GLOBAL WARMING IN PERSPECTIVE

THE SECOND LAW OF THERMODYNAMICS

Every action incurs this law. This law is recognised by every major religion, Plato recognised it & it has been quantified by science. So why do we ignore it today?

The Second Law is sometimes expressed as "Energy always moves from a greater to a lesser concentration.".

Every action uses energy. To use energy it must be obtained from a concentration of energy. The earth was made with some energy in it, unevenly distributed, & sunlight is received by it.

An action transforms energy. Some is transformed into the required result of the action & the rest is transformed into waste products & dissipated energy. So once all the available energy (from concentrations) is transformed into unavailable (dissipated) energy, there will be none left to use. This is what we ignore.

The concentrations of energy in the earth are available to us in different forms: heat, wood, coal, oil & gas.

We perceive energy in two ways, one as matter, & the other as energy. Einstein's $E = mc^2$ means that we do not have to differentiate. E is the amount of energy. M is the amount of mass. c is the speed of light = 3×10^8m/s & $c^2 = 9 \times 10^{16}$. So 1 kg x $9 \times 10^{16} = 9 \times 10^{16}$ joules of energy. When physicists do their calculations they do not have to differentiate between mass & energy. When we burn coal we are using energy.

The earth uses some of its energy. Volcanoes & tectonic plates use heat from the core to rearrange the lithosphere. The heat in the earth is a result of the method of the earth's formation, & there is only so much of it. Every time some is used there is less remaining, so these actions will eventually stop.

UV energy from the sun & lightning is used to modify biological organisms. Energy in the form of heat from the sun makes weather. Energy in the form of light from the sun is used to make plants.

When plants are buried by geological processes they are eventually converted to coal, oil & gas. It takes a long time for plants to grow, ie, make wood, & millions of years to make coal, oil & gas. We burn wood, coal, oil & gas far faster than they are made.

When we burn these products we are converting available energy into products, byproducts & dissipated heat, &, because we burn them faster than they are made, we are running out.

Byproducts of a process might be usable in another process, but we end up with waste products. So actions convert energy into products, waste & dissipated heat. Eventually the wanted products are discarded or corrode & end up as waste. We call the waste & dissipated heat pollution. One of the waste products is carbon dioxide, which accumulates in the atmosphere & traps heat from the sun, causing global warming. Note that global warming is only one form of pollution, so it is not the only form of pollution causing us problems - do you want a landfill site next door?

The only material product of science is, via technologists & engineers, technology. "Technology" simply means "a mechanism which converts available energy into unavailable energy faster than manual methods". So technology cannot

help with the problems of decreasing available energy & pollution; it can only make them worse.

The ratio of unwanted products & dissipated heat to available energy used is a measure of the action's efficiency. The faster an action is performed (via technology) the less efficient it is. So the use of technology makes the size of our problems grow faster, & reduces the number of wanted products that we will be able to make.

All man ever does, or will ever be able to do, is arrange mechanisms & dissipate the available energy into pollution.

SUMMARY

Every time we do something, we are exhausting our supply of energy & polluting the earth.
Every time we throw away something we are polluting the earth.
Every time we use technology we are wasting available energy & making more pollution than necessary.
Every time we do something unessential for survival, we are wasting available energy & needlessly polluting the earth.

We are an inseparable part of the earth; its fate is our fate.

AVAILABLE SOURCES OF ENERGY

In order of availabilty, ie, ease of use:
food & material from plants;
food & material from animals;
coal, oil & gas;
fission reactions;
possibly fusion reactions.

Very little energy is used in picking, eating & digesting a plant. Little energy is used in the getting & processing of animals. Eventually there were too many humans for hunting-gathering to support. Hunter-gatherers survived for millions of years.

Humans started to use farming. Farming uses more energy to process plants & animals into food & materials. Lower efficiency & more pollution than necessary. Eventually there were too many humans for farming to support. More people now applying technology meant more rapid conversion of available energy. Farming survived for thousands of years.

Humans started to use coal. More energy is used in getting & processing coal than farming to give us our food & material. Much lower efficiency & much more pollution than is necessary. Eventually there were too many humans for coal to support. Many more people applying much more technology meant much more rapid conversion of available energy. Coal lasted for hundreds of years.

Humans started to use oil & gas. Much much more energy is used in getting & processing oil & gas than coal to give us our food & materials. Much much lower efficiency & much much more pollution than necessary. Many many more people applying much much more technology meant much much more rapid conversion of available energy. Oil & gas lasted decades.

Humans started to use fission reactions (nuclear power). Fission reactions require huge amounts of energy to start & maintain. Their efficiency is incalculable: it could be less than 0%. They create a tremendous amount of pollution. Fission reactions have never been fully accepted by humans.

Fusion reactions are not yet (Sep. 2015) maintainable, their efficiency is incalculable, so trust no one who pontificates about them. One detail is important: they do create radioactive pollution.

Hunter-gatherers used one thousandth of the energy we do. Until there were too many of them they used no more energy than could be replaced by the sun.

TECHNOLOGY

Different studies apply different standards to different situations & so come up with different results. Despite this, each study can be adequate, & different ones can complement one another.

Study 1:

	BTU/manmile	BTU/tonmile
Mass transit	3,800	
Car	8,100	
Train		670
Lorry		2,800

Study 2:

	Tons	HP
Canal	20	l
Train	12	20
Lorry	20	400

Processing of results:

Study 1:
Assume that the weight of a man is 150lb & that 1 ton = 1000kg

Train:	11W/kg
Lorry:	121
Mass transit:	916
Car:	1953

Study 2:
Assume that the canal speed was 4mph, the others were 56mph.

Canal	0.04 W/kg
Train	1.24
Lorry	15

The figures demonstrate scientific method confirming what you already know viscerally.

A note of great interest: hybrid cars use more available energy & create more pollution during manufacture than they save while in use. When scrapped they form more pollution than conventional cars. *The energy & pollution costs of manufacture & scrapping are never counted.* This practice of ignoring the manufacture & scrapping costs is widespread. If it was used in the consideration of nuclear power the figures would be literally terrifying.

RECYCLING

This is the process of manufacturing a product from pollutants. Unfortunately there are very few processes which are more efficient than ones which use available energy. Most recycling merely saves a manufacturer some of the cost of getting material, *& the energy used in the gathering of the recycled material is ignored.* Recycling is a myth with which to absolve ourselves of guilt.

POLLUTION

Some of our pollutants are available energy for biological processes. We

describe the resulting process as natural recycling. Some natural recycling methods take thousands or millions of years. We provide more pollutants than natural recycling can handle, & overload of a natural recycling process can poison it, so we cannot assume that "the earth can handle it".

Most pollutants are poisonous to biological processes. Many biological processes, including natural recycling ones, are already damaged beyond recovery. If that process was part of a chain of events (an ecological system) then that chain is broken. Hence more things die which breaks more cycles...

We cannot argue that if we stop polluting then these will redevelop because the conditions under which they developed no longer exist.

Every time we affect the state of the earth we change it from that in which we evolved. We leave ourselves less fit to survive. Ozone layer, exhaust fumes, greenhouse effect, landfill sites, radioactive waste, chemical waste...

Talking of chemical waste, no one, I don't care who they are, can know the full effect of an artificial substance on a human, never mind the rest of the world, so be very cautious of artificial chemicals & all those with a vested interest in them.

There are less obvious effects of pollution. Noise & smell are stresses on humans & many other creatures.

LIMITS

In one year one human eats three hundred trout which eat ninety thousand frogs which eat twenty-seven million grasshoppers which eat one thousand tons of grass. One thousand tons of grass is the yield from a greater area than the arable surface of the earth.

1979: Fred Warshofsky, "Doomsday: the Science of Catastrophe": Nearly one third of the global population, 1.6 gigapeople, died directly or indirectly from malnutrition.

"Only when the last tree has died & the last river been poisoned & the last fish been caught will we realise we cannot eat money." The Cree Indians.

CONCLUSIONS

We are running out of the available energy & have changed the world such that we cannot, at least not all of us, survive.

It has been calculated that if humans want to pollute as much as they like, the earth can support 15 million of them. The current (June 2003) number of humans is approximately 6,000 million, so each of us has a 1 in 400 chance of survival.

"Entropy A New World View" by Jeremy Rifkin published by Paladin 0-586-08508-4.
"From Hiroshima To Harrisburg" by Jim Garrison published by SCM Press 0-334-00504-3