

OUR RELATIONSHIP TO RESOURCES

CRITICAL SHIFTS FOR THE NEW CENTURY

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If we are going to save our resource base for our children's world and sustain a healthy planet, we will need to use resources in the next century in entirely different ways than we have during the 150 years of the Industrial Revolution. We have been using resources in a linear pattern: extracting them from the ground, using them for fuel or in products, and then basically throwing them away. This has produced not only a massive stream of garbage, but is waste that represents destruction of basic natural resources that have their limits.

Among the critical shifts that have to take place in the next century is that we have to use energy and material resources with a great deal more efficiency. We have to treat the natural resources we use with enormous care and respect, and to gain much more value from them. This means new patterns of use: using materials in circular, rather than linear, patterns so that their use in making products or delivering services is only the first use. When the consumer no longer needs them, or they are taken back, those materials must be used and reused, optimally in just as high value a way as the first use, with their use continuing in a circular pattern.

Reining in waste and curtailing toxic chemicals

In the 21st century we need to move towards waste-free cities. We will need not only new products that last longer and that are made from materials that can be refurbished, reassembled or reused. We will also need to change the practices of our ordinary offices and our ordinary lives so that we treat materials with a great deal more care. If we do, within the next decade, we could eliminate a quarter, or possibly much more, of the waste that we now create through our community and office operations. This would make an enormous difference, saving millions and millions of dollars for human needs like education and health that now go under-

funded as we throw away waste and with it, vast numbers of dollars.

We also need to move away from the toxicity involved in the processes that make our products to more benign sources, so that we do not leave an enormous legacy of toxic waste and contamination to future generations. This means rethinking the uses we have so blithely made of chemical industry products and processes since the 1940s. Although the chemical industry is relatively new, it is one of the most quickly expanding industries all around the world. At the same time, we now realize that most of the 75,000 or more chemicals that we use have a level of potential danger to health and the environment that is not understood and not sufficiently tested. We have assumed those materials to be innocent until proven guilty, an assumption that has been proven invalid by the experience of half a century. We have had too many nasty surprises: DDT, PCBs, and a variety of substances that have been found to be carcinogens, mutagens or endocrine disrupters. The damage they cause may be very great, especially chemicals that persist in the environment or bioaccumulate (build up) in the tissue of living organisms, both people and animals. Once these chemicals are created, they are ever-present dangers. After years or decades, children who have these kinds of materials bioaccumulating in their systems may suffer enormously damaging effects.

To reduce or eliminate these risks in the future, we are going to have to use toxic chemicals in precautionary ways that eliminate exposures (the only safe type of use), in fully closed, looped manufacturing systems and move them in fully closed transportation and storage systems. In addition, their very use needs to be re-examined. We need to see where we can replace products that are made with toxic chemicals with products made by natural chemical processes that do not involve the heat and pressures, and toxicity, of current chemical manufacturing.

Dethroning carbon, Enlisting commitment

Finally, we will have to move away from the use of fossil fuels to power our industries, to generate our electricity, and most of all, to drive our transportation systems. During the last 150 years, we have gone from reliance on fossil fuels that contain high levels of carbon, a major environmental contaminant, to those that contain lower levels of carbon. Now we are moving to even less carbon toward, for example, natural gas, which is mainly hydrogen. It contains only one carbon atom and is far less polluting than oil. Central to any future scenario is getting rid of the carbon atom and moving to new energy sources. For the moment that may mean natural gas, the cleanest of the fossil fuels, but ultimately it will mean an exciting shift to totally pollution free, renewable energy. This is hydrogen-based power, made from water, and generated by breaking the oxygen and hydrogen bond through solar energy.

There is no question that these critical shifts in our relationship to resources are possible, and essential, in the next century. But the speed at which they take place, the goals that are possible, rely not as much on technology or politics or economics as they do on our commitment to making them happen. We can create these systems. We make hydrogen today, and have used it for 30 years in the U.S. space program. We can, rapidly, begin to clean up and convert to clean fuels the 600 million vehicles on the world's roads—200 million of which are in the U.S. alone. If we do, within a decade or so we could have air that truly meets public health standards and is safe for all our children to breathe. We can move materials in a circular pattern if we commit to building our reuse and re-manufacturing industries, and if we create incentives for the growth of those industries and disincentives for the use of virgin materials.

What happens in 2020 or 2040 is a matter of the extent of commitment that we have—and that is a human, not a technological, factor. We know we can do these things, but whether they happen or not depends on whether we choose to make them happen, and how much we care about the world that our children inherit.