Population Impact on Land-use/cover change: its impact on nature Global Change

Dataset · January 2014

1 author:

Salem Thawaba
Birzeit University
27 PUBLICATIONS **46** CITATIONS

SEE PROFILE

Population Impact on Land-use/cover change: its impact on nature

Global Change

Dr. Salem Thawaba

Land-cover: is the biophysical state of the earth surface (cropland, forest, grassland, settlement).

Land-use: is the way land-cover is manipulated, managed and exploited.

Global Land-use change 1700-1980

Vegetation Types	From 1700-1980
Forests and Woodlands	-18.7 %
Grassland and Pasture	-1.0 %
Croplands	466 %

Source: Richards, J. F. 1986.

Irrigated areas (1700-1984)	50,000- 2,200,000 sq. km

Meyer, W.1996

Cultivated land expanded (1700-mid 1990s) from 2.65 million sq. km. to 15 million

Deforestation:

North America lost more woodland in 200 years more than Europe in 2000

Forest occupied 170 mil.hec
Today 10 mil. Hec.

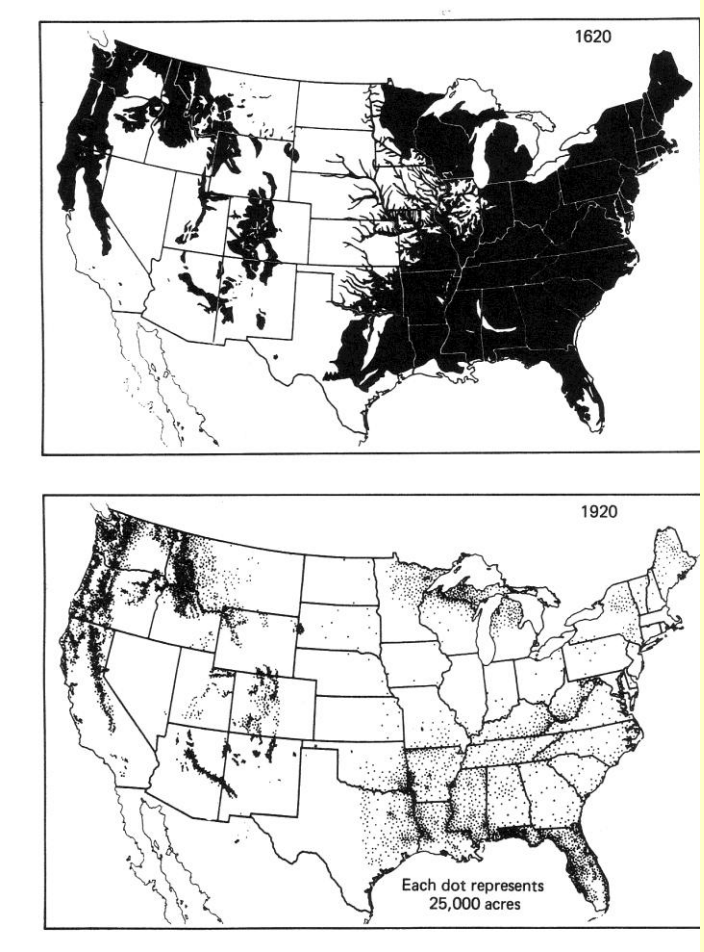


Table 3.3. *Estimated areas of forest clearance (in thousands of square km)*

Region or country		Pre-1650	1650–1749	1750–1849	1850–1978	Total high estimate	Total low estimate
North America		6	80	380	641	1,107	1,107
Central America	H	18				288	
	L	12	30	40	200		282
Latin America	H	18				925	
	L	12	100	170	637		919
Oceania	H	6	6	6	362	380	
	L	2	4				374
USSR	H	70	180	270	575	1,095	
	L	42	130	250			997
Europe	H	204	66	146	81	497	
	L	176	54	186			497
Asia	H	974	216	596	1,220	3,006	
	L	640	176	606			2,642
Africa	H	226	80	−16	469	759	
	L	96	24	42			631
Total highest		1,522	758	1,592	4,185	8,057	
Total lowest		986	598	1,680	4,185		7,449

Source: M. Williams 1990a.

Deforestation Impact

- Reduce biological diversity

- Changes in local and regional env.(soil degradation, water flows, increase sediments)

Changes in global env. (carbon stored in terrestrial biota, increase CO_2 , changes in global temperature, rainfall patterns)

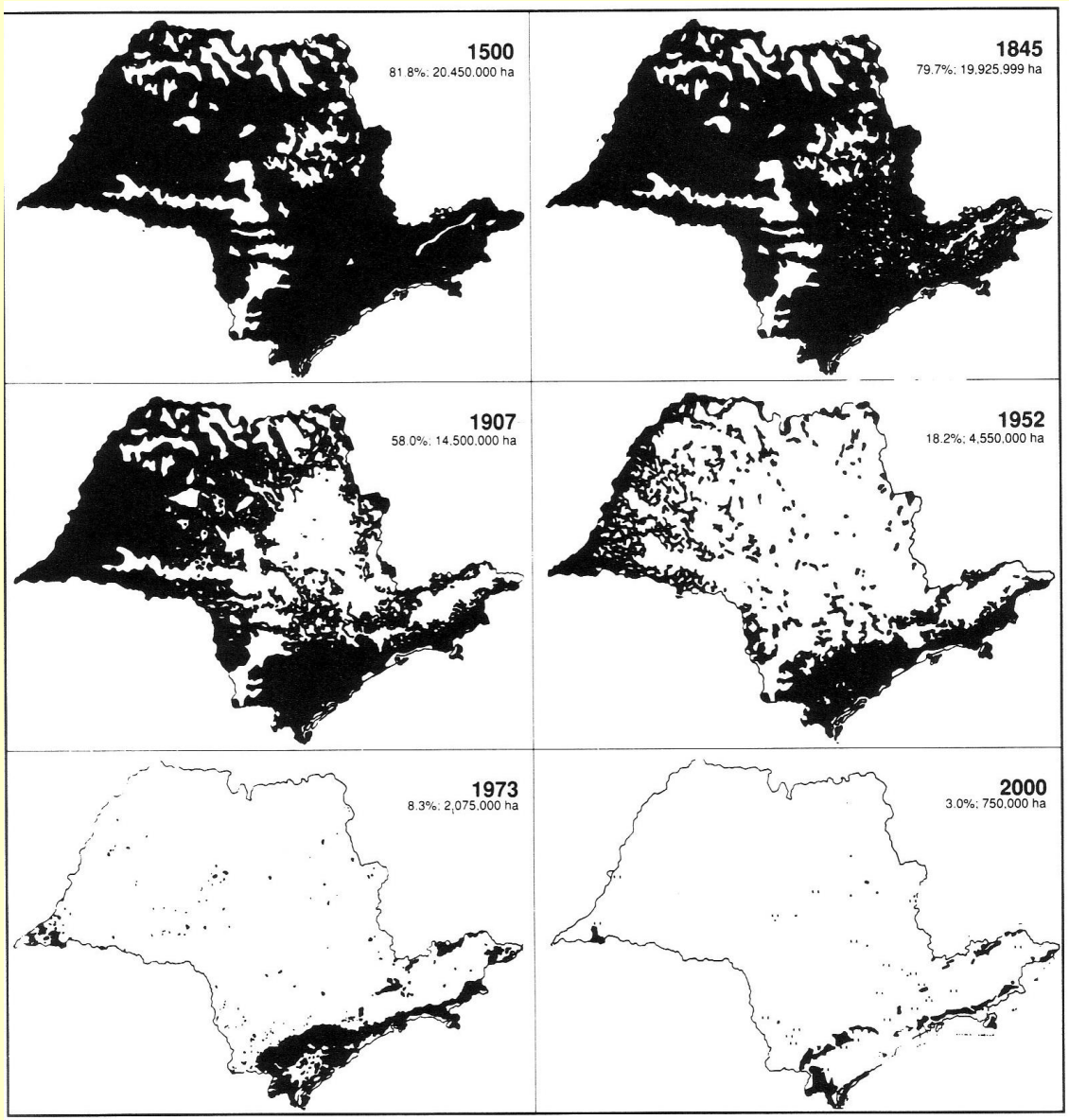


Figure 4.3 Depletion of the forest area in São Paulo State, Brazil. Redrawn from Oedekoven 1980 for Peters and Lovejoy 1990.

CO_2

- (1900- 2000) CO_2 into the atmosphere grew from 0.5 billion to 7.3 billion tons per year. (forest clearance, fossil fuel burning, land-fills, ..)

- Cities generate 80% of all carbon dioxide emissions.

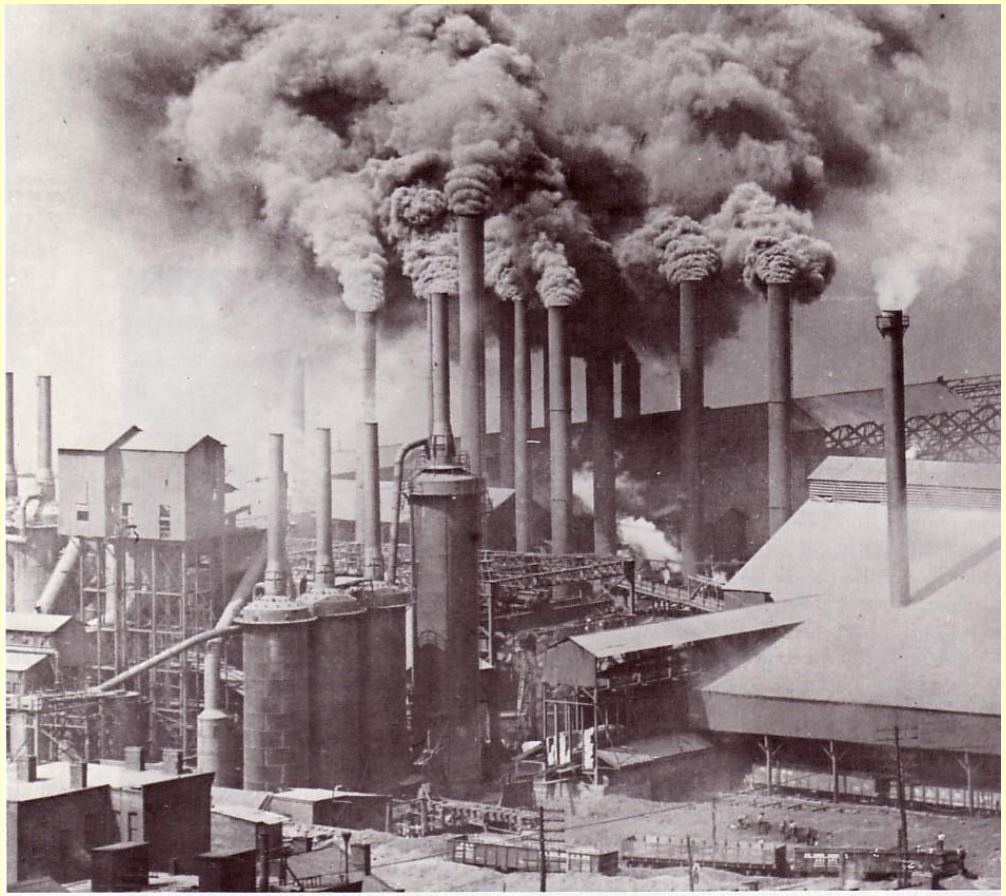


Figure 10.1 *Industrial smokestacks in Pittsburgh in 1906. (Carnegie Library of Pittsburgh.)*

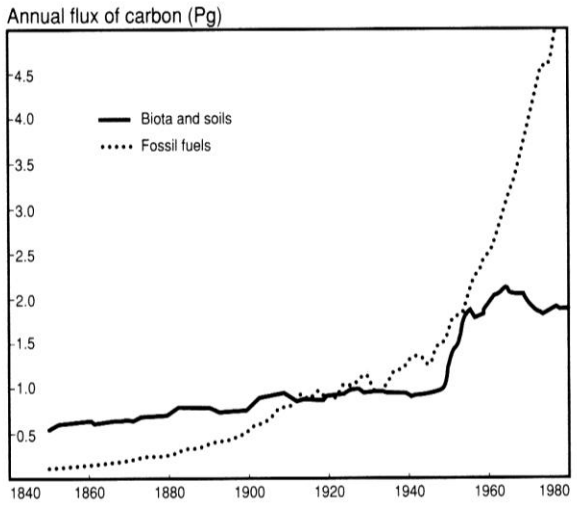
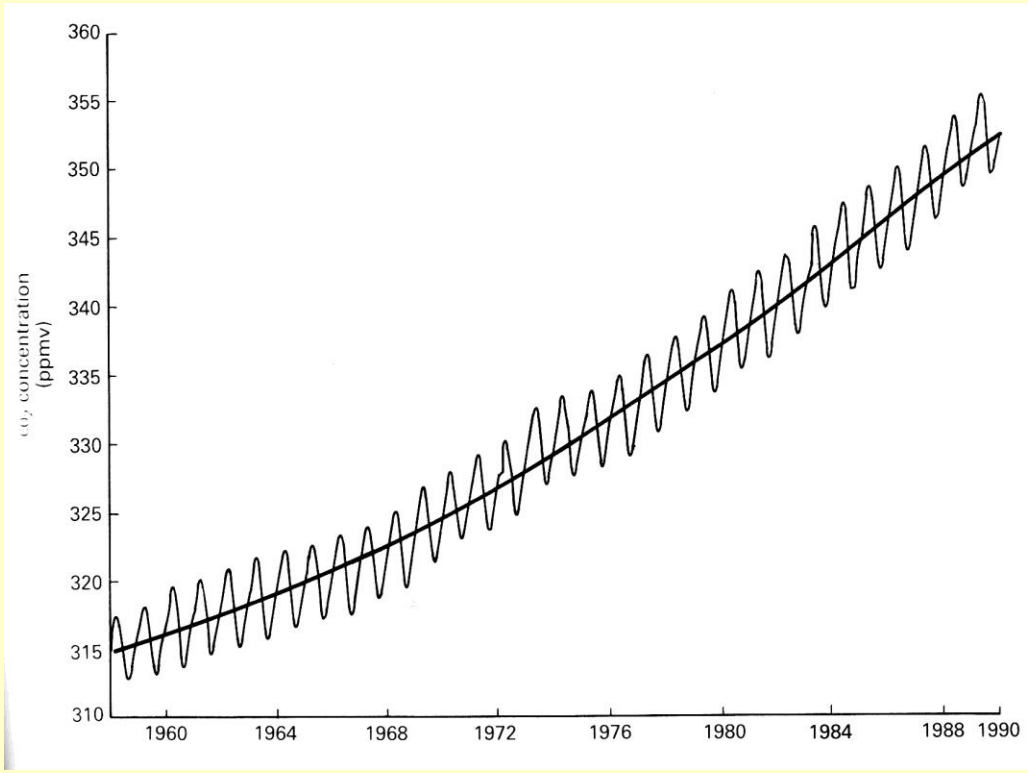


Figure 6.2 The annual net releases of carbon from changes in land cover (solid line) and the annual emissions of carbon from combustion of fossil fuels (dotted line) between 1850 and 1980, in Pg (one Pg = 10^{15} grams). Source: Houghton and Skole 1990.



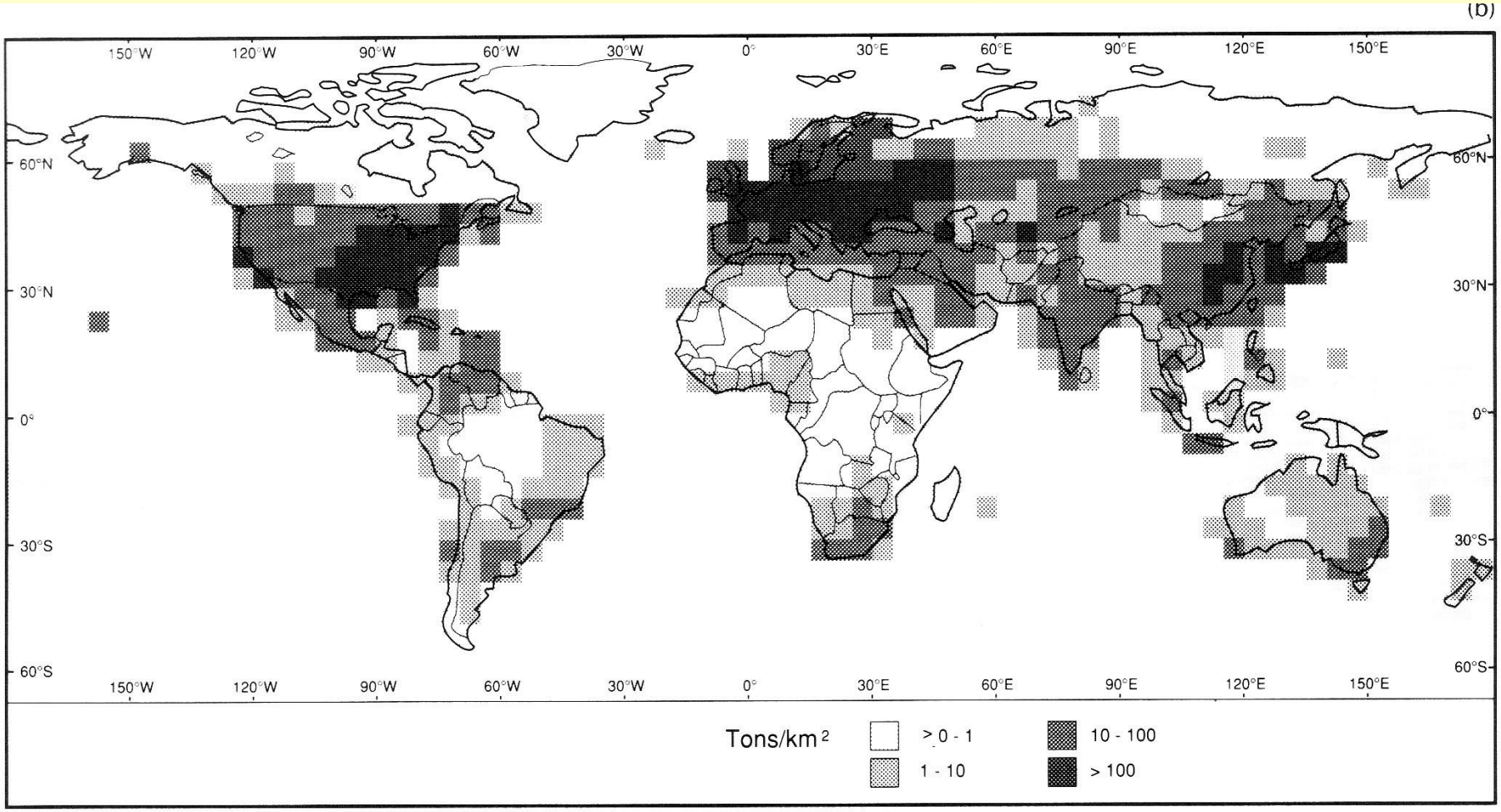


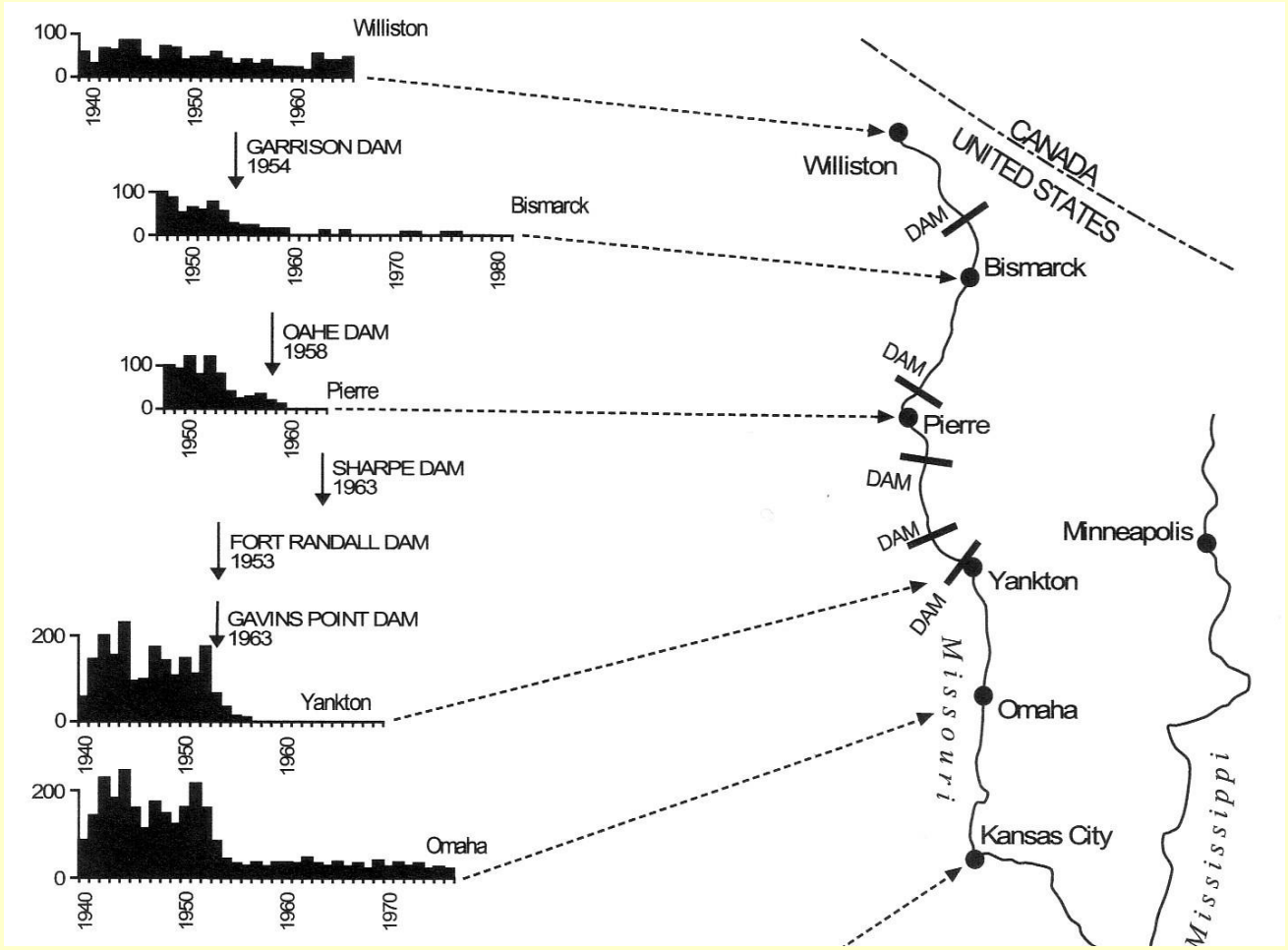
Figure 6.3 Releases of carbon from (a) land use and (b) fossil-fuel combustion, 1980, in tons per square km. Source: Houghton and Skole 1990.

Soil:

- Soil become salinized and altered due to irrigation and fertilizers (water evaporates and leaves the salt and minerals)

- Overgrazing increases the chance of soil erosion

- Dams cause reduction in sediment load of river downstream (reduction in flood-deposited nutrients, accelerating erosion of deltaic areas)



- Urban growth (construction phase) where is the highest rates in soil erosion (large amount of exposed land)

- Clearing land-cover for cultivation is a sharp increase in soil loss

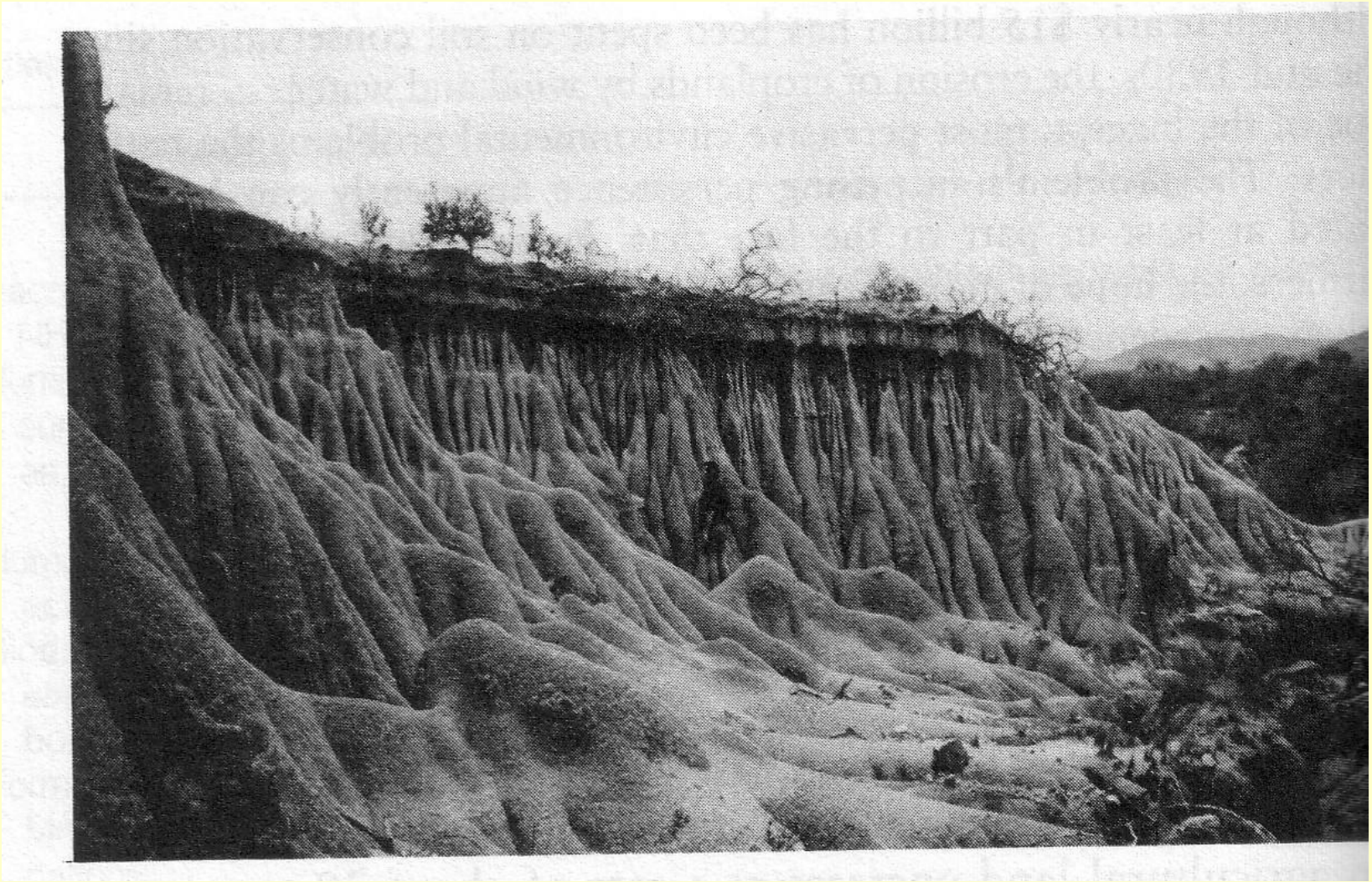


Table 3.4. *Increases of sediment yield due to human activity*

Situation	Magnitude of increase
In large rivers, generally	3.5 times
In small rivers, generally	8
Forest clearance, Cameron Highlands, Malaysia	5
From erosion of forest roads, Idaho	200–500
Forest clearance, South Island, New Zealand	up to 100
Coon Creek, Wisconsin 1870–1930	10
Cultivation on forest land, Java	2
Trinidad	9
Ivory Coast	18
Tanzania	5
Urbanization in rainforest area, Malaysia	20

Source: Douglas 1990.

Water:

- Saline water 97.2%, land holds 2.8%

- Ice-caps 2.14%, groundwater 0.61%, soil moisture 0.005%, freshwater in lakes 0.009%, rivers 0.0001%, saline lakes .008%. (more than 75% of water in land areas is locked in the ice caps or saline.

- World water withdrawal grew from 500 cubic kl. to 4000 cubic kl. per year -8-folds (1900-2000).

- Human annually withdrawal ¼ to ½ of all available renewable freshwater

- Agriculture is considered the main consumer of water and the main source of pollution (salt, fertilizers, pesticides, forest clearance changes the rate and volume of flow)

- Dams helps the intrusion of seawater into fresh groundwater (Aswan Dam), displacement of people

- Draining water from wetlands, can also cause long-term damage to soil quality (nutrients, organic materials, which is important for productivity)

- Dissolved oxygen affects rivers and lakes nearby urban areas- Impact on aquatic quality (dead zones)

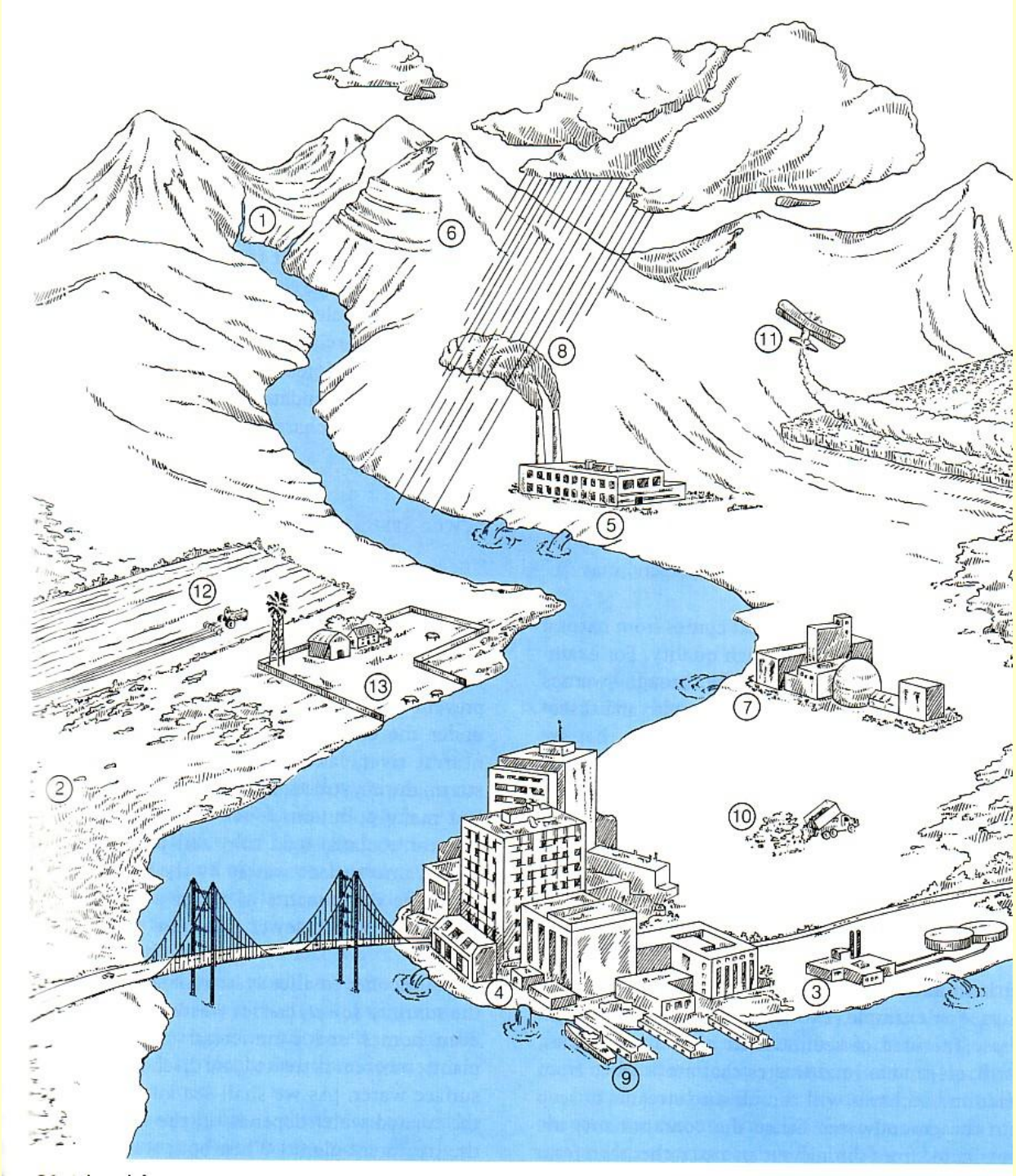
Septic tanks can cause a great pollution problem

- Over pumping of groundwater can cause land subsidence

(Mexico)

South Africa- (Goudie, 2000)

Human impact on water



Biodiversity

- (Industrial activities, waste, deforestation) alter the habitat and reduce biodiversity.

- Clearing native vegetation- threat to biodiversity, division of habitat into small parcels (more isolated areas- a loss of species- decrease in continuity).

Landscape transformation, drainage of wetlands, plowing of grasslands, clearance of forests,

Marine life is impacted by pollutants seeping into the sea

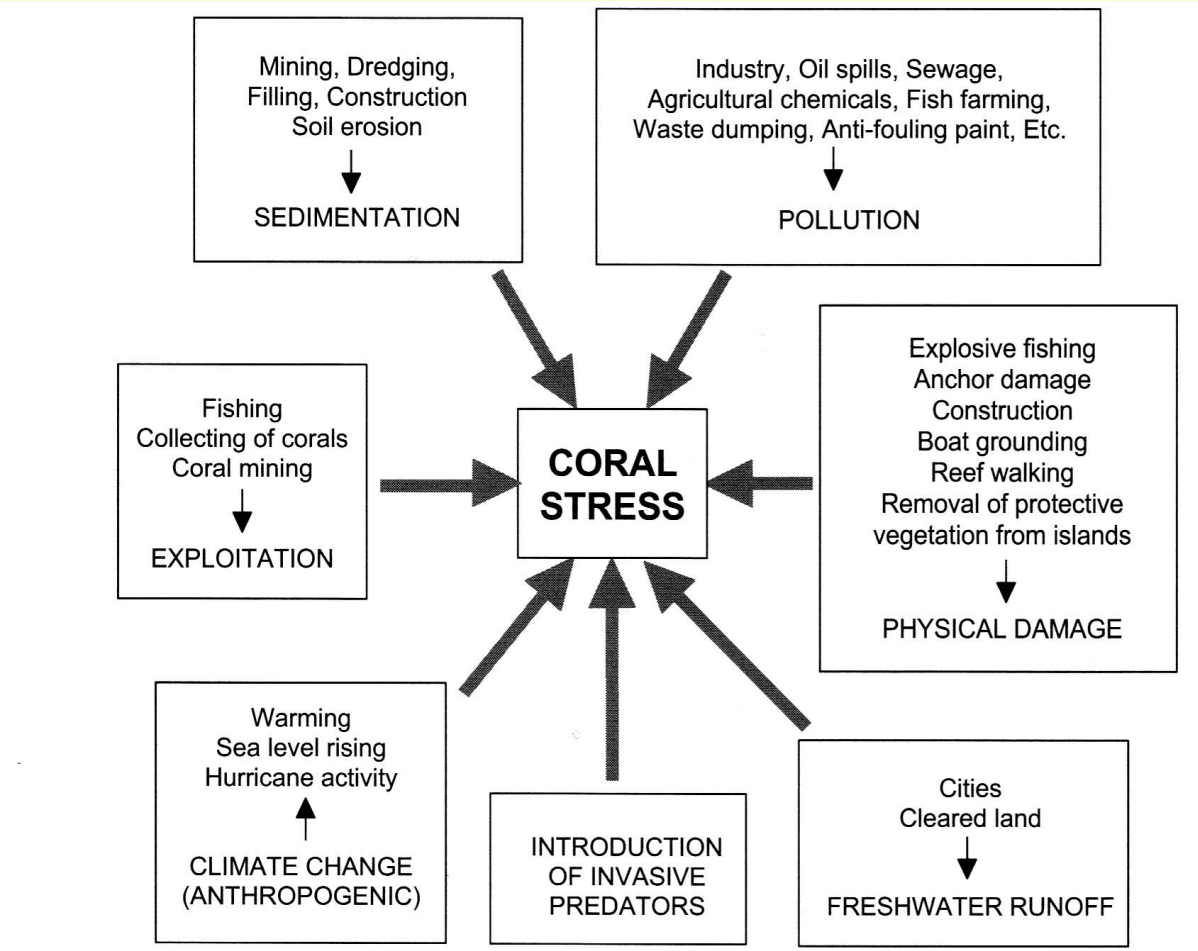


Figure 9.2
Some causes of anthropogenic stress on coral reef ecosystems

Marine life is threatened by over fishing

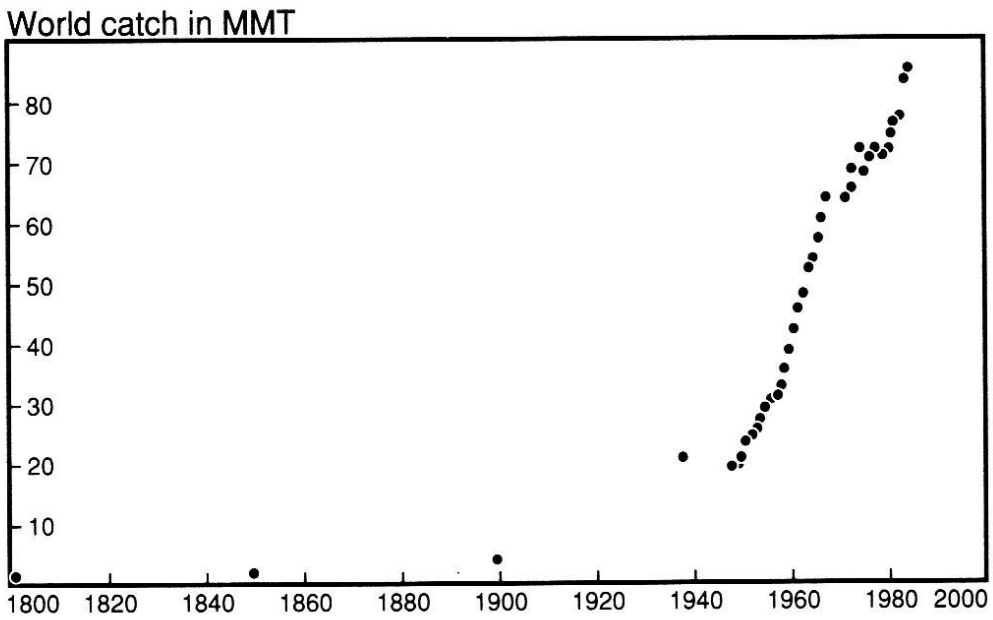


Figure 4.4 Historic trends in the catch from the sea, in millions of tons. Source: Hilborn 1990.

Urbanization

- World population in cities rose from 13% in 1900 to 47% in 2000.

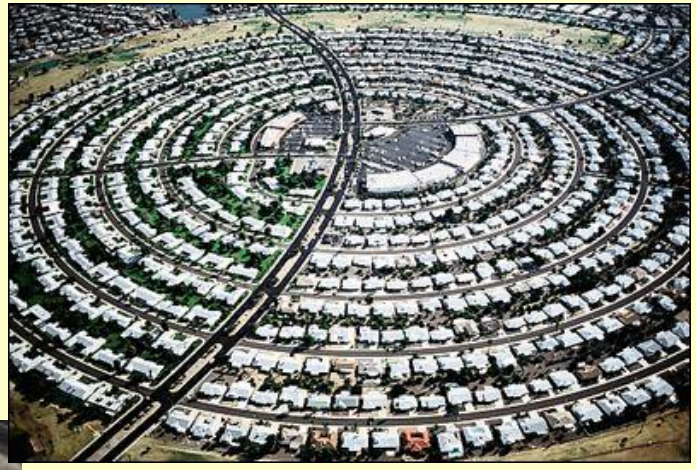
- City dwellers increased from 0.2 bil to 2.9 bil during 20th century.

- At the beginning of 20th entury no cities had 10 mil. or more. 1950- New York, In 2000, 20 cities (these cities are the home of 10% of urban people).

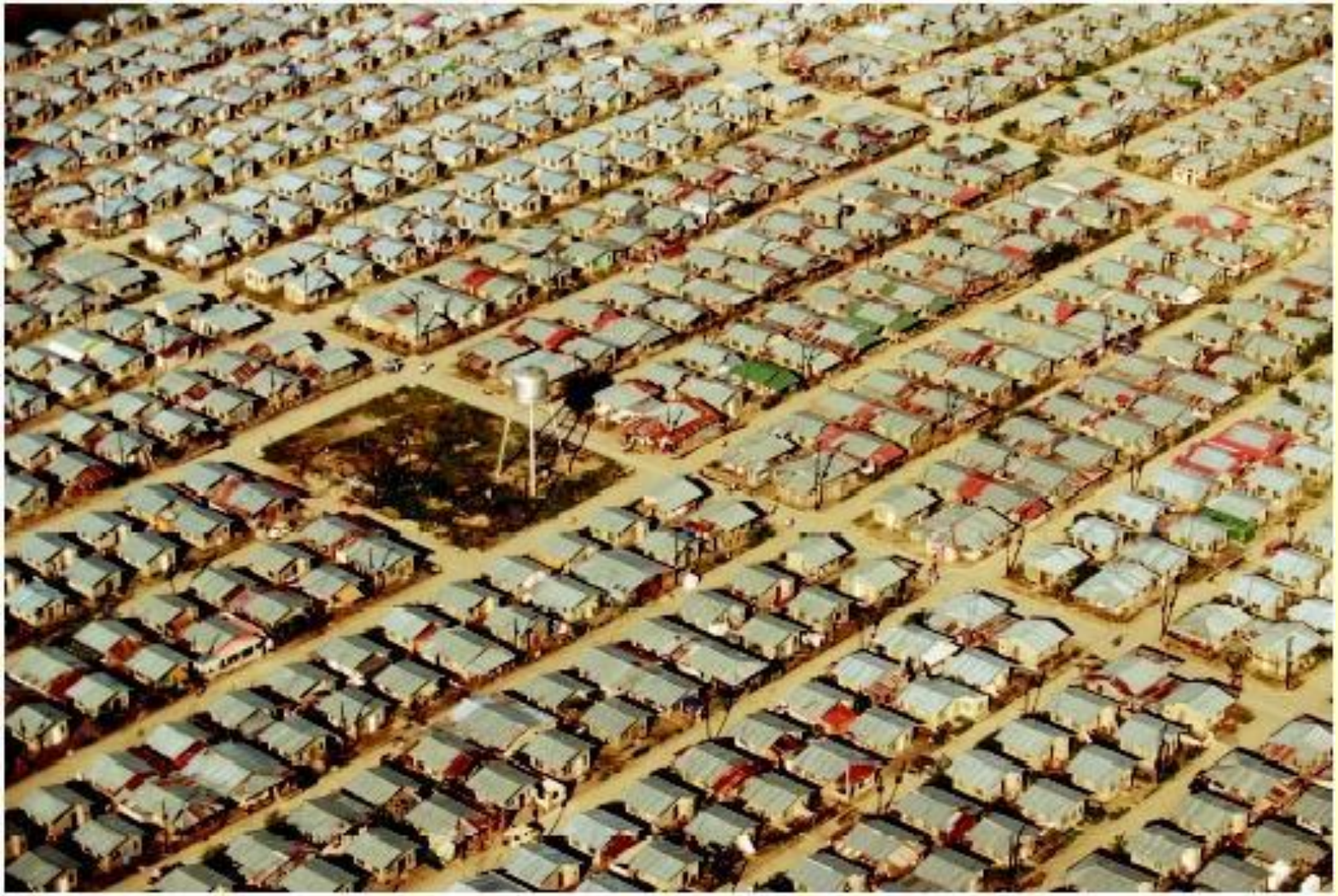
Population growth is the driving force of forest clearance (meet the needs- food shelter)

Land-use change (urbanization) has significant impact on hydrogeology (quality and quantity)

Runoff increases due to urban growth (more chance for pollution, affecting underground aquifers).



Coastal cities withdrawal of fresh water causes intrusion of salt (sea water into the aquifers)



Sustainable development

- It is the development that meets the present needs without affecting the future generation to meet theirs.

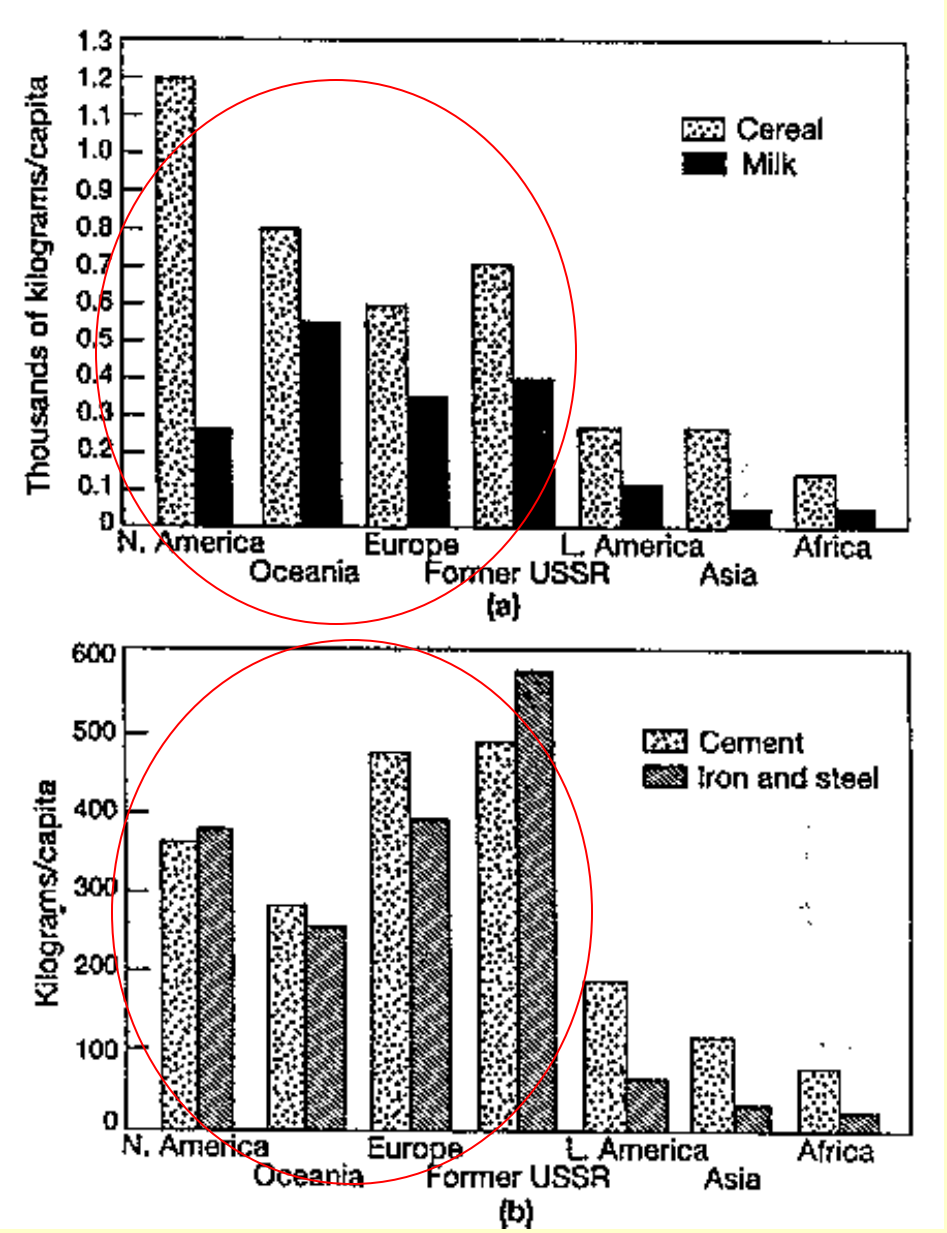
- Population growth – consumption and waste production – (birth rates, family planning)

-1995, 4.4 b. in Developing countries-77%.
And 1.3 b. in developed countries – 23%.
2025 developing – 84%. And 16% developed.

- Developed world (25%) used 75% of world energy (1993)

In 1994

1 second	6 humans
1 minute	360
1 hour	21,600
1 day	518,400
1 week	3,628,800
1 month	15,768,000
1 year	189,216,000



- In developing countries, there is an urgent need to establish more accurate data to determine critical issues.

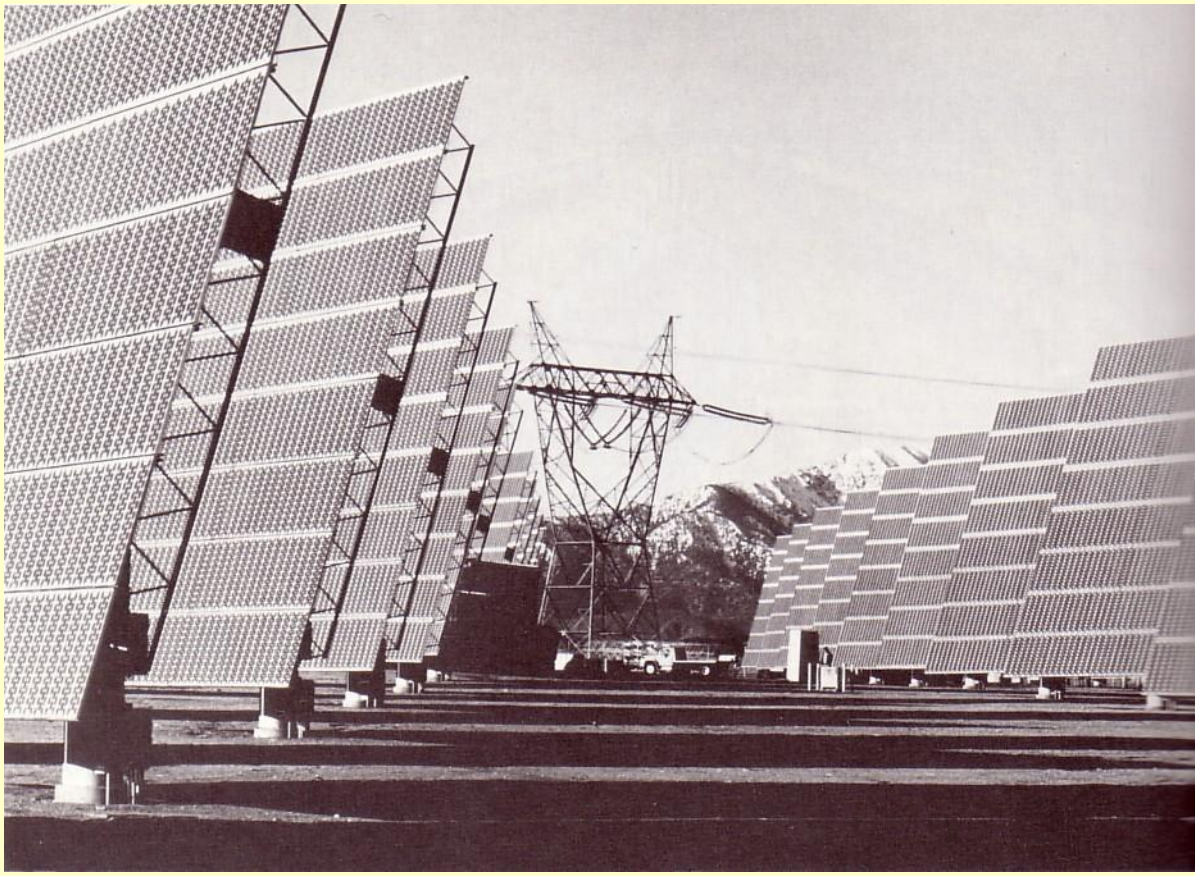
- The need for international agencies (UNEP,FAO,..) involvement.

- Local support and public awareness (environmental degradation and health)

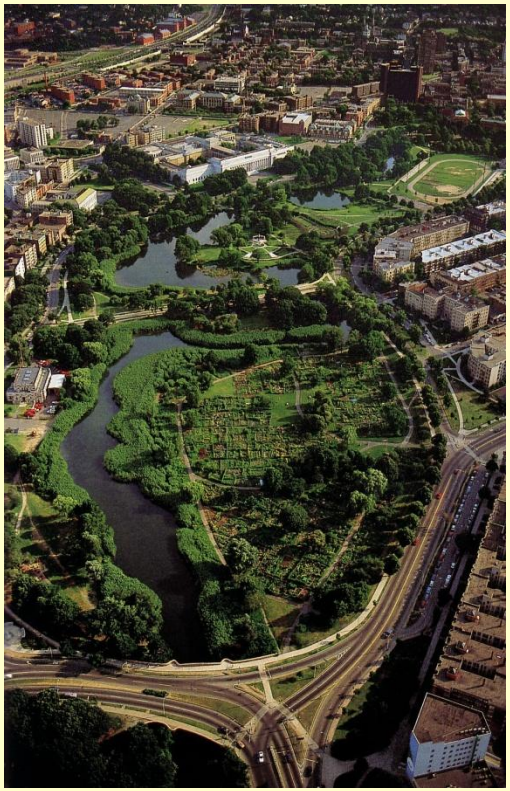
- In agriculture, there is a need for best management practice (fertilizers, manure application).

New Concepts:

Using solar energy (California- light 400 houses)

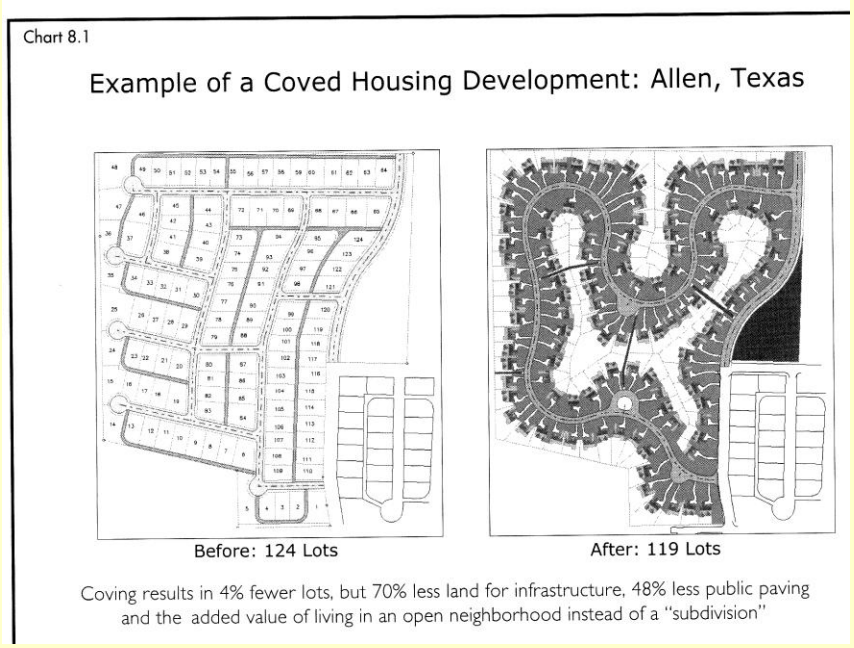


<u>Greenways:</u> to conserve nature, give the people places and routes to hike and walk, give corridors for species to cross from one habitat to another.



Smart Growth / Sprawl

Smart growth is intelligent, well-planned development that channels growth into existing areas, provides public transportation options, and preserves farmland and open space.



Saves 50% in infrastructure