The Precautionary Principle: The Extreme Side of Caution

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"DON'T DO THAT!" How many times did our parents scream that at us as we were about to do something stupid? When a mom yells that at the kid practicing his high wire act on the top bar of the swing set, her logic is pretty strong. To a lesser degree, the admonition to "Be Careful!" might be nothing other than an expression that mom doesn't want to see you hurt, but doesn't want to forbid the activity either.

There are other versions of the expression. The hoity one is "To err on the side of caution, is wisdom incarnate." The military, or that incorporated into any experimental engineering design, refers to the situation as one invoking the "Fail Safe" principle. These folks expect a certain amount of failure. Both equipment and strategies are then built so that, when it all falls apart, the human element is protected, at least to some degree. When engineers plan a trip to the moon or think about how to deal with a satellite that is falling out of orbit, they plan so that, if the system breaks, the satellite doesn't fall to earth in a highly populated area: Fail Safe.

This is all great advice if you're climbing a tree, stealing second base, or picking up a snake. For example, we all know, or should know, that after lighting the firecracker, we should toss it to an area where there are no people or animals. No blood. No damage. Applying the fail-safe principal might lead you to wear a welder's glove on the firecracker hand just in case it went off early: Fail Safe.

Over the first hundred years of the Industrial Revolution, the casual slogans used by engineers and mechanics evolved from "You first," to "That should work," and "Let's give it a try," or "I'll try it," and eventually to, "Hold my beer."

Then mathematicians became involved and created models. Originally, models were intended to reflect a fail-safe situation. No real humans, or even equipment, were involved. Failure meant nothing more dramatic than the occasional reboot. Mathematical models and working scale models gave the engineers insight into what might work or not work.

That's when things began to unravel.

A collection of scientists from around the world held a conference in Rio De Janeiro. They called it an "Earth Summit." Some good ideas came out of the meeting, as well as some that needed a bit more thought. The one that relates to the mother's concern for her children is the rise of what is known as "The Precautionary Principle."

The technical definition is somewhat convoluted and is often tailored to the enterprise at hand. In essence, it is a philosophical position that says, "If you aren't sure of the safety of the outcome, don't do it." Sounds good right? Sometimes, however, the unscrupulous or undereducated have used the idea to advance personal agendas in a manner never intended in the philosophy. As we all know, science is the pursuit of understanding. In some situations, however, the science – the understanding – is deemed not necessary by someone in charge.

Consider this fictional scenario. A new herbicide is developed and submitted to the appropriate federal agency for approval. The management at that agency notices something unusual or unfamiliar about the formula and decides that it should not be approved. Without data or testing, the agency applies the Precautionary Principle and tells the applicant that the herbicide will need more testing. Subsequently, the agency does not approve funds for testing, thereby killing the project. Conversely, an existing product can be pulled from the market because it "might" cause problems somewhere. The product was deemed to no longer be a threat and further research is set aside. Scientists are left to work on other things.

Examples are abundant. I shall relate only one here. It is a true story.

The Public Multi-Use Facility

In this case, a student seeking a post graduate degree in Environmental Science and Policy conducted a study under the guidance of a full professor at an accredited University. The study included both science and management aspects in order to demonstrate the competence of the student to earn the advanced degree.

The situation is as follows. The county was in the practice of operating certain public facilities. In one case, the facility was not used to capacity by one recreational group, and a second group had been granted authority to use it when the first group was not. The nature of the use by the first group was such that the soil could reasonably be expected to contain chemicals (elemental metals) produced by the activity. The use is commonplace throughout the United States and most facilities conduct maintenance activities to remove the byproduct on a routine basis.

The second recreational use is also rather common. What was uncommon was the joint use. The student postulated that the joint use exposed the second group to hazards by exposure to the byproduct from the first use through the production of dust

clouds during the second use. The actual element has been shown to be harmful to humans if ingested in chronic and high quantities. The student also postulated that the element would dissolve with rainfall and travel through the groundwater to contaminate the nearby creek, killing fish and other wildlife. The contamination of wells for drinking-water was also postulated.

When the thesis was presented to the county managers, the response was to close the facility entirely for both uses, put up a fence, and to prohibit entry and trespass. The student was awarded a Master's Degree based on the thesis and the action of the county. The county stopped short of declaring it a hazardous site. No clean-up activities were undertaken.

Questions asked during the defense of the thesis revealed that the student had not sampled the soils to determine the concentrations of the offending element. The mechanism for ingestion by the second group was never tested (the dust). The element is bound in soils above a certain pH and, to a greater degree, in soils of a certain composition. The pH was never tested, and soils were not determined to be silica based or carbonate based. The element is also bound by organic matter and the student had not analyzed the soil for organic content. The soil was never analyzed at all. The depth to the water table was not determined. The slope nor direction of the gradient of the potentiometric surface of the water table was not determined, making the exposure to the creek and wells speculative. The student had not determined whether the element could be, or would be, dissolved in rain, or how far, nor in what direction, nor how fast, it would travel. In fact, it had not been determined that it would travel at all.

Yet, the story the student told is a good story. It was just told in a data-free environment. The research was an exercise in the misapplication of the Precautionary Principle. Unfortunately, the result was the closure of what was a popular recreational facility: a closure based in nothing more than speculation and fear. Of course, a secondary result was the credentialing of an improperly trained student as a recognized environmental professional.