

Ecology Nurtures Community

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INSTITUTE FOR LOCAL SELF-RELIANCE

Environmentally Sound Economic Development

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The Institute for Local Self-Reliance (ILSR) is a nonprofit research and educational organization that provides technical assistance and information on environmentally sound economic development strategies. Since 1974, ILSR has worked with citizen groups, governments and private businesses in developing policies that extract the maximum value from local resources.

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"The central problem with our times", the French poet and philosopher Paul Valery once remarked, "is that the future isn't what it used to be."

If we polled Americans in 1955 about what life would be like in America in the year 2000 we probably would have had more of a consensus than if we polled the same group of people today and asked them to predict what life would look like just seven years from now.

Ten years ago no one would have predicted that communism would collapse within five years. And five years ago, when communism did collapse no one would have predicted that today the advanced capitalist countries would be suffering their longest recession and greatest loss of faith in their economic systems since the 1930s.

This is a time of profound change.

Nations are breaking down not only violently as in Yugoslavia but by peaceful agreement, as in the dismemberment of Czechoslovakia. We need not travel abroad to witness these emerging centrifugal political forces. Here in the Pacific Northwest Ecotopia is now referred to as Cascadia, an increasingly independent economic region encompassing not only the American Northwest but western Canada. Last year Californians voted to split the state into two or three independent states. Earlier this month citizens of Staten Island voted to secede from New York City. In last month's Canadian elections the second and third largest parties support larger provincial autonomy or the breaking up of Canada.

While political units are becoming smaller, economic units are becoming larger. As the nation state is breaking down the private corporation is expanding. Planetary corporations now stride the earth and their principal demand is to eliminate any barriers to

the movement of goods and services. The planetary free trade movement, with its single goal of increased mobility is now clashing with the increasing worldwide yearning for community and local democracy, for a sense of place and a genuine sense of participation.

We can no longer predict the future, but on an unprecedented scale and in an unprecedented manner we are inventing the future. John Naisbitt once called ours an age of parenthesis, an in-between time when the old ways of doing things have proven unworkable or even dangerous but a time in which we have yet to develop a coherent new way of doing things. We are struggling to develop new rules, new design principles that will channel investment capital, entrepreneurial energy and scientific genius in new directions.

In this struggle to invent the future two powerful forces provide the context for our efforts. One is technological, the other political.

The Technological Context

We are learning to manipulate matter in ways unimagined even two decades ago. We are on the verge of being able to make virtually any kind of final product from any type of matter. And we are learning to accomplish this feat at an ever lower price.

Consider how far we have come in a few short years. In 1975 the Chase Manhattan Bank, after a massive study, informed us that improving efficiency could have no impact on electrical demand growth. Yet from 1975 to today more than 100 times more electricity has been conserved than new electricity has been generated. On the supply side of the picture, in 1981 electricity generated from wind was five times more expensive than electricity from conventional power plants. Today wind

generated electricity is as cheap as conventional power. In 1975 the cost of generating electricity from photovoltaics--solar cells--was 100 times the cost of conventional electricity. Today the ratio has dropped to 5:1. By the end of the 1990s it could be as low as 2:1.

In 1975 we still believed that small was beautiful when it came to power plants. Today small scale on-site natural gas fueled cogeneration plants are competitive with large scale central power plants. Anyone designing a large office building or manufacturing plant today would be remiss if he or she did not seriously consider installing a power plant rather than a simple boiler or furnace.

Today we are learning how to extract useful work from heretofore overlooked resources: direct sunlight, windpower, plant matter, heat from the soil and groundwater.

In the non fuel area, our newly acquired technological knowhow, coupled with more rigorous environmental regulations, has spawned a re-emergence of plant matter as an important industrial material. The carbohydrate is again becoming a viable competitor to the hydrocarbon. In some ways this is an example of going back to the future. Little more than 100 years ago most of our industrial materials and chemicals came from living carbon, not dead or fossilized carbon: clothes, construction materials, paints, inks, intermediate chemicals.

The first plastic was made, not from petroleum, but from cotton. It became the basis for the photographic industry. To this day Hollywood calls its films "celluloids", the name chosen by the inventors of the first plastic because cotton is 94 percent cellulose, the basic building block of living material. The first synthetic fiber was not nylon but wood pulp derived rayon. In the 1920s the first film plastic was invented. It was made from wood pulp and was called cellophane. In the 1930s an engineer working for Minnesota Mining and

Manufacturing put some adhesive on the back and invented Scotch tape.

After World War II the carbohydrate economy went into eclipse. Petroleum came to dominate our lives. Indeed, by 1985 two thirds of the fibers used to make our clothes were derived from oil. But in the last ten years biological carbon is making a comeback. Vegetable oils are replacing mineral oils in inks and paints. Vegetable based dyes have re-entered the market. Enzymes are replacing phosphates in detergents. We are converting whey, a byproduct of the cheese making process, into ethanol and shortly, will be making it into a degradable plastic that could be used as a substitute coating for paper instead of clay coatings. Since the natural polymer disintegrates in the pulping process the paper will become easier to recycle.

In the construction field we are learning to make wood wastes into engineered wood with superior qualities. We are building straw houses in the southwestern United States.

One of the primary areas in which we are focusing our ingenuity is in extracting value from the enormous quantity of wasted materials. There is over 1 billion tons of solid waste generated each year and each month we hear another story of how entrepreneurs and inventors are learning to take those wastes and recycle them into high quality end products. One of my favorite stories comes from my home state of Minnesota.

In January 1991, sixth grader Molly DeGezelle decided to enter a science contest. She was looking to make building material out of recyclable products. She took some old newspapers, ground them in a blender, added Elmer's glue and baked the resulting goo in the oven. The consistency wasn't quite right. At the suggestion of her father, a building contractor, she zapped the concoction in a microwave oven and out came a product with very interesting properties.

Three years later Phenix Composites of Mankato, MN is manufacturing 2 by 4 sheets of Environ, a material that looks like granite but can be sawed and nailed like wood. It is a premium hardwood substitute for making cabinets or furniture and is substantially cheaper than conventional materials. It is 45 percent recycled newspaper, 45 percent soy or wheat flour and 10 percent additives.

We are learning to use materials more efficiently and to substitute recycled materials for virgin materials. Steve Lokken's ReCraft 90 home in Montana is an example of the state of the art. This conventional looking home was built with only one sixth the wood required for a conventional house. The siding is made from a mixture of sand, cement and cellulose fiber. The sheet rock is made from recycled newspaper mixed with waste fly ash. Some of the flooring is made of recycled grocery bags and recycled glass.

How far will our ingenuity take us? Who knows? A year ago some Japanese engineers were visiting me and presented me with their business cards. These cards, they informed me, were made from sewage sludge. The cost was about five times the cost of paper from trees but they expected the price to drop. And yes, my first impulse was to hold the card up to my nose and sniff it.

The Political Context

The technological revolution has given birth to new products, new businesses, even new industries. Yet these technological developments were not simply a result of the workings of a free market. It is important to emphasize in this historical moment when the philosophy of deregulation and free markets is sweeping the planet, that much of the progress we have made in the last ten years is a result of our changing the rules. Which brings me to the second powerful force guiding our future: the political revolution resulting from our increased environmental consciousness.

The environmental revolution is based

on a very simple principle: there is a distinction between price and cost. Price is what the individual pays. Cost is what the community as a whole pays. A market economy works well when it relies on accurate prices but we have discovered that the price we pay for goods rarely includes the true cost of extracting the raw materials, manufacturing them into final products, transporting them to the ultimate consumer, and disposing of all the waste generated along the way.

We have begun to move toward full cost pricing, to internalize the full cost of goods and services into their selling price. And because the price differential between environmentally benign materials and products and those that are environmentally destructive is now so small, this type of full cost accounting can have profound implications.

Consider what is happening in the electricity industry. Beginning in 1989, several utility regulatory commissions began to quantify the environmental costs of power generation and to use these numbers when reviewing utility construction plans. Seven have now gone through this process and on average they have concluded that the environmental cost of a conventional coal plant is 1-1.5 cents per kWh. Add this to the construction and operating cost of coal plants and coal is priced out of the market. Coal no longer becomes competitive with wind or plant matter for example. That wouldn't have been true ten years ago because wind power plants were then many times more expensive than coal power plants. It is true today because the differential is so narrow.

Coal is 55 percent of our electric utility fuel. We burn almost 1 billion tons of coal a year. Full cost accounting could change the fundamental material underpinnings of our electricity sector.

Some people are now applying the principles used in our electric utility system to

our transportation system. Americans are defined, in part, by our love of cars and our hatred of welfare. How shocking to discover, then, that our cars are by far our largest welfare clients. Collectively we pay \$300 billion a year to subsidize the car. It turns out that the taxes we pay for gas and the fees we pay for registration and license renewals cover only half the cost of road construction and maintenance. Transportation related taxes cover none of the police, fire or medical costs of accidents, nor any of the costs of pollution, nor the damage costs to buildings from the vibrations of heavy trucks. Nor do transportation related taxes cover the costs of taking massive amounts of land out of the tax base nor the costs of protecting our access to middle eastern oil. The bottom line from these full cost studies seems to be that if we had to pay the full cost of cars we probably couldn't afford them.

A few years ago Los Angeles did a full cost accounting of the environmental cost of pollution. It took the cost-benefit analysis a step further, putting a price not only on hospitalization and death but on physical discomfort. The analysts put a price on headaches and coughing spasms. They arbitrarily decided to impose a price of a few cents for each episode. Multiplied by the number of people who experience this kind of discomfort they arrived at a very large number. Indeed, as a result of their full cost accounting exercise they decided to embark on an unprecedented strategy. They decided to phase out the use of gasoline itself. Southern California was the first to demand that a certain percentage of cars have zero emissions, which means in effect, electric vehicles. In 1990 the state of California adopted the policy. Today 12 states from Maine to Virginia are about to adopt the same policy.

Just as full cost accounting in the electrical sector could lead to the end of the coal fired power plant, so full cost accounting in transportation could lead the demise of gasoline powered cars.

One final example of full cost accounting concerns solid waste disposal. Ten years ago it cost about \$10 to dispose of a ton of waste. Today the average cost has risen to more than \$50 per ton, and in many parts of the country disposal costs are over \$100 per ton.

An interesting experiment in garbage disposal economics is now taking place in Germany. In 1991 Germany enacted recycling legislation, initially targeting packaging. The legislation established mandatory recycling goals for each material. The private sector responded by setting up their own collection system financed by license fees to the manufacturers. As a matter of convenience this private collection system established a uniform license fee for all materials, that is, each material paid the same per pound fee. Earlier this year the system went broke. The private sector had underestimated the cost of collection and recycling. Last month they changed the rules. Not only did they raise the fees, but they established a variable fee structure based on the actual cost of collection and recycling. As of October 1993 the license fee for plastic packaging will be more than ten times, on a per pound basis, than the fee for paper.

Plastic's attractiveness is that very little material is needed to accomplish a specific purpose. But that very feature becomes a liability when plastic has to be recycled because a recycler has to visit many more households to gather a pound of plastic than a pound of glass or metal or paper. In other words, plastic is an attractive packaging material when the materials system is a one way system: from mining to manufacturing to the customer to the dump. But when we create a two way materials system, whereby the manufacturer must take back the product after it has been used plastic packaging becomes much less attractive. I wouldn't be surprised if by 1995 German manufacturers dramatically reduced

their use of plastics.

Miniaturizing the Materials Economy

Two revolutions. One technological, one political. The first establishes the potential. The second establishes the rules that move us toward that potential. So far my talk has been descriptive. Let me now add a few prescriptive comments.

"Perfection of means and confusion of ends seems to characterize our age", Albert Einstein observed almost 50 years ago. As we write the rules that channel investment capital and entrepreneurial energies and scientific ingenuity in new directions we should be clear about the kind of future we want.

In my travels around the country I come away firmly convinced that people prefer a future in which economies and societies nurture a sense of community, where production systems are humanly scaled, where communities take responsibility for their actions but also have the authority to influence their futures, and where a largely locally owned productive capacity is founded on environmentally benign practices. This desire for a sense of place, a feeling of community and an ability to participate in decisions affecting our lives, is probably universal. The major obstacle that stops people from trying to convert these yearnings into reality is their belief that this is utopian thinking. Those who believe that communities and regions can and should extract much of their wealth from local resources are viewed as anti-technological and anti-development romantics, yearning for an earlier, simpler time that can never come again.

I would argue that those who are trying to miniaturize major parts of the economy and emphasize a sense of community are not backward looking at all. And they are most certainly not anti-technology and anti-development. They embrace the most sophisticated and elegant technologies and

believe in a different kind of development.

Today, we have the technological and regulatory tools to structure our economy so that we extract the maximum value from local resources. And in doing so, I submit, we will encourage a profound restructuring of the economy along lines that value community. Let me discuss this in more detail.

The three primary strategies for achieving sustainable communities are:

- Improve efficiency
- Reuse materials and products
- Shift to renewable resources sustainably harvested and harnessed

We can reduce our energy consumption by anywhere from 20-50 percent. We can reduce the amount of materials needed for a given purpose by anywhere from 25-75 percent, depending on the product. Improving efficiency, by definition, reduces our consumption of materials, which, again by definition, reduces our use of imported materials. Improving efficiency also means keeping more money in the local economy. After repaying the investment in improved efficiency, hundreds of millions of additional dollars would be circulating within the regional economy.

Efficiency reduces our need for materials. Recycling and re-use creates an abundant amount of local materials and products available for local use. How far can we go toward recycling and reuse? From 1980-1985, before disposal fees increased and significant recycling legislation was passed, the amount of material recovered rose only slightly, from 15 to 16 million tons a year. From 1985 to 1990 materials recovery more than doubled, to over 32 million tons a year. Yet we have only scratched the surface of what is possible. The construction industry probably

recycles only about 1 percent of its waste. The manufacturing sector does only slightly better. Only 20 percent of our municipal solid waste is recycled, on a national average, but 60 percent recovery levels are achievable.

Substituting renewables for non-renewables for fuels and industrial materials also encourages a more localized materials economy. Wind power, ground and water heat pumps, biofuels, all are examples of harnessing local resources for local use. My favorite example is the potential for harvesting direct sunlight.

In the early 1980s a housing development in Arizona installed solar cells on the roof. These were not economically competitive with central power plants. The homes were subsidized by the federal government. But the results were enlightening. Not only did the rooftop provide all the electricity that a very energy efficient house would need, but it had sufficient electricity left over to fuel the family electric car. Thus when the rooftop became a power plant the car became a family appliance. Indeed, the car and house exhibited a symbiotic relationship. Most often the house provided the fuel for the car, but on long stretches of overcast weather the car's storage system could, in a pinch, provide backup power for the house.

Today the Sacramento Municipal Utility District is installing photovoltaics on dozens of customer homes. The Japanese company Sanyo is about to commercialize roof shingles with built-in solar cells. Texas Instruments predicts that it will halve the cost of solar cells by 1995. If we are able to use direct sunlight to generate electricity the slogan "power to the people" will take on a new dimension.

Sunlight and windpower and heat pumps can provide us energy but they cannot supply us molecules. To make a physical product we need physical matter and if we are talking about renewable resources this means

plant matter. The types of plant matter we rely on will vary depending on the climatic zone. South Texas will use kenaf to make paper while northern Minnesota will rely on fast growing aspen trees. Illinois will make plastics from corn starch while Missouri may make plastics from sawdust.

The end result of environmentally benign economic development may well be a reversal of the two centuries old trend of separating the producer from the consumer from the garbage dump. A sustainable future means bringing the producer and the consumer back together again, minimizing wastes and extracting useful work from previously overlooked resources like wind and sunlight and grasses.

Rebuilding the economy to nurture community and diversity and ecological systems will be no simple task. Over the last century we've developed a system of laws that seem to view community as an obstacle to progress. These laws and regulations and tax incentives heavily favor mobility instead of stability, long distribution lines rather than closed loop systems, large rather than small producers, and absentee rather than locally owned productive capacity.

Consider what some would see as the simple question of recycling. We've built a one way industrial system--from the forest or farm or mine to the manufacturer to the customer to the garbage dump. As we build a two way system we increasingly favor local producers. Recycling is only the first step toward improving materials efficiency. The ultimate step is re-use. But regulations demanding re-use favor local producers because they impose a heavy transportation cost on distant producers who would have to take their products back to the factories. The business of refillable bottles and cloth diapers is a local and regional business.

Re-use laws have been challenged, on both the national and international level as

violations of free trade. The Glass Packaging Institute has challenged the California and Oregon laws that require the use of recycled glass in bottles and the European bottlers challenged a Danish law that required uniform bottle sizes to facilitate re-use. The recycling provisions of the Danish law were upheld by the European Court of Justice, but the re-use provisions were not.

Responsibility and Ecology

The future most definitely is not what it used to be. A tidal wave of change is washing over us. Will we direct this change or will we simply teach ourselves how to body surf? New industries are emerging: electric vehicles, wind turbines, biorefineries. Design itself is becoming an increasingly important skill that cuts across many industries.

This conference takes a comprehensive view of our built environment, taking into account the energy and environmental impact of the materials we use and the designs we develop. I hope that we also take into account the economic and social impact of our built environment as well. A few months ago *TIME* magazine described Wal Mart's much ballyhooed new store in Lawrence, Kansas as an "Eco Mart" because it uses materials that consume a third less energy than conventional materials and has a high efficiency lighting system enhanced by skylights. One of the nation's leading green architects told *TIME*, "We're not talking about just another glib exercise in artifice. We're talking about a fundamentally new principle of design."

I quarrel with that assessment. Wal Mart survives only by getting people to leave their communities and drive long distances to shop. The increased energy consumed by shoppers far outweighs the decreased energy used in the building construction and operation. Moreover, in many areas Wal Marts are as large as the entire existing downtown shopping area. Instead of public shopping districts comprised of diversified

shops under diversified and often local ownership we have private, absentee owned shopping under one roof. A key element of ecologically healthy systems diversity. We should be very careful about calling a single structure a major ecological advance unless we understand how that structure relates to the community around it.

A sustainable future means not only taking a comprehensive view about the impact of our designs on our communities; it also means making communities responsible for their own wastes. Making us responsible for our wastes, I believe, would encourage us to create systems that minimize our generation of wastes.

In the early 1970s federal environmental legislation tried to reduce the impact of smokestack emissions by raising the height of stacks. That policy has been aptly dubbed, "the solution to pollution is dilution". A local problem became a regional and international problem. A far more ingenious and enduring method for coping with the problem of industrial waste is being practiced in Japan.

Toshiba's factory at Fukaya manufactures color televisions. T.v. tube manufacturing is a dirty process. The metal masks on the inside of the glass tube are coated with photosensitive materials developed like film and etched with concentrated acids. At every stage large amounts of water flush the wastes away. Toshiba's factory has a network of decorative canals connecting numerous large fish ponds and artificial lakes stocked with 10,000 giant koi carp and goldfish, each worth about \$100. They swim through the canals against the rapid flow of water from the water purification plant.

Any failure of the plant would immediately kill the fish at enormous cost and catastrophic loss of face. For Toshiba, this very public demonstration of the quality of its wastewater is the best way to force itself to do

as well as it claims.

Maybe in the 1970s we should have lowered the height of the smokestack and turned it back into the plant as a way to do this. This would have forced those who produce the pollution to suffer the consequences.

We've come a long way. This conference itself is evidence of that. Ten years ago a gathering of this kind would have been impossible. Not only would there have been a distinct lack of interest but there would have been a dearth of skills and experience.

We start from very simple concepts. Be as efficient as possible. Leave to future generations that same quantity and quality of physical resources we inherited from the last generation. Take responsibility for our wastes. Make the price we pay for products equal to the true cost of making, transporting and disposing of those items.

These are simple concepts but it has taken us almost 20 years to really understand their implication and to develop sufficient experience to translate theory into practice. the next step is to move these concepts from the margins of the economy, where they are now, to the center of economic planning.

"The real voyage of discovery lies not in seeking new lands but in seeing with new

eyes", Marcel Proust observed. Our voyage has been remarkably eventful. It is far from over. Yet even now the process of discovery has led us to envision a future that is not a simple extrapolation of the present. We have learned that we can marry economic, environmental and social objectives into a single comprehensive development strategy. We have learned that building with value means building with values.