RESOURCE CONSERVATION AND UTILIZATION A MAGNIFICENT OPPORTUNITY

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Recently I read the book The Crisis Years, 1960 – 1963, by Michael Beschloss. This excellent historical work reveals the world's terrible proximity to thermonuclear war during the building of the Berlin Wall and the Cuban Missile Crisis. Two men of peace, John Kennedy and Nikita Khruschev, were hard pressed to keep their respective militant leaders from actions that easily could have triggered a world-wide nuclear calamity. How can man be so stupid?

Unfortunately and tragically, it is not hard to understand. Mankind can be terribly stupid! How else can one explain today's world leadership's abject failure to recognize the dangers inherent to destruction of the ozone layer; an upcoming global warming crisis; destruction of the rainforests; and the pollution of our air by acid rain. Unnecessary combustion processes such as incinerators; pollution of our lakes and streams by uncontrolled point and non-point source discharge; the groundwater pollution by irresponsible land use disposal programs; and foolish overuse of chemical fertilizers and pesticides; all contribute to the immensity of the problem. Mankind must act now to prevent the destruction of civilization, or at least civilization as we know it!

I recently read an issue of Countryside magazine, published by the Hearst Corporation. The motto of this publication is an old Native American proverb: "We don't inherit our land from our parents — we borrow it from our children." WOW! That statement hits home with real truth!

In the USA, our forefathers left us a great heritage. How are we managing that heritage? With our trade deficit, our federal deficit, our education deficit, our job security deficit, and yes, our environmental deficit, can anyone truly say that we are meeting our responsibilities as a nation or as a society? Why is our generation so willing to burden our children?

We, in the USA, are the leaders in this terrible environmental, ecological, and sociological abuse. A great American President said, "The buck stops here!" Well, the buck must stop here and now. We, this generation of leaders, have the watch! It is our responsibility to meet this challenge now — not pass the crisis on to our children. The USA is the biggest world-wide user of resources, and as such, we as a government must first meet our own responsibilities before we seek to advise others. However, as individuals, we must speak out today so that all nations may see this critical problem and immense opportunity.

Yes, you heard me right. This ecological and environmental problem can, indeed, be converted to a magnificent opportunity. Science and technology exist today to convert and to recycle waste resources into critically necessary products that, in and of themselves, can greatly benefit the world. We can make use of wastes in economical and safe scientific ways to reduce chemical dependency, to improve our world-wide ecology and environment, and to help feed the world.

Mankind does not need to look to the future to see the folly of its actions, or more precisely, its inaction. The World Health Organization, and other respected public health institutions, are dedicated to forcing so-called intelligent industrial nations to recognize the terrible Third World devastation caused primarily by food shortages. Is society responding to this terrible human tragedy? Malnutrition is the major contributing cause in the deaths of over 14,000 children per day.

In 1992, the Business Council for Sustainable Development published Changing Course. This excellent book is a call to action in world-wide efforts for sustainable economic development.

"A larger portion of the world's population enjoyed adequate nutrition during 1990 than ever before, yet there are 750 million malnourished people in the world today, and 75,000 people die each day (27 million per year) from malnutrition-related causes; most of these are children."

The recently published Worldwatch Institute Report, State of the World – 1994, may, we hope, be a catalyst to challenge our national and world leaders to wake up to the crisis that their inertia is creating and to the magnificent opportunity that they are missing.

State of the World Says: "It may be the ultimate irony that in our efforts to make the earth yield more for ourselves, we are diminishing its ability to sustain life of all kinds, humans included. Signs of environmental constraints are now pervasive. Cropland is scarcely expanding any more, and a good portion of existing agricultural land is losing fertility. …"

"… much of the land we continue to farm is losing its inherent productivity because of unsound agricultural practices and overuse. The Global

Assessment of Soil Degradation, a three-year study involving some 250 scientists, found that more than 550 million hectares (one-third of all farmland) are losing topsoil or undergoing other forms of degradation as a direct result of poor agricultural methods. …" (Tables 1 and 2.)

In 1993 USDA published Agricultural Utilization of Municipal, Industrial and Animal Wastes, in an attempt to convince Congress to fund research and programs necessary to safely convert these wastes into sustainable agriculture and fertility products. This excellent report can be the cornerstone of a world-wide strategy to provide sustainable agriculture through safe and effective utilization of natural bio-organic and mineral by-products. The USDA report states:

"America's cities, farms and industries are producing increasing amounts of by-products and wastes. Currently much of our municipal waste is placed in landfills but landfill capacity is decreasing and disposal costs are rapidly increasing. Many of our urban areas have an urgent need for long-term environmentally safe methods for recycling and disposal of wastes. Our Industries produce hundreds of millions of tons of by-products annually. Alternative uses have been found for a small fraction of these materials, but most industrial by-products are stockpiled at the site where they are generated. A long-term solution to this problem is needed. Major components of our animal production industry are based on animals in confinement. Huge amounts of manure are generated in a small area, creating environmental problems at the site and a waste disposal problem. Agronomic management practices to protect environmental quality at the confinement site and to effectively utilize these manures in agricultural production systems are urgently needed."

"Waste utilization problems present a challenge and an opportunity for US agriculture. We are currently confronted with the long-term goal of developing crop production practices that promote sustainability. Animal wastes and many municipal and industrial wastes have substantial potential value for agricultural utilization. The development of methods to optimally integrate waste utilization into sustainable agricultural practices could provide a major part of the solution to urban and industrial waste disposal problems."

Soil and Water Quality

An Agenda for Agriculture was published in 1993 by the National Research Council. The following quotes are from that very important work:

"Erosion, compaction, acidification and loss of biological activity reduce the nutrient and water storage capacity of soils, increase the mobility of agricultural chemicals, slow the rate of waste or chemical degradation and reduce the efficiency of root systems. All of these factors can increase the likelihood of loss of nutrients, pesticides and salts from farming systems to both surface water and groundwater." (Figure 1.)

Table 1: Human-Induced Land Degradation Worldwide (1945 to Present)

Region	Over-grazing	Deforestation	Agricultural Mismanagement	Other[1]	Total	Degraded Area as Share of Total Vegetated Land
	(million hectares)					(percent)
Asia	197	298	204	47	746	20
Africa	243	67	121	63	494	22
South America	68	100	64	12	244	14
Europe	50	84	64	22	220	23
North & Cent. Amer.	38	18	91	11	158	8
Oceania	83	12	8	0	103	13
World	679	579	552	155	1,965	17

[1] Includes exploitation of vegetation for domestic use (133 million hectares) and bio-industrial activities, such as pollution (22 million hectares).

SOURCE: Worldwatch Institute, based on "The Extent of Human-Induced Soil Degradation," Annex 5 in L.R. Oldeman et al., *World Map of the Status of Human-Induced Soil Degradation* (Wageningen, Netherlands: United Nations Environment Programme and International Soil Reference and Information Centre, 1991).

Table 2: Population Size and Availability of Renewable Resources, Circa 1990, With Projections for 2010

	Circa 1990	2010	Total Change	Per Capita Change
	(million)		(percent)	
Population	5,290	7,030	+33	—
Fish Catch (tons)[1]	85	102	+20	–10
Irrigated Land (hectares)	237	277	+17	–12
Cropland (hectares)	1,444	1,516	+ 5	–21
Rangeland and Pasture (hectares)	3,402	3,540	+ 4	–22
Forests (hectares)[2]	3,413	3,165	– 7	–30

[1]Wild catch from fresh and marine waters; excludes aquaculture.
[2]Includes plantations; excludes woodlands and shrublands.

SOURCES: Population figures from US Bureau of the Census, Department of Commerce, *International Data Base*, unpublished printout, November 2, 1993; 1990 irrigated land, cropland, and rangeland from U.N. Food and Agriculture Organization (FAO), *Production Yearbook 1991* (Rome: 1992); fish catch from M. Perotti, chief, Statistics Branch, Fisheries Department, FAO, Rome, private communication, November 3, 1993; forests from FAO, *Forest Resources Assesment 1990* (Rome: 1992 and 1993) and other sources documented in endnote 30. For explanation of projections, see text.

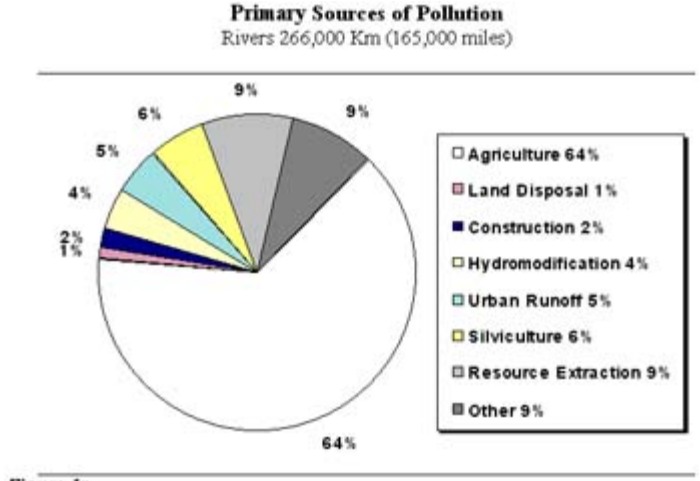
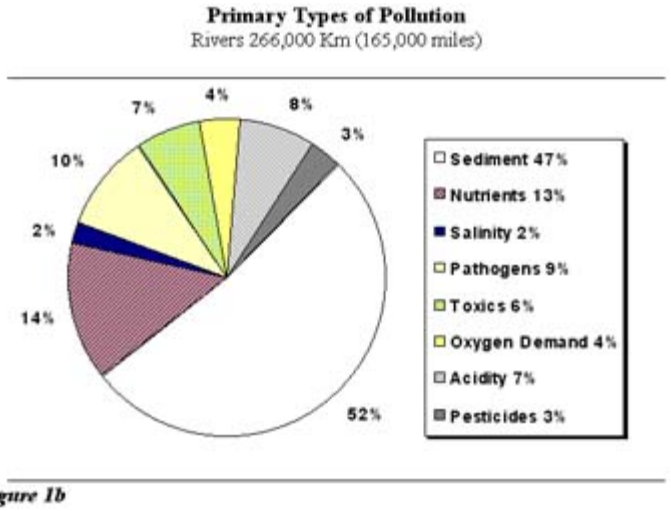


Figure 1a



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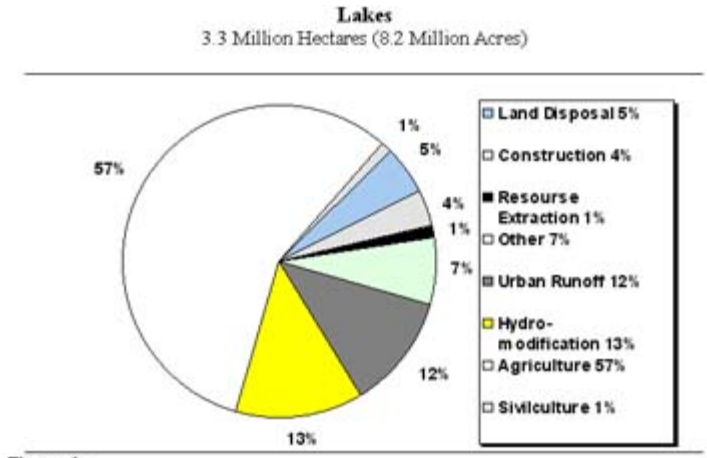

Figure Ic

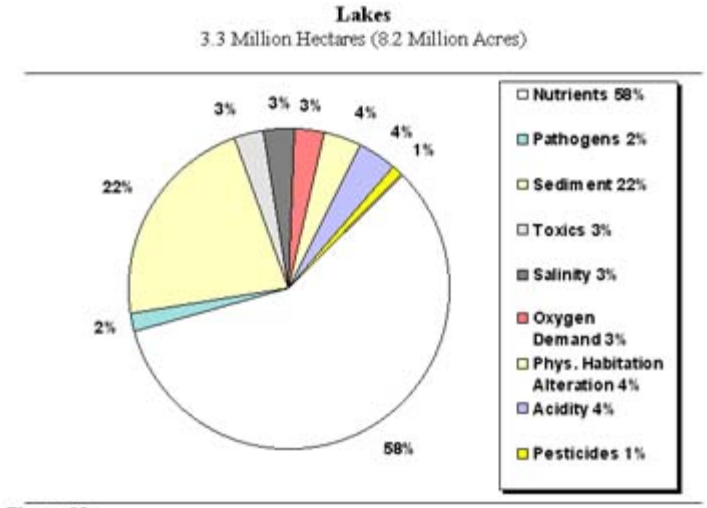

Figure Id

"Manure supplies nitrogen, phosphorus and other nutrients for crop growth; adds organic matter and improves soil structure and tilth; and increases the soil's ability to hold water and nutrients and to resist compaction and crusting. Disposal of manure as a waste often leads to both surface water and groundwater degradation. Improved manure management can effectively capture the benefits of manure as an input to crop production and can reduce the environmental problems associated with manure disposal."

We would add that organic and nutrient waste of all types, including sewerage wastes (e.g. bio-solids) and septage wastes, are both a major problem and a major opportunity. Sound soil management policies, together with immobilization technologies, are required.

In the USA alone, we generate, and basically waste, over 3,000,000,000 tons annually (Figure 4) of organic wastes, and over 100,000,000 tons annually of alkaline by-products (Figure 5). The potential for combining these resources as a world-wide source of bio-organic aglime fertilizer and topsoil blend is unlimited!

Table 3: Sources of Organic Waste in the USA

Organic Chemicals (tons)	58,864,000
Fertilizer & Agricultural Chemicals (tons)	165,623,000
Pulp & Paper Products (tons)	2,251,700,000
Food & Kindred Products (tons)	373,571,000
Textile Manufacturing (tons)	253,780,000
Animal Manures (dry tons) *Above from USEPA 1088, Solid Waste Disposal in the US*	175,000,000
Municipal Refuse (dry tons) *Municipal Refuse from USDA, 1978, Improving Soils with Organic Wastes.*	145,000,000

Organic by-product materials (domestic wastewater residuals, agricultural by-products, food processing by-products) and alkaline by-product wastes (fluidized bed residues, sulphur scrubbing residue, cement and lime kiln dusts and certain fly ashes) have tremendous value, particularly as organic and aglime products. While these materials are needed on our own cropland and pastureland, Third World countries desperately need these materials to cost-effectively utilize either chemical or sustainable farming technologies. Does it make any sense for large municipalities to require industry to spend hundreds of millions of dollars annually for wastewater pre-treatment programs, and then to spend as much as $1,000.00 per dry ton to destroy these residual resources. Until Third World countries can treat and develop their own organic residuals resources, the by-product resources of industrialized nations are desperately needed in many parts of the world to provide fertile soils. The US government should follow the lead of the World Bank and strongly support actions that safely and economically aid in generating great increases in food supplies, by the development of Third World soils for sustainable agriculture through the utilization of existing science and technology. These large urban wastes can be converted to soil products and transported for overseas use, at less expense than selecting publicly unacceptable disposal practices such as landfills and incinerators.

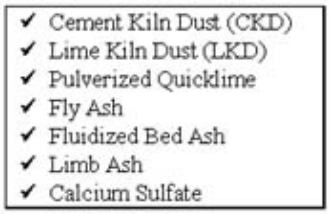

Figure 2: *Types of Alkaline Admixtures*

Agricultural scientists are unanimous in their concern for the problems of soil erosion, chemical dependency, and organic, mineral, and microbial deficiencies in soils throughout the world. Many of the organic wastes that we now relegate to the oceans, to incineration, to landfills, or otherwise destroy, are desperately needed in our world-wide effort to economically provide food for civilization without destroying the soil, the surface waters, and the groundwaters near agricultural land.

In a speech to the Institution of Water and Environmental Management in England, the Prince of Wales stated: "(Incineration) it seems to me, violates the most profound ecological principle of all, which is 'close the loop,' minimizing resource use and energy wastage at every stage of every economic process."

In his book, Earth in the Balance: Ecology and the Human Spirit, Vice President Al Gore states: "The latest scheme masquerading as a rational and responsible alternative to landfills is a nation-wide – and world-wide – move to drastically increase the use of incineration. The principal consequence of incineration is thus the transportation of the community's garbage – in gaseous form, through the air – to neighboring communities, across state lines, and, indeed, to the atmosphere of the entire globe, where it will linger for many years to come."

The Vice President adds "… the single most strategic threat to the global food system is the threat of genetic erosion: the loss of germplasm and the increased vulnerability of food crops to their natural enemies. …"

The Vice President discusses the fertility crisis with keen understanding: "Some of these [dangerous] bargains have already been exposed, and we are beginning to understand that many of the most widespread modern techniques used to squeeze more food from each season's harvest have done so at the expense of future productivity. For example, the high-yield methods frequently used in the American Midwest loosen and – over time – pulverize the soil to the point that large amounts of topsoil wash away with each rain, a process that leads inevitably to a sharp reduction in the ability of future generations to grow similar quantities of food from the same land. … And the huge amounts of fertilizers and pesticides now routinely used in agriculture frequently drain off into the ground-water beneath the fields, contaminating them for many centuries to come. Our inability to provide adequate protection for the world's food supply is, in my opinion, simply another manifestation of the same philosophical error that has led to the global environmental crisis as a whole: we have assumed that our lives need have no real connection to the natural world, that our minds are separate from our bodies, and that as disembodied intellects we can manipulate the world in any way we choose. … We are, in effect, bulldozing the Gardens of Eden."

Sustainable agriculture is a practice that is being recommended by the Rodale Institute and other concerned agricultural citizens in the USA. Sustainable agriculture is a back-to-the-future approach, in which low input sustainable agriculture (LISA) and/or organic farming methods are used to compliment traditional farming practices. Effective new sustainable agriculture technology can dramatically reduce non-point source pollution from agricultural soils.

The 1994 Clean Water Act appears destined to mandate responsible land application practices for all materials used on agricultural soils. Such practices will include seasonal restrictions to protect watersheds from surface and groundwater pollution from leaching. Agriculture represents over 85% (Figure 6) of the market for by-product organics. Such seasonal restrictions should require that bio-solids must be capable of long-term storage without re-growth of pathogens or odors. Organic products, capable of long-term storage for seasonal utilization and immobilized to ensure slow nutrient and organic release, can be the cornerstone of world-wide efforts to concurrently provide for sustainable agriculture,

reduce non-point source discharge, and maintain soil productivity.

We believe in a reasonable and scientific blending of traditional and sustainable agricultural practices, particularly in Third World countries where subsidies are not available, where by-product organic materials are readily available, and where the high cost of chemical fertilizers and pesticides creates huge economic burdens. Sound transitional farm management practices, such as those encouraged by the American Farmland Trust, must become a reality.

We fully recognize and respect the important scientific and technological contributions of the chemical industry to food and fiber production in the world. We also understand the immediate environmental problems and future soil problems that are the direct result of over-dependence on chemical fertilizers and pesticides. Sensible transitional agriculture practices can reduce chemical dependency by increasing the effectiveness of chemicals. World food and fiber production policies must be driven by good science, sound economics, and reasonable respect for the environment.

We salute the environmental and public interest groups that are providing the world-wide leadership to make civilization realize that waste management is best accomplished through a scientific combination of waste reduction, waste recycling, and waste reuse.

In 1994 and 1995, Congress will authorize a new Resource Conservation and Recovery Act, Clean Water Act, and Farm Bill. Congress must have the wisdom and courage to meet the dual challenge of ecological enhancement and sustainable development.

Resource Conservation and Recovery Act

Challenge: Reduce disposal through waste reduction, recycling and beneficial utilization

Opportunity

- Provide meaningful technology transfer and incentives for cost-effective reduction, recycling and beneficial utilization technologies.
- encourage utilization in lieu of disposal.
- Eliminate federal funding of any disposal practices.

Clean Water Act

Challenge: Reduce non-point source discharge pollution of surface and groundwater.

Opportunity

- Mandate land management policies and practices, such as seasonal restrictions and immobilization, that dramatically reduce leaching of organics, nutrients, and metals to surface and groundwaters. Treat all land applied materials in a similar fashion.
- Encourage soil practices that properly increase bio-diversity, organics, minerals, and tilth to soils to minimize leaching and erosion.
- Provide technology transfer on available science to achieve these objectives.

Farm Bill

Challenge

- Provide for sustainable agricultural development in the USA while concurrently maintaining cost-effective productivity and protecting watersheds and the environment.
- Assist Third World countries to be able to establish sustainable agricultural capability.

Opportunity

- Provide technology transfer and incentives to optimize blending of bio-organic and mineral by-product resources with chemical products to provide world-wide sustainable agriculture.
- Provide incentives to encourage practices that ensure long-term soil fertility with minimum surface and groundwater pollution.

In his 1968 tragic pursuit of the Presidency of the United States, Senator Robert Kennedy concluded his speeches by quoting the poet George Bernard Shaw: "Some people see things as they are and ask, 'Why?' I dream of things that have never been and ask, 'Why not!' "

I dream of a bridge between waste generators of this world and the food and fiber producers of this world. I dream that over that bridge will pass science, technology, understanding, communication, and cooperation. I dream that because of that bridge we will greatly reduce

starvation and the dangers that face the world now, and that will face our children and our children's children in the future. When we succeed in building that bridge, each of us will enjoy the ultimate satisfaction of knowing that we did our best!

Recycling is no panacea! Recycling and reuse must be safe, socially acceptable, and environmentally responsible. The USEPA 503 regulations were a big step in the right direction. The establishment of the Exceptional Quality Sludge (EQS) standard finally created a recognized standard of excellence – one that each public generator should seek to achieve. It makes far more sense for municipalities to produce a liability-free product, than to put their confidence and reputation in the sludge management credibility of the "low bidder." This is particularly true considering the lack of state enforcement of sludge management regulations. There are still serious public health issues not addressed by the 503 regulations. For example, while EQS products, which require either sterilization or pasteurization of disease causing pathogens, are required to be tested prior to use, after storage, no such requirement exists for traditional land-applied sludges, whose pathogen reduction standard is 2000 times less stringent than the EQS standard. The storage of land-applied sludges for seasonal application is an environmental and operational necessity, yet there is no requirement that traditional, Type B sludges, after storage, meet pathogen standards. No wonder that the public is concerned! In addition, neither EQS products nor Type B sludges are monitored for vector attraction after storage. Odor control is the critical issue in maintaining community acceptance. How can this critical aspect be left out without regulatory requirements?

Moreover, to date EPA has issued no guidance on seasonal restrictions on the land application of municipal sludges, while concurrently EPA is strongly supporting Clean Water revisions, which will mandate seasonal controls on manures and other surface-applied organics and nutrients. In order to prevent non-point source discharge pollution, does it make any sense to regulate farm manure, but not city sludge? Does it make any sense to spend billions of dollars annually to manage the discharge of pollutants at point source facilities, such as publicly owned treatment works, and concurrently tolerate year-around land application practices that accelerate non-point source discharge pollution? No way! Land use of all organics and nutrients, including farm organics, municipal and industrial sludge, and agricultural chemicals, must be controlled by sound science and technology, coupled with fair, responsible, and even-handed regulatory policies and practices. Both EPA and USDA are aware that technologies and practices exist that, through immobilization and soil management, can significantly reduce leachate pollution, while fortifying soils for sustainable agriculture. It's time for EPA and USDA to make available, through technology transfer, the vast amount of information on stabilization, immobilization, and mineralization that they already possess. The utilization of by-products makes great sense, providing that dedicated efforts are made by industry and regulatory authorities to be totally and completely credible. No one will tolerate practices or policies that jeopardize the public trust.

This is our watch. It is our generation. "The buck stops here" Why are our leaders so hesitant to act? They know the problem! They probably even recognize the opportunity! This challenge will require both political courage and political leadership. Now is the time!

The real challenge is to improve environmental protection, maintain productivity, and concurrently provide for long-term sustainable soil fertility and agricultural development. This is where effective and well-managed utilization of by-product bio-organic and mineral resources provide such a magnificent opportunity.

Our contribution to this world-wide opportunity is called N-Viro Soil. N-Viro Soil is a patented process which blends alkaline materials, particularly alkaline by-products, with bio-organic waste materials to create a cost-effective, safe, socially responsible, granular, soil-like bio-organic material used as an aglime, fertilizer, and/or topsoil blend. These products economically provide bio-diversity, organics, aglime, nutrients, minerals and tilth to the soil.

We now have over 30 facilities on-line throughout the world. The largest facility, in Middlesex County, New Jersey, produces over 800 tons of product daily, and the smallest facility, in Knox County, Tennessee, produces about 15 tons daily. All N-Viro facilities produce a product that meets the EPA Exceptional Quality Sludge (EQS) standard. Our N-Viro Soil product is protected by 5 million dollar product liability insurance.

Recent studies in Northwest Ohio demonstrated a first year value of N-Viro Soil to farmers exceeding $30.00 per ton. Savings to farmers from decreased input costs and increased yields exceeded $40.00 per acre. Savings exceeded $40.00 per acre! In 1992, average farm gross profit in the USA, including subsidies, was just over $50.00 per acre.

On October 31, 1991, our firm, then called N-Viro Energy Systems Ltd., was honored to be one of the first recipients of the President's Environment and Conservation Challenge Award Citation for Excellence in Innovative Technology, presented by President Bush at a ceremony held in the Rose Garden of the White House. In 1990, The USEPA recognized our organic aglime process and product as the "#1 Sludge Use Technology in the USA." Similar recognition was given to N-Viro Soil by the National Environmental Awards Council, and by the Friends of the United Nations Environment Program. Winning awards does not make our product perfect, but it does suggest significant demonstrated credibility. The selection committees for the above awards include such groups as the Sierra Club, World Wildlife Fund, Natural Resources Defense Council, the Soil and Water Conservation Society, Renew America, and other dedicated and respected environmental and conservation organizations. In 1992, N-Viro was one of five companies sponsored by the USIA at the Earth Summit in Rio de Janeiro.

In the spring of 1994, N-Viro International Corporation joined with the Composting Council and the Rodale Institute to sponsor legislation to provide incentives to encourage stabilization and immobilization of nutrients in land-applied organics. It is critical that all generators of wastes

containing large quantities of organics and nutrients recognize their public responsibility to prevent non-point source discharge pollution. Does it make any sense to spend billions of dollars annually to prevent point source discharge, and concurrently use year around land application practices that increase non-point source discharge pollution? How can we mandate that our farmers must implement seasonal restrictions on the land use of their manures, while we encourage the year around application of utility bio-solids? No way! Good science is good science! All land-applied materials, including chemicals, should be managed by the same laws.

Figure 3: *Soil and Water Quality: An Agenda for Agriculture. Most important and least done about it (February 6, 1936). Courtesy of the J.N. "Ding" Darling Foundation*

The Compost Council, Rodale Institute and N-Viro International Corporation also sponsored legislation to amend the 1995 Agriculture Appropriations Bill to provide 3 million dollars to USDA to provide research and technology transfer on the use of stabilized organics and compost to concurrently improve soil fertility, reduce non-point source pollution, and maintain soil productivity.

We believe strongly in the vision of resource conservation and utilization, and we are actively involved and dedicated to making that vision a reality!

At a recent Bio-Politics for the Environment conference in Athens, Greece, I heard a presentation by Dr. Donald Huisingh, of the Erasmus Centre for Environmental Studies in the Netherlands, on environmental protection approaches. The reactive approach looks at wastes at the end of the pipeline, and consultants are hired to implement reduction. In the receptive approach, the entire process is reviewed by management with the goal of optimization. In the constructive approach the product chain is evaluated by all involved sectors to seek a quantum leap. Ultimately, in the proactive pattern, the perspective is needs, the participants are society, and the consequences are visionary changes.

In the war on wastes, the war on pollution, and the war on hunger, it is time to be proactive.

In closing, let me quote the closing paragraph of President Kennedy's speech in the spring of 1963 at American University: "In the final analysis, our most basic common link is that we all inhabit this small planet. We all breathe the same air. We all cherish our children's future, and we are all mortal."

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J. Patrick Nicholson is now Chairman of the Board and Chief Executive Officer of N-Viro International Corporation N-Viro Energy Systems Ltd. The preceding company to N-Viro International Corporation, which was founded by Mr. Nicholson, was honoured in 1990 by the nationally respected "Searching for Success" program, sponsored by Renew America. The company's efforts were recognised by the Friends of the United Nations Environment Program on Earth Day, and by the Ohio House of Representatives. In 1990 the United States Environmental Protection Agency recognised N-Viro International's soil technology as "outstanding" in America. Mr. Nicholson's company was honoured by the President of the United States in 1991 and he received the President's Environmental and Conservation Challenge Award Citation. He was the guest of the United States State Department to make a presentation at the Earth Summit in Rio de Janeiro, in 1992. He has recently been elected to the Board of Directors of the Ohio Nature Conservancy, and to the Board of Directors of the American Health Association, the American affiliate of the World Health Organisation. Mr. Nicholson's keen interests lie in politics and resource conservation policies. He has invented and developed ten international patents on by-product utilisation, and has lobbied actively for resource conservation and recovery legislation since 1976.

Existing utilization/ conservation of the wetland resources The wetland as mentioned earlier is located in Mazandaran Province. The area is located within the administrative boundaries of Babolsar Township and districts of Fereydoon Kenar and Roodpost. The nearest city to the site is Babolsar. The total population of the settlements within the area is 17,824 people. The main activities of the local people are agriculture (rice farming), duck trapping, hunting, and fishing. Livestock breeding and commercial activities are other sources of income (Pourlak, 2000). 10. The Resource Conservation and Recovery Act (RCRA) of 1976 was the culmination of a long series of pieces of legislation, dating back to the passage of the Solid Waste Disposal Act of 1965, which addressed the problem of waste disposal. It began with the attempt to control solid waste disposal and eventually evolved into an expression of the national concern with the safe and proper disposal of hazardous waste.Â A major objective of RCRA is to protect the environment and conserve resources through the development and implementation of solid waste management plans by the states. The act recognizes the need to develop and demonstrate waste management practices that not only are environmentally sound and economically viable but also conserve resources. The exploitation of natural resources is the use of natural resources for economic growth, sometimes with a negative connotation of accompanying environmental degradation. It started to emerge on an industrial scale in the 19th century as the extraction and processing of raw materials (such as in mining, steam power, and machinery) developed much further than it had in preindustrial areas. During the 20th century, energy consumption rapidly increased. Today, about 80% of the world's energy consumption