

The Critical Role of "Unused" Resources

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Abstract

The complement to an often-observed, well-documented, and widely-accepted environmental principle about the distribution of resource use is observed. Together, the complement and principle comprise an original theory about resource distribution: The Resource Buffer Theory suggests a context for consideration of several current issues including long range population growth, resource use, and species survival.

KEY WORDS: population, sustainability, resources, energy, carbon, water

Introduction

The disproportionate distribution of resources has claimed the attention of scientists for generations. What has been overlooked is the role of the remainder of the resource that is not directly utilized. This concern about resources distribution is not the same as individuals and interest groups expressing care about or being active in environmental quality improvement projects: for the past 20 years or so, people have become more and more concerned about human health and aesthetic quality of the several environmental realms. Those activities are still important, but there is an overriding concern that puts the ubiquitous and fundamental disproportionate distribution of resource use into a new perspective that might better guide overall resource policy.

The Resource Buffer Theory

The principle that only a very small portion of a resource such as energy, water, or oxygen is used directly by a life form is a normal characteristic of the environment. The complement is that the continued existence and quality of the remainder of that resource is of critical importance to the life form as well.

The first observation, that only a usually small portion of a resource is directly used by a life form, is universally described, monitored, revered, and documented. It applies to the numbers of sperm produced to ensure that one will fertilize an egg, to the ratio of survivors to germinators, to the number of newly-hatched turtles that reach the sea, and most recently to the 99 percent of the Universe that is "dark matter" (Trefil 1993). The idea simply honors the relatively small percentage of the total resource pool that is used directly.

Science has failed to properly illuminate the ecological importance of the remaining portion: it is not just the ultra-small percentage that is used; it is the immense percentage that is not used that is indispensable. The full theory is at the foundation of the survival of life on Earth: The Resource Buffer Theory is that for every resource necessary to a basic life form where a very small proportion is directly utilized for life processes of individuals, the existence and quality of the vast remaining proportion is necessary to maintain environmental conditions under which the population can continue to survive.

The nature, verity, and universality of the uneven distribution and use of fundamental resources pervades the universe. For example, consider the observation that humans use an infinitesimally small percentage of the Sun's energy output, yet rely on the remainder of the Sun's energy to maintain a set of conditions in which life can continue to evolve at a fairly leisurely and uncertain pace. The awe about

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the astronomically small numbers involved in the first portion of the statement all but guarantees that the content of the second part is overlooked: "rely on the remainder of the Sun's energy to maintain a set of conditions" Or consider that an individual cannot live without 3 to 4 pints of water per day; but the human species cannot survive without the vast oceanic and fresh water buffers of the Earth's hydrosphere. The theory extends, of course, to all resource realms: humans directly use only a tiny fraction of the Earth's air, yet could not survive if the very much larger unused portion of the atmosphere were not there to buffer the incoming energy, to absorb water and dust, and to reduce incoming meteorites to harmless particles. Perhaps most important of all because it itself is a chemical buffering agent, a minute portion of the Earth's carbon is used in day-to-day physiological processes: only an estimated 0.004 percent of all the Earth's organic and inorganic carbon is in animals (Black 1993), yet the Resource Buffer Theory tells us that humankind could not survive if the very much larger storehouse of the "unused" carbon were not there.

Even if the distribution figures cited, or the ones we commonly see in encyclopedias or reported in the media are little better than approximations, it is the pattern that is critical. The foregoing examples demonstrate that the well-known first part of the theory is reliably at work, and they clearly illustrate the universality of the principle.

Violating the Theory

To whatever extent we violate the theory's fundamental precepts by reduction or degradation of the resource buffer, we endanger our own existence. Owing to regular violations of the second part of the theory, homo sapiens is an endangered species. Consider the all-important carbon budget: Earth's current population of 5.5 billion human beings incorporates approximately 3.7 percent of all the organic carbon in animals, evidence of the incredible success of this species (Wilson 1993). If the human population doubles by the year 2050, that percentage will double. Where will the carbon come from? From inorganic sources? If so, the effect will be to remove carbon from long-term sediment storage where it does not affect the atmosphere and, as more and more people breathe and utilize energy, to increase the level of CO₂ in the atmosphere even more than at present, thus enhancing the greenhouse effect, increasing worldwide temperatures, and supporting conditions that favor plants rather than animals in a classic example of Gaian-wide homeostasis (Lovelock 1988).

If, on the other hand, humans rob the carbon from other organic sources (there are no other reservoirs) to support the growing human biomass, it must be done at the expense of biodiversity, upon which human survival also depends. Like the traditional environmental realms of air and water, biodiversity is a resource: we directly use a small percentage of the total, but our survival depends upon the existence of the larger, unused portion. Unfortunately, there is little of this resource that is currently undisturbed, further violating the theory. This is exactly what is happening as, for whatever reason, tropical rain forests are cut and burned, coral reefs are decimated, and wildlife habitat is physically destroyed by developments that accelerate the extinction of species. Even though there is a vast pool of carbon, it too is a finite resource that is being severely stressed. Wilson (1993) calls attention to the suicidal nature of this type of resource use, observing that "the human species has doubled to 5.5 billion during the past 50 years. It is scheduled to double again in the next 50 years. No other single species in evolutionary history has even remotely approached the sheer mass in protoplasm generated by humanity". The vast use of Earth's resources in support of this protoplasm is in addition to the troublesome pollution we generate (Koshland 1993).

As stress caused by overpopulation increases, the vast reservoir of "unused" resource over and above that which we use directly must be considered as an essential part of the human environment, as a buffer. On a lesser scale, smaller units of Earth's life have demonstrated this buffering capacity. For example, before the United States was settled by Europeans, Native Americans benefited from the abundance of the buffalo and the salmon, but their continued modest harvest of animals for food and products

had no impact on the total numbers (Moos, personal communication). The critical concept of a natural resource buffer is contained in the last six words: no impact on the total numbers. With the buffalo and salmon now virtually gone because of disastrous impact by later settlers on their total numbers, human-kind is indirectly threatening other critical resources by reducing the quantity and quality of their buffers.

By definition, organisms exhibit a quality called "life" (the counter force to entropy) that is readily identified by characteristics like long-chain carbon molecules with certain unusual properties such as mobility, respiration, reproductive capacity, and the ability to effect conversions between certain types of energy and chemical substances. Thus, the truly basic and urgent resource issues that confront civilization are: (1) the distribution of carbon on Earth, (2) the quality of the air and water buffers, (3) the magnitude of the human population, and (4) the concomitant expenditure of energy resources to support population growth that in turn profoundly affects the air, biodiversity, carbon, and water buffers.

Meanwhile, with increasing frequency humans are blindsided and thereby diverted by compelling related conditions such as uncomfortable temperatures, unusually wet or dry seasons, changing ultra-violet radiation levels, ozone holes, water-borne diseases, or confused and stranded whales. As a consequence, resources are wasted and further adversely impacted while fighting brush fires against manifestations of the fundamental affliction, the lack of abundant and high quality resource buffers. In an example of meaning well but not recognizing the fundamental issue, Gordon (1993) states that "the salvation of the seas depends on us." In fact, it is the other way around: our future depends upon the salvation of the seas.

Subsidization is a Short Term Technological Fix

Eugene Odum (1989) discusses energy and its use on the three general categories of land use in the United States, as shown in Table 1. He points out that energy use on developed and cultivated environments is subsidized by borrowing from that produced on the natural environments; he refers to the shift of energy from areas of high production and low use to areas of high use and low production as originating on "ghost acreage". Those acres should actually be included in the total for any given category because we are relying on them to subsidize the cultivated or developed status.

Table 1. Energy subsidization of intensively used land use

Land Use Category	Percent of US actual area	Percent weighted by energy density
Natural	70	39
Cultivated	24	27
Developed	6	34
Totals	100	100

Source: Odum (1989)

The current Biosphere II research is an example of energy subsidization. The pioneer two-year attempt at sustainability might work for its limited life, but only because the facility is an open system, borrowing against energy resource availability at another time and place. In fact, the energy and carbon resource buffers demanded for true sustainability are not contained within the system: the air and water are recycled with energy produced externally. Although producing interesting and valuable information, the system would need to faithfully and reasonably model the planet's natural buffers to make a true demonstration of the Resource Buffer Theory and the sustainability it purports to represent. As it is currently structured and managed, Biosphere II cannot demonstrate true sustainability simply because the

buffers are being subsidized by a long-term loan. To create a realistic model of sustainability, the properly-scaled natural buffers of the basic resources would need to be provided and maintained. The exact same observation applies to the more immediate and unequivocal Biosphere I, Earth.

Reducing Consumption of Energy

In the long run we cannot afford not to reduce energy use, whether by direct reduction or by increased efficiency of use. "We cannot afford" means that the human race cannot continue current rates of energy use owing to the simultaneous deleterious impacts on the air, biodiversity, carbon, and water buffers. This is the fundamental reason behind the need for an energy tax or higher prices: not because energy is a lucrative source of income (itself a symptom of abuse of this undervalued resource), but because it is one of several means to curb energy use and, in particular, wastefulness (other means are needed in addition).

Generically, an energy tax is a good way to commence reducing energy consumption and waste by increasing costs to the consumer, especially for energy use excesses. The excess applies not just to the incredible amounts of energy used and wasted by the Group Seven nations, but by the energy used in excess of that needed to merely have the human race in all nations continue to subsist within its fixed energy resource buffer on the planet. Curbing energy use is not just a good idea: from the standpoint of the Resource Buffer Theory, it is an environmental imperative.

Incidentally, the Resource Buffer Theory suggests that harvesting unlimited solar energy will not work either. Even if fifty or more percent of the solar radiation incident on the Earth could be harnessed, the theory implies that survival without the unused buffer of the resource that benignly maintains the conditions under which humans thrive is impossible.

Resource Buffer Theory and the Future

As a start, civilization currently needs to focus on that level of resource distribution considered as "wealth", the amount of resources over and above that necessary to our biological survival. As the resource buffers that support wealth become stressed due to overpopulation, improper distribution of population, and growing urbanization, one or more of the four apocalyptic horsemen appear in the form of ever-greater heat, cold, floods, drought, famine, cholera, giardia, and AIDS. Unrest and poverty give rise to bickering, renewal of old animosities, and to the perceived need for "ethnic cleansing". Unemployment decreases opportunity to attain minimum living standards, which spawns lawlessness, lack of hope, despair, increased violence, terrorism, war, and, finally, discord. Like an overvalued stock market, internal forces will inevitably "make an adjustment."

Before deciding on strategies, some basic questions with regard to resources and population growth policy and to long term goals must be addressed. Is impact on the "unused" portion of a fundamental resource a valid measure of sustainability? If so, what level is a reasonable target? Do we want as many individuals as possible to merely subsist? Thrive? Develop? Colonize? Or do we want a smaller number to be able to enjoy the excess fruits of western "civilization"? Who is "we"? Who is going to decide? Under whose rules? When? These questions are certainly not easy to answer, yet they must be addressed in light of the Resource Buffer Theory for this concept is an integral part of our environment. The direct use of small amounts of Earth's resources and the concomitant requirement for bountiful and high quality buffers of air, biodiversity, carbon, energy, and water are simultaneously sobering thoughts and a monumental challenge.

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