goods: physical resources provided by ecosystems, used by humans.
- Services: benefits humans gain through the proper functioning of ecosystems.

Since the 2005 Millennium Ecosystem Assessment was published (<https://www.millenniumassessment.org/documents/document.356.aspx.pdf>), it has been much more common to talk of 'ecosystem services' and the term 'goods' has been replaced by the term 'provisioning services'.

It is important that students understanding ecosystem services are provided by intact or partially degraded ecosystems, not by ones that have been completely destroyed. For instance it would be wrong to say that destruction of a tropical forest for mining or urbanisation provides the 'service' of iron ore or land for housing.

Figure 7 is a summary of the 4 types of ecosystem service. For some of these, it may be possible to calculate a financial 'value' for the service: for instance the economic value of fuelwood, or African bushmeat. The cultural service of tourism from coral reefs or ecotourism in tropical rainforests might also be calculated for a place or country. However, the value of some other services is very hard to quantify such as spiritual value or the value of flood regulation.

Ecosystem services	
Supporting <ul style="list-style-type: none"> • Nutrient cycling • Soil formation • Primary production 	Provisioning <ul style="list-style-type: none"> • Food • Fresh water • Wood and fibre • Fuel
	Regulating <ul style="list-style-type: none"> • Climate regulation • Flood regulation • Disease regulation • Water purification
	Cultural <ul style="list-style-type: none"> • Aesthetic • Spiritual • Educational • Recreational

Figure 7: Ecosystem services

Another key concept is that ecosystem services operate at different scales, and have an importance at different scales:

- Climate regulation is of global significance, because ecosystems help regulate the amount of carbon dioxide in the atmosphere and maintain surface albedo; major destruction of ecosystems risks unbalancing the entire climate system.
- Flood regulation and water purification tend to be important at a sub-regional scale i.e. with a particular drainage basin such as the Amazon or Ganges.
- Food, fuelwood and spiritual value might be very important locally – to one group of people in a small area.
- In places with a low level of development, that rely on farming and the use of traditional materials, provisioning services may still be very important in everyday life (traditional medicines, water supply, bush meat, building materials etc.) whereas for the majority of people in the world this direct connection of gaining resources from ecosystems has been lost.

Attitudes to ecosystem services vary enormously, for instance:

- They might be revered and depended upon on a daily basis by the small number of remaining traditional indigenous groups in developing countries, and some developed countries (e.g. the Inuit)
- They are valued by scientists and environmentalists concerns about degradation of services and the impact of this on climate, water supply and food production.
- Western consumers are largely 'cut off' from ecosystem services and may simply never consider them as they consume resources.
- To businesses and TNCs, they may be seen simply as an economic opportunity i.e. there is greater value in removing an ecosystem for plantation farming, HEP or mining than there is in an intact natural ecosystem.

Threats to biodiversity

Enquiry question: What factors and processes threaten biodiversity?

This Enquiry Question should be studied drawing examples from ONE terrestrial biome, such as tropical rainforests, tropical grasslands (savanna) or temperate forests.

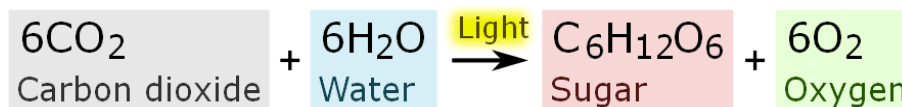
Ecosystem processes:

Two processes need to be understood:

1. **Energy flow** through an ecosystem as shown by food webs / food chains
2. **Nutrient cycles**, most often shown in the form of a Gersmehl diagram.

These twin processes are key to maintaining the health of ecosystems.

Energy in all ecosystems is fixed by green plants (primary producers) through the process of photosynthesis and this creates carbohydrate (sugar) which is the basis for the entire food web:

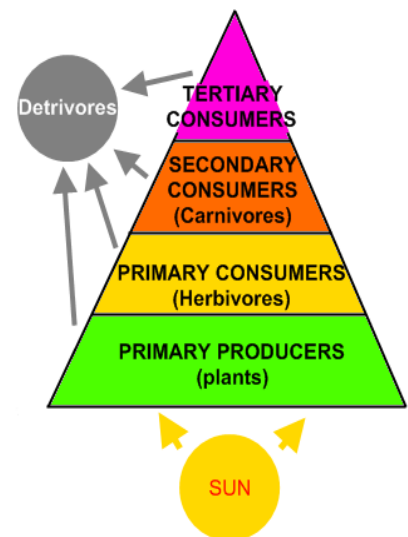


This means the health of an ecosystem depends on the health of the primary producers within it.

Energy then moves through an ecosystem's trophic levels (the position organisms occupy in a food web) from plants to herbivores, to carnivores, tertiary consumers (or top carnivores) and eventually to detrivores.

Energy flow can be considered as a simple food chain, but in reality ecosystems have complex food webs (see Figure 8). Food webs are very vulnerable to being degraded by a wide range of human processes such as:

- Hunting e.g. of large herbivores for meat, or carnivores in 'trophy hunting'
- Removal of plants through deforestation, conversion to farming or disease.



Any reduction in one group of organisms is likely to lead to a reduction in others, because the amount of energy available to higher trophic levels is reduced. A reduction in carnivore numbers can lead to an unstable increase in herbivore numbers, which then over-graze primary producers.

The introduction of **alien invasive species** can have devastating impacts of food webs. Deliberate or accidental introduction of species from another part of the world into an ecosystem often leads to a loss of native species. Alien species often have no natural predator in their new ecosystem, leading to ballooning populations at the expense of native organisms.

Successful alien invasive species tend to be: *capable of rapid reproduction, able to disperse, rapid growing, tolerate a range of environmental conditions, able to eat a wide range of foods.*
 Species such as rats, goats, the Chinese Mitten crab and Zebra Mussel are successful, and highly destructive.

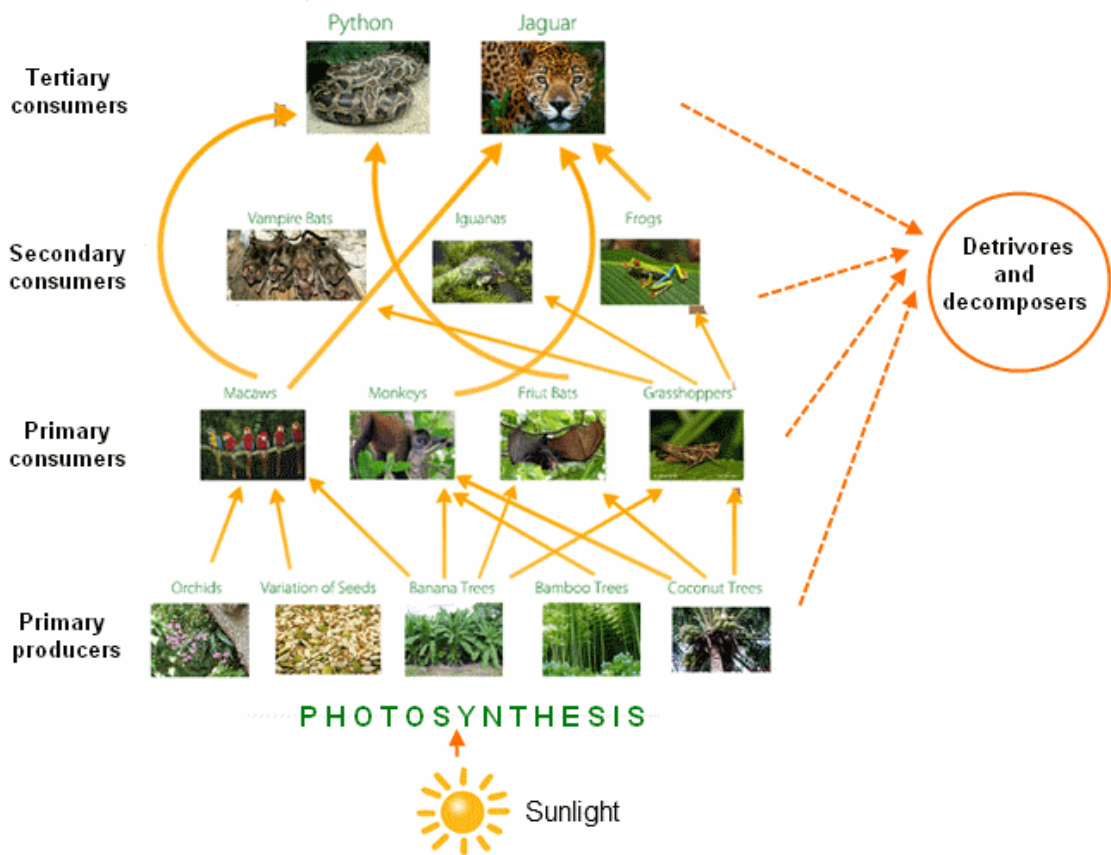
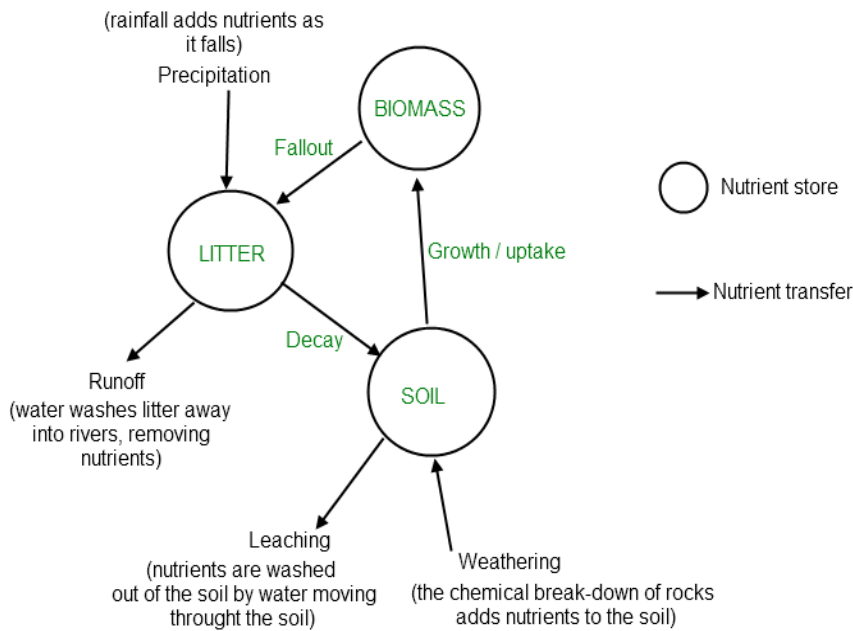


Figure 8: Example of a food web for a tropical rainforest



Nutrients include nitrogen, phosphorous, potassium and micronutrients that ecosystems need to be healthy. These chemical compounds are derived from the atmosphere (nitrogen) and rock / soil through weathering.

A **Gersmehl diagram** (see left) shows how nutrients are transferred around ecosystems via three stores. The size of stores and transfers in a nutrient cycle varies from ecosystem to ecosystems as shown in **Figure 9** for a tropical rainforest:

- Precipitation is high because rainforests typically get over 2500 mm each year.
- Because of the high precipitation, both runoff and leaching are high – so nutrients are being removed from the ecosystem.
- This is balanced by high nutrient input from weathering, made possible by the hot, wet climate promoting chemical weathering of rock.
- The growth transfer is large because growth is year-round in perfect conditions i.e. hot and wet; this also explains the large decay transfer to the soil because bacterial decay is rapid.
- Most nutrients are stored in the biomass (think of the multiple, complex layers in a tropical rainforest).
- Soil and litter stores are small because rapid decay and growth mean any available nutrients quickly move around the system into new biomass.

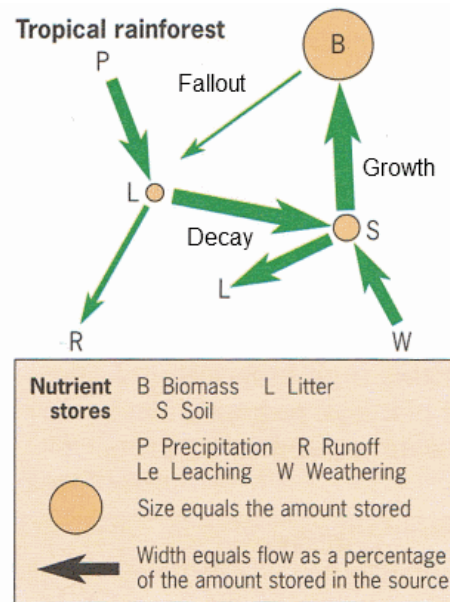


Figure 9: Tropical rainforest nutrient cycle

Local and global threats

There are numerous threats to ecosystems. Some threats might be described as 'context' threats because they are **global** in scale and threaten all ecosystems to some extent. These include:

1. **Climate change:** if, by 2100, the world's climate is between 2°C and 5°C warmer, this will mean disaster for some ecosystems such as the Arctic tundra and coral reefs, and place

huge stresses on other such as forests and grasslands through increased risks from drought, fire, the spread of alien species and desertification.

2. **Resource demand:** if global population increases towards 10 or 11 billion by 2100 then demand for land, farmland, water, minerals and ores will almost inevitably lead to ecosystem loss as the space humans require encroaches upon ecosystems.

3. **Affluence:** In 2017 the average global income per capita was around \$8000, up from around \$2000 in 1970. If global average incomes continue to grow, then so will per capita demand for resources (fossil fuels, minerals and ores, food) and this will increase pressure on ecosystems in terms of both exploitation and pollution.

Local threats are often related to economic development. As countries and regions develop ecosystems often suffer as habitats are degraded or destroyed. **Figure 10** shows the relative size of threats to ecosystems on a global scale, in 2016. Some of the threats of **Figure 10** are global (climate change) but most are local.

- Ecosystems are removed to make way for urbanisation (houses, roads, industry) as countries develop.
- The spread of farmland into forests and grasslands degrades ecosystems as some areas are destroyed, but the areas left intact are small and fragmented – unable to support large carnivores.
- Increasing levels of air and water pollution affect the health of ecosystems by increasing the incidence of disease, reducing the effectiveness of reproduction and directly killing some organisms.
- If areas are opened up to tourism, pollution and ecosystem disturbance increase.
- Rising populations increase the demand for food, leading to over-hunting and over-fishing.

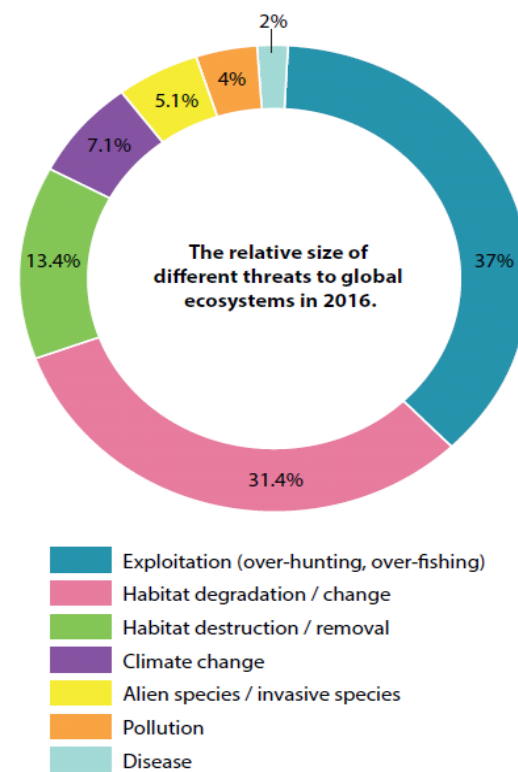
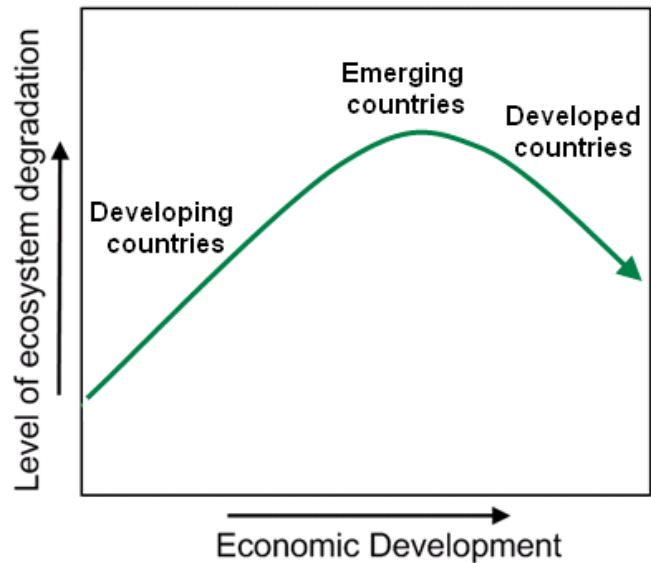


Figure 10: Relative size of ecosystem threats in 2016

Environmental Kuznet’s curve

It’s not all bad news for ecosystems. The Environmental Kuznet’s curve model (**Figure 11**) suggests that as countries develop economically, attitudes to ecosystems change.

- In developing countries ecosystem impacts are likely to be fairly small, as 80% of people are often engaged in farming.
- As countries industrialise, ecosystem degradation increases rapidly: air, water and land pollution, deforestation, mining and building modern infrastructure.
- Emerging countries have the most serious levels of degradation.
- As countries become fully developed, attitudes change because people have the time and money to enjoy natural areas, are educated in environmental issues and begin to value a healthy environment more than rapid increases in wealth. Thus ecosystem protection and conservation increase.



There is evidence to suggest this transition is real. **Figure 12** shows deforestation rates in the Amazon 1988 to 2013. These fell sharply after 2004 and have remained low, for several reasons:

- The Brazilian government was concerned about the 'image' of Brazil as host to the 2016 Olympics and 2014 World Cup
- As wealth and education levels have improved, Brazilians themselves have pressed their government for action to stop deforestation.
- Brazil's economy increasingly relies on services and advanced industry, not on exporting raw materials from the Amazon Basin.

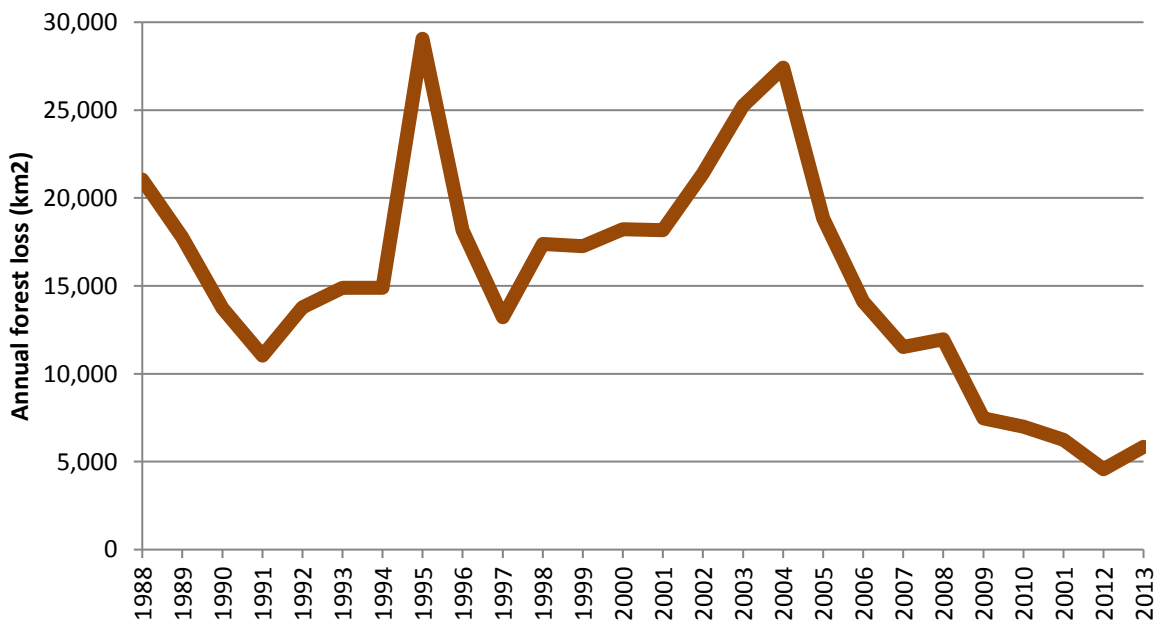


Figure 12: Rates of deforestation in Amazonia

There are some reasons to suggest the Environmental Kuznet's curve model might be a bit of a 'smoke screen'. Countries like the UK have protected huge areas of land as National Parks and conservation areas, but on the other hand might be accused of simply 'exporting' their environmental degradation to other countries. Emerging countries now produce the goods and much of the food that the UK once produced.

Attitudes to the environment vary around the world. **Figure 13** shows some results from a Pew global attitudes research question from 2014 (<http://www.pewglobal.org/2014/10/16/greatest-dangers-in-the-world/>). This asked people in many different countries what they thought was the greatest danger facing the world. In **Figure 13**, the issue scoring the highest percentage has been coloured for each country.

In developed countries there is often a focus on **iconic species** such as Pandas, Snow Leopards, whales and elephants rather than **keystone species** (species that are considered disproportionately important to maintaining the health of their ecosystems) such as bees and kelp which scientists might consider more important in terms of overall ecosystem health.

	Religious & ethnic hatred	Inequality	AIDS & other diseases	Nuclear weapons	Pollution & environment	<p>Figure 13 Pew global research, 2014</p> <p><i>"Which of the five dangers is the greatest danger facing the earth?"</i></p> <p>Notice that most of the countries choosing Pollution & Environment as the greatest threat are emerging countries, especially in Asia which are industrializing and arguably placing financial gain above environmental concerns and conservation – at least at the present time.</p> <p>Developing countries like Uganda, Senegal, Tanzania and Kenya tend to identify disease as the biggest threat. Is this because ecosystems are relatively intact, and</p>
Thailand	11%	29%	13%	9%	36%	
Colombia	8%	17%	15%	22%	36%	
Peru	7%	12%	22%	23%	35%	
Philippines	11%	22%	14%	19%	34%	
China	9%	14%	13%	26%	33%	
Vietnam	9%	13%	22%	21%	32%	
South Korea	11%	32%	2%	26%	29%	
Mexico	11%	19%	17%	26%	26%	
Italy	15%	32%	6%	20%	25%	
Argentina	12%	32%	12%	17%	25%	
Bangladesh	30%	16%	11%	19%	22%	
Chile	8%	27%	12%	30%	22%	
Venezuela	8%	16%	24%	29%	21%	
Japan	16%	12%	2%	49%	20%	
France	32%	32%	5%	14%	17%	
UK	39%	25%	4%	14%	16%	
Malaysia	32%	13%	12%	22%	16%	
U.S.	24%	27%	7%	23%	15%	
India	25%	22%	10%	19%	14%	
Greece	10%	43%	9%	23%	14%	
Germany	32%	34%	1%	19%	13%	
Russia	27%	19%	10%	29%	13%	
Indonesia	26%	18%	22%	18%	13%	

Brazil	19%	19%	20%	28%	13%	<p>other human concerns are much more pressing?</p> <p>Developed countries seem to focus on inequality and religious and ethnic hatred, or the issue of nuclear weapons. Is this because these countries have a relatively good natural environment and have already conserved what is left of their ecosystems?</p>
Ghana	17%	25%	20%	22%	13%	
Poland	14%	32%	9%	28%	13%	
Israel	30%	23%	8%	27%	12%	
Egypt	34%	27%	14%	12%	11%	
Ukraine	23%	15%	12%	36%	11%	
Spain	14%	54%	5%	17%	9%	
South Afr.	12%	29%	35%	10%	9%	
Uganda	7%	20%	44%	21%	8%	
Tunisia	39%	18%	10%	25%	7%	
Turkey	29%	17%	10%	34%	7%	
Senegal	27%	13%	28%	23%	7%	
Nigeria	38%	18%	7%	31%	4%	
Tanzania	25%	12%	41%	16%	4%	
Kenya	24%	17%	29%	24%	3%	

Managing biodiversity

Enquiry question: How can ecosystems and biodiversity be managed successfully?

Sustainable yield

The concept of sustainable yield can be used to determine the safe level of exploitation of an ecosystem. Ecosystems can be exploited by humans, to some extent, without causing serious damage. Examples include:

- Taking some timber out of forests.
- Hunting or catching fish.

As **Figure 14**, shows:

- The **Maximum Sustainable Yield** for a species / ecosystem is the level at which utilisation by humans does not lead to long term decline in species numbers.
- In reality, taking the **Maximum Sustainable Yield** leaves no room for error (or climate change, disease etc.) and even a very small amount of exploitation above this leads to long term damage.
- The **Optimum Yield** is lower, and safer in terms of long term sustainability.
- If ecosystems are exploited above the **carrying capacity**, they will quickly degrade towards complete collapse.

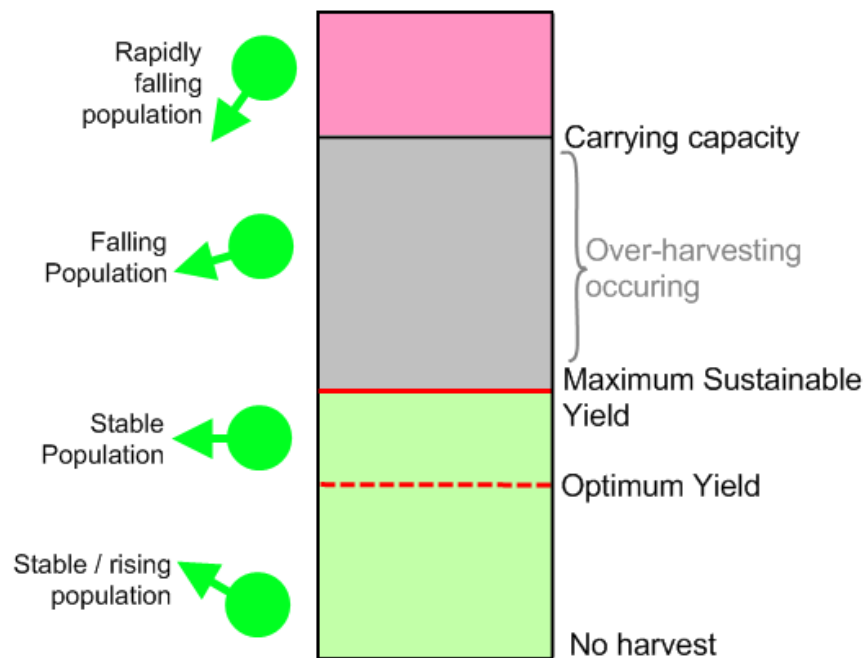


Figure 14: Sustainable yield for an ecosystem.

Players

Perhaps the key players in ecosystem management are the scientists and researchers that recommend levels of sustainable yield, track the health of ecosystems and suggest ways in which ecosystems should be managed. There are many other players that have a role in management:

International organisations	Individuals	NGOs and interest groups	Governments
UNESCO, UNEP	Sting, Al Gore, David Attenborough	Greenpeace, WWF	UK (local and national)
Different arms of the UN are responsible for CITES (Page 21), World Heritage Sites and helped with the Millennium Ecosystem Assessment. Global treaties, scientific research and monitoring are important aspects of their work.	Certain individual campaigners have the ability to reach a global audience and push for change.	Some NGOs, like WWF or The Nature Conservancy help manage conserved areas. Others like Greenpeace, campaign to keep issues in the media, and lobby governments and IGOs.	Government policy is crucial to ecosystems conservation and preservation of biodiversity. Governments implement and police treaties like CITES and set up and run National Parks and other conservation areas.

We should also consider players such as TNCs that explore for and exploit natural resources, and also consumers who buy products and make choices about what they buy. There is inevitably **conflict** between different players about managing ecosystems and biodiversity, because the attitudes and priorities of players varies so much.

Conservation strategies

There is much conflict over how best to conserve ecosystems and biodiversity. Some of this focuses on the question of what to conserve. There are not enough financial resources to protect all biodiversity, so decisions need be taken in terms of 'what' and 'where':

ICONIC species Raising money for Pandas, Tigers and Chimps is relatively easy, but how important are they at a global level?	OR	KEYSTONE species Species such as Bees, the pollinators of numerous plants, are crucial but hard to 'sell' to a wary public.
HOTSPOTS Hotspots are clearly under threat and very biodiverse; they would yield a lot of conservation per \$ spent, but many areas (like the Arctic) are not biodiverse enough to qualify.	OR	ECOREGIONS Ecoregions are large areas, like Amazonia; conserving them would achieve a great deal, but would be expensive and difficult to police and monitor. Ecoregions fit the 'single large' rather than 'several small' model which would allow species to shift due to climate change.

Single large of several small?

A key argument for conserving large 'ecoregions' is that if climate changes in response to global warming, animal and plant species may be able to move to a new location within a very large conservation area i.e. move into an area that still has a suitable climate.

Many small conservation areas would not allow this.

However, large ecoregions could cross political borders, contain large human populations and be difficult and expensive to manage. Managing small conservation areas is easier – but probably won't save species from the threats they face.

Then there is the question of which strategy to use to conserve biodiversity. In most parts of the world, conservation strategies need to take account of people who live in, or near, the area to be conserved. Conservation is easier in unpopulated locations, but there are very few of these.

In populated places a balance needs to be struck between the needs of conservation and the economic and social needs of people – in reality this is a very difficult thing to achieve.

Figure 15 shows the range of strategies available.

Total Protection	National Parks	Sustainable Reserves
Used in locations with no, or a very small human population. Almost all activities are restricted or banned, and the focus is entirely on conservation.	Used in areas with high visitor numbers but significant areas of wilderness. Policies usually allow human activity in some areas (often called 'honeypots') but attempt to limit access and activities in others.	Used in areas where people still depend on the land directly for farming and hunting. Often the focus is on educating people to use resources in a more sustainable way, and developing alternative income streams to logging, illegal hunting etc.

Figure 15: Local conservation strategies

Many conservation areas, such as National Parks and Sustainable Reserves, follow the principles of UNESCO Biosphere Reserves (**Figure 16**).

- Biosphere reserves use the principle of **zoning** to conserve core ecological areas, whilst allowing some economic development – such as eco-tourism or managed hunting or logging.
- Educating local people to conserve resources for future generations is important.
- Biosphere reserves usually have scientific research and monitoring activities too.
- Famous locations such as the Galapagos and Komodo National Parks use elements of the biosphere reserve model.

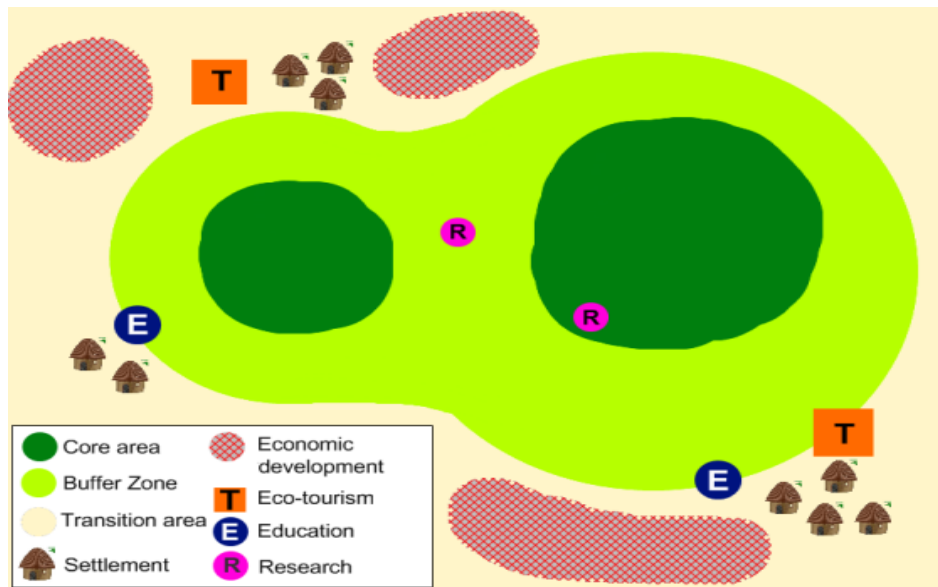


Figure 16: The UNESCO Biosphere Reserve model

Many local conservation strategies exist alongside global ones. Biodiversity Action Plans (BAPs) were begun in 1992 as part of the UN Convention on Biological Diversity, although only a few countries have fully developed them.

Most BAPs contain:

- A detailed inventory of existing biodiversity.
- An assessment of the conservation status of species i.e. threatened, endangered.
- Targets for conservation.
- Budgets and management structures.

A very well-known global approach is CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora

- In force since 1975.
- Signed by 180 countries.
- Protects about 34,000 species of animal (5,000) and plants (29,000).
- Appendix 1 species (about 1,200) are the most threatened and heavily protected e.g. Red Panda, most Rhino species, tigers, chimps.
- Bans / restricts cross-border trade in CITES listed species.

CITES has a number of advantages and disadvantages:

Advantages	Disadvantages
Many countries have signed up; countries co-operate on trade.	Protects species , not ecosystems , so does not prevent deforestation. Global Warming could undermine its successes.
Protected species include a wide variety of species geographically and by type.	Relies on countries putting in place / funding their own monitoring and policing systems.
Some key successes e.g. reducing the ivory trade and halting the decline of African Elephants.	Species have to be under threat to even get ' <i>on the list</i> ' by which time the problem may be too serious to solve.
Works well for high profile ' cute and cuddly ' threatened species e.g. Snow Leopard.	Economic interests get in the way e.g. failure to protect Blue Fin Tuna and many shark species.

The most extreme ways to conserve biodiversity are ex-situ conservation and ecosystem restoration.

- **Ex-situ conservation** usually involves zoos. Plants and animals are kept, and bred, outside of their natural habitat. In some cases, this may be the only way to ensure the survival of a species, but it can be seen as a failure to protect the species 'in the wild'. Long-term, the aim is often to **reintroduce** species to their original habitat – but this of course assumes the original threats have also been removed.
- **Ecosystem restoration** means repairing a damaged habitat and restoring it to health. There are few examples of this working, because it is both long-term and very expensive. One famous example is Florida's Kissimmee River.
<http://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/Kissimmee-River-Restoration/>

The future

UNEP's GEO-4 Project (2007) identified 4 possible futures for biodiversity and ecosystems (below) which are worth thinking about in the context of:

- Rising human population.
- Increased affluence and resource demand.
- Global warming.

Although these contexts may seem negative, there are others which are more positive:

- Increased global awareness of environmental issues, and the power of the internet and social media to force change and spread knowledge.
- Global cooperation on some issues, such as the COP21 Paris climate agreement in 2015.
- New technology, which might lead to rapid switching from fossil fuels to renewable energy.

<p>Markets First Profit driven future, playing lip-service to sustainability. Continued degradation of biodiversity. This is a future much like the past.</p>	<p>Policy First A greater balance between human and ecological wellbeing, but humans are put first by short-term policymakers and ecosystems that are protected only when possible.</p>
<p>Security First 'Me First' – the focus is on maintaining the wealth of the few in a very unequal world; IGOs like the UN are viewed with suspicion; the environment is there to be exploited.</p>	<p>Sustainability First Equal weight is given to human and ecological wellbeing, and thinking is long-term to gradually recover lost ecological ground.</p>