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STATUS OF SOLID WASTE MANAGEMENT IN THE UNITED STATES

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It is a privilege to take part in the second international congress of the International Solid Wastes Association, and to have this opportunity to discuss the status of solid waste management in the United States.

Beginning with a land rich in resources followed by a long period of general self-sufficiency, the United States has evolved into a highly industrialized, technologically-oriented society in its 200 years of existence as a nation. Historically, we have extracted, processed, and consumed resources as if the supplies were endless and have discarded the residual "wastes" into the air and water and onto the land as if the environment's capacity for absorbing them were endless. Also, we gave little thought to the long-term consequences of our traditional attitudes until the beginning of this decade, when, along with most of the rest of the world, we finally awoke to the alarming fact that continued environmental short-sightedness and misuse of industrial technology could condemn our country and, indeed, this planet, to certain disaster.

With the awakening came widespread public concern and protest about environmental degradation which, in this decade, has produced truly meaningful changes in our attitudes, habits, and institutions. Growing concern about the pollution of air and water in the last decade led, at the dawn of this one, to a much broader environmental awareness, which both produced, and is symbolized by, the National Environmental Policy

Act. This unique law marked the beginning of the end of 194 years of frontier philosophy by setting forth the remarkable notion that man and nature must exist in productive harmony.

Since concern about pollution of air and water preceded the awakening, it is not surprising that one of the earliest and most tangible benefits of it was a strengthening of air, water, and ocean pollution control at all levels of government in the United States. Concern about misuse of the third environmental medium, the land--illustrated by the indiscriminate dumping of industrial, municipal, agricultural, and other wastes--lagged behind and is just now beginning to receive serious public attention in our society. Ironically, the progress we are making in air, water, and ocean pollution control efforts is one of the important reasons why the undesirable consequences of land disposal are beginning to be noticed. We are finding that more and more of the discards that we once dumped freely into the air or water or ocean are now being placed on the land in ways which too often allow them to find their way back again into surface or ground waters, or into the air or ocean.

We are just now on the threshold of accepting the fact that the manner in which a society treats its land and manages its solid waste is a fundamental environmental problem, just as air and water pollution control are, with far-reaching public health, economic, and social implications, and with an important bearing on the essential integrity of ecological systems upon which we depend for life itself. We are beginning to acknowledge that it is environmental folly to continue to dispose

of solid waste irresponsibly, and economic folly to continue to consign valuable resources to the trash heap while the world's supplies of natural resources continue to dwindle.

We are on the threshold of a new era--an era in which the economic and environmental folly that has too often characterized our handling of solid wastes until now, must give way to an emerging economic and environmental imperative for responsible solid waste management. The status of solid waste management in the United States today, therefore, can best be described as "in transition."

In 1971, American agriculture produced 2 1/2 billion tons of plant and animal wastes, most of which were burned or dumped or flushed into the water. Timber processing in 1971 produced a half billion tons of waste; most of that was burned. Mining produced a billion tons of slag and tailings, and most of those wastes were left piled atop the land.

Of particular concern to municipalities is the collection and disposal of residential and commercial solid wastes. This is currently carried out at a total annual cost of about $3.5 billion. The costs are expected to increase substantially over the next five to ten years. In 1974, it cost an average of $26 to collect, process, and landfill a ton of municipal solid waste. It is expected that this cost will rise to $50 a ton by 1985. Per capita waste generation for 1973 was estimated at 3.5 pounds per day, compared with 3.3 pounds in 1971. Of these wastes, packaging accounts for 35 percent of the tonnage. Between 1958 and 1976, consumption of packaging, 90 percent of which is disposed of, will have

increased an estimated 63 percent. Projections to 1985 indicate that wastes disposed of will amount to some 30 million tons above the 1973 figure of 135 million--even if the tonnages of waste recovered for recycling or use as fuel are increased fourfold over 1975 levels.

In total, our local governments have to cope with some 135 million tons of municipal solid wastes a year, or more than 1,200 pounds per person per year of paper, glass, metals, plastics, food wastes, and other discards from our homes and businesses.

And the load is growing. It has almost doubled in the past 20 years, and we estimate that it will reach 165 million tons a year by 1985.

Most of this municipal waste ends up on the land. There are some 18,500 known land disposal sites in the United States. Some masquerade as sanitary landfills, but fewer than 6,000 of them meet State regulations. And there are unknown numbers of open dumps.

Moreover, recent investigation gives us good reason to question whether the sanitary landfill which does comply with current standards of good practice is really good enough. We are now intensifying study to determine whether we are adequately protecting our groundwater supplies from potential leachate damage. In one important sense, we are just beginning to explore the frontier of what is meant by the term "adequate" land disposal of municipal, hazardous, and all other wastes.

Almost half of our cities estimate that they will run out of known and available municipal waste disposal sites within a few years. Our 48

largest cities now spend nearly half of their environmental budgets on solid waste collection and disposal.

In addition to the mounting waste loads, other important factors figure in this extremely difficult problem. Citizens have put up increasing resistance to having disposal sites established near their neighborhoods, which is understandable, since many sites that have been called sanitary landfills are really little more than open dumps. The general scarcity and rising costs of undeveloped tracts of land near cities and the requirements for environmentally sound site selection that states are now beginning to impose are other constraints that must be considered.

Moreover, there is little incentive to curb municipal waste growth. The various costs of disposal are borne by taxpayers and are not included in the costs of the products that make up the waste stream. Those who produce and those who consume products, therefore, do not receive the cost signals that would serve as incentives to curtail unnecessary contributions to the waste stream.

Neither are we properly handling the 260 million dry tons of solid waste generated each year by industry in the United States. These are of particular concern to the States and to the Federal Government. Unlike residential and commercial solid wastes, industrial residuals are generally disposed of by the waste generators themselves rather than by municipalities. The level of interest in industrial wastes has not been high historically, but has risen sharply in this decade. Studies conducted in the last three years indicate that hazardous wastes, which are

generated mainly by industry and which require special procedures in handling, storage, transport, processing, and disposal, have health and environmental impacts far greater than our past or prevailing practices would suggest. It is estimated that from 10 to 15 percent of the approximately 260 million dry tons of waste that industry generates each year contains hazardous substances, such as toxic metals and organic solvents, in sufficient concentration to be potentially hazardous to public health if disposed of improperly. At present, only about 4 percent of hazardous waste is treated before disposal on the land; another 4 percent is recycle

The expected future trend in hazardous waste generation is of even greater concern: studies point to a 56-percent increase during the next decade. A major factor is the progressive implementation of air and water pollution control laws, ocean dumping bans, and cancellation of certain pesticides. The significance of this factor is illustrated by EPA estimates of the combined total waste and the pollution control residual fraction for four major industries (inorganic chemicals, paper, steel, and nonferrous smelting/refining) in 1971, 1977, and 1983. The total waste will increase by 70 percent in 1977, and by 100 percent in 1983. Pollution control residuals account for about 75 percent of the total waste in these industries. While not all industries will have this degree of waste growth, the trend is unmistakable.

Added to these waste problems are some seven million tons of sludge generated by our municipal sewage treatment plants each year. And that amount is growing, too, as more and more communities are building new wastewater treatment facilities.

In sum, we estimate that about 90 percent of municipal and industrial solid wastes are disposed of on the land in environmentally questionable ways. The results are potential public health problems; groundwater contamination by leachate; surface water pollution by runoff; air pollution from open burning, evaporation, sublimation, and wind erosion; fires and explosions at dumps; and needless risk to ecological systems.

Many land disposal sites are leaching heavy metals, biological contaminants, and other pollutants into the groundwater, on which we are becoming increasingly dependent for drinking water. EPA studies show that thousands of acres of landfills containing municipal and industrial solid wastes are major potential sources of groundwater contamination, and that industrial storage and disposal lagoons, pits, and basins are leaking millions of gallons of potentially hazardous substances into the groundwater each year.

Our concerns are compounded by the fact that subsurface migration of pollutants is generally an extremely slow process. Thus, we may not yet know the long-term public health, economic, and ecological consequences of the huge quantities of municipal and industrial solid wastes we have dumped upon the land in past decades.

Ironically, in spite of greatly increased environmental concern, we are currently recycling a lower percentage of our resources than ever before in history. The United States annually consumes over 200 million tons of major metals, paper, glass, rubber, and textiles. It has been estimated that about three-fourths of the total comes from virgin

resources; the remaining quarter is obtained from resource recovery operations. Virtually all of the recovered materials are derived from discards of industrial processing and manufacturing activities rather than from post-consumer waste from the municipal solid waste stream.

The mixed municipal wastes from our larger urban areas now pose an environmental problem, but they could be made to generate 830 trillion BTU's of energy--the equivalent of 400 thousand barrels of oil per day, which is a third of the initial output of the trans-Alaskan pipeline. Seven percent of our iron, 8 percent of the aluminum, 5 percent of the copper, 3 percent of the lead, 19 percent of the tin, and 14 percent of the paper consumed each year could be supplied from what is now waste. And these are simply the obvious potentials, based on the recovery of mixed residential and commercial wastes. Recovery of materials or energy values from industrial sludges that now go to disposal, from crop and animal wastes, and from timber residues could easily triple the potential.

Studies indicate that the failure to control the amounts of waste produced in the first place and to recover resources that have become wastes have far-reaching environmental consequences. The benefits of curtailing the production of wastes in the first place are perhaps as obvious as they are far-reaching. However, even the recovery of resources that have become wastes produces benefits much more consequential than most people realize. When two production systems are compared--one using virgin materials and the other, secondary materials--the system using secondary material causes less air and water pollution, generates less

solid waste, and consumes less energy.

EPA's role in dealing with solid waste management derives from the Solid Waste Disposal Act of 1965. This Act authorized the creation of a modest program of technical assistance to States, local governments, and interstate agencies for the planning and development of solid waste management programs, and to promote national research programs to find better methods of controlling, processing, recovering, and recycling wastes and disposing of residues. In the early years of implementation of the Act, major emphasis was placed on improving collection and disposal of the municipal solid waste stream.

In 1970, this Act was amended by the Resource Recovery Act, which stressed the need to advance resource recovery in solid waste management and directed that studies be made, with requirements for reporting back to Congress, to determine the best means for recovering materials and energy from solid waste and reducing waste at its sources, and to recommend public policies, including economic incentives, that would encourage the reclamation and recycling of solid wastes. It required, also, a comprehensive report on the hazardous waste problem in the United States and recommendations for action.

The three interrelated issues which are receiving renewed attention today are: first, how to curtail the adverse effects on the environment and public health of the improper disposal of wastes on the land; second, how to bring about as quickly as possible the recovery of energy and materials from wastes, which requires that we overcome

deeply-rooted institutional barriers which, despite strong public interest, continue to inhibit the recovery of materials and energy; third, the issue of waste reduction--that it to say, the question of how to reduce unnecessary materials consumption in the first place, and how to avoid materials and products which may cause irreparable harm to the environment.

These problems are not likely to be susceptible to solution within the framework of existing environmental legislation. Effective solid waste management requires a clear emphasis on the interrelationship between resource use and pollution control problems, as well as a clear recognition of the fact that the land is one of the three environmental media susceptible to overburdens of pollution and capable of transferring pollution, in turn, to the other media--air and water.

There seems to be little question that the first issue, land disposal, calls for a regulatory approach, to bring state, local, and federal enforcement efforts to bear on industrial and other sources of harmful residuals. Disagreements on approaches exist among the public, environmentalists, industry, and government, and can be expected; but the need for controlling the random disposition of wastes on the land is not seriously questioned and is just as real as the need to keep them out of the water and out of the air.

A principal thrust of EPA's solid waste management strategy has been to assist States in preparing to assume the primary regulatory role in land disposal and to become the primary catalyst and facilitating

agent to bring about increased resource recovery.

The second issue--the recovery of materials and energy from the waste stream--has great popular appeal.

Materials recovery is achieved by either mechanical or separate collection approaches. Separate collection systems potentially have much wider application than mechanical systems, because they do not require intensive capital investment, are not dependent on economy of scale, and generally allow more flexibility.

To what extent separation by the householder and separate collection can be an active and viable form of resource recovery is not known. Most of those who are currently promoting resource recovery of municipal solid waste strongly favor technological approaches applied after the wastes have been homogenized and deposited at a recovery/disposal site. Moreover, those officially responsible for municipal collection and disposal are not, in general, inclined to "experiment" with separate collection initiatives, because of the past history of unstable markets, waning citizen interest, and abandoned systems. This does not necessarily mean that such approaches will not work, particularly since the citizen today may be more positively motivated than was true in decades past. Newsprint, which is easy to collect separately as an uncontaminated waste, is currently the sole exception to this general attitude about separate collection.

EPA has identified over 60 major metropolitan areas where mechanical energy/materials recovery seems feasible. These areas account for about

180,000 tons of solid waste a day, 66 million tons annually, or more than half of the municipal waste stream.

About 7 percent of the energy and materials available from municipal waste is being recovered today. Dry fuel production and steam recovery incinerators have been demonstrated and are actually being employed in a few cities. Energy recovery by dry or wet shredded fuel production, as steam or electricity, and as pyrolytic gas and oil, should all become viable, demonstrated technical in the not too distant future. Mechanical materials recovery systems are somewhere between the demonstration and the operational phases.

There is growing evidence that utilities and private fuel users are beginning to view solid waste as an attractive fuel. High materials and energy prices, along with demands for environmentally sound disposal practices, will no doubt require municipalities to place more attention on resource recovery as it becomes more economically competitive with disposal.

In 1971, only two cities had source separation programs. There were no State resource recovery programs. Only two federally-funded projects were under way to demonstrate resource recovery technology. No city was committed to a large-scale resource recovery facility. Private industry was not marketing large-scale resource recovery systems and had barely begun to design or test such systems.

Today, a number of federal and private industry demonstration projects are under way. More than 30 major companies are promoting

resource recovery systems. Nineteen large-scale resource recovery operations are planned by local governments working with private industry. Over 40 other cities are considering similar projects. Some 135 cities are conducting source separation programs, and 12 States are planning or regulating resource recovery programs.

Moreover, bills introduced in the past few years leave little doubt that Congress is seeking ways of increasing the incentives for municipalities and industries to engage in widespread post-consumer resource recovery operations.

Nevertheless, resource recovery must grow in a national soil and climate which, historically, has favored in countless ways the use of virgin materials and the random production and disposal of wastes. Attention is just beginning to be focused on the inhibitions to resource recovery which are inherent in our tax structure, depletion allowances, transportation rates, and national public attitudes.

The third area of emphasis--waste reduction--is one which touches most directly at the heart of the environmental issue. The furor it has caused has focused mostly on packaging, but this may be deceptive, for the issue touches on a central question which has very disturbing implications for those who hold the view that high energy/materials use and high consumption are necessarily the hallmark of a technologically advanced society. Behind the packaging and the returnable versus the nonreturnable beverage container arguments lie more serious issues concerning, for example, long-lived tires, more durable appliances, smaller

cars, more renovation and less demolition, and could involve the redesign of many thousands of products to make them require less energy, use less material, and last longer.

Those who contend that the marketplace will automatically take care of such questions say that the rising cost of materials, energy, and waste management will inevitably lead to increased resource conservation, to more efficient materials use throughout the economy. A dispassionate appraisal of our country's historical record in the use of technology and resources, however, does not offer assurance that market signals will necessarily result in socially optimal uses of material and energy resources and environmental protection. The producers of products have never had to take into account the social and environmental costs of land disposal associated with their operations.

When waste reduction is discussed, one is inevitably led to the subject of packaging. Packaging activity in the United States has grown at a very rapid rate over recent decades. Shipments of containers and packaging were valued at $19.7 billion in 1971, an increase of 5 percent since 1970, and an increase of 82 percent since 1960.

The growth of packaging consumption has led to increased consumption of raw materials and energy, and an increased rate of generation of solid waste. In 1971, packaging accounted for approximately 47 percent of all paper production, 14 percent of aluminum production, 75 percent of glass production, more than 8 percent of steel production, and approximately 29 percent of plastic production. At that time, energy

used for production of packaging materials represented an estimated 5 percent of total U.S. industrial energy consumption.

Post-consumer solid waste resulting from the discard of packaging material was estimated at between 40 and 50 million tons in 1971. Packaging was thus estimated to be between 30 and 40 percent of municipal solid waste, based on the EPA estimate of 125 million tons of municipal solid waste in 1971.

None of the above is intended to imply that packaging per se is an evil. The passing of the picturesque and unsanitary packaging practices of the past is hardly an occasion for mourning, and the materials, techniques, and practices of yesterday could not possibly suffice in our society of today. Moreover, some of our current packaging practices do curtail significantly other potential components of the municipal waste stream. What is needed is a clearer definition of what comprises undesirable packaging, agreement to curtail its use, and renewed efforts to employ packaging materials, whenever feasible, which avoid excessive energy and materials use, coupled with vastly extended and improved resource recovery programs throughout the country.

The leading edge of the packaging controvery has to do with the returnable versus the nonreturnable beverage container. For many years, those who advocated use of the returnable beverage container based their case primarily on the litter problem, and those who felt differently countered by offering litter-control programs of one kind or another and by pointing out that littering in general was a personal problem that

could be overcome only through public education. But in recent years, as the Environmental Protection Agency finished the resource recovery reports that were called for in the 1970 Resource Recovery Act and the energy shortage hit home, the emphasis has shifted. When energy and materials consumption and attendant environmental damage are taken into account, the efficacy of the nonreturnable beverage container should be reevaluated.

Historically, throughout the economy, the environmental, public health, and direct dollar costs of the disposal of wastes have affected only very slightly, if at all, the extraction, manufacturing, and distribution decisions of those sectors of the economy which produce the products which account for the size and nature of various waste streams. While no single piece of legislation and no single agency of government can or should be expected to control all the technical, sociological, and economic variables which influence the size, nature, and disposition of the waste stream, sensible and timely changes in the direction of more intelligent resource use/disposal decisions will occur because of the body of knowledge and the assistance and demonstration activities which have evolved from passage of the Solid Waste Disposal Act (P.L. 89-272) of 1965.

Since even a doubling of current projections of resource recovery plant installations by 1985 would still leave over 70 percent of the municipal solid waste stream unrecovered--or 145 million tons destined for disposal--it is clear that waste reduction alternatives should be

given serious consideration. Local public agencies, whose solid waste management expenditures dwarf those of the State and federal levels, have virtually no influence over the types and quantities of wastes produced. We can no longer close our eyes to the fact that the producer of what ultimately becomes waste bases his decisions on the costs that he directly experiences, not on the costs incurred by those who must dispose of the wastes.

As we learned in our efforts to control air and water pollution, the solid waste management problem is national--indeed, international--in scope.

Federal law has so far limited the federal role to research into solid waste problems; to encouraging proper collection and disposal practices; to providing technical information; to providing modest federal grants to promote the development of State solid waste management plans; to providing modest federal grants to demonstrate new resource recovery technology; and to studying the hazardous waste problem and suggesting ways to cope with it.

Under our existing legislative authority, and with a budget of $15.6 million this year, we in EPA are expanding our knowledge of the total environmental consequences of our traditional mining, manufacturing, marketing, and distribution practices as they relate to the use of resources and to air, water, and land pollution. We are evaluating ways of encouraging voluntary waste reduction in the manufacture and distribution of products. We are monitoring resource recovery projects and

providing technical assistance to ensure the development of appropriate technology and workable institutional and financial arrangements for maximum recovery and reuse of resources from solid waste.

We are helping to finance several projects to demonstrate new technology in the recovery of energy and materials from waste. Federal assumption of part of the costs reduces the risks to State and local governments of investing in expensive and unproven technology. One project uses shredded waste as a partial substitute for coal as fuel to generate electricity. Another project recovers metals, color-sorted glass, and paper fiber from municipal refuse and then incinerates the residues along with sludge from an adjacent sewage treatment plant. Another will produce a marketable oil-like fuel and recover metals and glass from solid waste. Another project will produce aggregate for street paving and steam for heating and cooling from solid waste. Another will extract metals and glass and then produce supplemental boiler fuel from municipal solid waste, industrial waste, and sewage sludge.

In addition to these "high technology" demonstration projects, whose financial soundness is dependent in part on the production of energy, we are also supporting source separation demonstration projects to spur the recovery of materials from the municipal waste stream. With the help of EPA grants, two communities are now determining to what extent the public will cooperate and separate municipal solid wastes at the source--in their homes. If these tests are successful--and preliminary reports indicate they will be--this could represent a significant

step forward. It will show that mechanical and "high technology" separation of mixed solid wastes, which requires a large capital investment and large amounts of energy, is not the only useful approach. Separation at the source of paper, corrugated, glass, aluminum and steel cans, and food wastes could greatly improve the economics of materials recovery in metropolitan areas. In addition, for thousands of small communities, source separation may be the only feasible way to recover resources and lower disposal costs.

EPA is also continuing to support research and to develop new knowlege on the public health and environmental effects of land disposal. We are working with local and State governments to improve solid waste collection practices. We are providing technical assistance and a flow of information to local and State governments to speed the application of sound waste management practices.

We are encouraging State solid waste management agencies to take a stronger role in protecting the land and a more responsible role in managing solid wastes. I am pleased to report that the number of people employed by State government solid waste management programs has risen from ten to over 650 in the last ten years.

And there are other encouraging signs of new awareness of the seriousness of the solid waste problem in our State governments:

Forty-five States now require a permit or license for land disposal; 20 States have special regulations for at least some hazardous wastes; 9 States have grant or loan programs for resource recovery; and 15 States

hope to have operating energy recovery systems by 1980.

We are also continuing to call attention to existing federal policies which directly or indirectly favor the use of virgin materials. We are challenging freight rates that discriminate against the transport of secondary materials. We are pressing for modifications in federal procurement regulations to specify the use of recycled materials whenever and wherever feasible.

We are continuing to improve our understanding of the scope of the hazardous waste problem. We are furthering our knowledge of the quantity, composition, and sources of these wastes. We are identifying and assessing safe treatment and disposal methods; developing criteria for proper processing and disposal; and investigating the health and environmental effects of improper hazardous waste management. And we are providing much needed information on the state of the art of hazardous waste management technology to industry and to State and local governments.

Rising fuel costs, rising costs of land for disposal, and indiscriminate use of energy and materials inherent in our prevailing solid waste management systems, and, most important of all, rising public awareness of these interrelated issues have led to a new level of interest in both the legislative and executive branches of our government.

In both the Senate and the House of Representatives of the United States Congress, the committees primarily responsible for solid waste management have drafted major new bills intended to help our society cope with solid waste management as it is increasingly perceived today--a

problem that is concerned with the interrelated issues of resource use and the disposal of waste of all varieties on the land. Within the Executive Branch of government, the same issues are being considered. At some point in the future, as all the various segments of our society who have opinions on one or another aspect of the problem let their views be known, the nature of the legislative base will emerge.

Let me conclude by summarizing briefly some of the major legislative issues that are currently being debated in the U.S.

Under consideration are proposals:

- To ensure the regulation of all land disposal, including hazardous wastes and municipal wastes, by State governments operating under federal guidelines.

- To make federal funds available to state and local governments to plan and implement resource and energy recovery systems.

- To encourage, through financial and other means, regional solid waste management planning.

- To enhance EPA's capacity to provide solid waste management technical assistance and information to state and local government.

- To broaden the information base on energy and materials recovery, on waste reduction options, and on the environmental and health effects of improper disposal practices.

- To internalize the cost of solid waste management in various ways, including the possible use of disposal charges and tax credits.

- To study and report on ways of reducing solid waste generation.

- To investigate management practices and costs affecting solid wastes.

While I certainly cannot predict when or precisely through which legislative means the United States will move to focus a level of attention on the land commensurate with that it has focused on air and water, I am convinced that we are now moving in the proper direction. It is a direction that Russell Train, Administrator of EPA, pointed to when he said recently, "We must act now to save the land from becoming the sink of last resort for pollutants that we are finally and firmly insisting shall no longer be placed in the air and the water."

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