The Ecological Imperative:*

the six biophysical requirements for sustainable societies

The following are the fundamental, irreducible, "non-negotiable" conditions required for sustaining the life-support system of planet Earth.

#1: Non-renewable natural resources must not be consumed at rates faster than their slow redeposition and reintegration into the Earth's crust from which they come.

- If a draw-down rate is greater than renewal, then the additional amount should be "invested" in alternative stocks (substitute renewable resources), so as not to reduce the overall income flow over time.

#2: Renewable resources must not be consumed at rates greater than their ability to renew, i.e., beyond *sustainable yield*.

- The size of the resource stock must be maintained in order to sustain the level of income flow.
- The rate of harvest cannot exceed the rate of regeneration, or diminish the service-flow from related stocks.

#3: Wastes from human economic activities must not enter the biosphere at rates greater than its ability to absorb them.

- Examples of such disturbances on the global scale include: global warming, ozone-shield rupture, land degradation, diminution of fresh water supply and quality…

#4: Ecological health and integrity - nature's ability to generate stocks and provide flows of useful resources and services - must not be compromised.

- ***Ecosystem health*** includes species diversity and complexity, resilience, efficiency, low net productivity, robust food chain, adequate energy flow…
- ***"Nature's services"*** include: pharmaceuticals, timber, soil fertility, pest control, waste detoxification and decomposition, pollination, flood control, air and water purification, uv-ray protection, climate stabilization…

#5: The <u>scale</u> of human activity must not exceed carrying-capacity.

- The human ***"ecological footprint"*** must be within the carrying-capacity of the biosphere - as outlined above.
- Human biomass appropriation must not preclude the requirements of all other species.

#6: Entropy and irreversibility must be recognized.

- The laws of thermodynamics underlie **<u>all</u>** of the above.
- Entropy's **"hourglass"** flows in <u>one</u> direction and cannot be reversed.
- Resources should be used so as to achieve the greatest service for the least throughput: **ultimate efficiency = *doing <u>better</u> with less.***

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