

Human Impact on the Environment: Part IV



The late Alan Gregg pointed out that human population growth within the ecosystem was closely analogous to the growth of malignant tumor cells, that man was acting like a cancer on the biosphere. The growth of human numbers certainly seems wild and uncontrolled. Four million a month -- the equivalent of the population of Chicago. We seem to be doing all right at the moment; but if you could ask cancer cells, I suspect they would think they were doing fine. But when the organism dies, so do they; and for our own, selfish, practical, utilitarian reasons, I think we should be careful about how we influence the rest of the ecosystem.

Marston Bates



A forest in the Amazon is being illegally burned, near Novo Progresso, in the northern Brazilian State of Para.

8. DEFORESTATION

Deforestation



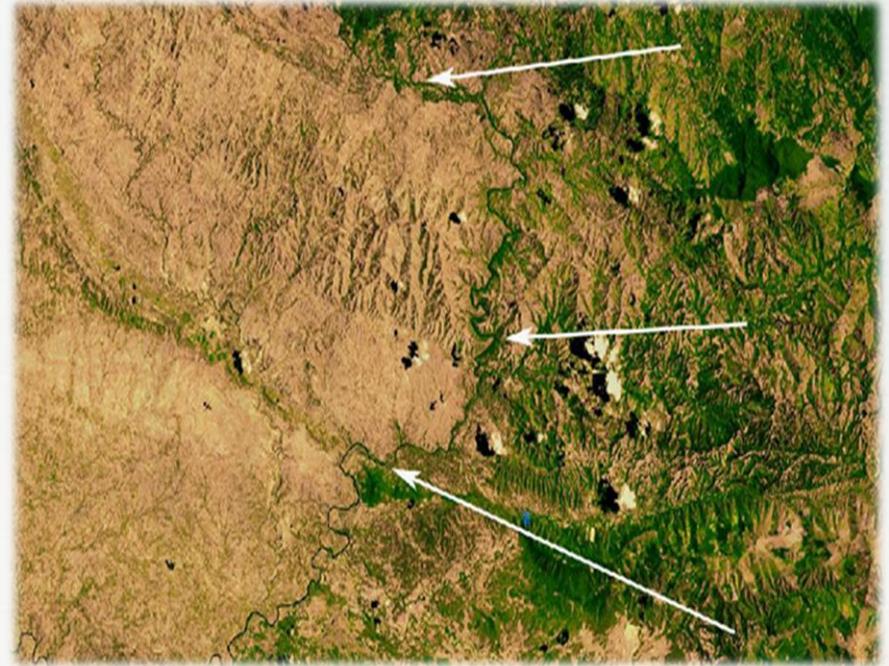
- Deforestation is clearing natural forests on a massive scale for alternative uses, resulting in damage to the quality of the land.
- Causes include:
 - money
 - firewood and charcoal
 - agricultural crops
 - livestock grazing
 - housing and construction
 - palm-oil plantations
 - roads
 - paper products
 - unsustainable logging

Deforestation



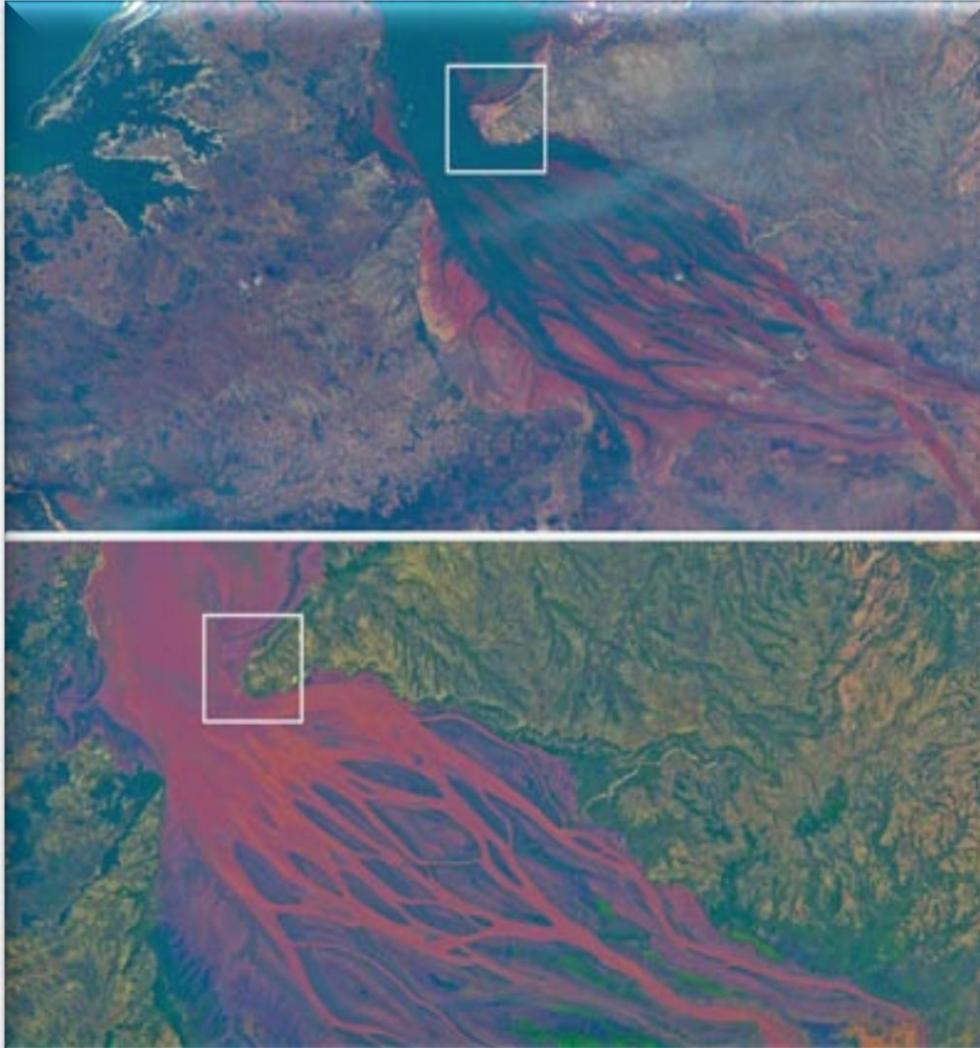
- **Clear-cutting** of forests causes erosion, flooding and weather pattern changes.
- The **slash-and-burn method** of clearing tropical rain forests for agriculture increases atmospheric CO₂, contributing to the greenhouse effect.
- Most of the nutrients in a tropical rain forest are stored in the vegetation ... burning the forest destroys the nutrients.

This NASA satellite image shows Haiti (left) and the Dominican Republic (right).



- As a result, the soil of some rain forests can support agriculture for only one or two years.

Deforestation



Madagascar: Betsiboka River,
September 2003 and March 2004.

Deforestation has led to catastrophic erosion in northwestern Madagascar.

The top image shows normal river levels.

The lower picture shows widespread flooding and a massive red sediment plume that followed tropical cyclone Gafilo, which hit northern Madagascar on March 7 2004.

Not only is the soil upstream eroding, but the sediment is silting up the estuary, causing further problems.

Deforestation



Bolivia: near Santa Cruz, June 1975 and May 2003.

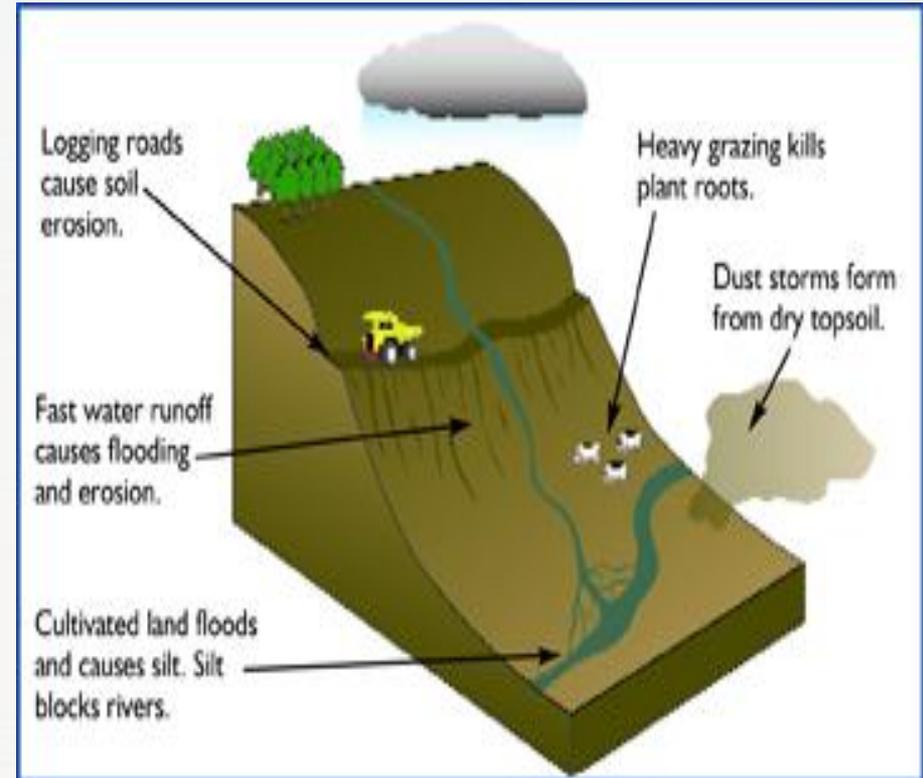
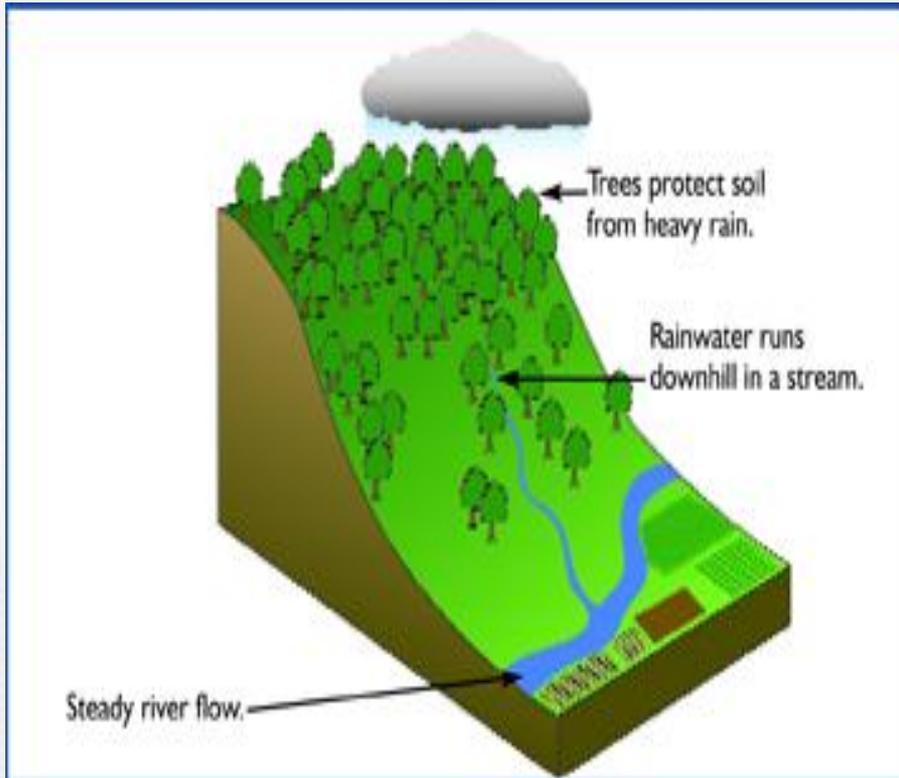
In 1975, the area adjacent to the Rio Grande ó Guapay river was one of rich, dense rainforest crossed by a handful of tracks.

By 2003 the area had been transformed into a major agricultural area

Deforestation



Before and After Deforestation

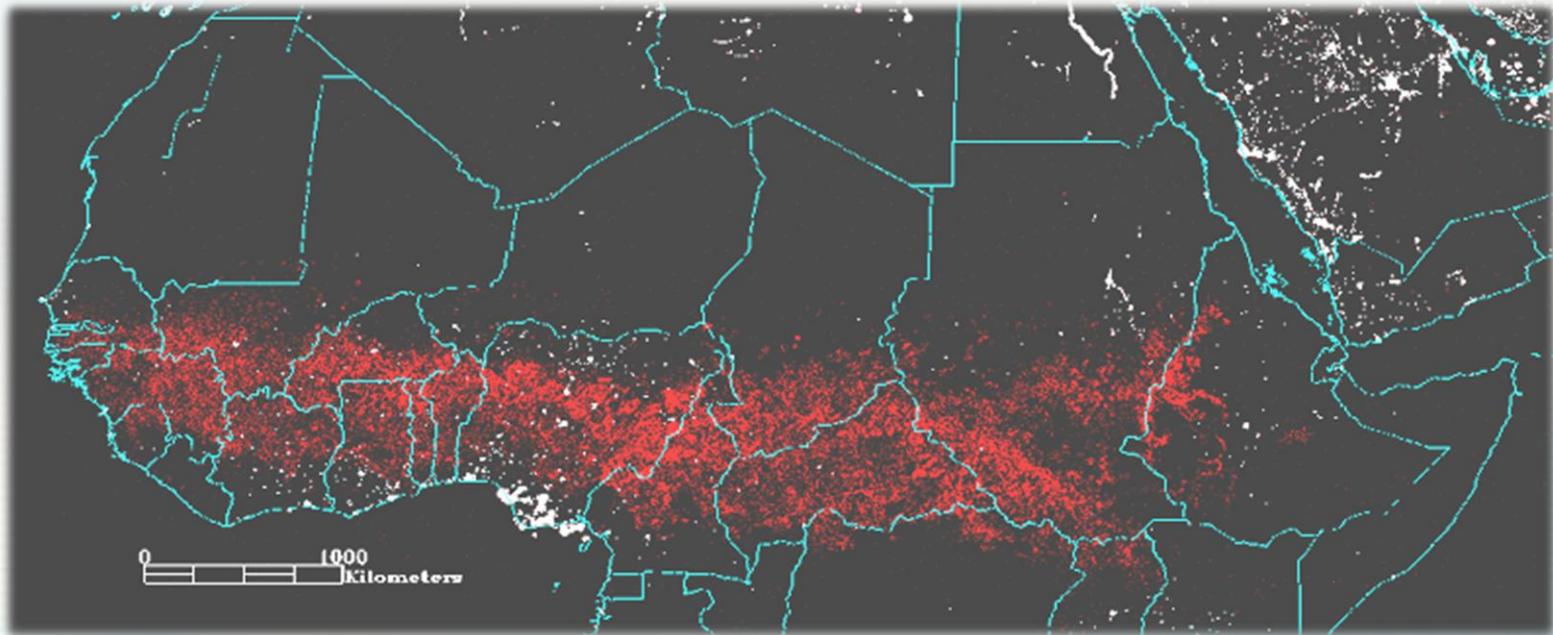


Deforestation

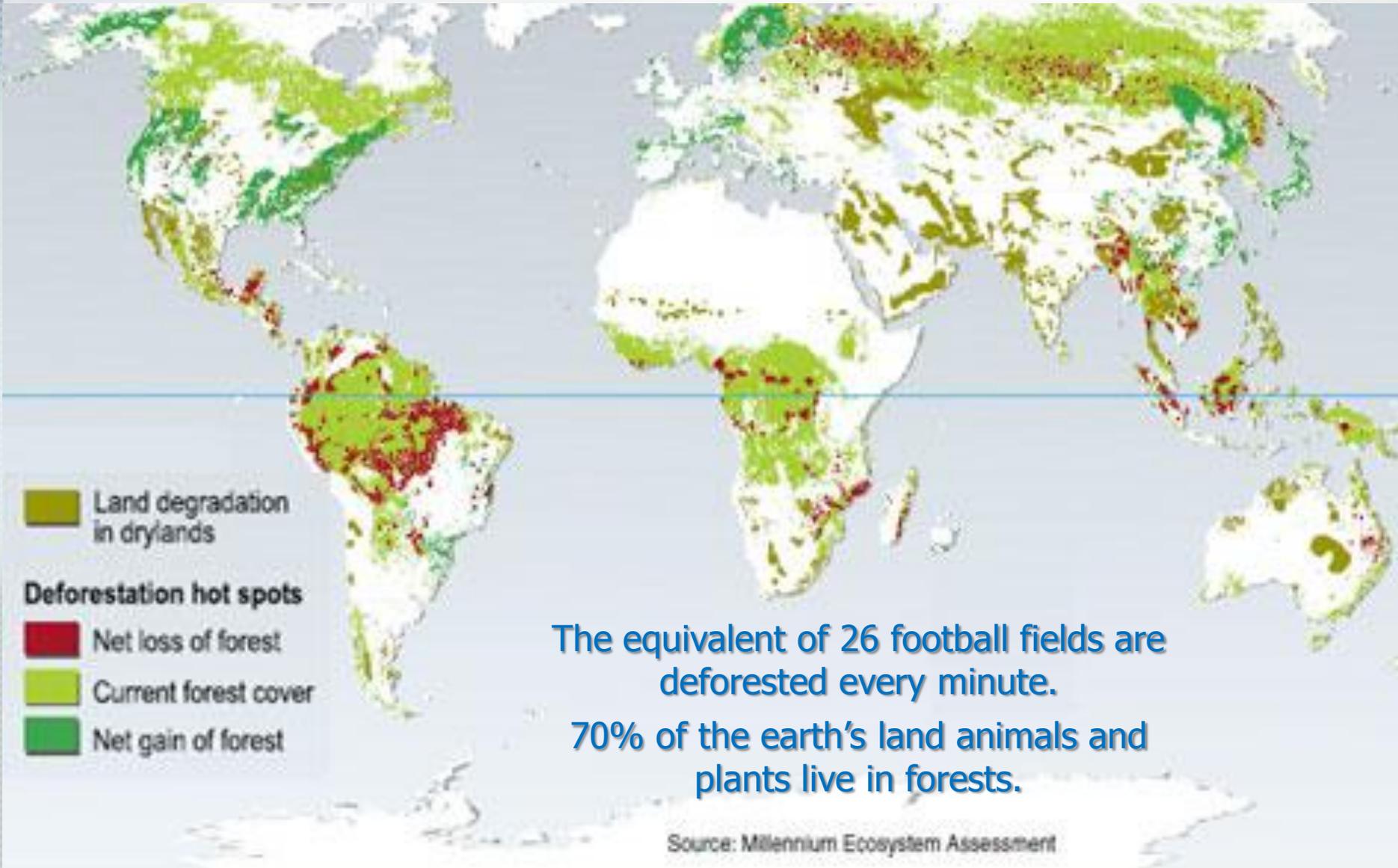


One of the most serious current environmental problems is the burning of the world's forests. Not only does this destroy forests much faster than they can be replaced, it also releases huge quantities of smoke and carbon dioxide into the air, both of which may contribute to global warming. The smoke can cause breathing problems for people hundreds of miles away.

The image below shows all the fires detected in [central Africa](#). Central and South America, Madagascar and Indonesia also have high levels of biomass burning.



Deforestation



Deforestation



Case Study: Haiti

- Haiti is a mountainous island state, the poorest in the Western Hemisphere.
- In 1923 forests covered app. 60% of the country; today they cover less than 2%.
- Wood became and continues to be the principal energy source in Haiti, accounting for 70% of energy consumption.
- This led to Haiti's steady and almost complete deforestation.
- With no forest cover, there is nothing to keep Haiti's soil in place and it loses massive amounts annually.

Deforestation



Case Study: Haiti (continued)

- Without forest cover, hurricanes lead to deadly landslides and floods sweeping through down-slope settlements.
- Soil erosion damages productive infrastructure such as dams, irrigation systems, roads and coastal marine ecosystems.
- Gulley erosion is endemic, particularly along footpaths and roads.
- Soil erosion also lowers agricultural productivity, worsens droughts, leads to desertification and increases pressure on the remaining land and trees.

Deforestation



Case Study: Haiti (continued)

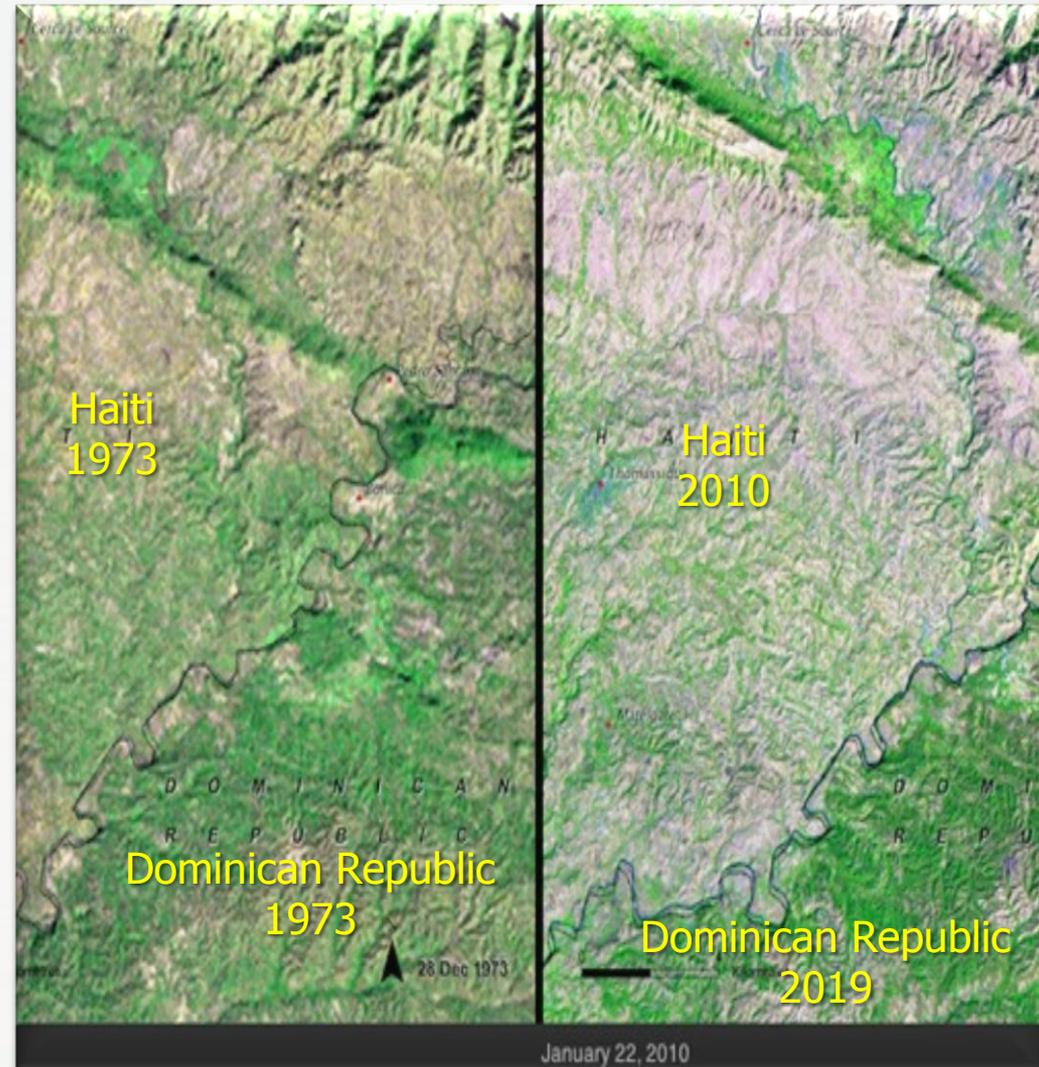
- Excessive runoff silting has reduced river flow by 80%.
- Heavy sedimentation has reduced drainage and increased soil and groundwater salinity.
- Sediment deposition and overfishing damage Gulf waters around Haiti.
- Solid waste clogs urban waterways and leads to increases in water-borne diseases.
- The majority of the rural population has access only to the hillsides for subsistence agriculture of maize, beans, cassava and fruit.

Deforestation



Case Study: Haiti (continued)

- Most hillsides are visibly eroded and the land is severely degraded. In many areas, bedrock is visible.
- Rural populations have attempted to fight erosion but the rate of loss is too great for their efforts to be sustainable.



Deforestation



The effects of deforestation include:

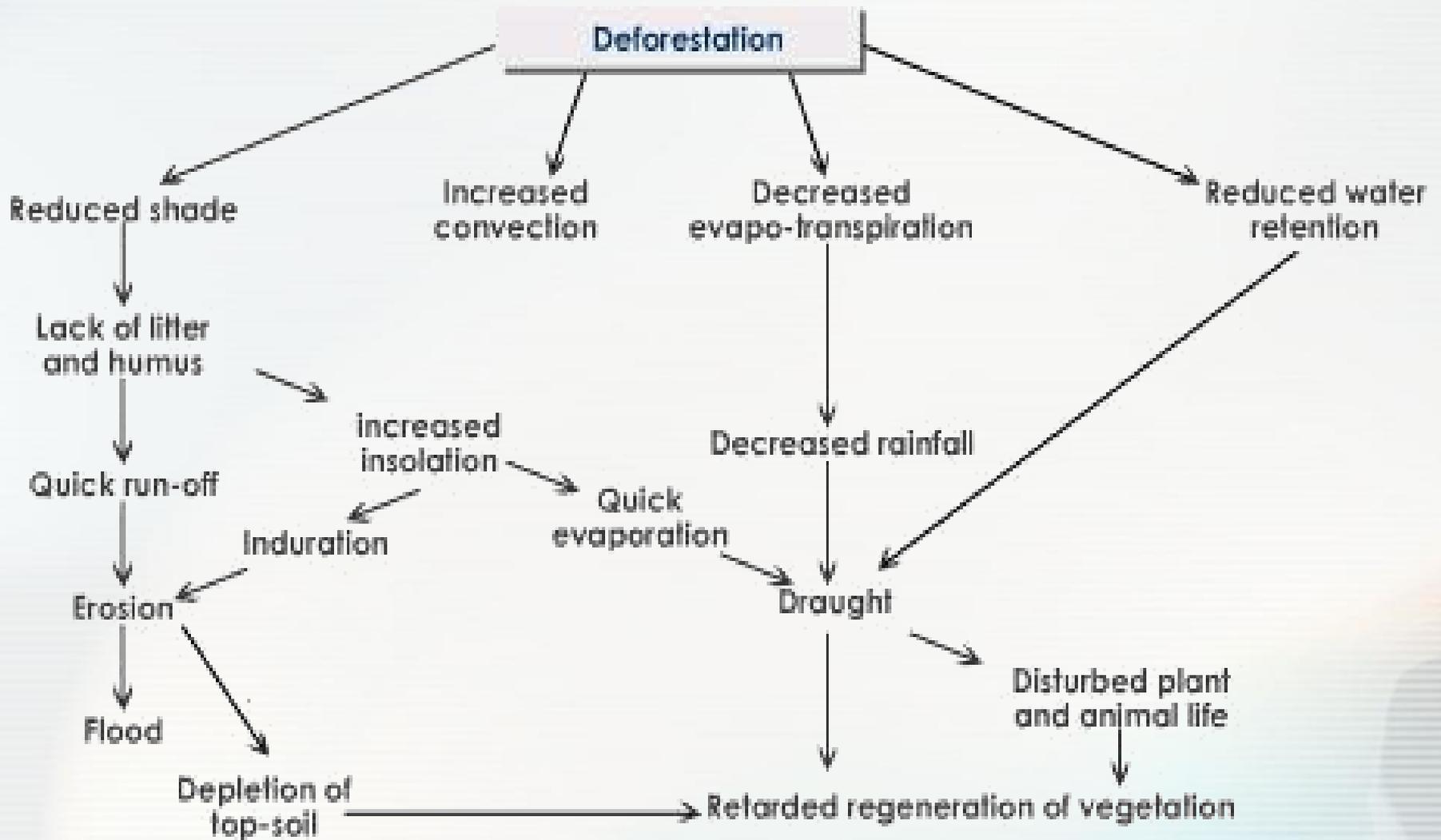
- flooding, leaching and erosion
- reduced precipitation and drought
- habitat loss
- loss of top soil
- decreased crop yields
- decreased forest health and productivity
- slow regeneration
- decreased supply and quality of fresh water
- increased competition for water
- change in weather patterns



Deforestation



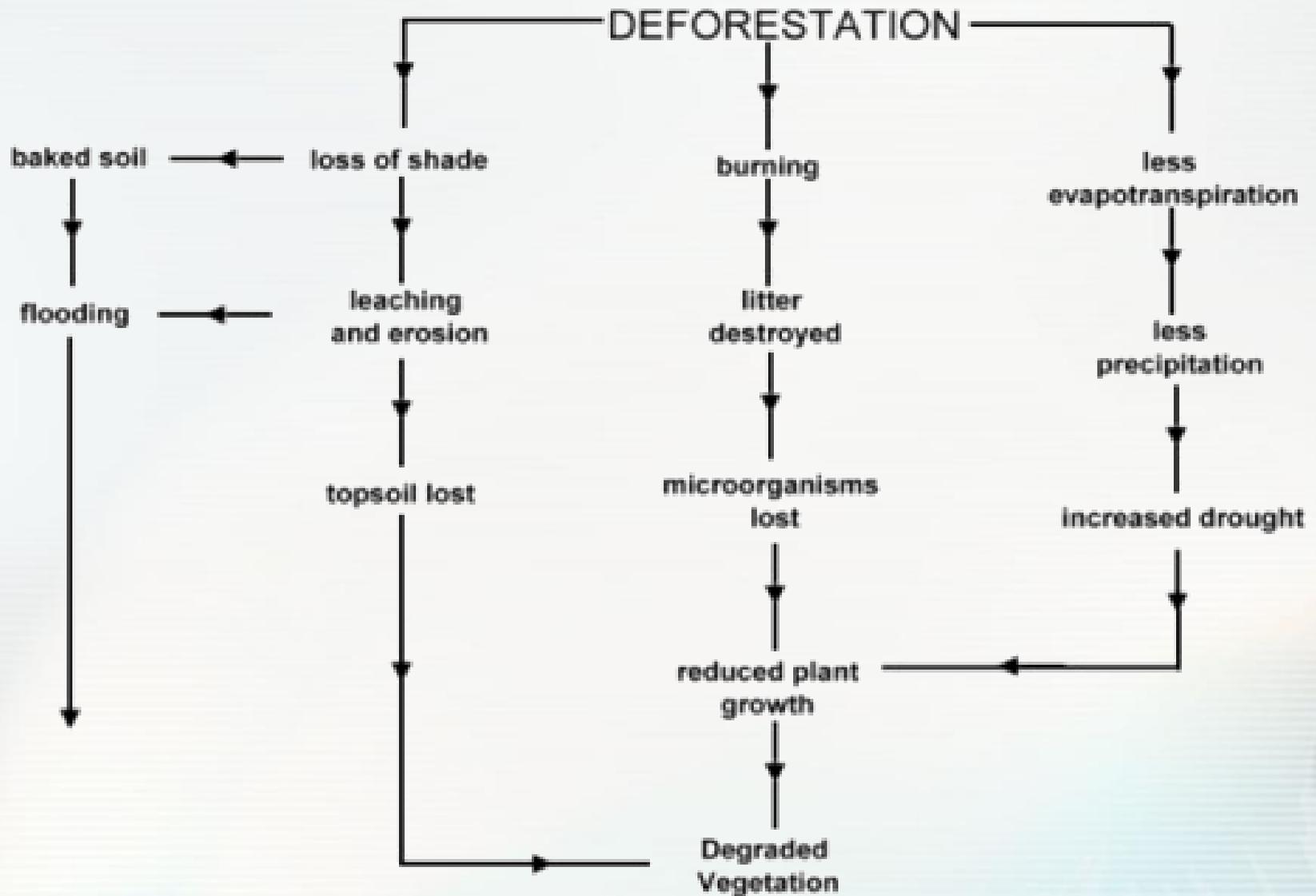
Effects of Deforestation

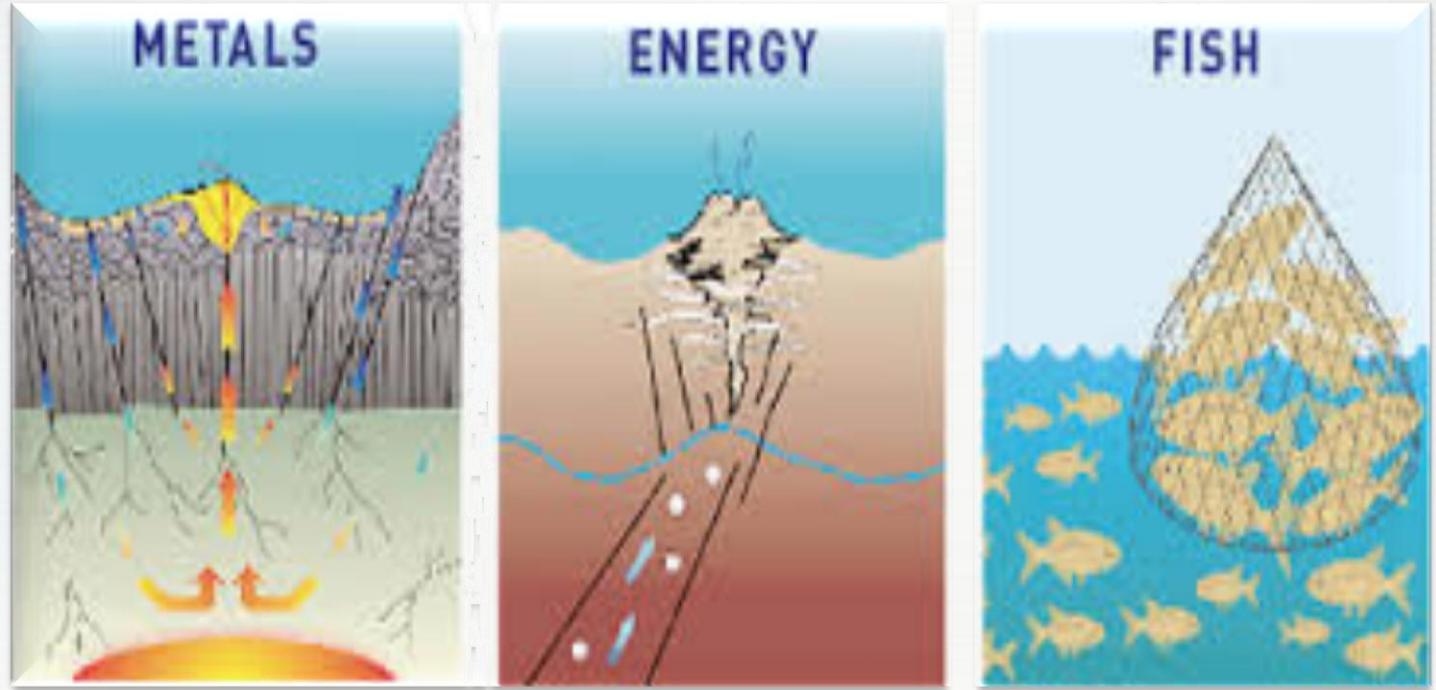


Deforestation



Effects of Deforestation ... Another Look





9. OVERUSE OF RESOURCES

Overuse of Resources



▲ Number of Earths needed to sustain human activity

1970



1

2015



1.6

2030

• If we continue consuming natural resources as at present



2.0

• If we cut CO₂ emissions by 30%



1.5

Source: Global Footprint Network

Under pressure to grow GDP each year, states continue to overuse and sell-off their limited natural resources to increase economic expansion. As populations grow and the earth's resources are constrained, the effects can become disastrous.

The world's population demands the resources of 1.6 earths annually. If everyone lived like the US, it would be 5 earths.

Overuse of Resources



Human use of natural resources can lead to the **depletion** of those resources, sometimes slowly and sometimes catastrophically, as in the case of nonrenewable energy sources. The geometrically increasing human population puts a great deal of strain on even renewable resources, such as lumber and fish.

In areas of tremendous population growth, fossil fuels, timber, water and arable land can become scarce because of overconsumption and degradation.

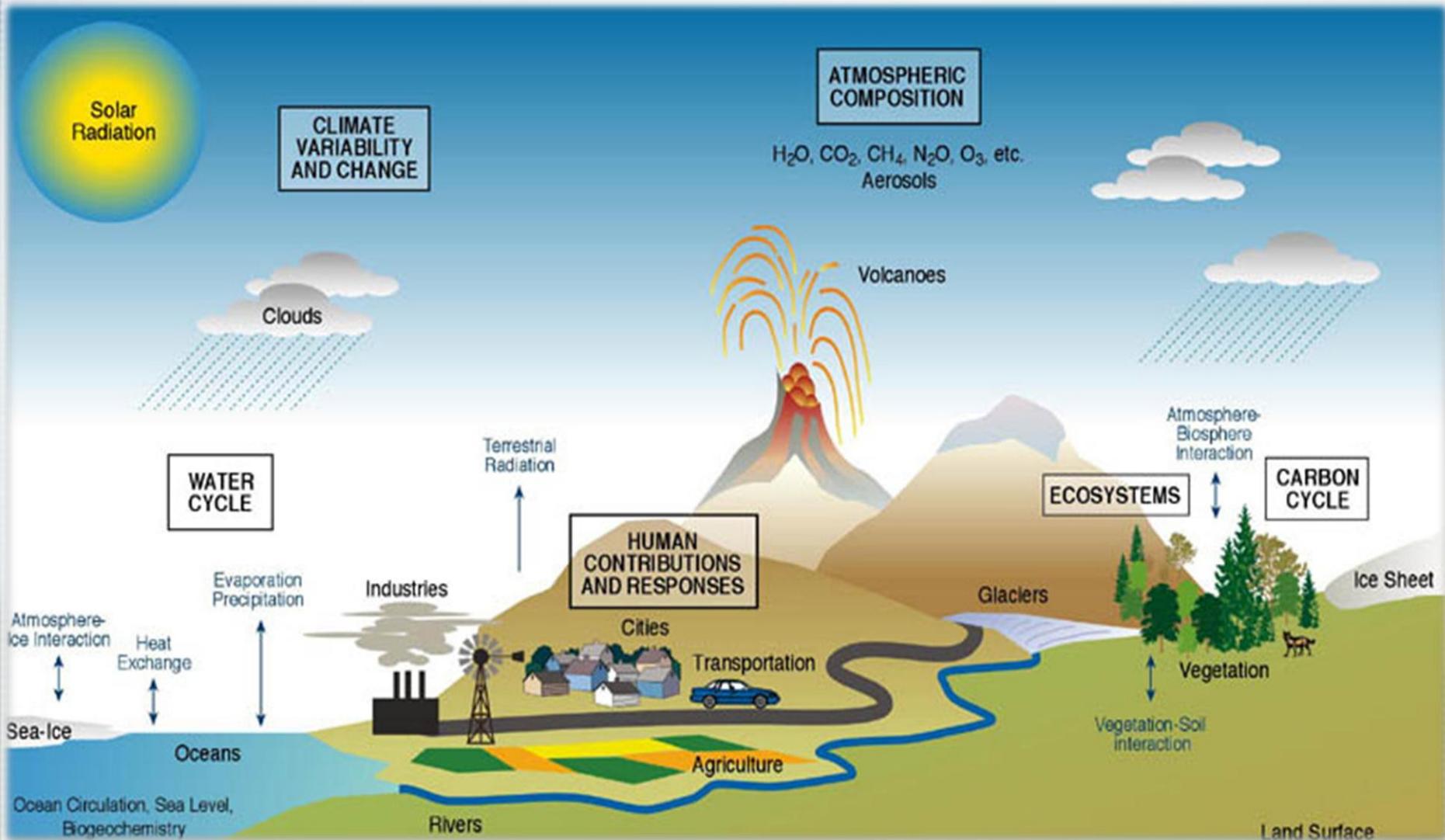
Resource scarcity has several consequences, including the forced migration of people and rising costs.

Overuse of Resources: LULCC



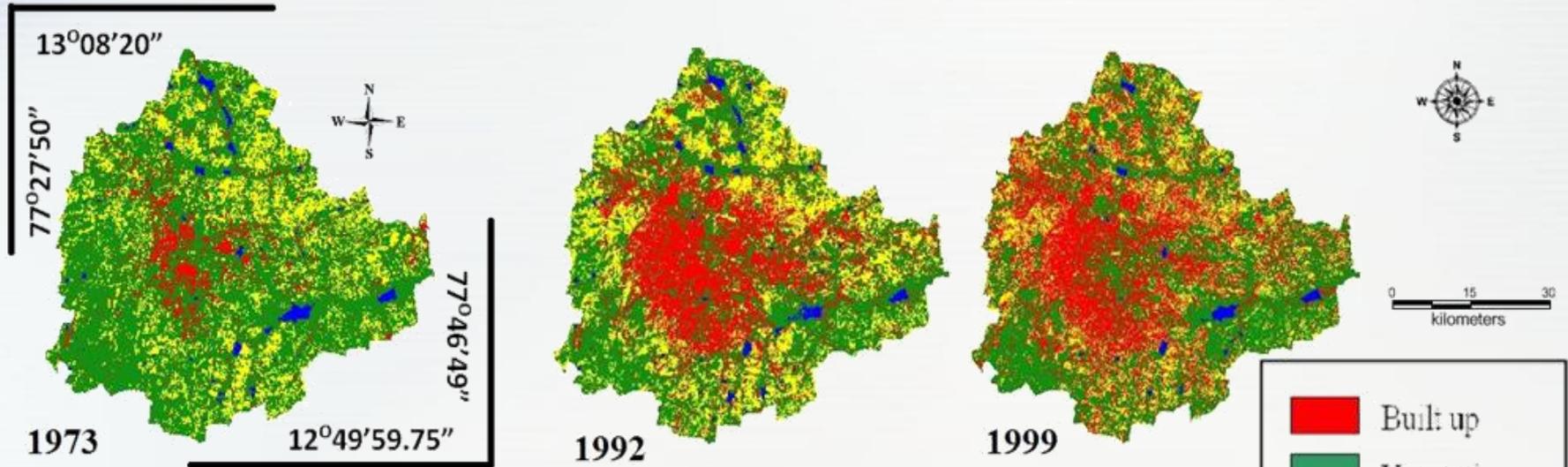
- **Land-use and land-cover change (LULCC)** is a general term for the human modification of Earth's terrestrial surface.
- Humans have been modifying land to obtain food and other essentials for thousands of years.
- Current rates, extents and intensities of LULCC are far greater than ever in history, driving unprecedented changes in ecosystems and environmental processes at local, regional and global scales.
- Monitoring and mediating the negative consequences of LULCC while sustaining the production of essential resources has become a major priority of researchers and policymakers around the world.

Overuse of Resources: LULCC

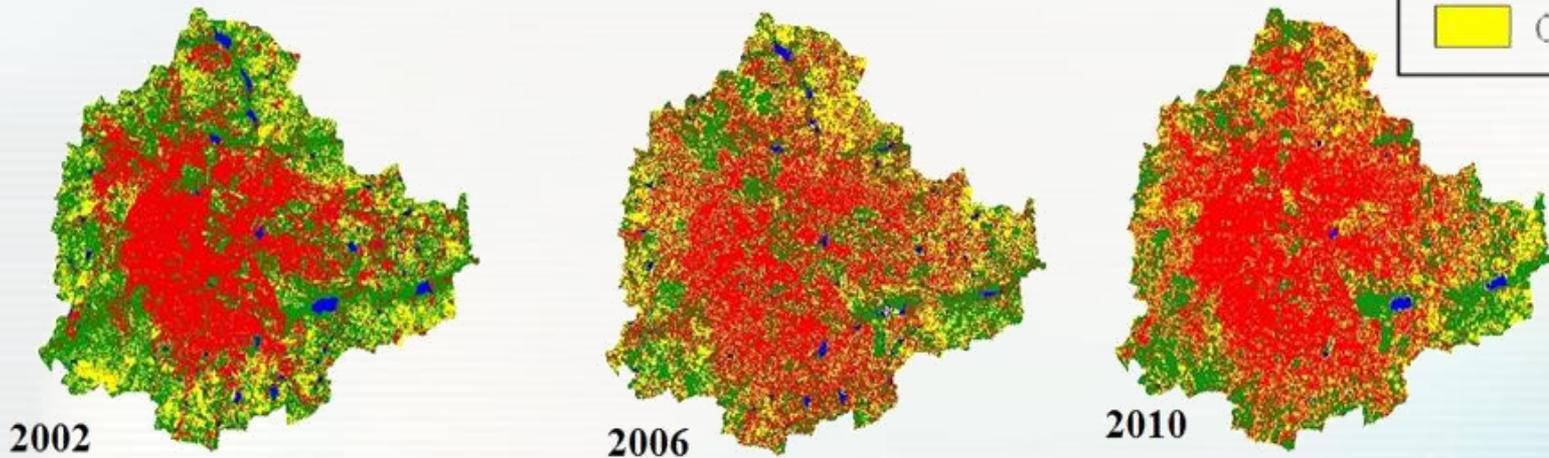


Land Use / Land Cover Change

Overuse of Resources: LULCC



Land Use Changes in Greater Bangalore



Overuse of Resources: LULCC



The effects of LULCC include:

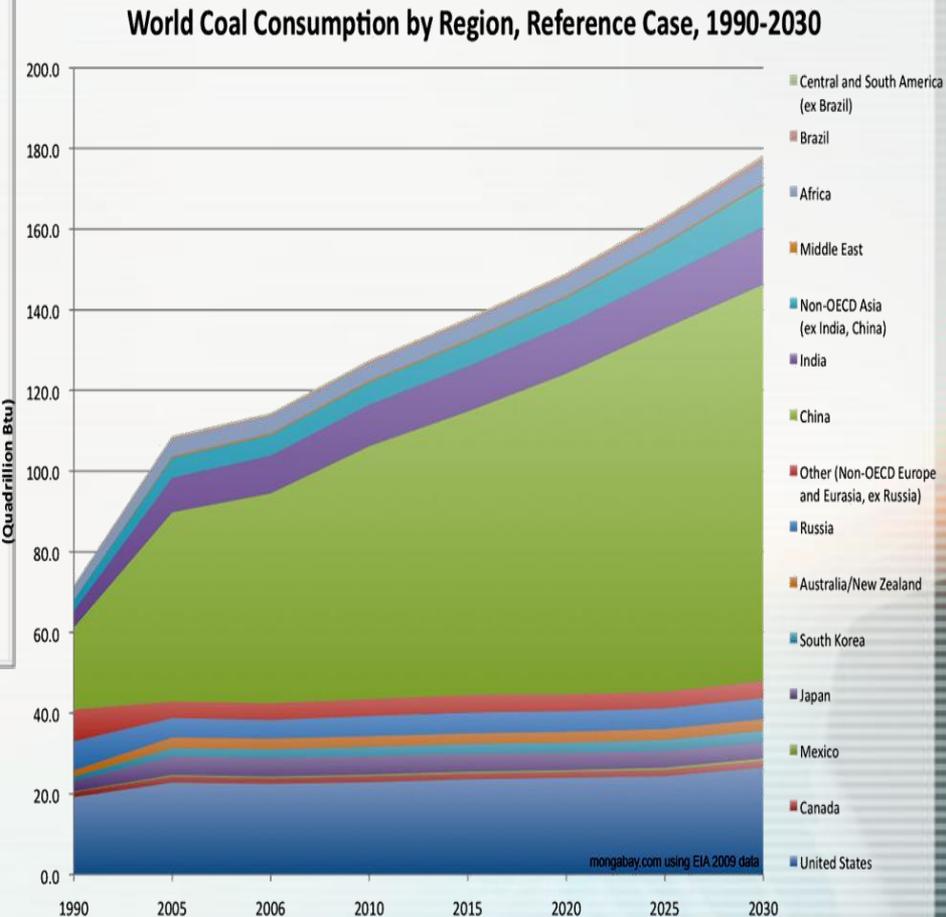
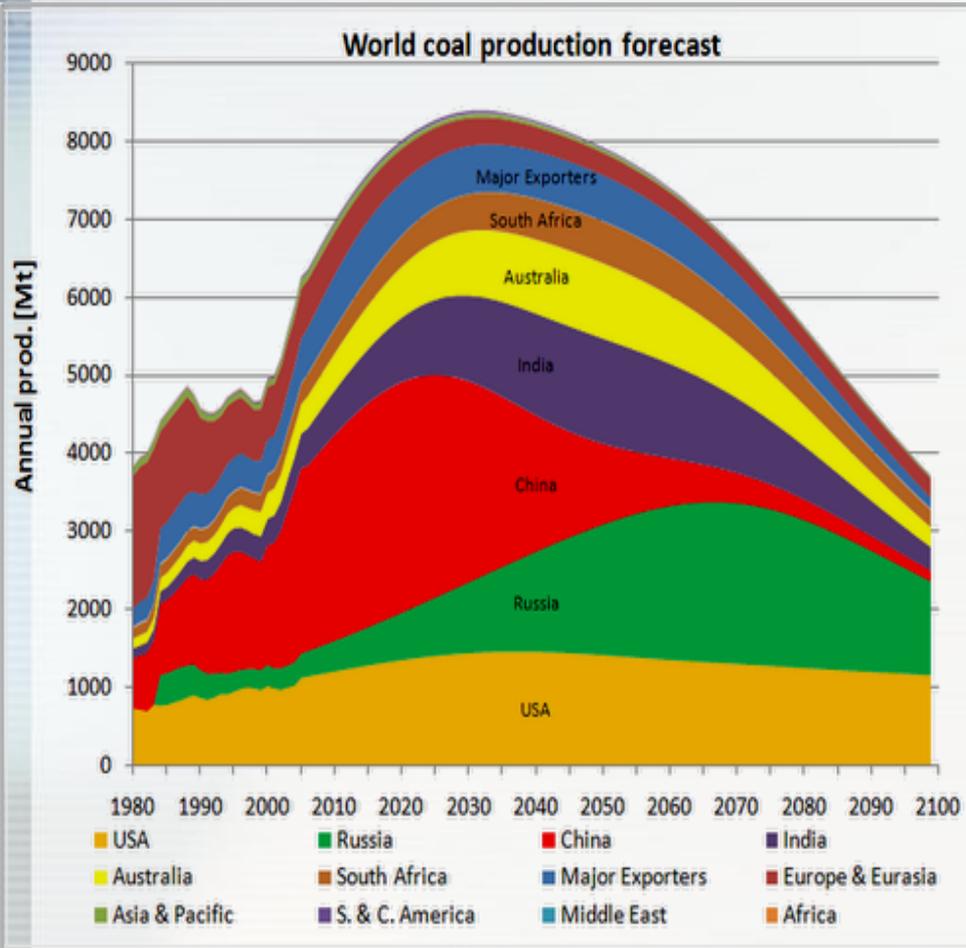
- directly impacts biotic diversity worldwide
- contributes to climate change
- is the primary source of soil degradation
- by altering ecosystem services, affects the ability of biological systems to support human needs
- urban heat islands
- unnatural dust storms
- silting of harbors and bays

Overuse of Resources: Coal



- not as affordable as oil but still pretty affordable
- non-renewable but still has the largest reserve globally
- easy to burn and produces high energy upon burning ... a reliable energy source
- not as cheap and efficient as oil
- produces a large amount of carbon dioxide leading to global warming ... not environmentally friendly
- mining has environmental consequences, including water shortages and water pollution
- costs $\frac{1}{3}$ to $\frac{1}{2}$ trillion dollars annually in external costs

Overuse of Resources: Coal



Overuse of Resources: Oil

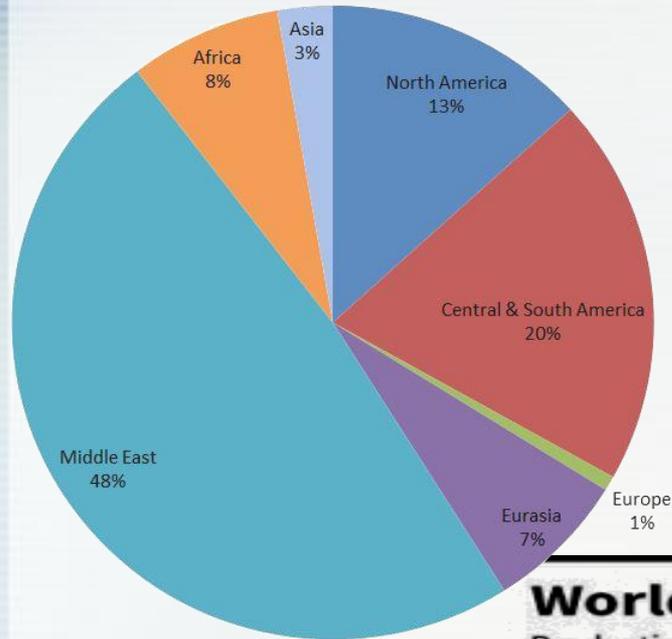


- a good source of energy because it is efficient and cheap compared to other fuels
- nonrenewable
- major contributor to global warming, acid rain, oil spills and pollution
- uneven global distribution
- drilling has environmental consequences

Overuse of Resources: Oil



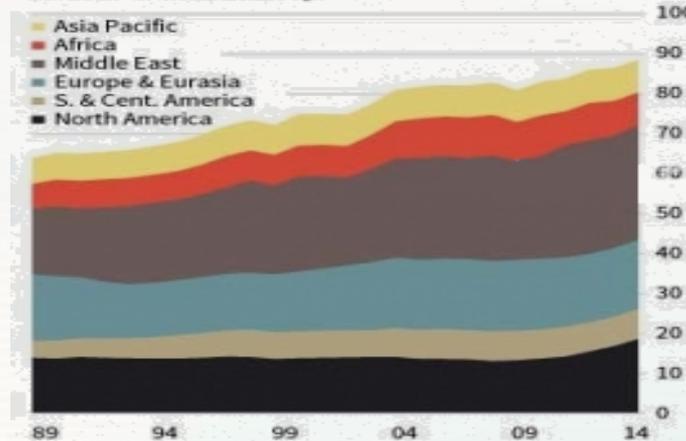
2014 Crude Oil Reserves



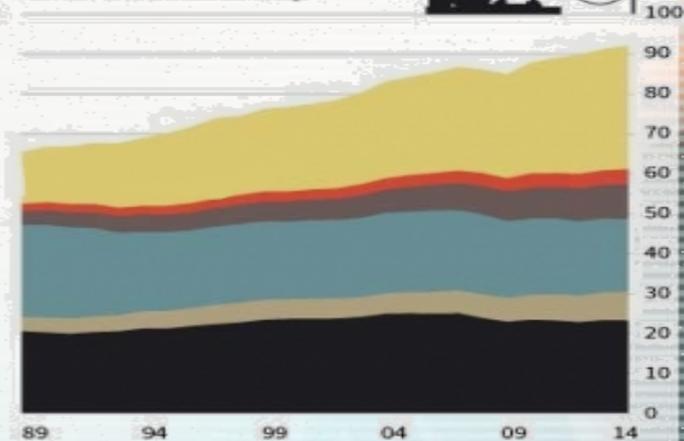
Region	Billions Barrels
North America	219.79
Central & South America	328.26
Europe	12.28
Eurasia	118.89
Middle East	803.60
Africa	126.73
Asia	46.01
	<hr/>
	1,655.56

World oil production and consumption

Production by region
Million barrels daily



Consumption by region
Million barrels daily



Overuse of Resources: Water



- close to 2 billion people use water that is unsafe and dangerous for their health, 3.4 billion people use water of doubtful quality, at least from time to time
- fecal contamination a major cause of disease ... water-related sickness kills a child every 21 seconds.
- people in impoverished, densely populated areas often spend more money and time accessing clean water than people living in developed areas
- water problems getting worse due to insufficient investment in water infrastructure
- destruction of natural safety nets by overuse of groundwater

Overuse of Resources: Water



- massive shortfalls in global cereal production due to lack of water
- slow down of power generation in thermal plants due to lack of cooling water
- drying wetlands and rivers, and sinking groundwater tables
- farming and raising livestock account for 75% of water consumption
- used in many of the steps involved in manufacturing products, from fabrication and processing to washing and transport



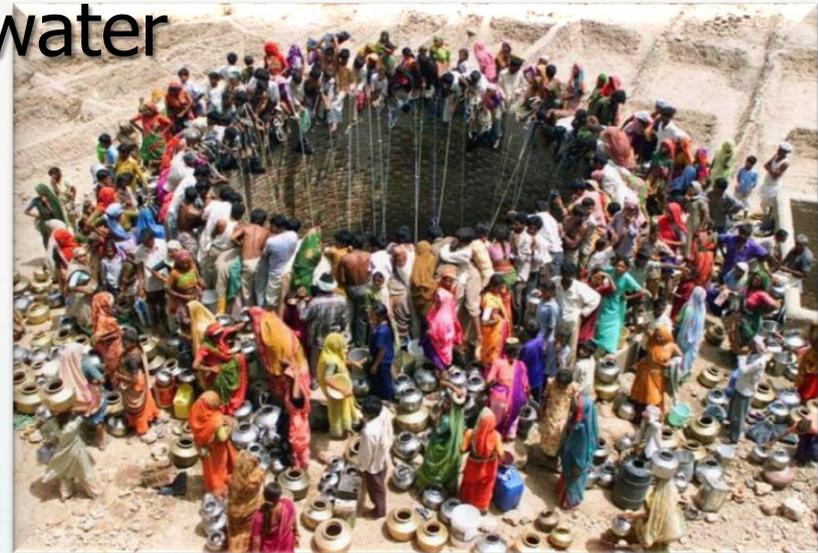
Kenya

Overuse of Resources: Water



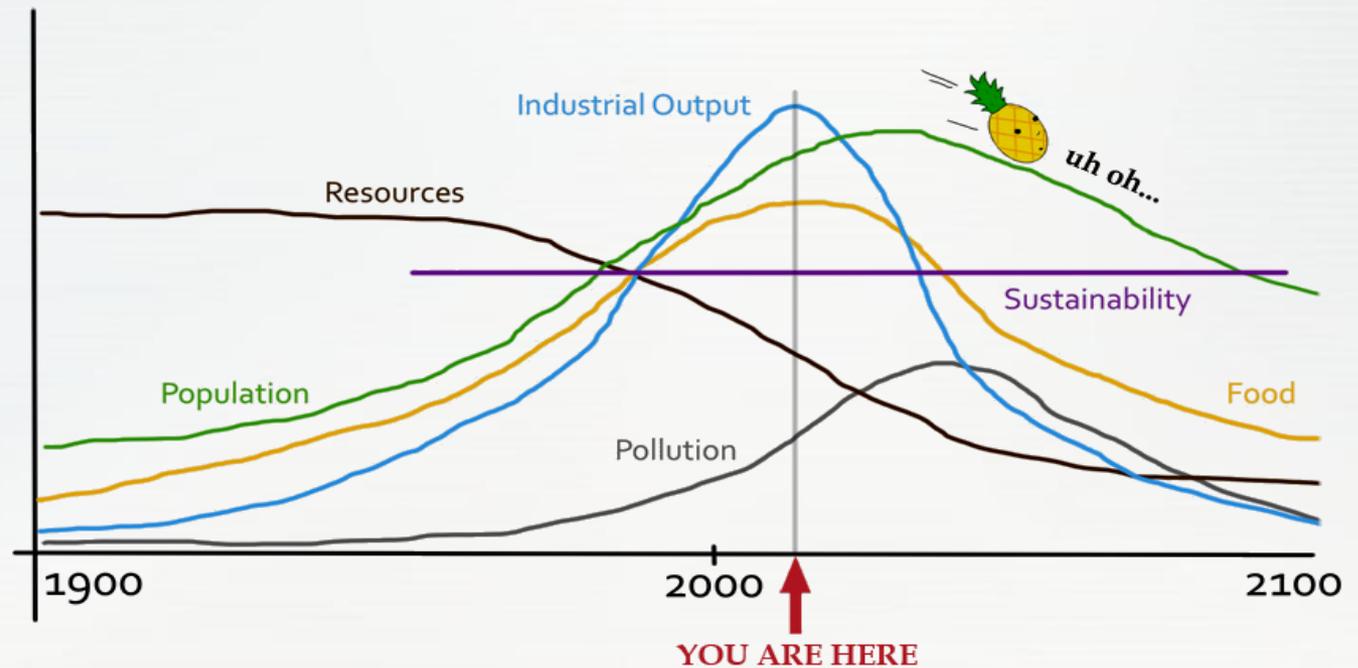
The effects of the overuse of water include:

- decreased crop yields
- decreased forest health and productivity
- decreased supply and quality of fresh water
- increased competition for water



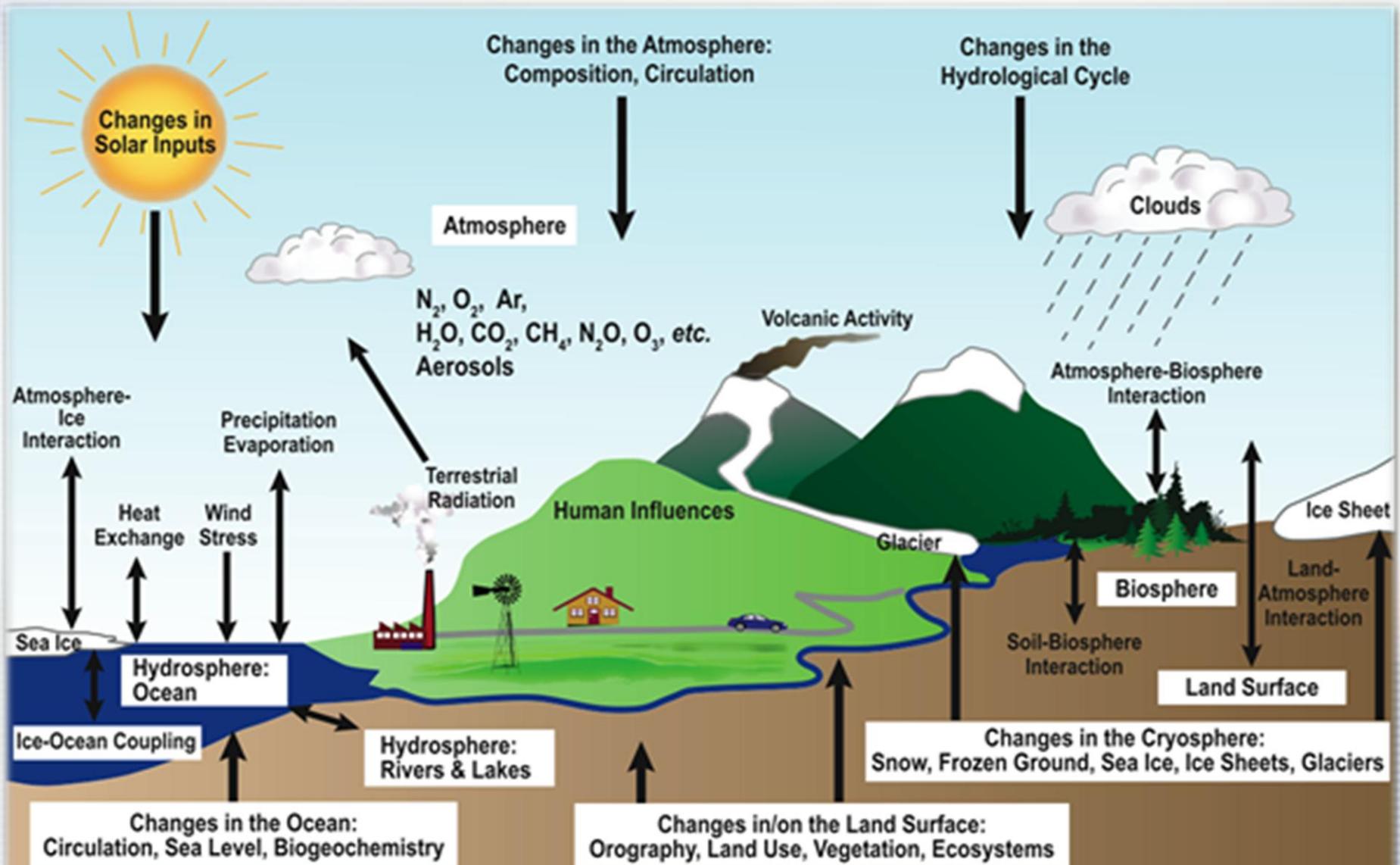


State of the World



HOW MUCH IS HUMAN CAUSED?

Human Effects



Ecological Footprint



Globally, we now require the equivalent of 1.5 planets to support our lifestyles. This is humanity's current **Ecological Footprint** -- the demand people place on the natural world.

Ecological Overshoot



Humanity uses almost 50% more resources than nature can regenerate in a year.

This problem -- using resources faster than they can regenerate and creating waste such as CO₂ faster than it can be absorbed -- is called **ecological overshoot**.

Ecological Overshoot



HOW MANY CHINAS DOES IT TAKE TO SUPPORT CHINA?

CHINA 2.2 

WHAT ABOUT SOME OTHER COUNTRIES?



We currently maintain this overshoot by liquidating the planet's natural resources. We cut trees faster than they regrow, and catch fish at a rate faster than they repopulate. (More than 70% of the fish we consume are over-farmed.)

While this can be done for a short while, overshoot ultimately leads to the depletion of the resources on which the global economy depends.

Ecological Overshoot



Human demands on natural resources have doubled in less than 50 years.

The rate at which resources are being utilized with the population as is – or growing – will exceed the capacity of the planet in about 30 years.

We have only one planet. Its capacity to support a thriving diversity of species, humans included, is large but fundamentally limited.

[The Living Planet Report](#)

[24 Charts Every Leader Should See](#)



The End