

CLIMATE CHANGE & BIODIVERSITY

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Impact Of Climate Change On Biodiversity

Hotter temperatures & desertification lead to loss of habitat, food & water shortage

Populations of mammals, birds, amphibians, reptiles and fish studied have seen an average global decline of 69 per cent since 1970.

Species loss 1-2%

What Is Biodiversity?

Biodiversity is all living things on Earth & how they are interconnected (animals, plants...)

Why Is It Important?

We rely upon biodiversity for food, clean air and water

Lower biodiversity makes the world less resilient to climate change

What Is An Ecosystem?

An ecosystem is a geographic area where plants, animals, weather & landscape, work together to form 'a bubble of life'

Global Response

Do nothing & allow nature to recover slowly

Introduce wild life parks, zoos & various other schemes for protected species

International Framework Agreement to reduce species loss & extinction - UN Biodiversity Conference, Montreal 7-19 Dec 22

UK Response

The UK Environment Act 2021

THE IMPORTANCE OF BIODIVERSITY

Biodiversity & healthy ecosystems maintain the supply of resources & services on which life depends (Food, Clean Air & Water...)

Importance Of A Biodiverse Planet

The Importance of Biodiversity



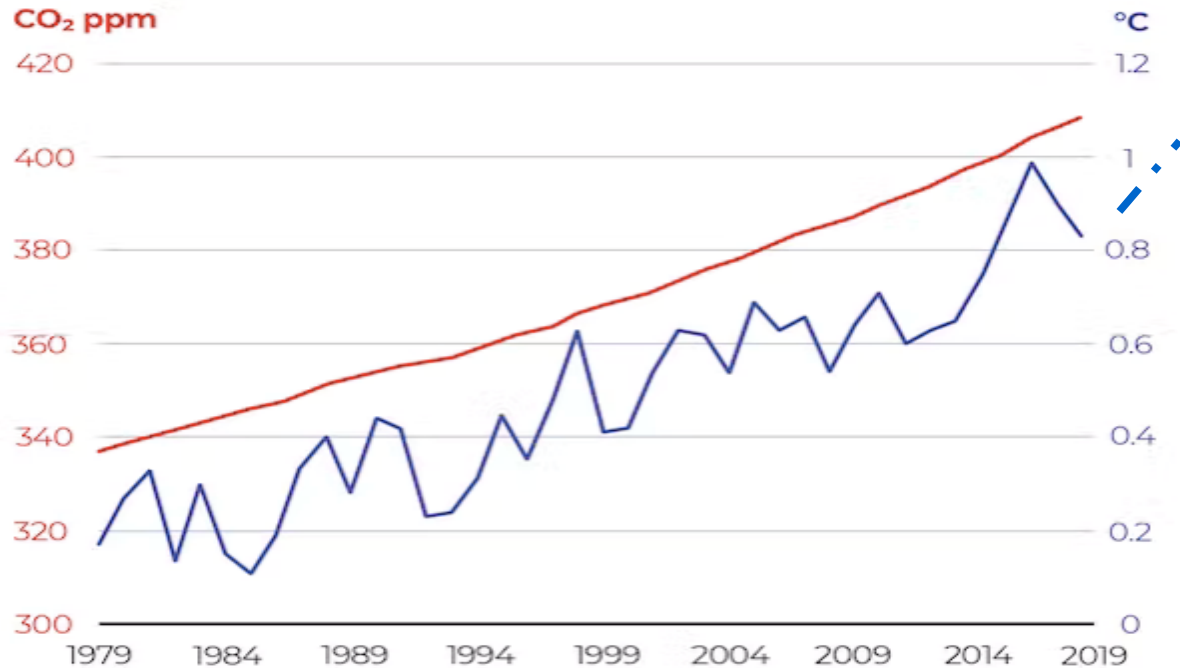
How is this related to climate change?

THE WORLD IS GETTING HOTTER

Global rise in CO₂ & methane emissions

Our climate over the last 40 years

Annual mean CO₂ emissions (ppm, from Mauna Loa observatory) versus global mean surface temperature anomaly (°C, NASA), 1979-2019.



Source: Author provided

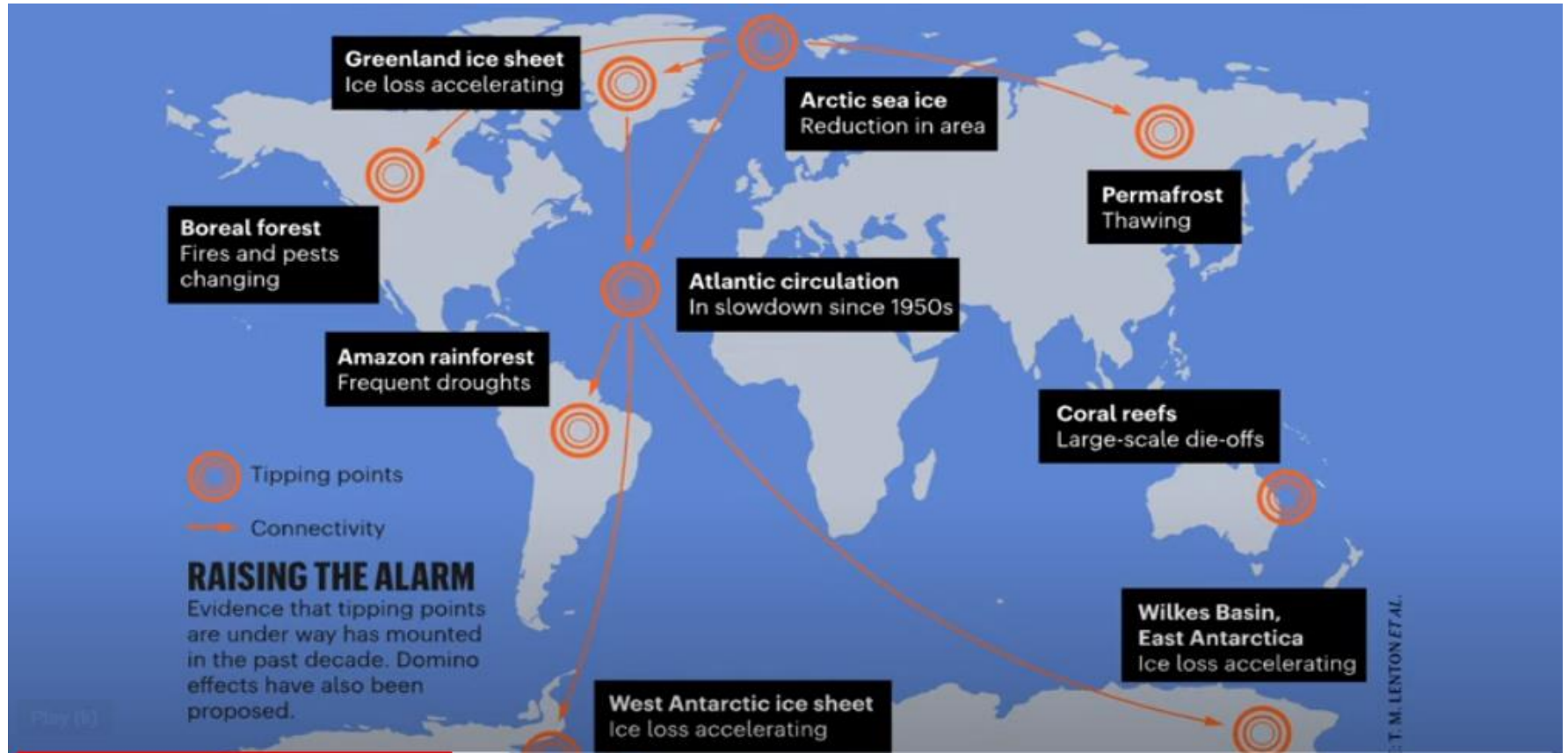
Author provided/The Conversation, CC BY-ND

Temperatures predicted to rise by 2.6 – 2.9°C by 2100
Unless there are major policy changes worldwide

ACCELERATED CLIMATE CHANGE

Tipping Points are rapid & irreversible changes in the climate system

Arctic ocean warming affects other tipping points



This produces a domino effect where tipping points are triggered one after the other

4 Tipping Points already passed at 1.2C

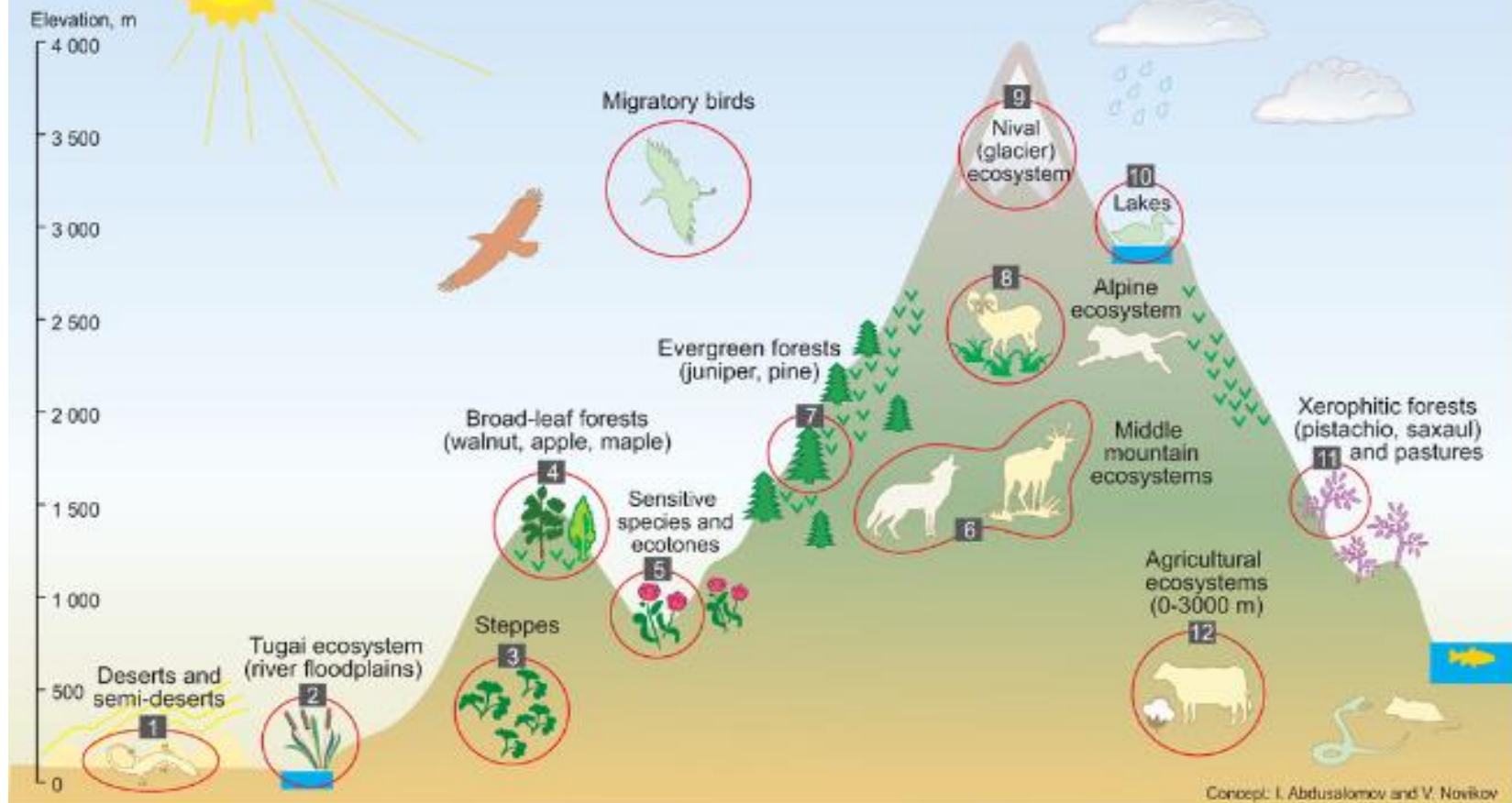
A 3C WORLD 2100+

As the planet warms changing rainfall patterns, desert expansion, extreme weather, ocean acidification, diminished food supply puts pressure on all species



These climate changes are producing large losses in biodiversity

Climate change impact on ecosystems



1 - Increased climate aridity, expansion of desert areas

2 - Ecosystem degradation due to reduced river flow, increased risk of fires and diseases

3 - Increased ecosystem productivity in northern parts of Central Asia, northward shift of vegetation

4 - Forest degradation due to reduced runoff, increased risk of droughts and diseases

5 - Changes in species composition, risk of extinction of endangered and vulnerable species

6 - Alteration of food-chains, change in the balance of predators and herbivorous animals

7 - Shift of forest communities to higher altitudes, risk of fires

8 - Degradation and reduction of habitats, reduction of forage

9 - Glacier melt and vegetation succession, alpine habitat loss

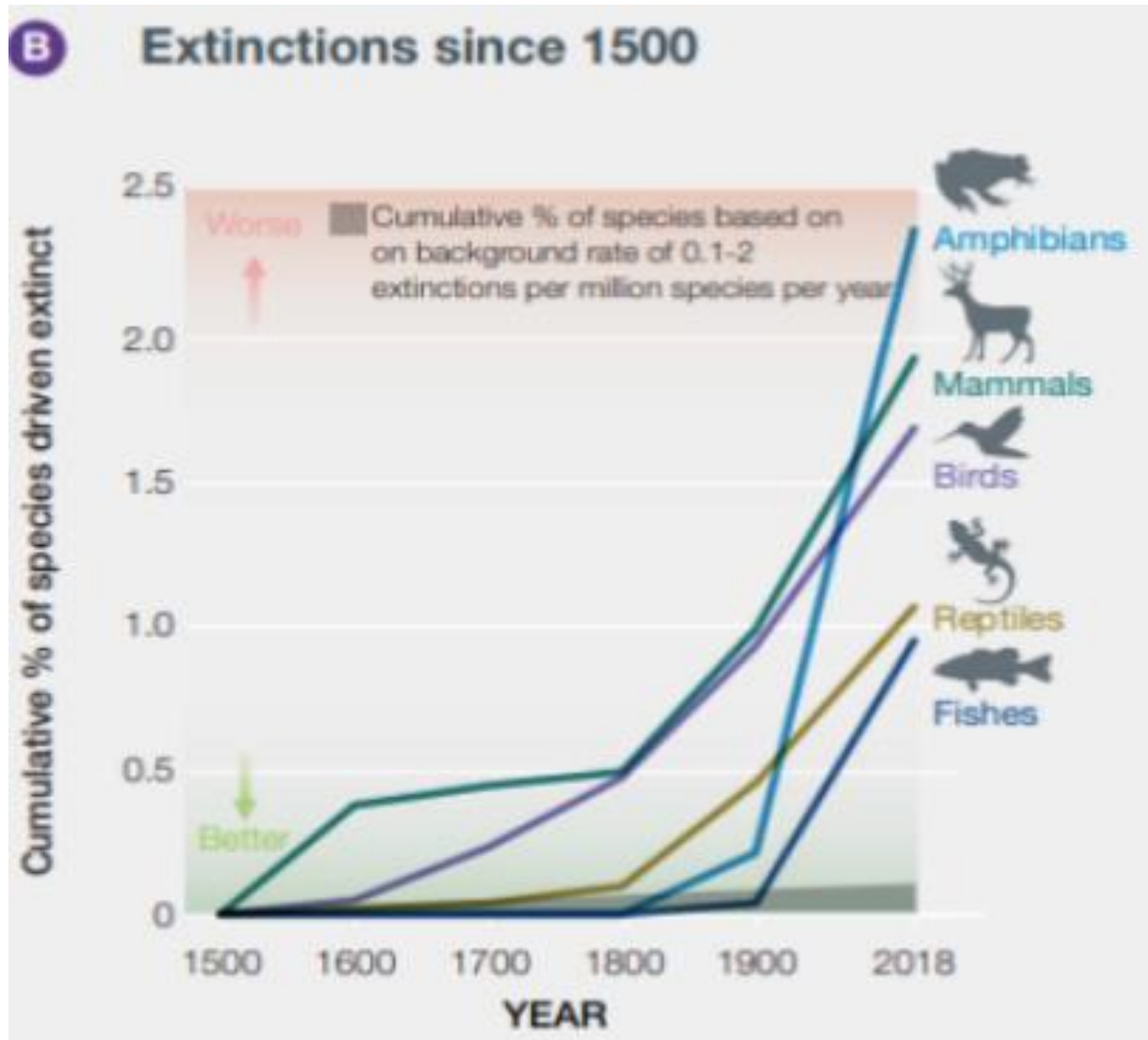
10 - Physical and biological changes in high mountain lakes

11 - Changes in phenology (earlier ripening, fading), pest attacks

12 - Mixed negative and positive effects of climate warming

SPECIES EXTINCTION

Climate change, habitat loss & pollution



These species are lost forever

SPECIES EXTINCTION HISTORY

Background extinction rate is normally 1-5 species per year

Scientists estimate we're losing species at 1,000 to 10,000 times the expected rate

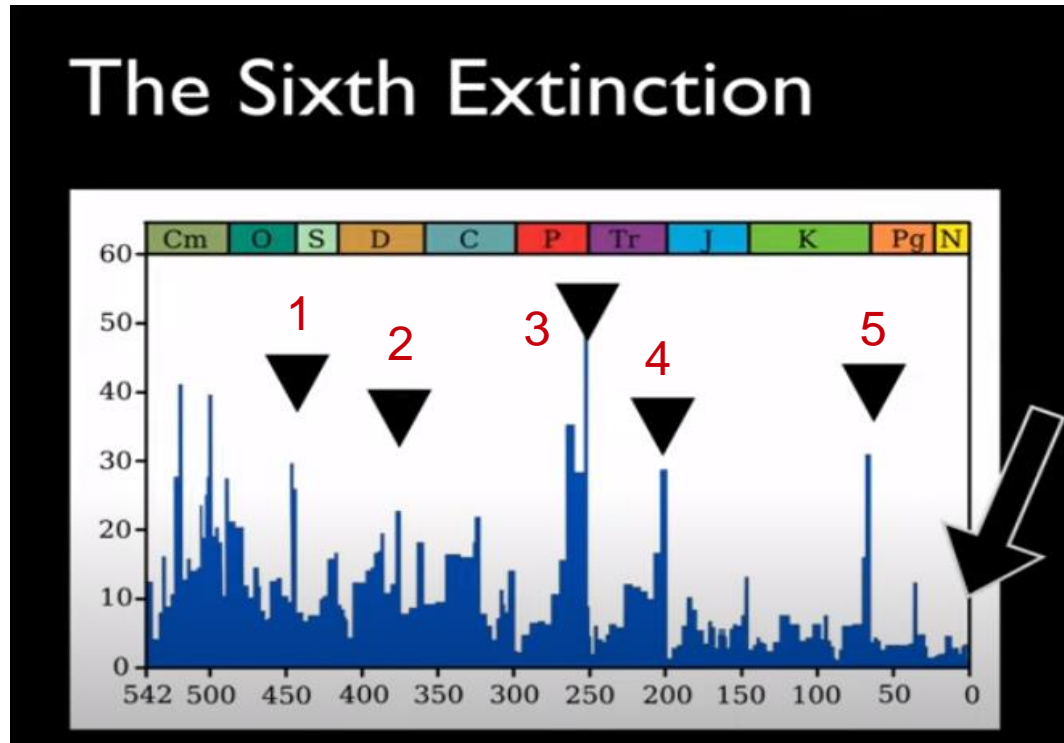
30 percent of species are heading toward extinction by 2050 - 2100



Species

1-5th Extinction

Volcanoes
Asteroids



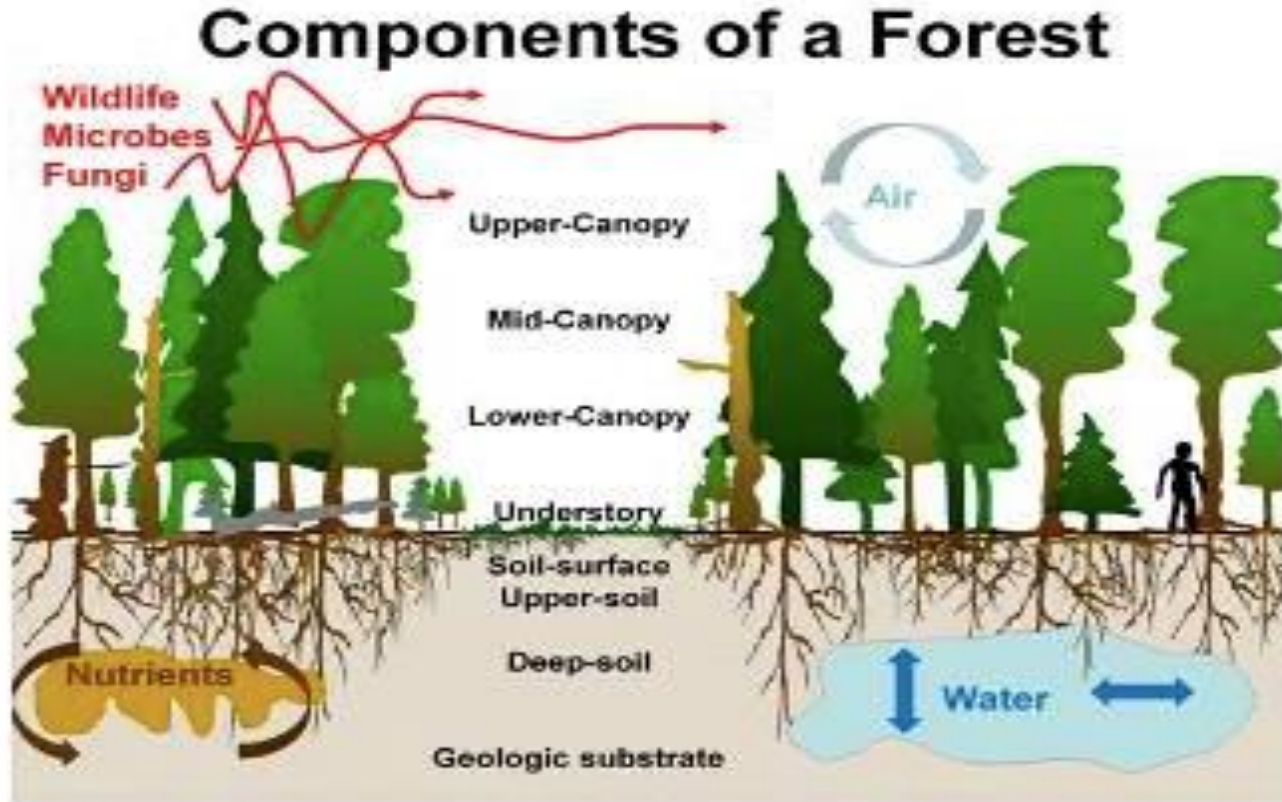
6th Extinction

Man made

Millions Years →

NATURAL ECOSYSTEMS MUST BE SELF SUSTAINING

CO₂ absorption and conversion by photosynthesis in plants -> plant decay
-> storage of carbon & moisture in soils -> further plant growth

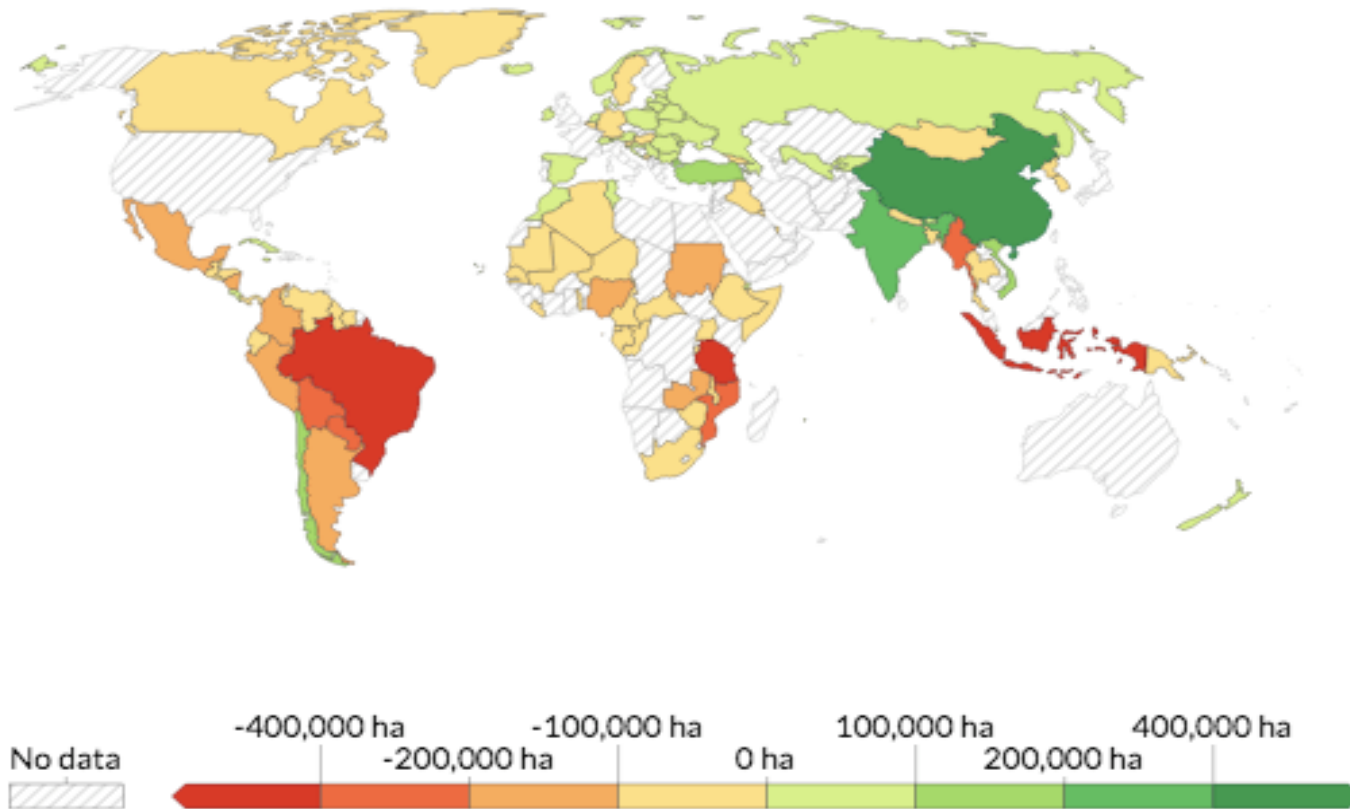


Rising temperatures release of carbon & water from the soil makes it less productive

Annual change in forest area, 2015

Net change in forest area measures forest expansion (either through afforestation or natural expansion) minus deforestation

World



Source: [UN Food and Agriculture Organization \(FAO\). Forest Resources Assessment.](#)

Annual tree loss increased from 13.4 million hectares per year in 2001 to 25.3 million hectares in 2021 due to deforestation & dryer conditions due to desertification

OVER HARVESTING

Many wild species are being harvested unsustainably, putting food security at risk
Fishing, Hunting, Logging...



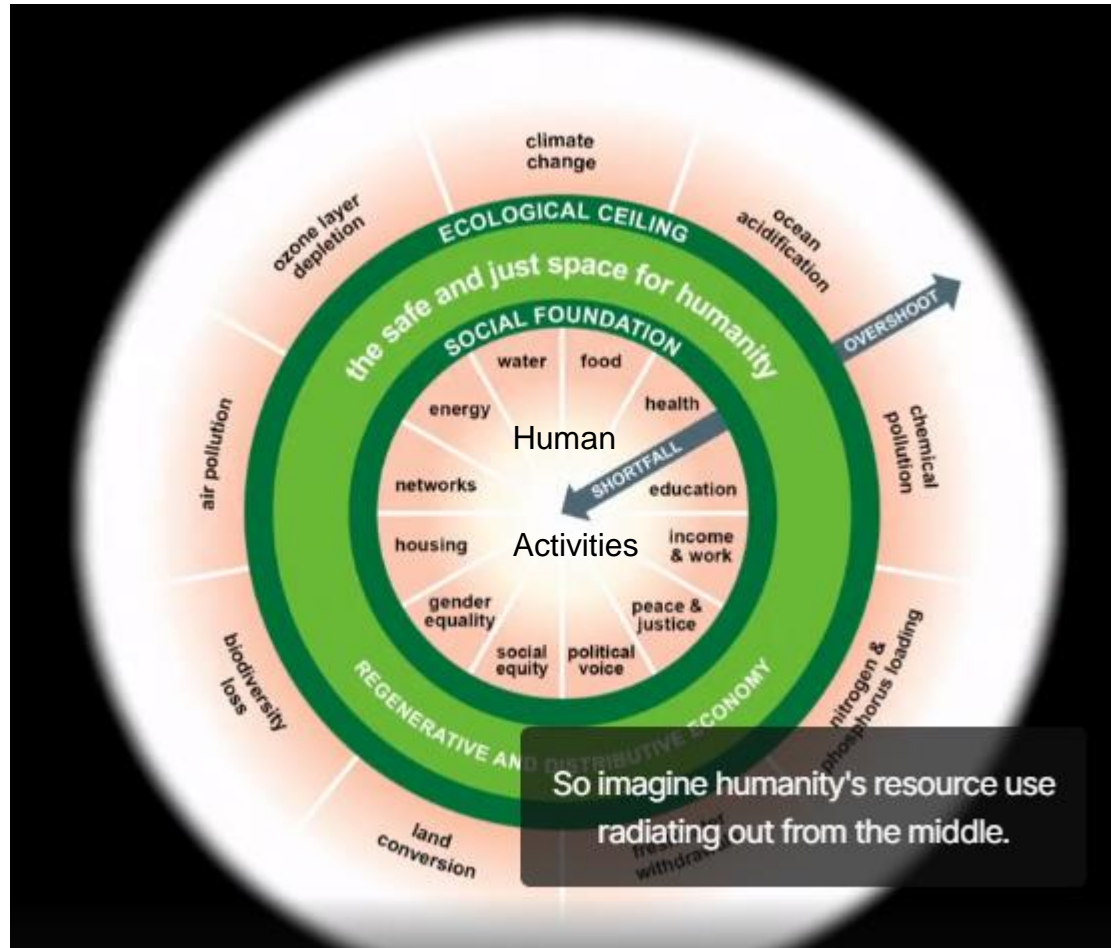
The IPBES reports widespread exploitation of nature
About a third of wild fish in the ocean are being over fished
More than 10% of wild trees are threatened by unsustainable logging
Mammals pushed to extinction by unsustainable hunting (Rhinos, Leopards, Tigers...)

IPBS = Science-Policy Platform on Biodiversity and Ecosystem Services

HOW DO WE MANAGE THE BIODIVERSITY PROBLEM?

MAINTAIN A HEALTHY WORLD

Human activities stay within ecological limits



Reduce emissions

A steady state economy

Low carbon economy

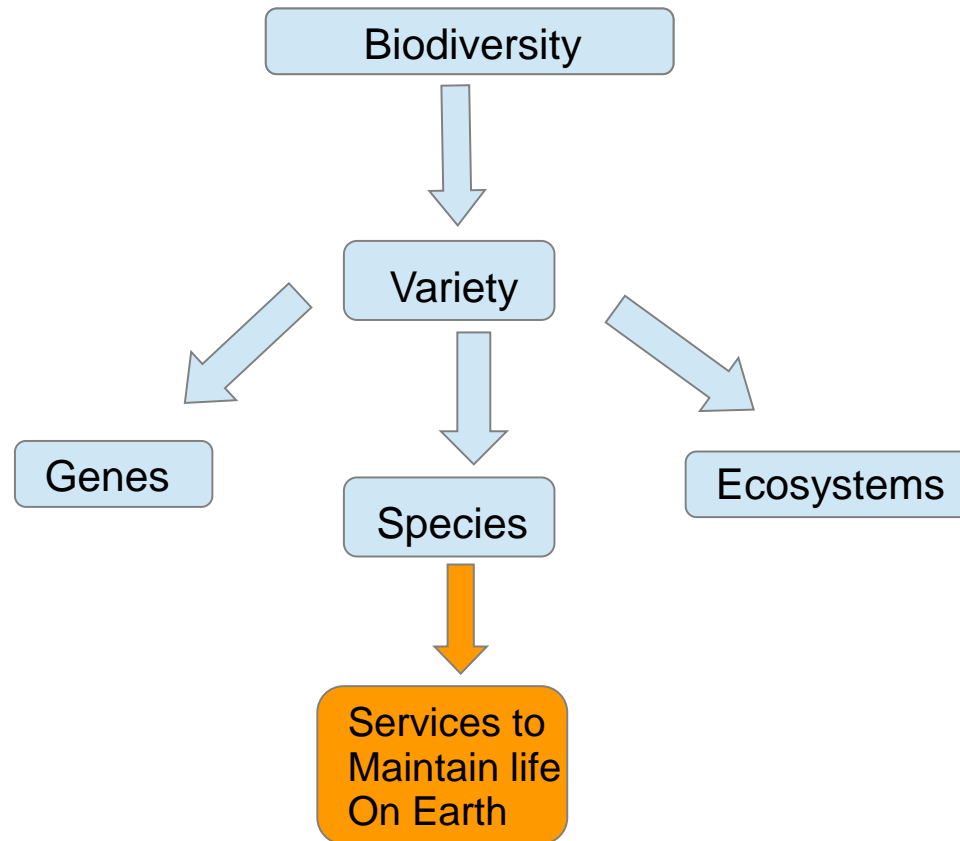
Better financial regulation

Protect/restore ecosystems

International co-operation

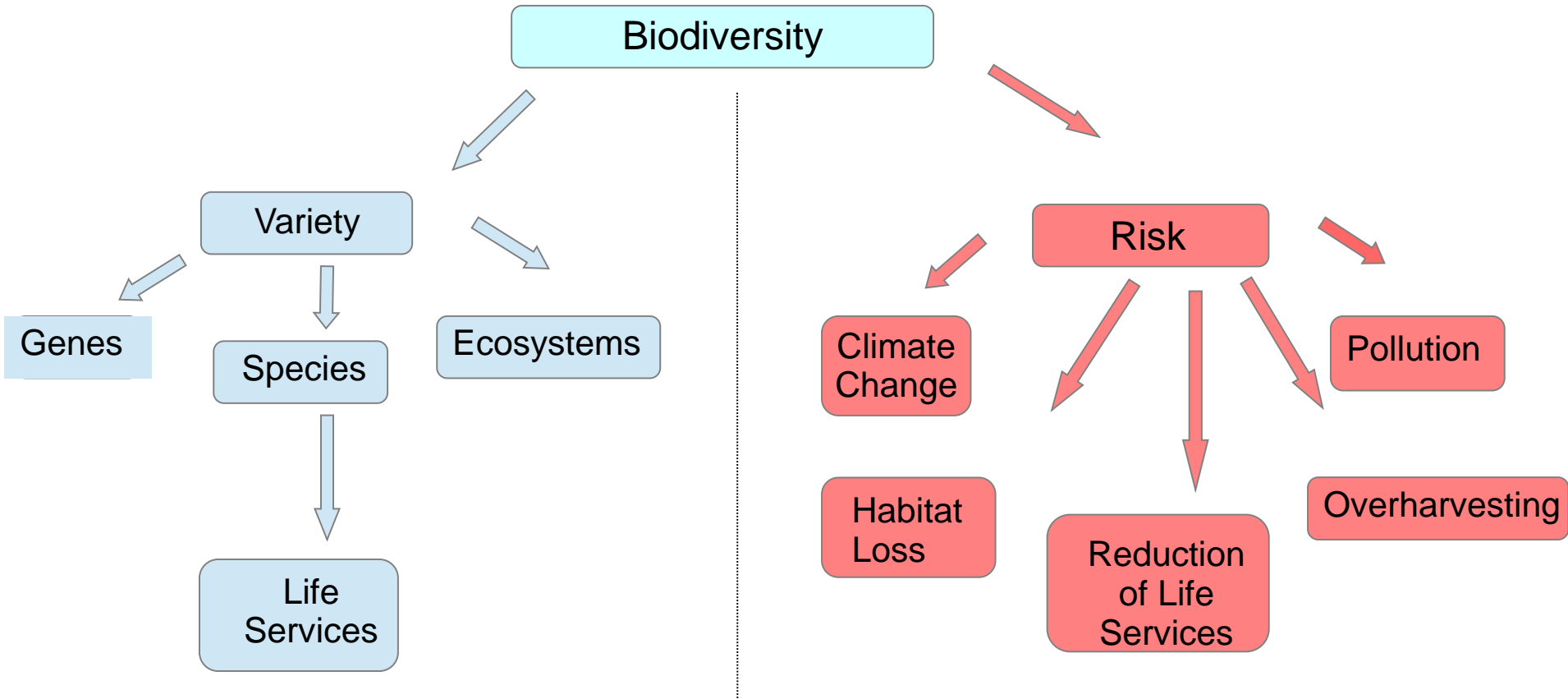
BIODIVERSITY

Biodiversity refers to the variety of living species on Earth including plants, animals, bacteria, fungi genes, species & ecosystems



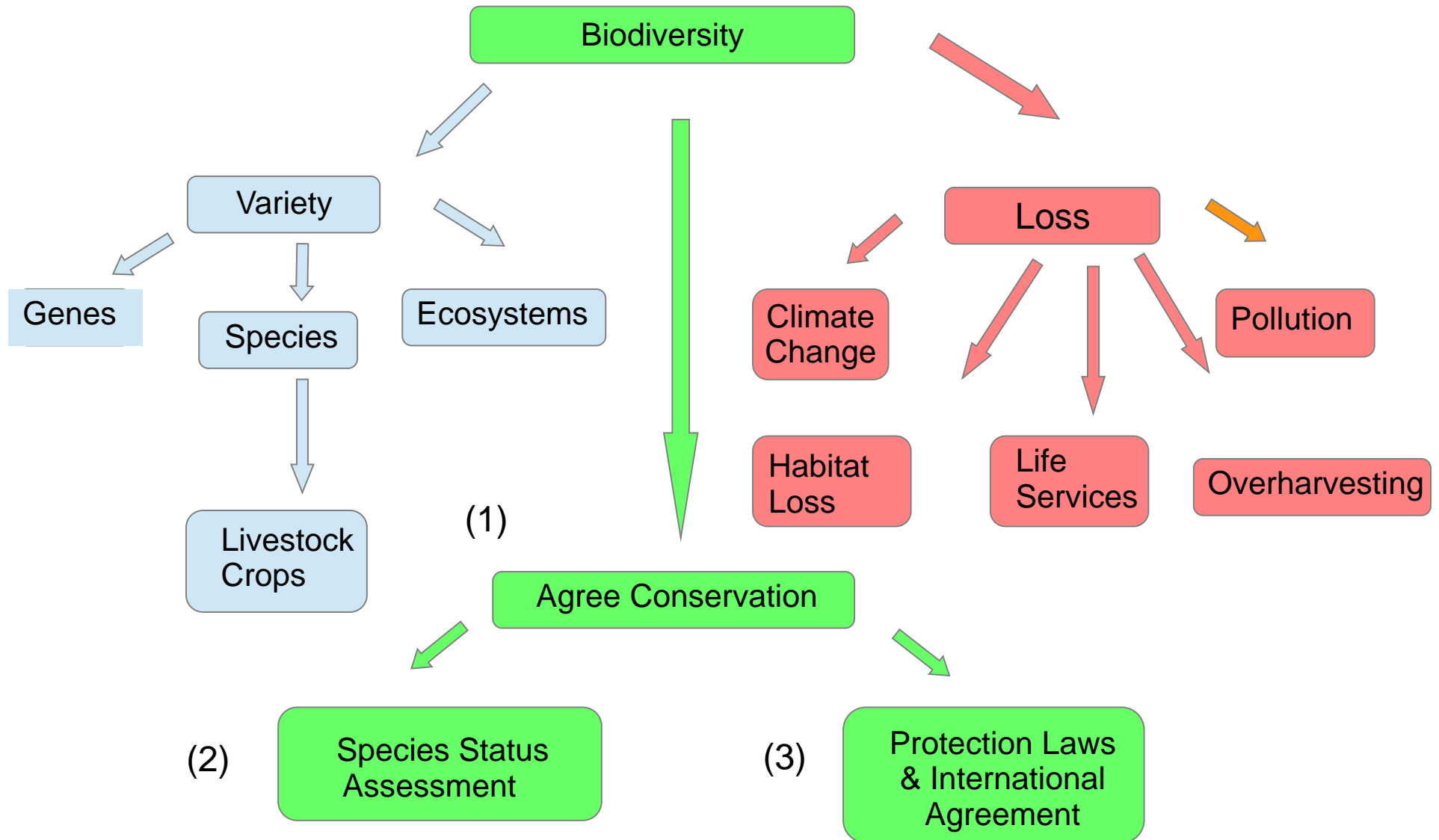
Biodiversity provide the resources & ecosystem services to maintain life on Earth

BIODIVERSITY RISK FACTORS

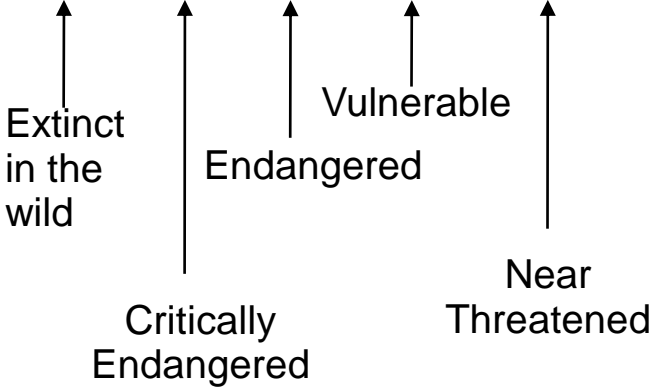


What about Species Conservation?

BIODIVERSITY & CONSERVATION



BIODIVERSITY RISK CLASSIFICATION



RISK CLASSIFICATION EXAMPLES

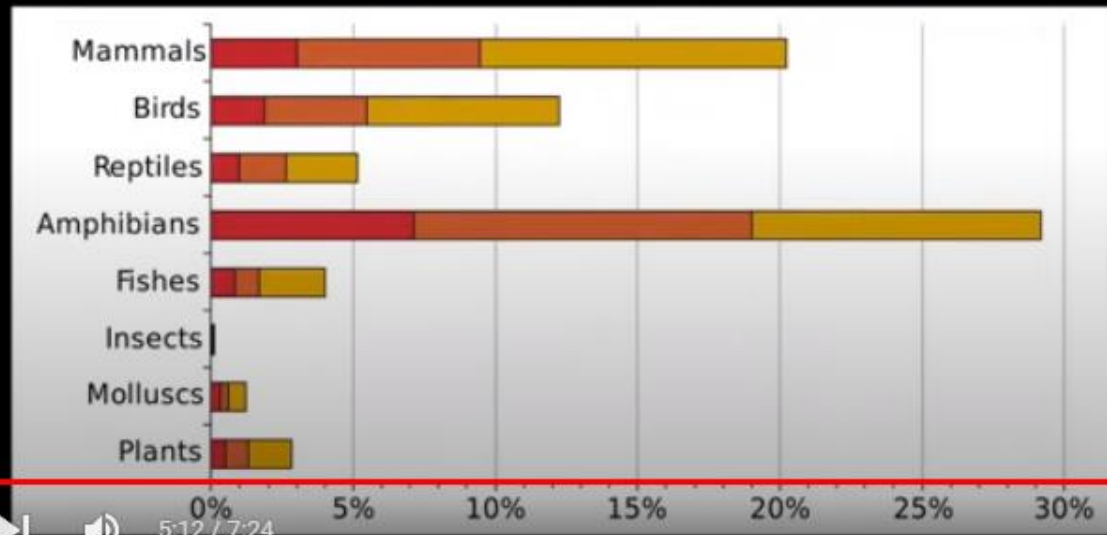
Conservation Status



ENDANGERED SPECIES

Evaluation 2020

Conservation Status



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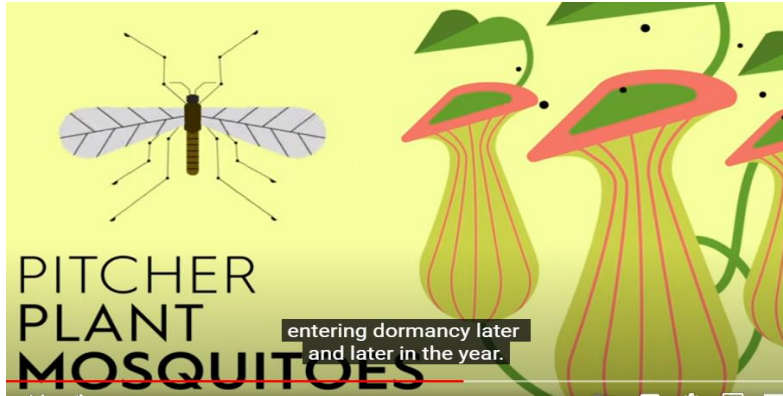
ACTIONS TO REDUCE LOSS OF BIODIVERSITY?

1. Rely on nature to adapt to change (Adaptive Evolution) - slow
2. Introduce various ad hoc schemes to protect species – limited
3. Gain international agreement to implement major co-ordinated change to protect ecosystems & biodiversity - comprehensive



ADAPTIVE EVOLUTION TO CLIMATE CHANGE

Natures responds slowly with natural variability



Pitcher plant mosquitoes have evolved to enter dormancy later in the year to avoid higher temps



With less snowfall the Brown Tawney Owl now has an advantage



Lady birds which absorb less heat have become dominant



Wild Thyme repellent oils change to protect against predator migration due to climate change

VARIOUS AD HOC SCHEMES

Climate refuge sites including wild life parks have been established

Projects are moving chosen species to more suitable climates



This is small scale & will not address biodiversity loss

LAND TRANSFORMATION SCHEMES

Regenerative Agriculture & Wildlife



African Valley



After Regeneration



Saudi Desert Area



After Regeneration

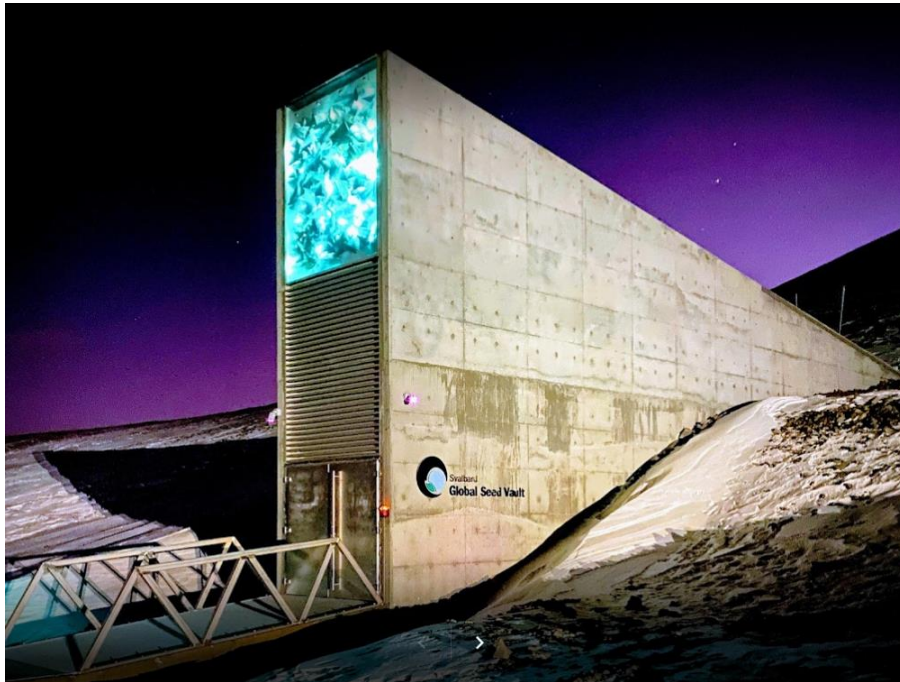
1. Keep carbon & water in the ground to allow micro-organisms to flourish
2. Use a cover crop to maintain a healthy root system all year
3. Maximize crop diversity to fight pests & disease
4. Integrated livestock farming to break up the ground & provide natural manure

SVALBARD GLOBAL SEED VAULT

Provides security of the world's food supply in seed banks

Seeds will be available to use 1000's years into the future

The site is cold and unaffected by earthquakes & sea level rise



The Government of Norway owns the facility and the depositing gene banks own the seeds they send

The Seed Vault contains 1,145,693 seed varieties from almost every country

Worldwide there are > 1,000 seed banks

INTERNATIONAL FRAMEWORK AGREEMENTS

Holistic approach to protect all species

1992 UN Convention on Biological Diversity

The Convention recognized for the first time in international law the conservation of biodiversity as "a common concern of humankind". The agreement covers all ecosystems, species, and genetic resources

2021 UN General Assembly declared 2021-2030 'The Decade of Ecosystem Restoration'

Aims to prevent, halt and reverse the degradation of ecosystems on every continent and in every ocean

2022 UN Biodiversity COP15 (Montreal, 7-19 Dec)

196 governments meet to agree a framework to guide global actions on biodiversity & reverse nature loss by 2030

2022 UN Biodiversity COP15

Montreal, Canada 7-19 Dec 22



Agree a Global Diversity Framework **PRINCIPLE AGREED**

Actions to halt species extinction & reduce loss of biodiversity

The agreement includes 23 targets & 4 “long-term goals” to protect the natural world by 2050 (summarised below)

Ensure 30% of land & sea protected against exploitation by 2030 **PRINCIPLE AGREED**

Currently 17/10. Allow degraded ecosystems to recover (whilst protecting the rights of indigenous peoples)

Conservation to include restoration. **What about implementation?**

Biodiversity finance for developing countries **PRINCIPLE AGREED**

Increase finance to developing nations to \$20bn each year by 2025 & \$30bn by 2030

Total spend \$200bn a year of biodiversity-related funding by 2030 domestic/international from public/ private. **How?**

Reform harmful subsidies for fisheries, agriculture & fossil fuels **PROGRESS**

Reduce by \$500bn a year government subsidies that harm nature.

Encourage nature based solutions **PROGRESS**

Use natural resources to maintain & develop ecosystems to resist climate change

Maintain & restore healthy wetlands and forests that lock away greenhouse gas emissions

Reduce agricultural pollution, pesticides & increase sustainable production **AGREED**

2030 targets to halve global food waste, excess nutrients and risks posed by pesticides

Zoonotic Diseases **PROGRESS?**

Reduce the risk of diseases like SARs, Covid-19, Ebola and HIV, spilling over from wild animals

Digital Sequence Information to be available to all countries **PROGRESS**

Climate resistant crops...**Patent free?**

<https://www.cbd.int/article/cop15-cbd-press-release-final-19dec2022>

BIODIVERSITY IN THE UK

Farming, building and industry have made the UK one of the most nature-depleted countries in Europe.

15 per cent of UK species are now threatened with extinction

The abundance of UK species has declined by 50% since 1970 (global average is 25%)

Of the 218 countries assessed for biodiversity the UK is ranked 189

RSPB estimated 5 per cent of the UK's land is being protected

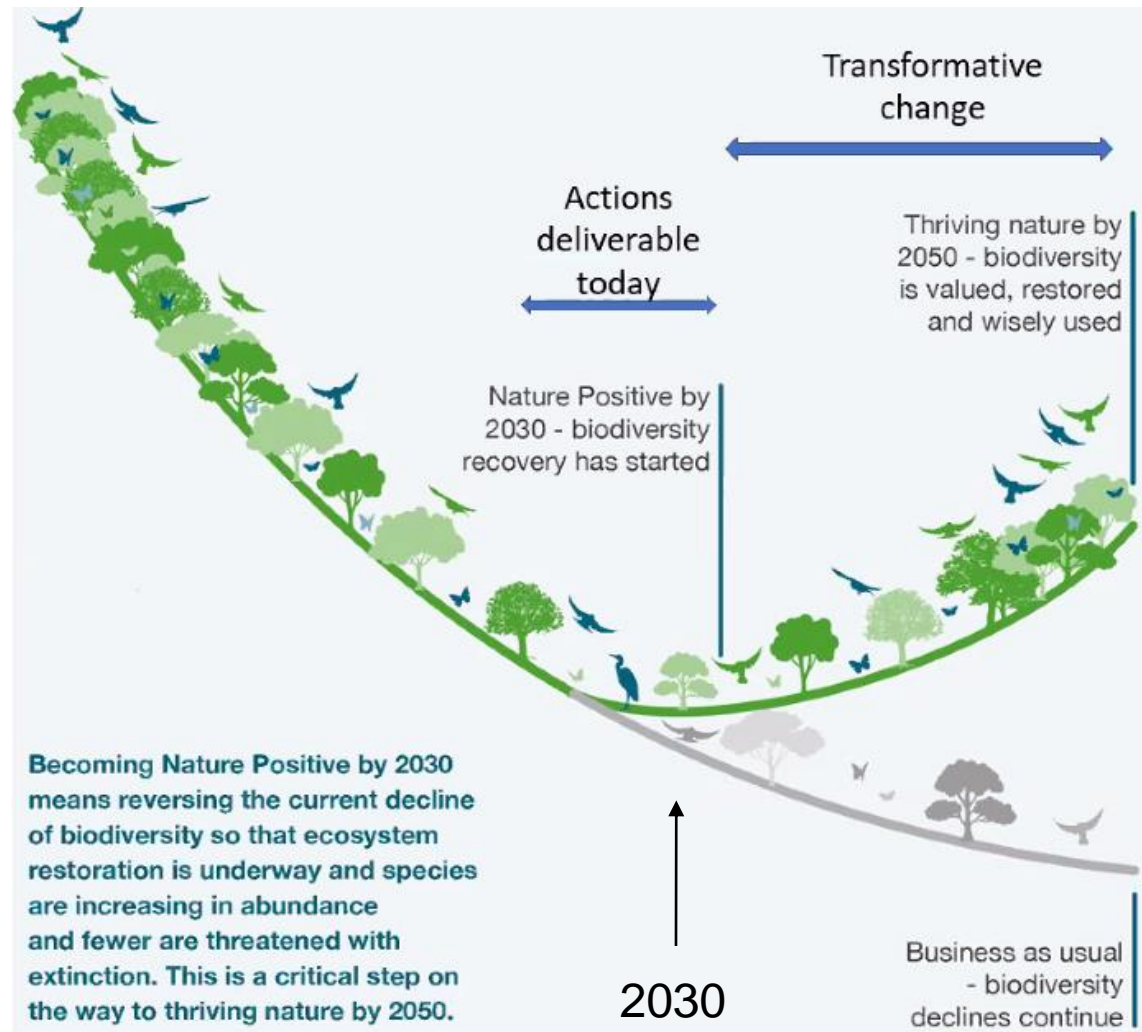
The government claims this figure is 28%!

What is the government planning to do about this crisis?



WHAT NATURAL ENGLAND WOULD LIKE TO SEE

Government Advisory Body



Is 2030 a realistic date to halt biodiversity loss?

THE UK ENVIRONMENT ACT - 2021

The Environment Act became law in 2021 as the UK's new framework of environmental protection

Established the Office for Environmental Protection (OEP) to hold the Government to account

Broad objectives of the Environment Act:

Enable a range of environmental, economic and social benefits, such as carbon capture, flood management, clean water, pollination and recreation

Restore 75% of protected sites on land (including freshwaters) to favourable condition

Create/restore 500,000 hectares of additional wildlife-rich habitat outside of protected sites

Recover threatened plant species by providing more, diverse and better-connected habitats

These changes are to be enabled through a variety of government policies

UK ENVIRONMENTAL POLICIES

The Environment Act 2021 has created 2 main policies so far:

Environmental Land Management (ELM) scheme

The sustainable-farming incentive focuses on soil health and reducing fertilisers and pesticides

The landscape-recovery scheme will pay landowners for an ambitious large-scale "rewilding" project

Land Stewardship to create habitats for breeding birds or restore wetlands

Via 3 payment subsidies over several years

England Tree Strategy

The government has committed to increasing tree-planting to 30,000 hectares per year by March 2025

Statistics show 13,840 hectares were planted in the 12 months

prior to March 2022 so 1/3 the agreed number

More to policies follow?

Much more needed on biodiversity loss & climate adaptation



RESTORING BIODIVERSITY IS PART OF ADAPTATION PLANNING

CCC Risk Report 2021

<u>Risk</u>	2020	2050	2100	<u>Impact</u>
Risks to diversity of land & freshwater habitats				Continued decline in animal & plant biodiversity
Risks to soil health from flooding & drought				By 2050 much of SE England may be unsuitable for agriculture
Risks to natural carbon stores bogs & forests				Reduced carbon sequestration
Risk to crops & live stock due to drought				Reduced food supply & Increased prices
Risks to industry with collapse of supply chains				Reduced supply & increased cost of all goods & services
Risks to power supply				Dependency on electricity to increase 50% to 100% by 2050
Risks to human health & productivity due to overheating				x3 heat related deaths by 2050 2,000 to 7,000 each year
Risk to imports				Reduced supply of overseas goods & components