

## 17.8: The Seventh Commandment

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MATERIAL DEMAND MUST BE DRASTICALLY REDUCED; MATERIALS MUST COME FROM RENEWABLE SOURCES, BE RECYCLABLE AND, IF DISCARDED TO THE ENVIRONMENT, BE DEGRADABLE

Reduced material demand is essential to sustainability. Fortunately, much is being done to reduce material demand and the potential exists for much greater reductions. Nowhere is this more obvious than in the communications and electronics industries. Old photos of rail lines from the early 1900s show them lined with poles holding 10 or 20 heavy copper wires, each for carrying telephone and telegraph communications. Now far more information can be carried by a single thread-sized strand of fiber optic material. The circuitry of a bulky 1948-vintage radio with its heavy transformers and glowing vacuum tubes has been replaced by circuit chips smaller than a fingernail. These are examples of dematerialization and also illustrate material substitution. For example, fiber optic cables are made from silica extracted from limitless supplies of sand whereas the conducting wires that they replace are made from scarce copper.

Wherever possible, materials should come from renewable sources. This favors wood, for example, over petroleum-based plastics for material. Wood and other biomass sources can be converted to plastics and other materials. From a materials sustainability viewpoint natural rubber is superior to petroleum-based synthetic rubber, and it is entirely possible that advances in genetic engineering will enable growth of rubber-producing plants in areas where natural rubber cannot now be produced.

Materials should be recyclable insofar as possible. Much of the recyclability of materials has to do with how they are used. For example, binding metal components strongly to plastics makes it relatively more difficult to recycle metals. Therefore, it is useful to design apparatus, such as automobiles or electronic devices, in a manner that facilitates recycling.

Some materials, by the nature of their uses, have to be discarded to the environment. An example of such a material is household detergent, which ends up in wastewater. Such materials should be readily degradable, usually by the action of microorganisms. Detergents provide an excellent example of a success story with respect to degradability. The household detergents that came into widespread use after World War II contained ABS surfactant (which makes the water “wetter”) that was poorly biodegradable such that sewage treatment plants and receiving waters were plagued with huge beds of foam. The ABS surfactant was replaced by LAS surfactant which is readily broken down by bacteria and the problem with undegradable surfactant in water was solved.

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