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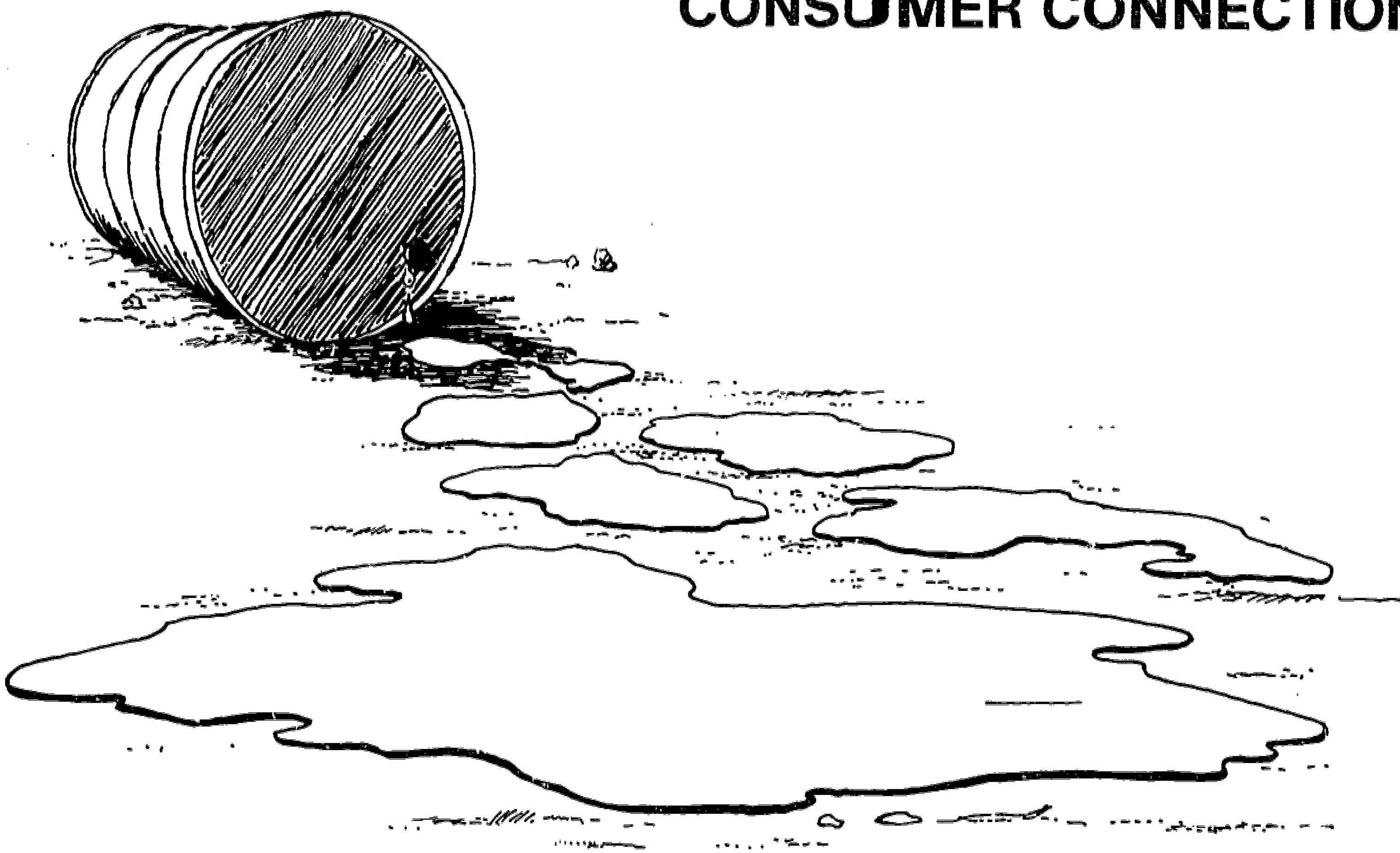
ABSTRACT

Many consumers do not see a strong connection between our lifestyles and buying decisions, and the amount of hazardous wastes generated in the United States. This guide was developed to be used by educators and citizens concerned with the role of consumers in the generation of hazardous wastes. It examines several products in terms of their potential for producing hazardous wastes. These include such common objects as fishing line, plastic bags, frisbees, and paper bags. The document urges citizens to learn more about the industrial processes that transform raw materials into the products we use, and, if it is found that a product generates hazardous waste, the consumer should ask several questions. These include: (1) Do I really need this product at all? (2) Should I substitute another product for this one? (3) Can I use less of this product, or use it less frequently? (4) How will I use this product? and (5) Where will this product ultimately end up? Each of these questions is discussed and options for individual decision making are presented. Also contained in the guide are a glossary of terms and an annotated bibliography of other information and resources. (TW)

HAZARDOUS WASTES and the CONSUMER CONNECTION



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HAZARDOUS WASTES AND THE CONSUMER CONNECTION

A Guide for Educators and Citizens Concerned With The Role of Consumers in the Generation of Hazardous Wastes

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HAZARDOUS WASTES AND THE CONSUMER CONNECTION

"Consumer" is a word that always seems to fit us like somebody else's clothes. Certainly we all buy things, but few of us see ourselves as a moving force in the economy.

Making the connection between "picking up a few things" at the store and "changing consumer trends" is often as difficult as associating our deli order with our cholesterol count. Yet the relationship is just as real. Just as everything we eat --or don't eat--affects our health, everything we buy--or don't buy--affects the economy and often the environment.

It takes an even greater leap of imagination to associate our buying habits with the generation of hazardous wastes. Many products are "hidden generators"--goods that are safe end-products but generate chemical by-products during their production. To a greater extent than most of us realize, our lifestyles and buying decisions determine the amount of hazardous waste generated in America.

LANDSCAPE IN OILS

A quiet rural community with clear skies, shady woods, cold rushing streams, and an abundance of groundwater, must import its drinking water because of chemical contamination. The residents of this community trusted their land and their water to sustain them for a long time. Now the residents shake their heads and wonder who is to blame. Leaking tanks of hazardous chemicals in a local dump have made this deceptively healthy-looking landscape one of the many contaminated sites across America.

When asked who is responsible for the contamination of the community's drinking water, some residents will say that the damage results from those industries which generate wastes without providing for their disposal. Others will say the midnight dumpers, hired by industries to dispose of the substances, are the villains. Still others point to dumpsite owners, who allow toxic chemicals to be dumped on their land without proper precautions.

But a problem as pervasive as improper handling of hazardous wastes is too complex to be attributed to one factor. "Midnight" haulers dump illegally because there are no legitimate, safe places for them to dump within an economical distance of their customers. Some landfill owners accept hazardous chemicals secretly and dispose of them improperly because of fear of the public's reaction if these chemicals were accepted publicly under safe, regulated conditions. And industries generate hazardous wastes because with current technology there is no other way to produce the complex and diverse products which American citizens demand.

The problems of hazardous wastes can only be solved by action on many fronts: (1) public support for siting of safe disposal facilities, which should be as much a part of every community as its sewage system or its paved roads; (2) increased research on the development of cost-effective production methods which generate less hazardous waste; (3) recycling of these chemicals instead of discarding them; and (4) informed consumer decisions in purchasing products which generate hazardous chemicals in their production. This publication concerns itself with this fourth area: consumer decisions, which may inadvertently ensure the generation of more hazardous waste every year.

PUBLIC ACCEPTANCE

A citizenry that perceives hazardous waste as a by-product of civilization (just as we already view sewage, trash, or stormwater runoff) will see the need to pay for waste disposal facilities out of its tax base. Hazardous wastes are here to stay. We can ignore them (until our community, too, is importing its water); we can refuse them (boldly running them out of town at high noon only to have them sneak back in at midnight); or we can prepare for them, regulating them so that the[illegible] re no longer an uncontrolled element [illegible]n our communities.

OPTIONS FOR INDUSTRY

Hazardous waste can be viewed as a valuable resource to be saved, recycled and reused. Some industries already recycle hazardous chemicals. A recovery system needs to be perfected to make this process more cost-effective and to link the industry needing a chemical with the disposer. Alternate production techniques can be developed which are less likely to generate large quantities of hazardous wastes. Are we, as consumers, willing to accept the higher prices imposed on products to cover the cost of implementing such technologies?

OF FRISBEES AND FISHING LINE...

Let us return to our quiet rural community with its contaminated groundwater. How might the lifestyles of its residents have contributed to the generation of hazardous wastes?

Under those clear, cloudless skies, young people play frisbee in the sun. Picnickers in the shady woods consume food that is kept safe from ants and dampness by air-tight plastic containers. And in those cold, rushing streams, fishermen are casting for trout on miraculously lightweight monofilament fishing line.

In nearby homes, children gather around a kitchen table eating cookies from a cardboard package and drinking milk from a plastic container. Both the milk container and the cookie box will shortly make an appearance in a green plastic garbage can that keeps cookie-minded flies from gathering for pillage.

In the living room the children's parents sit reading newspapers--two dailies (a morning and a late edition, just in case anything happened in the interim) and a couple of weeklies. Magazines and catalogues are piling up in the corner which will shortly be recycled by the children in making collages for school. The dog chews quietly in the corner, discreetly mauling a wooden softball bat.

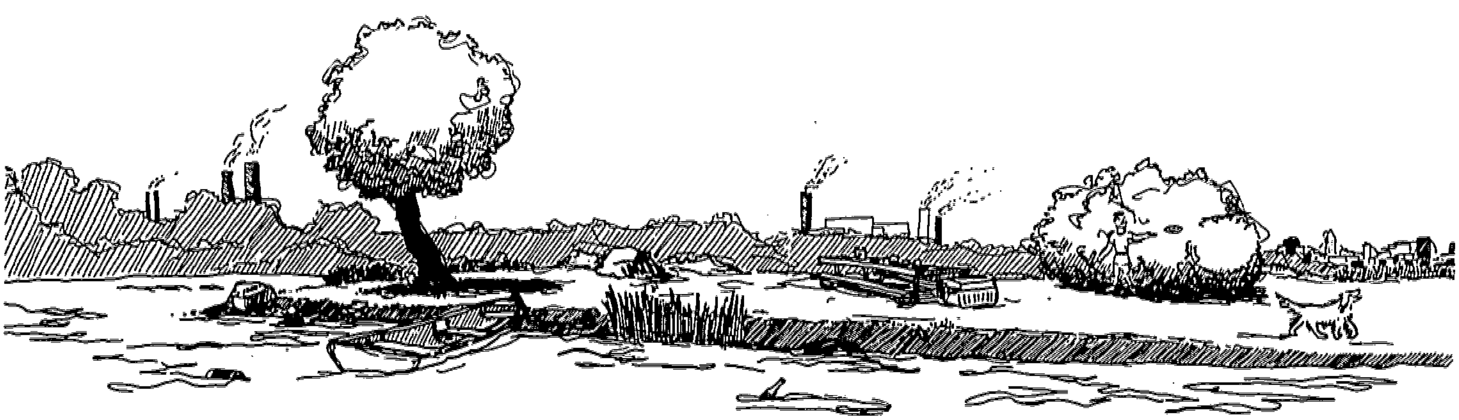
In a nearby office a supervisor asks a secretary to make sure the board of directors, regional managers, and department heads all receive copies of a memorandum. Once received, these copies are placed in fresh manilla folders and filed with six thousand of their kind in sagging filing cabinets. Requests are submitted (in triplicate) for extra storage cabinets.

These activities have one thing in common: they all utilize, with varying degrees of efficiency, products which generate at least one type of hazardous waste.

WHENCE THE WASTE?

Can anything as innocuous as a frisbee and as educational as a newspaper really contribute to hazardous waste generation? What about the fishing line, and that symbol of the great American pastime - the softball bat? In another era it may have been possible to produce toys and home products using relatively chemical-free processes. Today there are few products which can go from cradle to grave--from mining of the original resource to disposing of the finished product--without some potential for environmental contamination.

If we follow as case studies the lifecycles of two common household products--a plasic bag and a paper bag--we will uncover in each an unexpectedly checkered past. Examining the production of these goods should provide us with some insights into the impacts of our own buying decisions.



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THE LIFE OF A PLASTIC BAG

The little plastic bag that keeps your peanut butter sandwich from drying out is made from a product called polyethylene. Many other commonly used items, from frisbees to squeeze bottles, are made of this substance. Polyethylene, in turn, is a petroleum product. So to trace our plastic bag to its infancy we must begin with the processing of crude oil.

Petroleum (or crude oil) is a naturally-occurring, complex mixture of carbon and hydrogen compounds. It also usually contains some sulfur and trace amounts of nickel, vanadium, and other elements.

Petroleum itself is quite toxic in high concentrations. Blow-outs at wells and leaks from pipelines, wells, storage tanks, and oil tankers release petroleum into the environment, killing plants and animals. It also enters the food chain and has the potential for causing cancer. Since heavy metals and chlorinated hydrocarbons (like DDT and PCB) are soluble in oil rather than water, oil pollution tends to collect and hold these non-petroleum toxic substances. The toxic effects of crude oil have been observed for up to ten years after a spill. (See "OILY WATERS").

After drilling, crude petroleum is piped or shipped by tanker to refineries. There it is first washed to remove salts and suspended solids, then subjected to three processes:

SEPARATION (or fractionating)--where the hydrocarbons are separated by evaporating and then condensing them at different temperatures.

CONVERSION (or cracking)--where components are treated with heat, pressure, and/or catalysts such as platinum to change the molecular weight and shape of the resulting compounds.

UPGRADING--to meet product qualities desired, such as adding antistalling chemicals to gasoline.

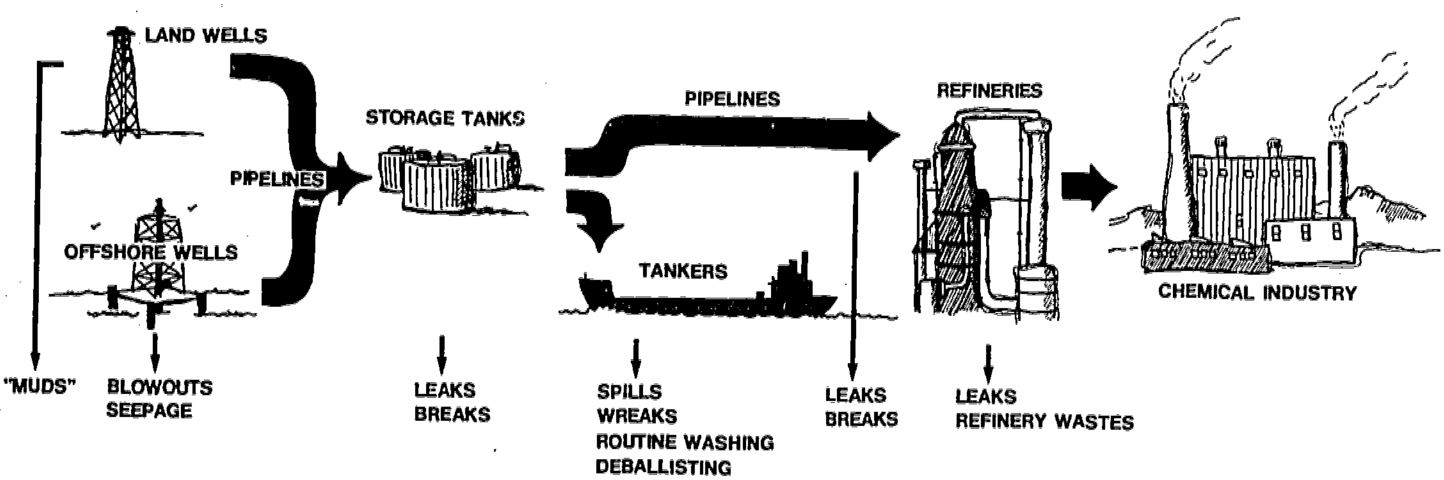
OILY WATERS

More than 12,600 wells have been drilled in U.S. waters, plus many more around the world. Such offshore drilling has been associated with severe oil pollution, as in the case of the 1979 Campeche Bay blowout in the Gulf of Mexico.

Over 7,000 oil tankers world-wide average 1,000 accidents per year (two to three per day). But petroleum pollution from these accidents is still smaller than (about one-fourth of) the amount of oil pollution from routine tanker operations such as deballasting and tanker washing.

About eight million tons of petroleum pollute the oceans each year. Thor Heyerdahl in the RA II crossing of the Atlantic saw evidence of oil pollution 47 out of 57 days. Each barrel of oil (weighing one-seventh of a ton or 130 kilograms) when spilled covers from one-half to as much as three square miles (1.3 to 7.8 square kilometers) and may poison about 500 pounds (227 kilograms) of clams, lobsters, fish, seals and birds.

Of all the water pollution in and around the United States, crude oil and fuel oil account for 68% of it by weight.



Toxic air pollutants are released from refineries through leaks, evaporation, and handling losses. These pollutants include various hydrocarbons, particulates, nitrous oxides, and carbon monoxide (the last two from burning petroleum to provide heat for refining). Sulfur oxide compounds are also produced if sulfur is not removed from the petroleum in early processing.

Refineries also contribute to water pollution with toxic metals, hydrocarbons, sulfur compounds, chlorine compounds, and ammonia. (See "TOXIC POLLUTANTS FROM REFINERIES")

The petroleum refining industry is one of the largest United States manufacturing operations. It is also considered one of the five most polluting industries. In 1977, for example, it contributed 1.8 million metric tons of hazardous waste to the environment.

TOXIC POLLUTANTS FROM REFINERIES

ammonia (NH_3) - used for pH control and normally not at toxic levels, but can cause toxic pH change in water

carbon monoxide (CO) - toxic air pollutant

chlorine and subsequent chlorine compounds - used to treat cooling water to control corrosion and biological fouling; usually a minor pollutant and replaced by other chemicals in some plants

chromium, copper, lead, zinc - metals which can be toxic; small amounts released

crude oil

hydrocarbons - variety of toxic air and water pollutants made up of hydrogen and carbon

hydrogen sulfide (H_2S), sulfur-containing mercaptans, and other sulfides - toxic water pollutants and major sulfur compounds produced, but generally under control

nitrous oxides - toxic gases of nitrogen and oxygen

polycyclic hydrocarbons, such as benzopyrene - carcinogenic hydrocarbons

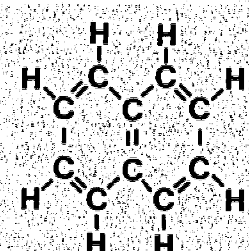
sulfur oxides - toxic gases of sulfur and oxygen

From the refinery we must somehow get ethylene in order to make polyethylene for our plastic bag. Ethylene can be manufactured from several components of petroleum: ethane, propane, or mixtures such as natural gas liquids, naphthas, or gas oils. Increasingly the trend is to use the heavier naphthas, so let's follow that pathway. (SEE "NAPHTHA")

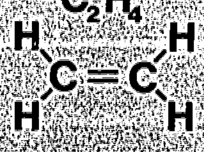
All the pollutants mentioned to this point are not only potentially associated with our plastic bag but also with the more than 2,000 other petroleum products. These products include gasoline, heating oil, asphalt, detergents, cosmetics, pesticides, textiles, medications, alcohols, solvents, synthetic elastomers, and many kinds of plastics.

NAPHTHA

A mixture of similar weight hydrocarbons found in petroleum; heavier and bigger than gasoline molecules; made up of fused polycyclic hydrocarbons such as the napthalene on the right.



C_2H_4



ETHYLENE

A colorless gas at normal room temperature and pressures. As the formulas show, ethylene is an unsaturated hydrocarbon. A double bond connects the two carbons, allowing additional atoms or molecules to attach to the carbon if one of the bonds break.

Naphtha, derived from the initial separating column, is further refined by heating in the presence of a catalyst. This causes the large compounds to break into smaller molecules. After a series of steps involving repeated evaporation, separation by weight, and condensing into liquids, six chemicals are produced: methane, propylene, butylene, ethane, hydrogen, and ethylene.

These chemicals (along with benzene) represent less than 10% of the output of oil refineries, but they account for more than two-thirds of the organic chemicals used in the United States. They supply more than half of the plastics and fibers, two-thirds of the synthetic rubber, two-thirds of the soaps and detergents, and appear in almost all cosmetics, pharmaceuticals and insecticides.

Ethylene is today's largest volume organic chemical--almost 30 billion pounds are used in the United States each year. (See "ETHYLENE") In addition to being useful, however, it is also dangerous. Ethylene is moderately narcotic, toxic, and possibly carcinogenic. These properties concern workers in ethylene industries where they clean out equipment or bag polyethylene (where small amounts of nonreactive ethylene may still be present). The greatest danger is the risk to workers due to its high flammability and explosiveness.

Polyethylene is formed when the double bonds between the carbon atoms of ethylene are broken. This allows many ethylene molecules to join together into long chains or polymers. The formation of polyethylene polymers can be done under different conditions, resulting in three classes of polyethylenes with different properties and uses. (See "TYPES OF POLYETHYLENE")

TYPES OF POLYETHYLENE	PRODUCTION	USES
Low Density Polyethylene		
- many branches - melting point 107-121°C - Density 0.92 g/cm^3 - stiffness 25-30 psix10^3 (more flexible than other types)	high temperature, (about 300 C) high pressure (25,000-50,000 psi), and peroxide catalyst	mostly in films for packaging: food, garment, refuse, and shipping bags, Shrink and stretch wrapping; coatings for cardboard milk containers; some lids and housewares
High Density Polyethylene		
- no branches - melting pt. 125-132°C - density 0.95 g/cm^3 (less permeable to gas) - stiffness 90-150 psi x10^3 (stiffer) - stronger, harder, less glossy, more grease resistant	metallic catalysts (e.g. chromium oxide or titanium tetrachloride), temperatures about 150 C, and low pressures (few hundred psi)	plastic milk bottles, bleach, liquid detergent beverage and anti-freeze containers; snack food, bakery, and grocery bags; dish pans, waste baskets, pipes
Linear Low Density Polyethylene		
- new, non-branching but low density form - more haze (not as clear) and somewhat greater stiffness than Low Density Polyethylene	low pressure, but high temperatures (about 100 C)	often used in place of low density polyethylene where greater strength or thinness desired but clarity and high flexibility not as important

In addition to the physical manufacturing processes, chemical additives and fillers are used to vary properties of the end product. (See "ADDITIVES FOR PLASTICS") Our plastic lunch bag will only have a few of these additives since it is 90-99 percent pure polyethylene. Most commonly it would have antioxidants (specifically cleared by the Food and Drug Administration for food contact) as well as slip and anti-block additives (to keep the film from sticking to itself).

We've seen the astonishing number of chemicals generated or used in the production of one simple plastic lunch bag. What are the alternatives? One possibility is the paper bag, a product that appears to be natural and biodegradable. Since we've "aired the family linen" of the plastic bag, let's take a look at the paper bag to see what skeletons are rattling in its closets.

ADDITIVES FOR PLASTICS

Antioxidants - chemicals such as phenols, amines, and phosphites added to prevent loss of properties during processing and use.

UV Stabilizers - often carbon black, added to plastics destined for outdoor use; prevents degradation due to ultraviolet radiation.

Anti-block Additives - inorganic fillers like silica to keep film from sticking to itself.

Slip Additives - fatty acid amides to keep film from sticking.

Fillers - added to reduce cost or modify physical properties; wood pulp or mica for bulk; glass fibers or clay to reinforce, improve rigidity and tensile strength.

Surface Coatings - to make plastic receptive to printing inks and glues.

Colorants and Pigments, Dyestuffs, and Minerals - to change color.

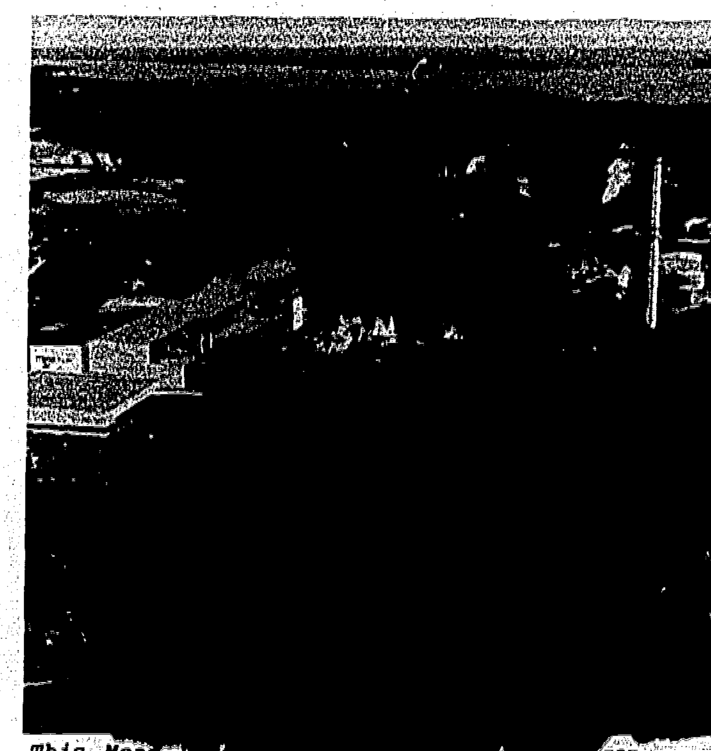
Plasticizers - a kind of internal lubricant, overcoming the attraction between the chains and preventing them from intermeshing; they increase moldability. Most plasticizers are organic compounds called esters. There are serious health concerns with some but strict regulation restricts those which are hazardous from being used in products that come in contact with food.

THE LIFE OF A PAPER BAG

The story of the brown paper bag can be traced back as far as 4,000 years. At that time papyrus was first pressed into a writing surface by the Egyptians. Over the years, techniques for mashing and pressing fibers from cotton, linen, rags, straw, and bark were perfected. Today 99 percent of all paper fiber comes from wood pulp. Wood, however, has only been a feasible source in the last 100 years with the advent of a chemical-intensive pulping process.

For the most part, the companies that produce paper also own forest land. Nursery greenhouses raise genetically superior trees with fertilizer chemicals before the seedlings are transplanted to clearcut patches of open ground. To reduce competition from herbaceous plants and hardwood trees, the young forests are repeatedly sprayed for 5-10 years with herbicides. Pesticides are also used to guard against infestations by insects and fungi.

When ready to be harvested the trees are cut and chipped before being transported to a pulp mill. At the mill one of the several pulping processes separate and break down the wood fibers.



This Mead [illegible] gan employs about 1,500 people. Because it produces high-grade paper, more chemicals are used. But modern equipment and management philosophy result in very little release of pollution from the plant.

WOOD PULP PROCESSING CHEMICALS

Sulfite Process - wood chips are cooked under controlled temperatures and pressure in an acidic solution of calcium bisulfite.

Soda Process - wood chips are cooked in an alkaline solution of caustic soda.

Sulfate or Kraft Process - wood chips cooked in an alkaline solution of sodium hydroxide (NaOH) and sodium sulfide (Na_2S). Odorous, volatile, and toxic sulfur-containing compounds are commonly released from plants built before 1970. (Some plant explosions have occurred because of these vapors). The sulfur compounds include hydrogen sulfide (H_2S), dimethyl sulfide ($(CH_3)_2S$), dimethyl disulfide ($(CH_3)_2S_2$), sulfur oxides (SO_x), nitrogen oxides (NO_x), and methyl mercaptans (CH_3SH).

Bleaching - done with sodium bisulfite ($NaHSO_3$) and sodium peroxide (N_2O_2) [with sodium silicate ($NaSiO_3$) and magnesium sulfate ($MgSO_4$) to buffer the solution] or four to five of the following in various combinations: chlorine gas, sodium hydroxide (NaOH), calcium hydroxide ($Ca(OH)_2$), chlorine dioxide (ClO_2), oxygen, hydrogen peroxide (H_2O_2), ozone (O_3), calcium or sodium hypochlorite (NaHCl), solid sodium or zinc hydrosulfite ($ZnS_2O_6 \cdot 2H_2O$), sulfuric acid (H_2SO_4), and sulfur dioxide (SO_2).

***

Mutagenic organic chlorine compounds are produced in the waste water when some of these chlorine compounds are used. Attempts are made to avoid their production by using chlorine dioxide. But chlorine dioxide is explosive, toxic, and highly corrosive. For safety, it is generated in small quantities at the point it is used.

The toxic bleach-plant wastes are least amenable to solution of all the wastes from paper plants.

In one process, pulp is produced by physically grinding the wood or by applying heat and pressure. This pulp is restricted to lower quality paper (e.g., egg cartons and most newsprint) because the fibers are too short for much strength.

Other pulp processes involve cooking the chips in a chemical solution of sodas, sulfites, or sulfates. The most widely used, producing 65% of all papers, is the sulfate or Kraft process. An alkaline solution of sodium hydroxide and sodium sulfide breaks down the wood fibers at high temperatures. (See "WOOD PULP PROCESSING CHEMICALS") In older plants the volatile and toxic sulfur-containing compounds are a source of much air pollution. Sulfur dioxide can extensively damage crops up to fifteen miles from the mill.

The pulp is then usually bleached with a solution of sodium or chlorine compounds. Some of these chemicals generate toxic vapors. A few are known to cause mutations. The newer plants attempt to recycle these bleaching agents for reasons of economy and pollution control.

An array of chemicals are added to enhance pulp whiteness, paper strength, and printing quality. (See "CHEMICAL ADDITIVES IN PAPER MANUFACTURING")

CHEMICAL ADDITIVES IN PAPER MANUFACTURING

Release Agents - often aluminum sulfate ($Al_2(SO_4)_3$),* used to prevent paper from sticking to presses

De-Foamers* - to eliminate foam spots on paper

Bentonite Clay* or Diatomaceous earth - to absorb pitch

Slimicides* - a kind of pesticide to prevent the growth of bacteria or fungal slime on machinery

Fillers - clay or calcium carbonate ($CaCO_3$) used to fill cavities or pores between wood fibers

- titanium dioxide (TiO_2) or zinc sulfide (ZnS) to increase capacity

- calcium silicates ($CaSiO_3$), gypsum, or calcium carbonate ($CaCO_3$) to improve ink absorbency and receptivity

Sizing Agents - gum rosin* from pine trees used with caustic soda or sodium carbonate (Na_2CO_3) to decrease wettability (= increase resistance to liquid penetration). Because of disadvantages in this process, synthetic sizing agents are becoming widely used. Many new agents are being developed.

- starch* or "chemically modified fibers" involved in strengthening fibers when weakened by sizing agent, and fillers.

Wet Strength Resins* and Lattices - melamine formaldehyde and urea formaldehyde resins are used to increase the paper's strength when wet.

- phenols, rubber lattices, and latex are also used, and many other chemicals are being researched.

(*Most common agents in manufacturing a brown paper bag)

SO WHO'S THE VILLAIN?

If you notice right about now that your brown paper lunch bag is slumping guiltily in the corner, little wonder. But it is not for the purpose of pointing blame that we have illuminated the histories of these two products. Rather, it is to illustrate that many consumer products generate hazardous wastes which might contaminate the environment.

So which is better: a plastic bag or a paper bag? It is difficult to decide. Both are the result of chemical-intensive production processes. In addition, new chemicals are constantly being developed to improve product quality and reduce cost.

Whether or not hazardous wastes are released into the environment depends upon how new the manufacturing plant is, how efficiently and conscientiously it is run, and the type of process used to make the product.

When we consider that these case studies represent only two of the thousands of such products used in our daily lives, it becomes clear how closely our purchases contribute to America's waste problem. As Pogo once said, "We have met the enemy, and he is us."

WHERE HAZARDOUS WASTES COME FROM

Industry	Million Metric Tons in 1977
Batteries	0.164
Inorganic Chemicals	3.900
Organic Chemicals, Pesticides and Explosives	11.666
Electroplating	4.053
Paint and Allied Products	0.110
Petroleum Refining	1.841
Pharmaceuticals	0.074
Primary Metals Smelting and Refining	8.973
Textiles Dyeing and Finishing	1.870
Leather Tanning	0.143
Special Machinery	0.153
Electronic Components	0.078
Rubber and Plastics	0.944
Waste Oil Re-refining	0.074
Total	34.043

SOURCE: Environmental Protection Agency

THE PRODUCTS WE USE . . .

THE POTENTIALLY HAZARDOUS WASTE THEY GENERATE . . .

Plastics	Organic chlorine compounds
Pestcides	Organic chlorine compounds, organic phosphate compounds
Medicines	Organic solvents and residues, heavy metals (mercury and zinc, for example)
Paints	Heavy metals, pigments, solvents, organic residues
Oil, gasoline, and other petroleum products	Oil, phenols, and other organic compounds, heavy metals, ammonia salts, acids, caustics
Metals	Heavy metals, fluorides, cyanides, acid and alkaline cleaners, solvents, pigments, abrasives, plating salts, oils, phenols
Leather	Heavy metals, organic solvents
Textiles	Heavy metals, dyes, organic chlorine compounds, solvents

"UNNECESSARY NECESSITIES"

"Civilization is a limitless multiplication of unnecessary necessities."
- Mark Twain

Now that we have identified our own contribution to the problem, how do we resolve it? As we have seen from our paper bag/plastic bag dilemma, the choice of one product over another is often not enough. There are, however, some questions we can ask ourselves before we buy any product in order to help us make our decisions.

Do I really need this product at all?

"Beware of all enterprises that require new clothes," Henry David Thoreau once warned. Any new purchase might be eyed with similar suspicion. Americans tend to be compulsive consumers, intent on possessing what Mark Twain referred to as, "all the modern inconveniences." It is amazing how many goods we can say "no" to without affecting our comfort, health, or enjoyment of life. Each person makes these decisions based on their own priorities. However, asking yourself "do I really need this?" before you buy will not only help you to order your own priorities, but also to carefully and critically examine those priorities.

Should I substitute another product for this one?

If most products generate hazardous wastes, perhaps we should consider buying those which last longer, so that less waste will be produced. Cotton or jute shopping bags, for example, last much longer than plastic or paper. Since one out of every four pounds of plastic sold in the United States goes to packaging, buying goods that are less heavily packaged and buying food in bulk quantities can reduce the amount of plastic discarded. Reusable cloth towels, cleaning rags, handkerchiefs, and napkins can be substituted for disposable products.

Can I use less of this product, or use it less frequently?

Since most products involve at least some hazardous waste generation, the answer may not be in purchasing one product over another but in simply consuming less of everything.

If the label says to use one cup of laundry detergent, will two-thirds of a cup do the job? If the package says to spread lawn fertilizer three times a season, will once or twice be sufficient?

How will I use this product?

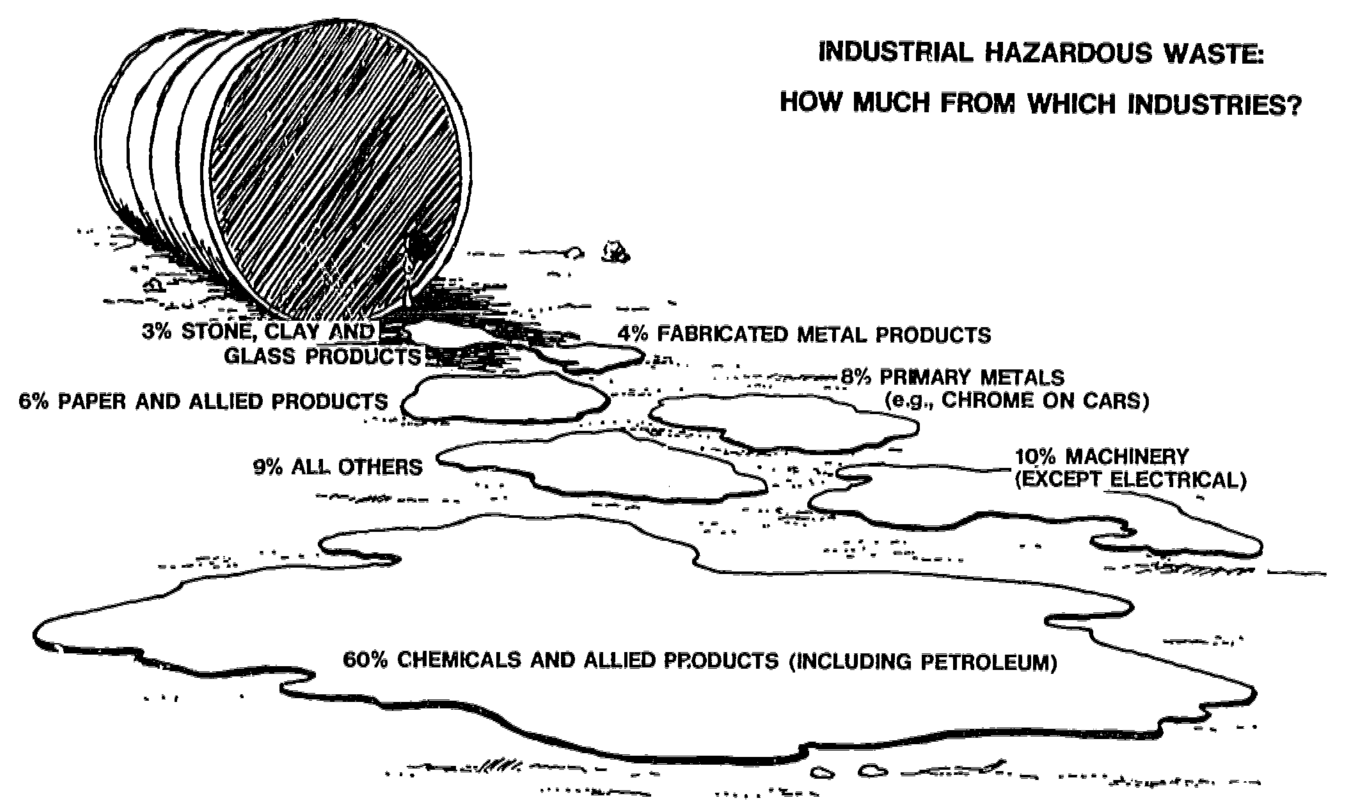
What happens to this product when we bring it home? Do we waste a great deal of it, or do we reuse it? If we need only a small amount and have no future use for the rest, do we throw it away or find a friend or neighbor to share it with? Do we pass along books, magazines, and catalogues to friends or public institutions?

"Waste is worse than loss," Thomas Edison tells us.

Where will this product ultimately end up?

...In a landfill? In the groundwater? Considering the ultimate disposal of a product can help us decide which type to use. If de-icing salt will eventually leach into the groundwater, can we use ashes or sand on our driveways instead?

Will we recycle this product, or just toss it out and buy more when it's gone? This question, too, can affect our choice. Paper bags, plates, and cups, for example, are biodegradable but not usually reusable -- while the same products made of plastic are usually reusable but not biodegradable. Most urban centers have recycling drop-off points for glass, metal, paper, and motor oil.



Percent of Total Hazardous Waste in the United States
(Source: EPA, 1979)

WHY BOTHER?

"Everyone thinks of changing the world, but no one thinks of changing himself."
- Leo Tolstoi

All of the considerations in the preceding section can help us examine and possibly alter our buying decisions to reduce the amount of hazardous wastes generated to serve our needs. But why bother? Why take the trouble to change? There are a few more questions we may want to ask ourselves before we decide.

Does our own comparatively minor contribution to the problem really make that much difference?

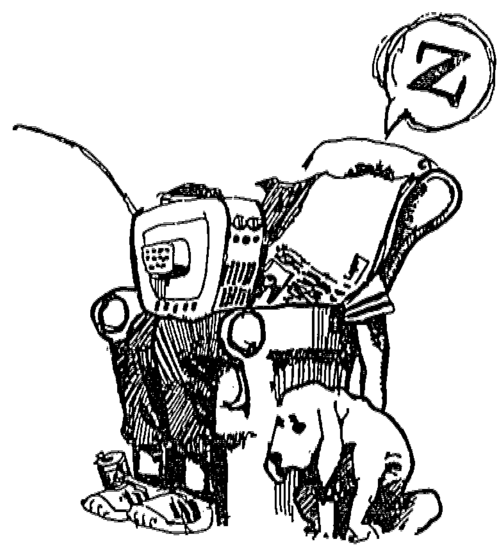
Naturally, we don't want any sacrifice we make to be merely a "beau geste" -- a beautiful but empty gesture. We want it to have an effect. But if we expect the effect to be immediate and visible, we may be disappointed. Quiet changes in our lifestyles may not produce dramatic results, but they will produce results.

Are we willing to sacrifice some personal convenience in order to reduce our own contribution to the problem?

Change can be uncomfortable, and initiating change within our own lives is, as Tolstoi remarked, so difficult that we seldom even consider it. But change won't occur until we challenge the assumption that our own peaceful, comfortable lifestyles do not in any way connect with America's hazardous waste problems. Challenging this assumption is unsettling, because it forces us to make a decision. Do we continue as we have been, even in the light of our new knowledge, or do we make a change which may possibly make a ripple in a pleasantly predictable lifestyle?

If no one else changes, why should I?

If you don't change, why should anyone else? All of us have good reason to want hazardous wastes minimized, and all of us bear at least some responsibility for preventing the problem from getting out of control. If we all assume that our behavior won't make a difference, then certainly things will get worse. It is important to remember, however, that you ar not alone. Other people are making these same decisions, and every major trend has begun with a few pioneers.



Will industry notice and respond to these changes?

When consumers began demanding phosphate-free detergents, manufacturers and legislators were eventually forced to respond. When Americans demanded fuel-efficient cars, the auto industry responded with a shift to small-car production. As a consumer, your buying decisions and those of your friends and family are carefully monitored and studied by industries that expend a great deal of money trying to find out what you want and how you want it packaged. Consumer trends have an important impact on manufacturing, packaging and services.

Whether the word seems to fit us or not, we are all consumers. When we consider that a ton of hazardous waste is produced for each man, woman and child in the United States every year, it becomes more apparent that we all have far more impact on the generation of hazardous wastes than we probably ever imagined.

Hazardous wastes can accumulate to the point of no return--if not in our own time, then in that of succeeding generations. Not to have made every reasonable effort to avoid that consequence is a heavy responsibility for all of us to bear.

WHEN IS WASTE HAZARDOUS?

HAZARDOUS WASTE is defined by the U.S. Environmental Protection Agency as a waste that has any one of four characteristics:

IGNITABILITY, which identifies wastes requiring special containers during routine management.

CORROSIVITY, which identifies wastes requiring special containers because of their ability to corrode standard materials, or requiring segregation from other wastes because of their ability to dissolve toxic contaminants.

REACTIVITY (or explosiveness), which identifies wastes that, during routine management, tend to react spontaneously, to react vigorously with air or water, to be unstable to shock or heat, to generate toxic gases, or to explode.

TOXICITY, which identifies wastes that, when improperly managed, may release toxicants in sufficient quantities to pose a substantial hazard to human health or the environment.

SOME TERMS OF TOXICOLOGY

CARCINOGEN - a substance capable of producing a cancer

FETOTOXIN - a substance that produces harmful effects in the developing fetus

HERBICIDE - a pesticide which kills plants

INSECTICIDE - a pesticide which kills insects

MUTAGEN - a substance capable of producing a heritable change in genetic material

ONCOGEN - a substance capable of producing tumors

PESTICIDE - a chemical designed to kill specific, unwanted living things

POISON - a harmful chemical substance

TERATOGEN - an agent or factor that produces birth defects

TOXIC - harmful; poisonous

FOR MORE INFORMATION

Hazardous Waste Management in Michigan, 1981 (10p.). The Michigan experience with hazardous waste is described in this brochure, along with requirements for planning, management and regulation in Michigan's Hazardous Waste Management Act. Copies are available free from the Department of Natural Resources; Environmental Services Division; Office of Hazardous Waste Management; P.O. Box 30038; Lansing, MI 48909 (517/373-2730).

The Toxic Substances Dilemma: A Plan for Citizen Action, (122p.). This manual is designed to (a) provide a clear explanation of toxics, their effects and comparative risks; (b) explain the federal laws which control toxics; (c) demonstrate through a real case study how action is accomplished; and (d) provide detailed guidance for you, the citizen, to be effective in your own area. Single copies of the report are available free from the National Wildlife Federation; 1412 Sixteenth St., N.W.; Washington, D.C. 20036 (202/797-6800).

Everyone's Backyard. The Citizen's Clearinghouse for Hazardous Wastes was formed to provide citizens groups, small towns and concerned citizens with information on toxic substances, government agencies, federal laws, community organizing, and grassroots scientific and technical resources. For a minimum contribution of $15, members of the Clearinghouse receive a one-year subscription to this monthly newsletter on hazardous waste issues around the country to help citizens solve their waste problems, successfully work with government officials, and organize public action. Write to the CCHW; P.O. Box 7097; Arlington, VA 22207 for more information (703/532-6816).

Exposure. This monthly newsletter exposes the resources, strategies, citizens, experts, laws and technical developments that can help you deal with local waste and toxic problems. An annual subscription costs $10 to $50 ($15 for individuals and grass-roots citizens groups) from the Environmental Action Foundation; 724 Dupont Circle Building; Washington, D.C. 20036 (202/296-7570).

Ending Solid Wastefulness in the United States: A Communications Kit of Options and Information, 1977 (51p.). This report describes the shortages of energy and mineral supplies, expanding populations, increased food needs, lowered food productivity, and climatic and weather changes that offer compelling reasons for exploring and implementing methods of waste reduction, recycling and resource recovery. Copies are available for $2.50 from the West Michigan Environmental Action Council; 1324 Lake Drive, S.E.; Grand Rapids, MI 49506 or the Department of

Natural Resources; City of Northglenn; 10701 Melody Dr., Suite 313; Northglenn, CO 80234.

NIOSH OSHA Pocket Guide to Chemical Hazards, 1981 (191p.). For more detailed information on the health risks of various chemicals, this guide can be obtained from the Superintendant of Documents; U.S. Government Printing Office; Washington, D.C. 20402. Specify GPO Stock Number 017-033-00342-4 and enclose a check/money order for $6.50 along with a return address label with your order.

Everybody's Problem: Hazardous Waste,1980 (36p.). This public information brochure defines hazardous wastes, defines the national program to control them, provides examples of good and bad management practices, and tells how the public can get involved. Copies are available free from the U.S. Environmental Protection Agency; Solid Waste Program; 230 S. Dearborn St.; Chicago, IL 60604 (312/353-2197).

"Managing the Wastes Problem", EPA Environment Mid-West, 1981. (31p.). This special issue is devoted to the problems of solid and hazardous wastes, disposal methods and options (including incineration, landfills, and recycling), the states' role, siting, innovative local programs, industrial recovery processes and waste exchanges. Single copies are free from the Office of Public Affairs; U.S. EPA Region V; 230 S. Dearborn St.; Chicago, IL 60604 (800/621-8431).

Michigan Waste Report. For up-to-date information, this biweekly newsletter reports on the solid waste-related activities of Michigan's seven environmental Commissions and Boards, administrative actions of State agencies, developments in the Legislature, local government and the private sector, as well as pertinent conferences, seminars and workshops. Write for more information and a sample issue to the non-profit Waste Systems Institute of Michigan, Inc.; 3250 Townsend, N.E.; Grand Rapids, MI 49506 (616/363-7367).

Hazardous Waste Management in Michigan: A Guide for Local Government and Citizens, 1982 (108p.). Primarily a legal analysis and interpretation of hazardous waste laws, rules and policies in effect as of May, 1982, this guide includes chapters on coverage, the tracking system, permit review and standards, authority of the Site Approval Board, license requirements, preemption by local ordinances, enforcement, liability and funds, the planning process, development of local programs, the Michigan Environmental Protection Act, and obtaining information as well as appendices. Copies may be purchased for $5.00 plus $1.50 postage and handling from Community Development Programs; Michigan State University; 27 Kellogg Center; East Lansing, MI 48824 (517/355-0100).

Publications on Toxic Substances: A Descriptive Listing, 1979 (96p.). This annotated bibliography was prepared by the Interagency Regulatory Liaison Group and lists free or low-cost publications by the Consumer Product Safety Commission, Environmental Protection Agency, Food and Drug Administration, and Occupational Safety and Health Administration. The guide includes listings on toxics in the home, in the workplace, in agriculture, in the environment and on the role of the federal government. Copies are available from the Superintendent of Doucuments; U.S. Government Printing Office; Washington, D.C. 20402. Specify stock number 052-011-00226-7.

Training Materials on Toxic Substances: Tools for Effective Action, 1981 (Book 1-229p.; Book 2-375p.). These training materials were produced as a collection of activities and readings to help groups of concerned citizens learn rapidly about toxic substance problems and to acquire the skills needed for grassroots action. Copies of the two-volume set are available from the Sierra Club, 530 Bush St., San Francisco, CA 94108 at prices ranging from $11.50 for citizen action groups to $15.50 for individuals and public institutions, plus $2.25 for postage.

Resource Recovery: A Statewide Solid Waste Management Strategy, 1984 (21p.). This booklet describes a new approach for dealing with the 25,000 tons of solid waste generated each day in Michigan. The planned strategy would achieve a seventy percent reduction in the need for landfill space through a combination of recycling, transfer stations, composting, and waste to energy incinerators. The effort calls for a 289.5 million dollar state bond program providing fifty percent matching grants to government agencies and low-interest loans to private industry. Copies of the publication are available free from the Department of Natural Resources; Community Assistance Division; P.O. Box 30028; Lansing, MI 48909 (517/373-0540).

OTHER USEFUL SOURCES

Environmental Action Foundation; 724 Dupont Circle Building; Washington, D.C. 20036 (202/296-7570). Ask for their publications list which includes a resource guide (describes over 250 publications, articles and films on hazardous waste, recycling and resource recovery, media, toxic substances and occupational/environmental health) and information packets on recycling, hazardous waste transportation and technology, right to know and resource recovery. Prices range from $2 to $10.

The Institute for Local Self Reliance; 1717 Eighteenth Street, N.W.; Washington, D.C. 20009 (202/232-4108). A brochure listing services and publications of the Institute is free on request. Reports on recycling, composting and resource recovery are available at costs ranging from $1.50 to $11.00.

Michigan Department of Natural Resources; Resource Recovery Division; P.O. Box 30028; Lansing, MI 48909 (517/373-0540). Ask for their publications list of 28 free papers on various aspects of solid waste management including technologies, costs and financing recycling, collection, markets, educational materials and other information. Also available are copies of the State Solid Waste Management Act (Public Act 641 of 1978), the administrative rules for the Act, as well as application guidance and information materials for plans and facilities.

National Solid Waste Management Association; Suite 930; 1120 Connecticut Ave., N.W.; Washington, D.C. 20036 (202/861-0708). A series of free brochures on landfill siting, design, operation, closure and post-closure care; incineration, deep-well injection and management of hazardous wastes are available from this trade association representing the waste management industry.

League of Women Voters; 1730 M Street, N.W.; Washington, D.C. 20036 (202/296-1770). A brochure listing many low-cost publications on hazardous waste and related topics is available free upon request.

The Hazardous Chemical Education Project; Michigan Environmental Education Association; 4360 Hagadorn Road, Okemos, MI 48864 (517/351-8888); Attention Dave Chapman. Ask about materials for teaching about various aspects of our hazardous chemicals problem.

Center for Environmental Toxicology; C 231 West Holden Hall, Michigan State University, East Lansing, MI 48824-1206; (517/353-6469). Ask about speakers, publications, and classes for the lay public explaining toxicology, waste disposal, consumer protection, and research.

Science for Citizens Center of Southwestern Michigan; Western Michigan University, Kalamazoo, MI 49008; (616/383-3983). Ask for free materials explaining services available. A publications list and speakers bureau brochure are free on request.

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