Tragedy of the Commons

Theoretical and Practical Observations from an Ecological Perspective

Contributors

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Hardin is best known for his 1968 article in *Science*, "The Tragedy of the Commons".[1] In it he argued that if everyone had free access to common property, the resource would be lost to all. But Hardin was immensely influential in a host of related causes, including environmentalism, population control, abortion rights, and restrictions on immigration. His hard-headed approach to the competition for resources won him notoriety as well as fame--as when he suggested that if rich people let poor people into their "lifeboat," all will sink. "The human species viewed as a whole has been a disaster for the Earth," he said in a 1996 interview.

Friends say the Harding's practiced what they preached by collecting rainwater to drink, recycling, composting, and eschewing newspapers because the squander newsprint. They were members of the Hemlock Society, and their deaths occurred a week after their 62nd wedding anniversary.

Source: Hardin G, 1968. The Tragedy of the commons. Science Vol.162:1243-1248. [1]

http://www.sciencemag.org/site/feature/misc/webfeat/sotp/commons.xhtml

Garret Hardin‘s Profile

- Best known for his 1968 Article in Science, „The Tragedy of the commons“
- PhD in Microbiology (Stanford Uniiversity, 1941)
- Masters in Zoology (University of Chicago)
- Emeritus Prof. (University of Cal., in St. Barbara)
- Totalled of 27 books and 350 articles written.
- Practiced what he has preached:
  Collecting rainwater for drinking.
  Recycling, practicing family planning, etc.

Hardin received a Ph.D. in microbiology from Stanford University in 1941 after studying zoology at the University of Chicago. He taught at the University of California, in Santa Barbara, and until his retirement in 1978. He remained active, however, and in 1986 he and his wife helped found Californians for Population Stabilization. His output totalled of 27 books and 350 articles.

Tragedy of Freedom in a Commons

"The essence of dramatic tragedy is not unhappiness.

"This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness.

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The Tragedy of the Commons in a nutshell:

i) "The tragedy of the commons," using the word "***tragedy***" as the philosopher Whitehead used it: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things." "This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama."

ii) Therein is the tragedy. Each man is locked into *a system that compels him to increase his herd without limit -- in a world that is limited.*

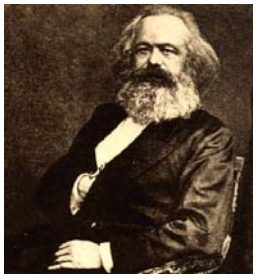
iii) Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

iv) The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy. As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?"

History of the Concept

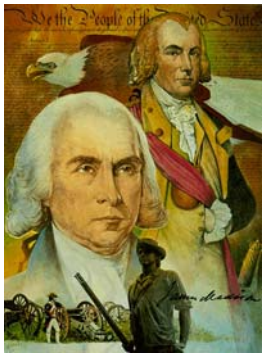
Karl Marx:

„To each according to his needs“



William Forster Lloyd in 1832:

„Each Human exploiter of the common was guided by self-interst. At the point when the carrying capacity of the commons was fully reached and ultimately, the common property would be ruined.“



James Madison in 1788:

„if men were angles, „that is, if all men were angels, but in world in which all resources are limited, a single no-angel in the commons spoils the environment for all.“

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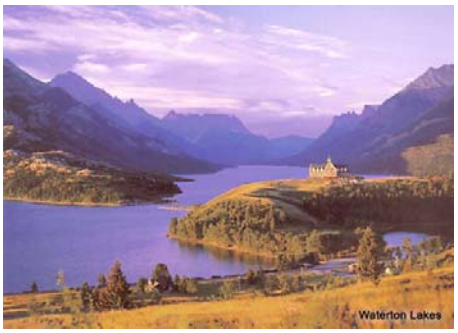
Marx: They did so because the owners had an incentive to take care of their land. But outside the ranch, no one owned the land. It was open to nomads and their herds. Though knowing nothing about Karl Marx, the herdsmen followed his famous advice of 1975: "…to each according to his needs." Their needs were uncontrolled and grew with the increase in the number of animals. But supply was governed by nature, decreasing drastically during the drought of the early seventies. The herds exceeded the natural "carrying capacity" of their environment, soil was compacted and eroded, and weedy plants, unfit for cattle consumption, replaced good plants. Many cattle died, and so did humans. But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into *a system that compels him to increase his herd without limit -- in a world that is limited.* Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. Even at this late date, cattlemen leasing national land on the Western ranges demonstrate no more than an ambivalent understanding, in constantly pressuring federal authorities to increase the head count to the point where overgrazing produces erosion and weed-dominance.

Lloyd: The rational explanation for such ruin was given more than 150 years ago. In 1832 William Forster Lloyd, a political economist at Oxford University, looking at the recurring devastation of common (i.e., not privately owned) pastures in England, asked: "Why are the cattle on a common so puny and stunted?" Why is the common self so bare worn, and cropped so differently from the adjoining enclosures?" Lloyd's answer assumed that each human exploiter of the common was guided by self-interest. At the point when the carrying capacity of the commons was fully reached and ultimately, the common property would be ruined. Idealist may appeal to individuals caught in such a system, asking them to let the long-term effects govern their actions. But each individual must first survive in the short run. If all decision makers were unselfish and idealistic calculators, a distribution governed by the rule "to each according to his needs" might work, but such is not our world.

Madison: As James Madison said in 1788, "if men were angels. "That is, if all men were angels, but in a world in which all resources are limited, a single non-angel in the common spoils the environment for all.

Environments of the commons …. (1)

Inexhaustible resources of the oceans and the land bring species after species closer to extinction.



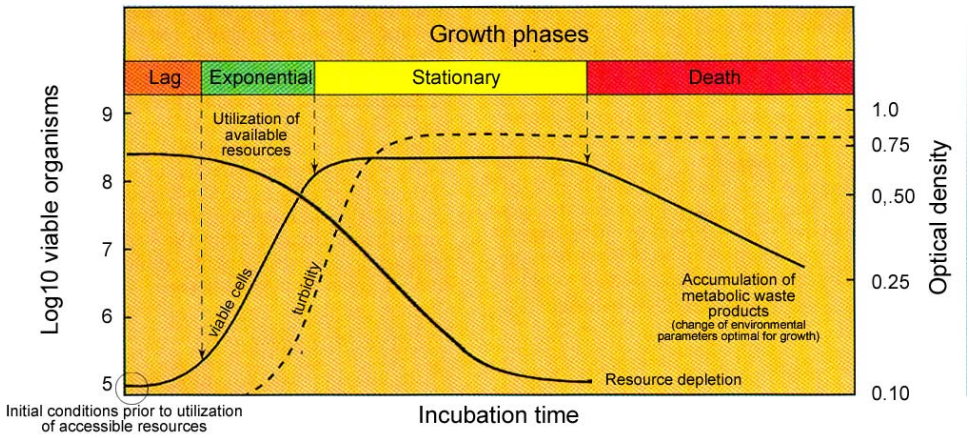
Likewise, the oceans of the world continue to suffer from the survival of the philosophy of the commons. Maritime nations still respond automatically to the shibboleth of the "freedom of the seas." Professing to believe in the "inexhaustible resources of the oceans," they bring species after species of fish and whales closer to extinction.

The National Parks (on land or water) present instances of the working out of the tragedy of the commons. At present, they are open to all, without limit. The parks themselves are limited in extent -- there is only one Yosemite Valley -- whereas population seems to grow without limit. The values that visitors seek in the parks are steadily eroded. Plainly, we must soon cease to treat the parks as commons or they will be of no value to anyone.

Industries and even nations are apt to regard the cleansing of industrial discharges as prohibitively expensive. The oceans are also treated as common dump.

Environments of the commons …. (2)

A simple case of microbiota (yeast culture) …. or
When growth becomes the ultimate goal



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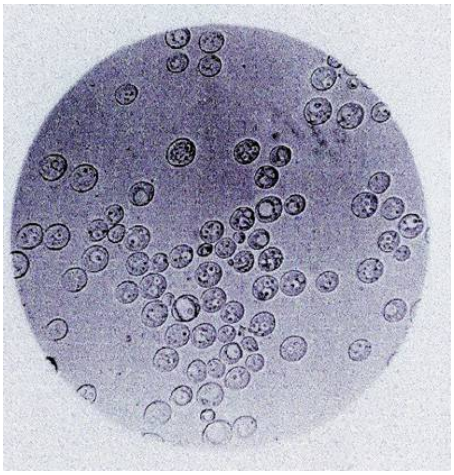
Micro-organismic growth pattern (Yeast):

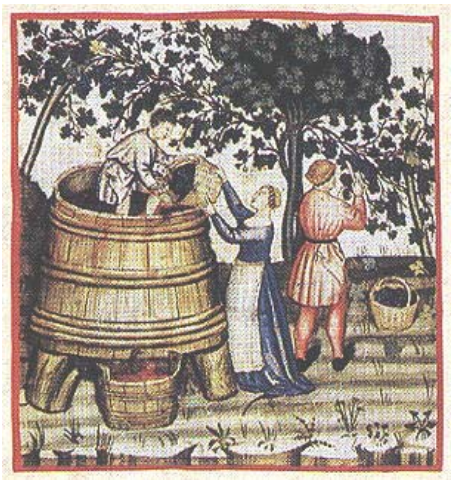
- **alarm:** the onset of disturbance is followed by stabilization of the structural and functional conditions (for the normal pursuance of vital activities). Too rapid an intensification of the impairment results in acute collapse (**acute damage**). If the intensity of the stimulus remains unchanged restitution in the form of "repair" process is quickly initiated.
- **resistance:** restitution leads onto the resistance phase, in which, under continuing stress, the resistance increases (**hardening**). Due to the resulting improvement in stability, normalization can take place despite continued stress (**adaptation**).
- **exhaustion:** if the state of stress lasts too long, or if the intensity of the stressor increases, a state of exhaustion may set in, thus rendering the organism susceptible to infections that occur as a consequence of impaired host defences, and leading to premature collapse. However if the impairment was merely temporary, the functional state is restored to its original level. If necessary, any damage incurred may be repaired in a phase of regeneration. If the limits of tolerance are exceeded and the adaptive capacity is overtaxed, premature damage or even death may result.

Source: modified after Madigan M.M., Martinko J.M., Parker J., 1996. Brock's Biology of Microorganisms (8th ed). Prentice Hall Inc.

Environments of the commons …. (3)

A simple comparision ….





Single celled organisms, plant, animals (incl. humans) and even ecosystems can behave quite similar. Indeed, we are quite familiar with this response pattern if we imagine ourselves rushing to an appointment but wasting time while stuck in a traffic jam. Stress hormones rush through our body and …. Well, I am sure everyone has already experienced such a situation. The only difference now and then (referring to our fore/mothers-fathers), is that nowadays we have to "sit" it out, while our relatives in the stone age had the chance to run away. Chronic stress acts like a pressure-cooker, at a certain point it will explode, similar to a machine permanently operated at high RPM, eventually the pistons will get jammed up.

Nature treated human-beings like winemakers treat yeast cells, by endowing our world (especially Europe's New World) with abundant but exhaustible resources. People promptly responded to this circumstance as do yeast cells respond to the conditions they find when put into the wine vat …. The drive in growth at skyrocking numbers.

Environmental Pollution (1/1)

Air - Industry

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*

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The tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but *of putting something in:*

i) The tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but *of putting something in -- sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the atmosphere; acid rain, the greenhouse effect, and the erosion of the earth's protective ozone layer.*

ii) we are locked into a system of "fouling our own nest," so long as we behave only as independent, rational, free enterprisers.

iii) But the air and waters surrounding us cannot readily be fenced …. *The law, always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons* …. Common roads are financed by common taxes; therefore, the government (!) …. Distracting activities and unpleasant advertising (free market) signs into the line of sight.

iv) The pollution problem is a consequence of population. *Yet continuing to defend the freedom to pollute will ultimately lead to ruin for all. Nations are just beginning to evolve controls to limit this damage.*

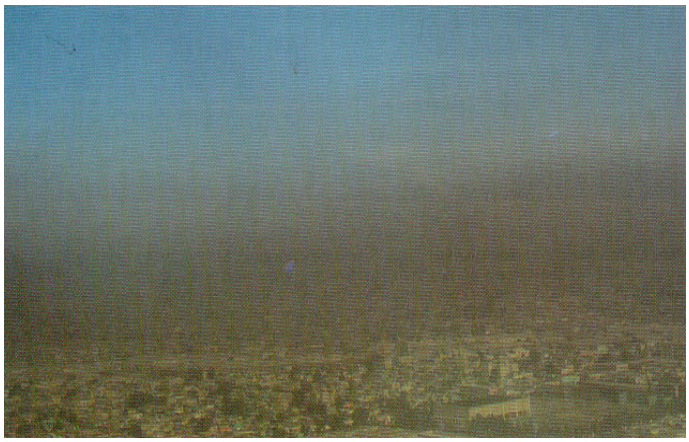
Environmental Pollution (1/2)

Air - Urban

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*



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Air pollution above Mexico City

http://biophysics.sbg.ac.at/mexico/air.htm

Environmental Pollution (1/3)

Air – Personal Exposure

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking something out of the commons,

but *of putting something in!*

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The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by ***coercive laws*** or ***taxing devices*** that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. We have not progressed as far with the solution of this problem as we have with the first. Indeed, our particular concept of private property, which deters us from exhausting the positive resources of the earth, favors pollution. The owner of a factory on the bank of a stream -- whose property extends to the middle of the stream -- often has difficulty seeing why it is not his natural right to muddy the waters flowing past his door. *The law, always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons.*

The pollution problem is a consequence of population. It did not much matter how a lonely American frontiersman disposed of his waste. "Flowing water purifies itself every ten miles," my grandfather used to say, and the myth was near enough to the truth when he was a boy, for there were not too many people. But as population became denser, the natural chemical and biological recycling processes became overloaded, calling for a redefinition of property rights.

Environmental Pollution (1/4)

Water - Runoff

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*

Environmental Pollution (1/5)

Soil – Illegal Dumping of Waste

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking something out of the commons,

but *of putting something in!*

Environmental Pollution (1/6)

Waste

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking something out of the commons,

but *of putting something in!*

Environmental Pollution (1/7)

Waste - Toxic

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*

i) Radioactive and bio-hazardous waste

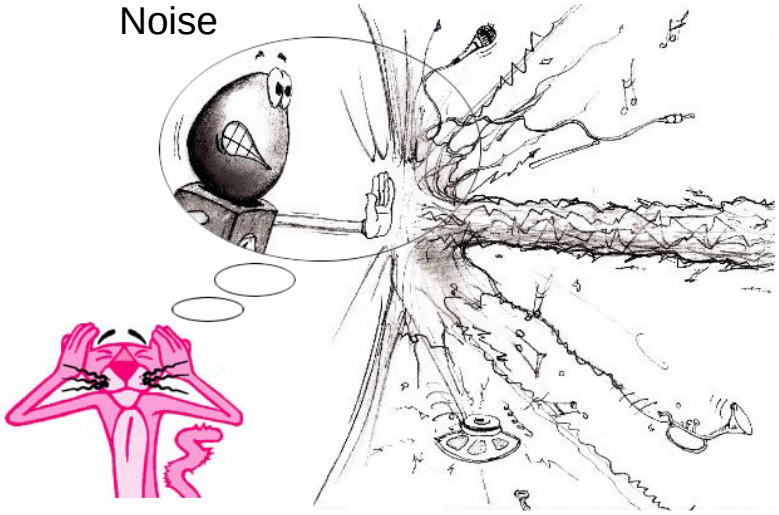
Environmental Pollution (1/8)

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*

Noise

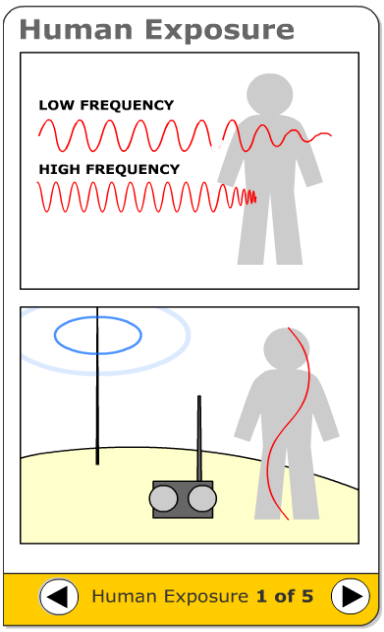


Environmental Pollution (1/9)

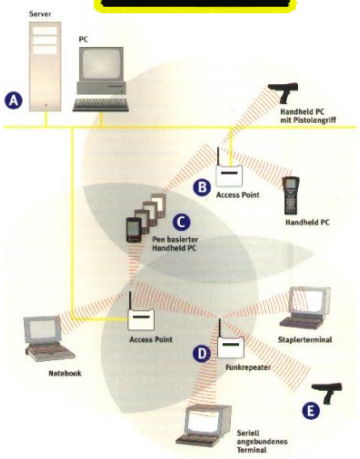
The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*



EMR



http://www.hpa.org.uk/radiation/understand/at_a_glance/index.htm

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i) When radio waves pass through the body, some of their energy is absorbed. The amount of energy deposited in the body tissues depends upon the frequency of the radiation.

ii) At higher frequencies more energy is absorbed, a greater proportion of it close to the surface on the side of the body facing the source. At 1GHz almost all the energy is in the first 2 to 3cm of tissue!

iii) Resonance: people behave like antennas. When their height is about half a wavelength they absorb energy more efficiently ($\lambda = c/f$).

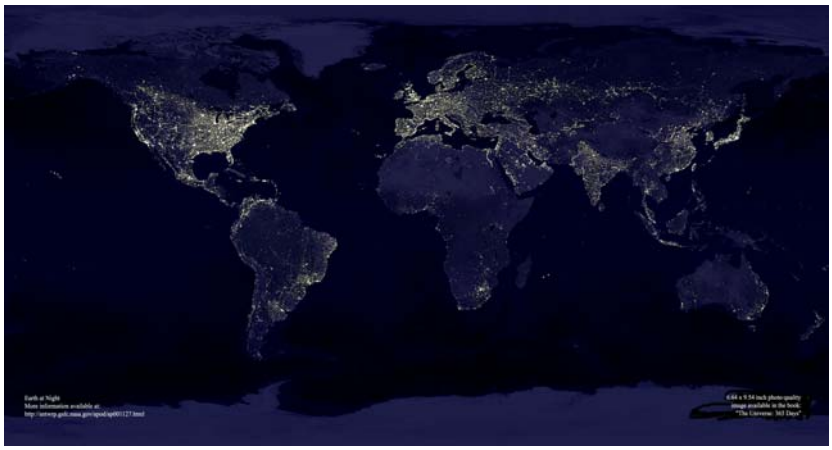
Environmental Pollution (1/10)

Light

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking something out of the commons,

but *of putting something in!*



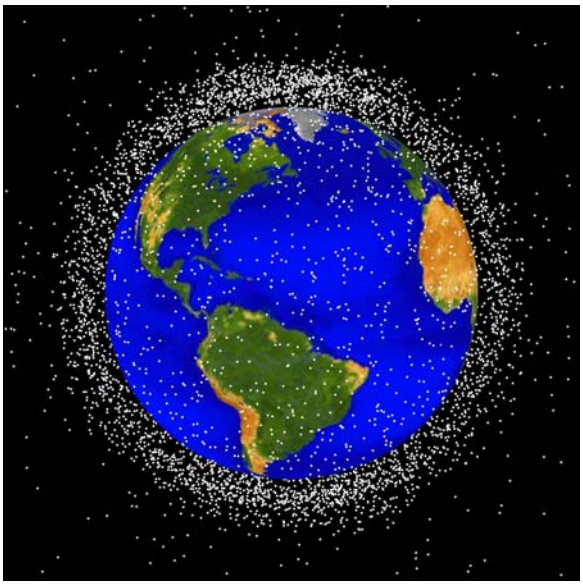
http://antwrp.gsfc.nasa.gov/apod/ap001127.html

Environmental Pollution (1/11)

The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking some-thing out of the commons,

but *of putting something in!*



Space

http://www.orbitaldebris.jsc.nasa.gov/photogallery/beehives.html#leo

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i) In a reverse way, the tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but *of putting something in -- sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air; and distracting and unpleasant advertising signs into the line of sight.*

ii) we are locked into a system of "fouling our own nest," so long as we behave only as independent, rational, free enterprisers.

iii) But the air and waters surrounding us cannot readily be fenced …. *The law, always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons.*

iv) The pollution problem is a consequence of population.

v) To couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action.

vi) "The Universal Declaration of Human Rights: describes the family as the natural and fundamental unit of society. It follows that any choice and decision with regard to the size of the family must irrevocably rest with the family itself, and cannot be made by anyone else."

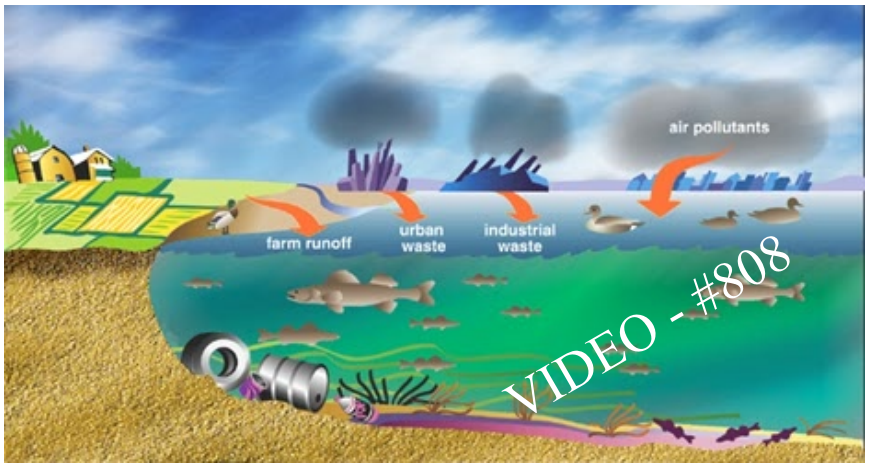
vii) OBJECTS IN ORBIT

- i) About 10,000 catalogued items
- ii) 7% - operational spacecraft
- iii) 22% - redundant spacecraft
- iv) 17% - old rocket bodies
- v) 13% - mission-related objects
- vi) 41% - miscellaneous fragments

Source: Esa

Fouling our own Nest

We are locked into a system of “fouling our own nests”, so long as we behave only as independent, rational, free enterprisers.



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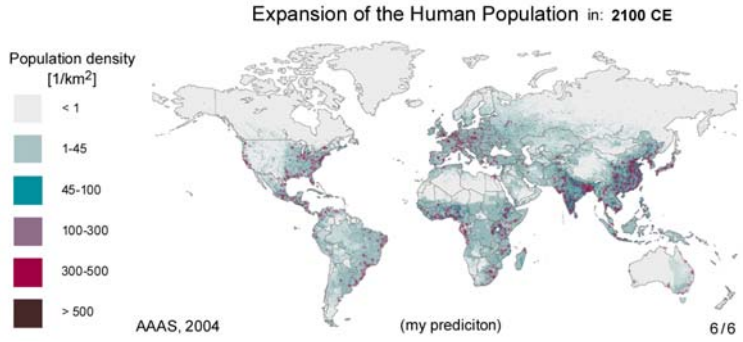
In order to understand the implications resulting from such a scenario, we should briefly focus on some basic issues.

- **atmo-, hydro-, geo-/lithosphere:** these are the three basic foundations that make up our planet;
- **biosphere:** the biosphere constitutes the manifold diversity of life – be it aquatic, terrestric or a combination of both.
- **antroposphere:** the successful colonization of the entire globe of *Homo sapiens*, along with the capabilities to produce tools, utilizing natural energy sources for his purposes (animals, wind, water, later on even slaves, and machines) made this species so successful in exploiting the vast but limited natural resources of this planet.

Universal declaration of Humans Rights

describes the family as the natural and fundamental unit of society. It follows that any choice and decision with regard to the size of the family must irrevocably rest with the family itself, and cannot be made by anyone else.''



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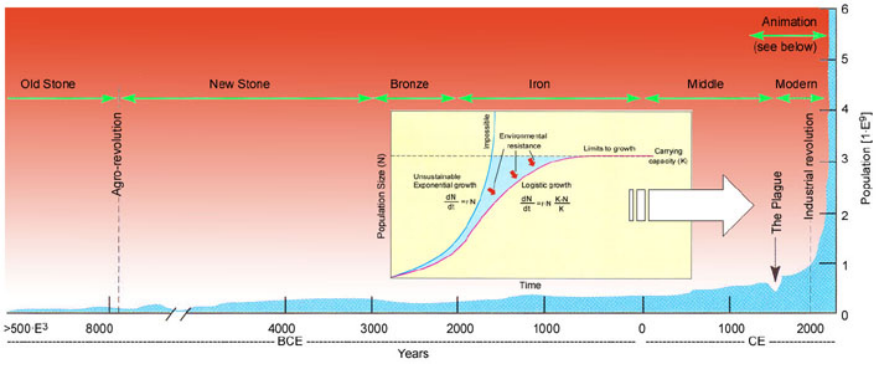
It is painful to have to deny categorically the validity of this right; denying it, one feels as uncomfortable as a resident of Salem, Massachusetts, who denied the reality of witches in the seventeenth century. At the present time, in liberal quarters, something like a taboo acts to inhibit criticism of the United Nations. *There is a feeling that the United Nations is "our last and best hope*," that we shouldn't find fault with it; we shouldn't play into the hands of the archconservatives. However, let us not forget what Robert Louis Stevenson said: "*The truth that is suppressed by friends is the readiest weapon of the enemy*." If we love the truth we must openly deny the validity of the Universal Declaration of Human Rights, even though it is promoted by the United Nations. We should also join with Kingsley Davis in attempting to get Planned Parenthood-World Population to see the error of its ways in embracing the same tragic ideal. We still seek the definite social arrangements that will keep it from becoming a commons.

Source: http://www.un.org/en/documents/udhr/

Universal declaration of Humans Rights

Growth must stop there where individual suffering begins



Logistic growth: experienced to a certain extend exponential growth, but intuition tells us that even this must flatten out to logistic growth (**sigmoidal path**).

i) agricultural food supply

i) population growth;

i) ecosystem stability (climax community);

i) even in economical terms (some ones gains is some one else's loss);

Source: IPAT http://atlas.aaas.org/index.php?part=1&sec=theory

In every human interaction with the environment -- even in the simplest societies -- the three major elements are in play. They can be linked in the famous formula introduced by *Ehrlich* and *Holdren*:

I = P x A x T, or **Impact = Population x Affluence x Technology**

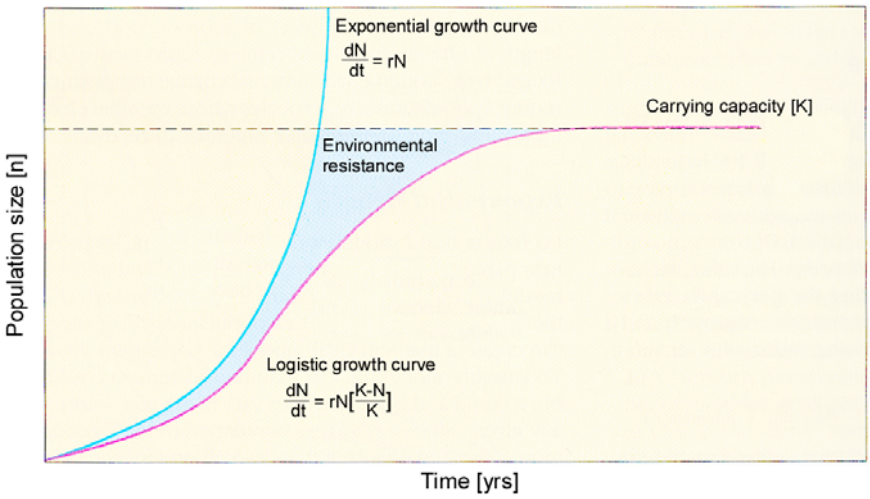
More explicitly, environmental impact is the product of population,

multiplied by consumption per person,

multiplied by the amount of resources needed, or waste created,

while producing each unit of consumption.

Carrying Capacity



Carrying Capacity describes the load an environment can hold without experiencing irreversible change

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Carrying capacity needs to be understood:

- as the maximum load an environment can permanently support (i.e., without reduction of its ability to support future generations), with load referring not just to the number of users of an environment but to the total demands they make upon it.
- The carrying capacity of a territory is defined as the maximum number of animals that can be supported year after year without damage to the environment.

Growth patterns: curves for exponential growth (left) and logistic growth (right). The difference between them is a measure of environmental resistance.

Webner-Fechner Law: Sensation increases arithmetically as a stimulus increases geometrically; the least perceptible change in stimulus intensity above any background bears a constant proportion to the intensity of the background; i.e. the smaller the stimulus, the larger the reaction – or to put it in simple terms: the 1st piece of cake tastes excellent, the 2nd piece is superb, the 3rd piece goes with fatigue, the 4th piece turns you pale-green, the 5th piece causes your stomach to revolt - you will threw up.

Source: modified after Dorit R., Walker W.F., Barnes R.D. 1991. Zoology. Brooks Cole Publ.

Case-1: St. Matthew Island

„The Carrying capacity of a territory is defined as the maximum number of animals that can be supported year after year without damage to the environment.“

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Case Study 1:

In 1944 some two dozen reindeer were released on St. Matthew Island where previously there had been none. Lichens were plentiful and the animals increased at an average rate of 32% per year for the next 19 years, reaching a peak of about 6,000 in the year 1963. During the heavy snows of 1963-64 almost all of the animals died, leaving a wretched herd of 41 females and 1 male, all probably sterile. It was not so much the inclement weather that devastated the herd as it was a deficiency in food resources, a deficiency that had been brought about by overgrazing.

The carrying capacity of a territory is defined as the maximum number of animals that can be supported year after year without damage to the environment.

After careful study Klein concluded that 5 reindeer per km2 was the carrying capacity of an unspoiled St. Matthew Island.

Case-1: St. Matthew Island (cont'd)

Case Study -1 cont'd"

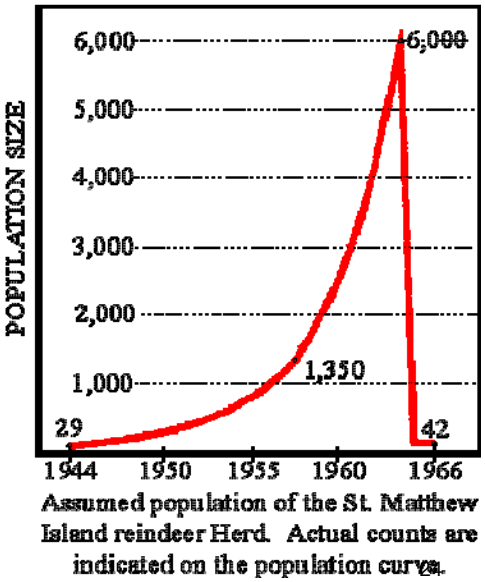
i) "The tragedy of the commons," using the word "***tragedy***" as the philosopher Whitehead used it: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things." "This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama."

ii) Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited.

iii) Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

What would happen if we ignored all estimates of carrying capacity?

The short answer is disaster.



Assumed population of the St. Matthew Island reindeer Herd. Actual counts are indicated on the population curve.

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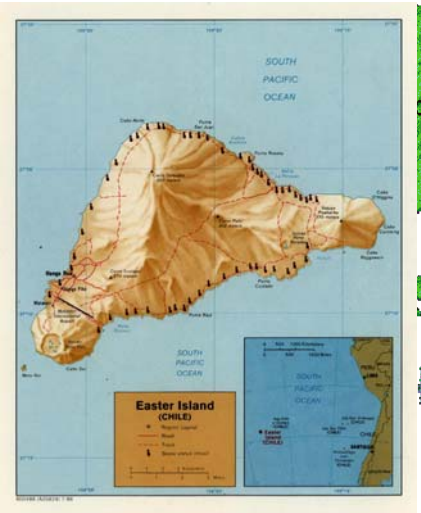
Whenever a population grows beyond the carrying capacity, the environment is rapidly degraded; as a result, carrying capacity is reduced in subsequent years. Uncontrolled, the population continues to grow larger (for awhile) as the carrying capacity grows smaller, one example, is the Easter Island.

i) The consequences of systematically exceeding the carrying capacity are serious and, more often than not, irreversible even when the territory is freed of excess animals.

ii) Because transgression is so serious a matter, the conservative approach is to stay well below the best estimate of carrying capacity.

The details of transgression-disasters vary from one situation to another, but some of the consequences are extremely common. Overexploited edible plants are replaced by weeds previously rejected by the exploiting herbivores. Soil that has been laid bare is eroded away; this reduces local productivity in subsequent years. Soil turned into silt fills reservoirs and clogs irrigation systems. Loss of the rain-absorbent capability of soils produces faster runoff after rain, and more devastating floods in lower areas. These effects are especially severe when forests on steep slopes are destroyed.

Case-2: Easter Island

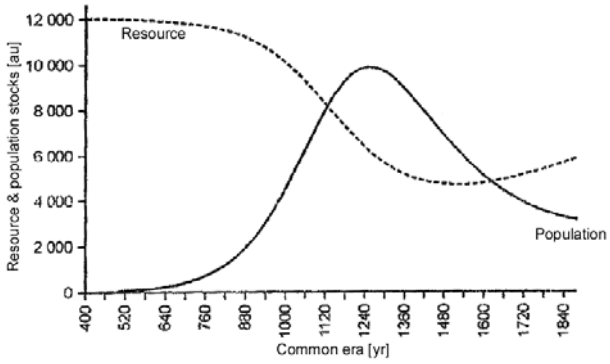


The consequences of systematically exceeding the carrying capacity are serious and, more often than not, irreversible even when the territory is freed of excess animals.

Thou shalt not transgress the carrying capacity (Hardin 1976).

Ccccc

Case-2: Easter Island (cont'd)



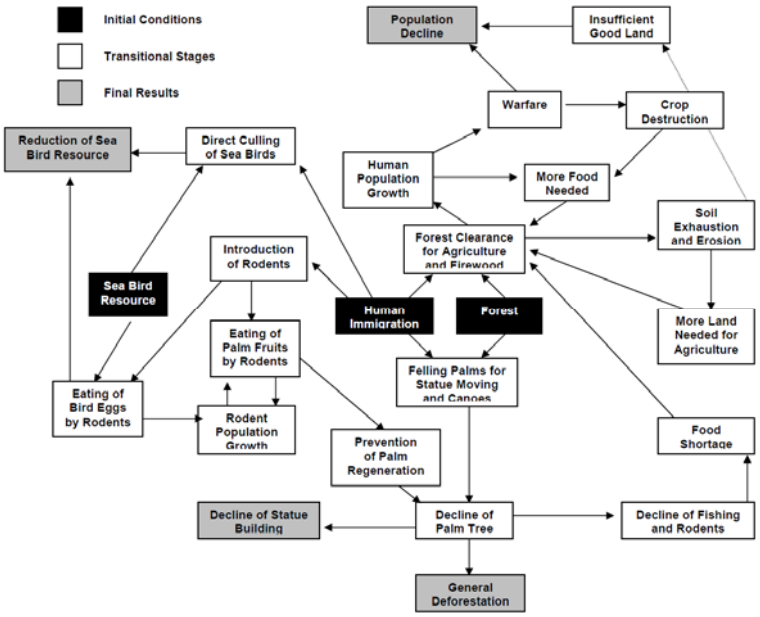
The consequences of systematically exceeding the carrying capacity are serious and, more often than not, irreversible even when the territory is freed of excess animals.

Thou shalt not transgress the carrying capacity (Hardin 1976).

A Copy of Brander and Taylor's "Ricardo-Malthus" Model for Easter Island. The estimate indicates that in the twelfth century population overshoots an already declining resource base, and peaks at roughly 10,000. Afterward the boom cycle the ensuing bust cycle enables the resource base to recover slightly. The carrying capacity of the resource stock is set by Brander and Taylor at 12,000. According to them, "It is convenient for the resource stock to be similar in magnitude to the population… This is the starting value of the stock when Polynesian colonization first occurred."106 Their reasoning suggests that peak population could only go as high as peak resource use allows.

Source: Barzin Pakandam 2009. Why Easter Island Collapsed: An Answer for an Enduring Question. Working Papers No. 117/09

Case-2: Easter Island (cont'd)



Flenley and Bahn's network relationship chart (pp. 201). The inter-relationship of each actor within the ecosystem led to the results encountered by Europeans in the eighteenth century

Source: Barzin Pakandam 2009. Why Easter Island Collapsed: An Answer for an Enduring Question. Working Papers No. 117/09

Results (1v6)

Carrying Capacity and Liebig's Law

The law of the minimum and how to overcome its restrictions ….

Introduce knowledge

and apply it recklessly!

The law of the minimum: if one crop nutrient is missing or deficient, plant growth will be poor, even if the other elements are abundant. Liebig likens the potential of a crop to a barrel with staves of unequal length. The capacity of this barrel is limited by the length of the shortest stave (in this case, phosphorus) and can only be increased by lengthening that stave. When that stave is lengthened, another one becomes the limiting factor.

Te role of Society & Culture: the great monotheistic traditions are the major sources of (western) moral and political attitudes. These religions focuses on humanity's uniqueness as a species.

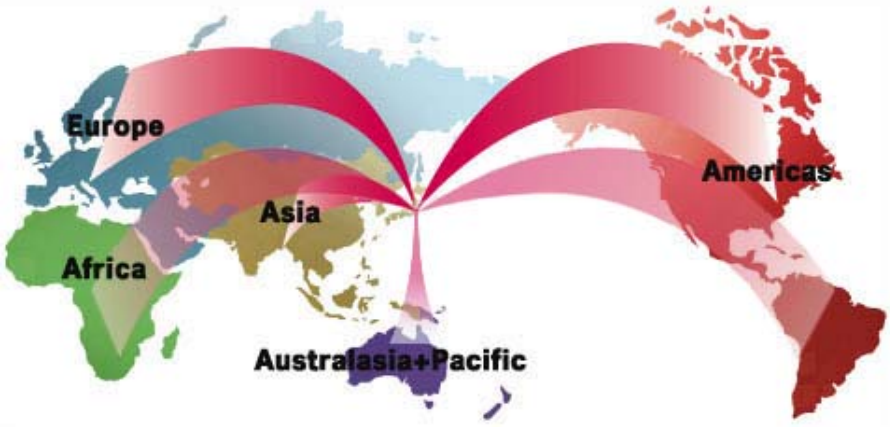
In fact, by simply separating the places of worship with daily life, we created an ambivalent situation. We go there to churches, synagogues, mosque, to worship the holy ideals, and at the same time we use it to "**dump**" - so to speak - **our sins**, as if we are dealing here with a (spilling) trash-can. Once back out, in "good old nature" (or that what's left of it), rather than contemplating the very roots of our existence in a natural setting, we flip-flop back into this familiar habit of oppression.

Callicott and ***Roger*****:** nature is viewed **politically** and **hierarchically** - God over humanity, male over female, humanity over nature - which establishes an exploitive ethical-political **pecking order** and power structure. The image of god-in-humanity is the ground of humanity's intrinsic value, but non-human entities lack the divine image and are religiously and ethically disenfranchised and possess merely instrumental value for god and human beings. The biblical view of nature's instrumental value is compounded in mainline Christian theology by an *Aristotelian-Thomistic* teleology that represents nature as a support system for rational human beings.

Source:

Globalization

The Principle of Scope enlargement



$$CC_{(A+B)} > CC_A + CC_B$$

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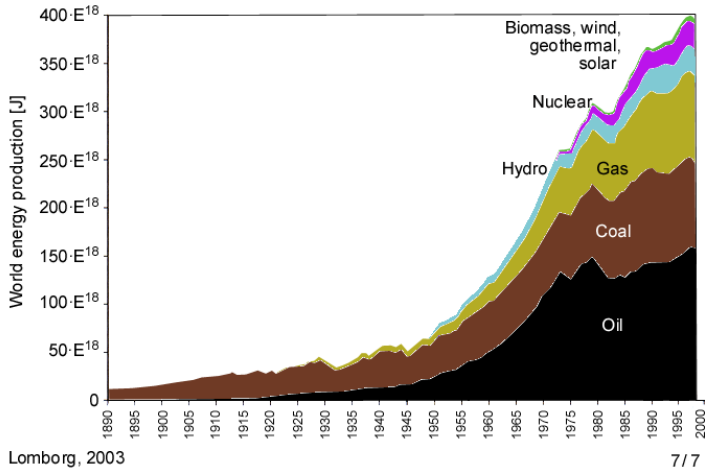
„To conserve resources by causing resource depletion elsewhere, just as part of the solution of Japan and other First world countries to problems of resource depletion today is to cause resource depletion elsewhere.“

Globalization: we can see im portant processes of history in a new light. Progress in transport technology, together with advancements in the organization of commerce, often achieved only after conquest or political consolidation, have had the effect of enlarging the world's human carrying capacity by enabling more and more local populations (or their lifestyles) to be limited not by local scarcity, but by abundance at a distance.

Industrialization

Craving for energy and resources



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i) **Industrialization:** The Industrial Revolution made us precariously dependent on nature's dwindling legacy of non-renewable resources, even though we did not at first recognize this fact. Many major events of modern history were unforeseen results of actions taken with inadequate awareness of ecological mechanisms. Peoples and governments never intended some of the outcomes their actions would incur

ii) The human body supplies energy equivalent to a 100W bulb; but already early in history, *Homo sapiens* attempted to gain control over more energy; i.e. by letting others do the work, primarily through the use of animals and slaves.[1] Not long after we learned to harvest nature's energy; e.g. sails for ships as well as wind and water mills. It was not until *James Watt's* invention of the steam engine in 1769 that it became possible for man to produce large amounts of energy on demand. The steam engine laid the foundation for the Industrial Revolution, which over the past century and a half changed production from an almost exclusively human-based labour to the current and primarily fossil fuel based society. Our so-called modern lifestyle is **craving** for ever increasing amounts of **energy** to maintain unsustainable production cycles for inefficient produces that pose heavy burden for generations to come.[2]

[1] Craig J.R., et.al; 1996: 25-36;

iii) [2] Lomborg B.; 2003: 118-136;

The Industrial Revolution made us precariously dependent on nature's dwindling legacy of non-renewable resources, even though we did not at first recognize this fact. Many major events of modern history were unforeseen results of actions taken with inadequate awareness of ecological mechanisms. Peoples and governments never intended some of the outcomes their actions would incur.

To see where we are now headed, when our destiny has departed so radically from our aspirations, we must examine some historic indices. We can begin by taking a fresh look at ***the Great Depression of the 1930s***, an episode people saw largely in the shallower terms of economics and politics when they were living through it.

The Great Depression, looked at ecologically, was a preview of the fate toward which mankind has been drawn by the kinds of progress that have depended on consuming ***exhaustible resources***.

When the world economy fell apart in 1929-32, it was not from exhaustion of essential fuels or materials. From the very definition of carrying capacity—the maximum ***indefinitely*** supportable ecological load—we can now see that non-renewable resources provide *no* real carrying capacity; they provide only ***phantom carrying capacity***. If coming to depend on phantom carrying capacity is a Faustian bargain that mortgages the future of ***Homo colossus*** as the price of an exuberant present, *that* mortgage was not yet being foreclosed in the Great Depression.

Results (1v1)

Garbage outsourcing – electronic waste shipments to less developed countries

Results (1v2)

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Seas of shame – the great plastic trash hotspots of the pacific

Source: http://sixtyminutes.ninemsn.com/stories/liambartlett/598914/seas-of-shame

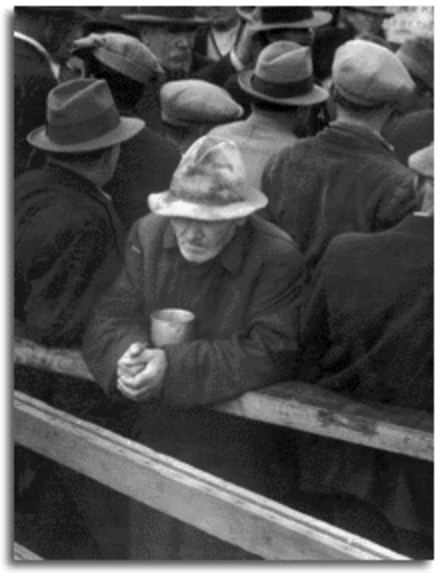
Results (1v3)

Child labour

Results (1v4)

Cheap Labour

Results (1v5)



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Loss of dignity - Vulnerability to Scope Reduction

As human numbers (and appetites) grew in response to this exchange-based enlargement of composite carrying capacity, continued access to non-local resources became increasingly vital to human well-being and survival. As the ecological load increased beyond what could have been supported by the sum of the separate carrying capacities of the formerly insulated local environments, mankind's vulnerability to any disruption of trade became more and more critical. The aftermath of the crash of 1929 demonstrated that vulnerability.

Results (1v6)

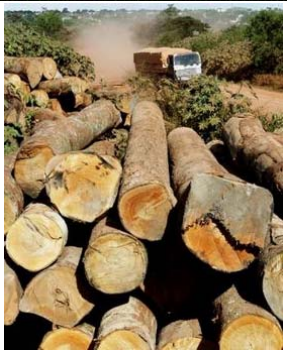

Plate 4. The now abandoned Zortman-Landusky Mine in Montana

Biodegradation – e.g. Amazonian Deforestation

Results (1v7)

Resource Depletion – e.g. Fishing with Super-trawlers. The Margiris is a super trawler currently on its way to Australia. Ships of this kind deplete fish stocks that nourish subsistance fisheries in less developed countries.

Source: www.abc.net.au/radionational/programs/backgroundbriefing/2012-08-12/4185150

Solutions (*Hardin*, 1968)

Education can counteract the natural tendency to do the wrong thing, but the inexorable succession of generations requires that the basis for this knowledge be constantly refreshed.

We seek the definite **social arrangements** that will keep it from becoming a commons.

We must soon **cease to treat the commons as commons** or they will be of no value to anyone.

- Coercion Laws
- Taxing Laws
- Introduction of entrance fees
- Allocation might be on the basis of wealth
- By the use of an auction system
- It might be on the basis of merit
- Agreed upon standards
- It might be a lottery
- It might be on a first-come, first-served basis

VIDEO - #872

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To educate the common people to treat the common property not as commons, otherwise they will have no value to all.

i) Culture enables ***Homo colossus*** to be, in this sense, the **world's most polymorphic species**:

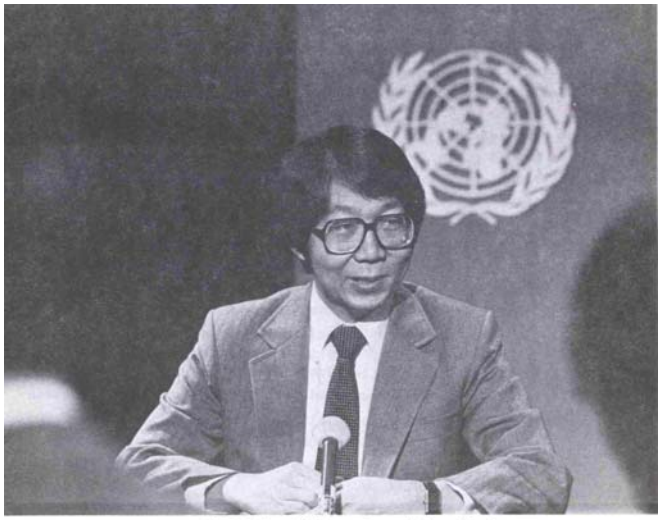
ii) There are two reasons **Homo sapiens** is a species especially likely to transgress an environment's sustainable carrying capacity:

iii) First, humans have an unusually **long period of maturation**. Therefore, sociologists commonly view learned culture (rather than biological instincts) as the explanatory mainspring in accounting for human behavior patterns. We must now also see that the modesty of an infant's demands upon an ecosystem obscures the immensity of the load each adult may later impose.

iv) Second, our **cultural nature** enables our wants vastly to exceed mere physiological appetites.

v) Humans develop **technology** and humans organize into groups more elaborately and more variably than nonhuman populations do.

United Nations Convention in 1972



Ambassador Tommy Koh, President, UN Convention on the Law of the Sea. *(UN Photo)*

The conference in Stockholm was meant to begin the process of preventing our only earth from being rendered less and less usable by humans. (in an important sense) the conference sought to undo succession in order to preserve history, they sought to preserve a world ecosystem in which *Homo sapiens* might remain the dominant species—and might remain human.

Global Solutions

- Use and development of fast-renewable alternative, efficient and clean fuels.
- Zero Population Growth
- Encouragement of limiting consumption and accumulating reserve supplies in order to protect the world against disaster.
- Large Scale Police Monitoring of Natural Resources and Pollution
- Goverment and private interprises to begin planting forests on land that they either bought or lease which entry is forbidden or control.
- Knowledge about Silviculture

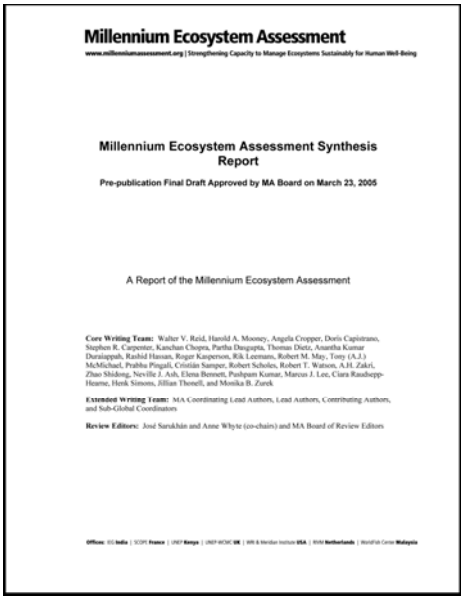
The conference in Stockholm was meant to begin the process of preventing our only earth from being rendered less and less usable by humans. (in an important sense) the conference sought to undo succession in order to preserve history, they sought to preserve a world ecosystem in which *Homo sapiens* might remain the dominant species—and might remain human.

Global Solutions (cont'd)

- Long-term & continous stake in preserving, caring, conserving, mantaining, educating about natural resources, ecosystems, ecology, pursue environment / Biology.scie. studies. etc.
- Invest in and to plan for the long-term future of their domains.
- Enforcement of peace within the country and overseas neighbors.
- Elite and peasants alike are expected the future to be like the present, and future problems to have to be solved with present resources.
- Love for nature, respect of life, don't treat the commons as commons, give them value.
- Adopt a tree, a park, or a piece of land and conserve it or take care of plants.

The conference in Stockholm was meant to begin the process of preventing our only earth from being rendered less and less usable by humans. (in an important sense) the conference sought to undo succession in order to preserve history, they sought to preserve a world ecosystem in which *Homo sapiens* might remain the dominant species—and might remain human.

Literature



THANKS for
Your attention

Even though the concepts so far presented are largely generalized. Knowing that this is not necessarily correct, it is useful to emphasize the direction we are heading to. Neither one nor the other is entirely in the wrong or the right, only together as an entire unit can we interfere correctively for a sustainable future.

- Excess numbers and ravenous technology had already brought *Homo colossus* to an ecological impasse
- Deft avoidance of political deadlock once again preserved the illusion that cake could be both eaten and saved. But illusion preserved was still illusion.
- resistance to change. Accustomed ways of behaving and thinking tend to persist; this is probably as true of the ***detritovorous*** habits of *Homo colossus* as it was true of earlier human folkways.
- habits of *thought* persist. As people continue to advocate further technological breakthroughs as the supposedly sure cure for carrying capacity deficits.
- prosthetic man has become so dependent.
- Most of today's underdeveloped nations are destined never to become developed

A final comment about this classical chinese painting. As evident, classical paintings of this kind characterize human existence as being part of the ecosphere. Thus if we only practise some of these principles, the world would and will be a better place for all of us and the generations still to come.