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# The Environmental Impact on Management Decisions

Daniel C. Ingham

# THE ENVIRONMENTAL IMPACT ON MANAGEMENT DECISIONS

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An Abstract Presented to the Faculty of the Graduate School of Lindenwood College in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

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ABSTRACT

This thesis will focus on how the environment will impact management decisions. The impact is measured in dollars when possible.

Management needs to have a working knowledge of how their decisions can impact the environment and ultimately the bottom line. The environmental impact ranges from depletion of the ozone to contamination of groundwater. The potential business changes due to the environment cover the range from the planning to the disposal stages of a product and to include shifts in marketing and advertising strategies.

The environment is getting more attention today from the public than at any other time. The public is pressuring politicians to enact laws and enforce stricter environmental standards. Business needs to take heed to the public outcry for cleaner water, air and land.

Fines levied by the Environmental Protection Agency (EPA) in FY 1988 proved to be the biggest year ever on imposing civil judicial and administrative penalties. A company not only needs to take heed to laws that the EPA is presently enforcing, they also have to be concerned about old products that have been disposed of

in a defunct landfill that is contaminating groundwater. Regardless of when it was disposed of, a company can be held responsible for the cleaning bills, especially those companies that have "deep pockets".

The study demonstrates, through the use of a spreadsheeet, how costly it can be when caught by the EPA for environmental infractions.

The hypothesis in question - Corporate decision makers who fail to comply with environmental laws will experience a loss in revenues - was supported within the context of the study.

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# Chapter I

# INTRODUCTION

## Environment

The origin of the environment dates back to the beginning of time and is made up of the interaction between the abiotic and biotic environment (McGowan 260a).

The abiotic environment consists of nonliving factors such as temperature, sunlight, soil, water, weather, atmosphere, radiation, nutrients and living space. The biotic environment is made up of living or recently living things such as food, plants and animals (260a).

In order to get a better idea of how the environment began and to clarify the terms above, the following should illustrate the origin of the environment we live in today.

The abiotic environment began in the Paleozoic era approximately 600 million years ago. The earth's crust was forming, the seas and continental land masses emerged. Volcanic activity, geologic and climactic

disturbances, rising sea levels that inundate much of the North American continent and the ice ages shape the continent during the next 600 million years to carve out a world as we know it today (Beiser 136).

The biotic environment also began in the Paleozoic era as the first life appears as algae, fungi, soft-bodied marine animals and progresses from simple life forms to man (137).

The environment has been around a lot longer than man, yet man has learned how to adapt to and exert control over his environment. The inevitable by-products of our modern existence must be dealt with. For example, the ozone problem. It is becoming increasingly evident that the next generation must be one of cooperative coexistence between man and his environment.

## Environmental Pollution

Environmental Pollution is a term that refers to all the ways by which people release waste materials into their surroundings (Hinkley 333).

From the discarding of human waste to using wood to cook and keep warm, people have polluted the environment since the beginning of time. It was not a concern when people lived in uncrowded rural areas, and the

pollutants (waste products) they produced were widely scattered. During the 1700's and 1800's pollution became a major problem which was due to the development of crowded industrial cities (McGowan 260b).

The industrial revolution brought about technological advances. Man transformed original materials into materials that became harmful when reacting together or with other substances to produce, for example, toxic chemicals (Kneese 4).

When the automobile was mass produced air pollution became more prevalent. Industrial and sewage facility discharge produced greater concentrations of water pollution. Agriculture, landfills and mining produced soil pollution (Moore 4).

By the mid-1900's, with further advances in technologies, pollution had affected the water in every major lake, river and the air over every major city in the industrialized countries (McGowan 260b).

An example of how air pollution emitted from one area of the country can affect other areas hundreds or thousands of miles away and how one city is proposing to control their air quality is as follows: Mid-western high-sulfur coal burning factories and utility plants spew pollutants from their smoke stacks which produce

acid rain that contribute to the killing of trees, water life and degradation of structures in the Northeast and Canada (Earthwatch 28 Apr. 89). Pollution Indexes in major cities are getting worse due to exhaust from vechicles, factory emissions and residential burning fireplaces. The Los Angeles air quality authority recently unveiled a plan under which gasoline power would be banned by the year 2007. It is projected that eventually limits on cars per family, rules against free parking and mandatory carpooling will take effect (Easterbrook 34).

There are rivers and lakes that can't support marine life due to various types of discharge. Technology, growing population, third world countries undergoing industrialization, burning of fossil fuels and limited resources are, to name a few, how business and people are overburdening our environment.

## Environmental Concern

The history of environmental thought in the United States began with two major themes: The first being that of trying to establish a balance between humans and nature, or harmony, as first suggested by George Perkins Marsh in the 1860's. Gifford Pinchot, the first head of the U.S. Forest Service represented the second theme of

simultaneously using and husbanding (conserving) resources. In the last few decades the theme of harmony has been nurtured more by groups and environmental and conservation history of the late 197Ø's and early 198Ø's. Harmony is also instilled into the process of industry's and society's learning by environmental laws, which are probably the most comprehensive on earth (Greenland 5).

Government, especially the federal government is associated with the second theme, that of using and husbanding resources. Oliver Owen, author of Natural Resource Conservation: An Ecological Approach, has summarized events in this theme as occurring in three waves. President Theodore Roosevelt initiated the first wave in 19Ø8 by calling for a White House Conference on Natural Resources. This conference led to the formation of the National Conservation Commission which earmarked large areas of land for "reserves" or national forests (6).

Franklin Roosevelt is associated with the second wave. During this period the Public Works Administration, National Resources Board, Civilian Conservation Corps, Soil Conservation Service and the Tennessee Valley Authority were established (6).

It was during this period that the environmental movement began. Fourty years ago the name for environmentalism was conservation. It was more of a sentiment which was held and expressed by a handful of organizations which ranged from the National Parks Association to the Sierra Club. The movement did not come until the 1940's, due to the widely held feeling during the 1930's that progress was an unrelieved good and that land put to human purposes was fulfilling its highest meaning (Watkins 92).

During the 1940's and 1950's environmental awareness grew into a national concern, which helped promote the third wave of conservation emphasis. This third wave has been credited to John Kennedy. Kennedy's administration spawned several laws. For example, the water and air quality acts, and the Environmental Protection Agency (EPA) were developed during this era.

Different Acts and amendments to those acts were implemented during the next two decades by the Federal government (late 1960's to the late 1980's). These acts ranged from the quality of water and air to atomic energy (Foegen 27). An example of the aforementioned is an extension of the 1972 Clean Water Act that came into effect in 1987 that forced municipalities and industries to control pollution by cleaning waste water before

discharging it into waterways (Perlman 24). In essence, companies could no longer discharge raw matter into the local water way without going through some kind of purification process first (Wolf 15).

However, companies had to meet standards on the emission of pollutants from their smoke stacks. For example, if a company was emitting too much particulate (particles that float in the air) they might have to put scrubbers into the smoke stacks to comply with the new standards. Even stricter standards on emissions could cost the nation's largest coal purchaser, American Electric Power Co., of Columbus, Ohio, $7 billion to add more scrubbers to it's plants or convert boilers to burn another source of energy like low-sulfur coal (Industry Week 62).

Chemical companies were also being held accountable for how chemicals were disposed of (Bloom 61). It wasn't until the 1970's that it was determined that groundwater could be contaminated from disposing of chemicals in drums and depositing them in landfills (Foegen 22). The common belief was that if the contaminant ever did permeate from the container it would be naturally purified by going through clay, limestone, and other porous substances prior to getting

to the groundwater (22). However, research reveals that this is not always the case.

Corporations that do contaminate groundwater find out real fast that the fine imposed by the Environmental Protection Agency is a mere slap on the wrist compared to the liability they incur when an individual sues for reparations. For example, a Xerox factory near Rochester, New York, paid a $95,000 fine for failing to report in a timely fashion that a chemical (trichloroethylene) was seeping toward wells of nearby homes. Xerox then paid $4.75 million to two families with poisoned wells (Easterbrook 38).

Due to businesses having more political clout during the Reagan administration, the EPA's power was usurped. The EPA had little power to influence compliance and became more bureaucratic (Manning 15). Most recently, the Valdez disaster is a good example of how an environmental tragedy impacts politics. The media has capitalized on the Valdez catastrophe and continued to keep the publics attention focused on the ongoing impact to the environment of such a disaster (Time 40). Opinion polls suggest that Americans consider acid rain as great a threat to the United States security as Soviet aggression (Easterbrook 29).

President Bush ran as a supporter of the

environmental cause during his presidential campaign. He has even presented an environmental plan to the Congress. Today, there are political leaders with clout that seem to be more sympathetic to the environment than in the past administration (Easterbrook 32).

Stricter standards are being proposed and implemented on topics such as emission control, discharge and disposal (Perlman 24). Large sums of money are earmarked to cleanup hazardous and toxic dumpsites (Bradburn 38). Under the Superfund law (approximately $10 billion), federal and state authorities are suing polluters to make them pay for cleaning up their dump sites. The United States Supreme Court has taken the tough line that the assets of a bankrupt company must be used for clean-ups before creditors can be paid (Main 97). Corporations with "deep pockets" are being held accountable for cleanup efforts if their waste by-product has been disposed of in a landfill that is contaminating the water supply (Bloom 58). In order to explain the term "deep pockets" the following true scenario is provided. The EPA in Kansas City is seeking to clean up a five-acre toxic-waste dump that has leached into the area's groundwater and the Missouri River. When the EPA sued the operator

of the dump for cleanup purposes, and the operator could not pay for reparations, the EPA sued four firms that had allegedly deposited waste at the dump. Two of the four firms were IBM and Western Electric Co. Approximately 300 firms had used the dump, the federal Superfund law allows the government to require any one firm to pay the cleanup costs, even if the amount disposed is minimal. To illustrate how this can impact a corporation, Monsanto agreed in early 1987 to contribute to the $13 million costs of cleaning up a site where it had dumped acids more than 50 years ago (Bloom 58, 61).

While federal laws are becoming stricter, state laws are becoming more rigid than their federal counterparts. Water quality standards are becoming more unyielding in some states than what the EPA deems fit for consumption. For example, the state of Missouri has proposed a Safe Drinking Water bill which would test the public water supply for 134 chemicals every year. Federal regulations require testing the public water supply for approximately 30 chemicals every 3 to 5 years (Earthwatch 28 Apr. 89).

Landfill legislation is proposed to be much tougher and more capital and technology intensive. Demand for disposal will increase but the supply of landfill space

will decrease (Cook 172 and Kocheicer 12). Recycling, massburn incinerators and landfills could be the future of our waste stream (Rice 100). Residential, commercial and industrial waste disposal will undergo significant changes in the next decade. Separation of trash into categories (i.e. aluminum, paper, metals, garbage waste) for pick-up has become mandatory in some states and is being looked into by others (Kindel 48). Disposal costs are on the increase (Kocheicer 12).

The problem is one of how corporations will adapt to our environment. Pollution is costing industries millions of dollars yearly and is becoming more expensive from discarding of waste in the manufacturing stage to disposing of the end item when obsolete or having to purchase pollution abatement equipment. Public opinion is becoming stronger toward industry cleaning up their act when dealing with environmental concerns. When the public speaks politicians listen, and laws are enacted which makes compliance expensive and non-compliance more expensive.

The environment is dynamic and ever changing. It will impose situations to companies in the future that past generations have not had to contend with. For example, separation of waste before disposal, recycling

waste paper and other products for profit, water discharge requirements and regearing advertising philosophy to promote the environment. This is primarily due to our technological advances and our limited resources. The decision maker of tomorrow will need to be aware of how a decision today must take into account the impact on the environment. There are plenty of pitfalls for companies that are complacent and don't heed the changes in laws and public opinion. There are also plenty of opportunities for those companies that are astute to the changes and respect our natural resources. It's important for today's businessman to realize how environmental factors can effect the decisions they face, contingencies that should be forecasted, diversification possibilities, long range planning, tactics, advertising, public relations and virtually all facets of business.

## Statement of Purpose

The purpose of this study is to make business managers and executives aware of the impact of environmental issues on their decision making process by illustrating how much it has cost and is costing

corporations that do not comply with environmental standards.

## Chapter II

## LITERATURE REVIEW

The cause and effect relationship between man and the environment has produced various theories and studies. It is becoming more important for corporations to be aware of the harmonious interaction between their operations and the environment. This literature review will be broken down into three areas - air and groundwater pollution and landfills. Different theories and studies will be explained in order to bring the reader to a basic understanding of each.

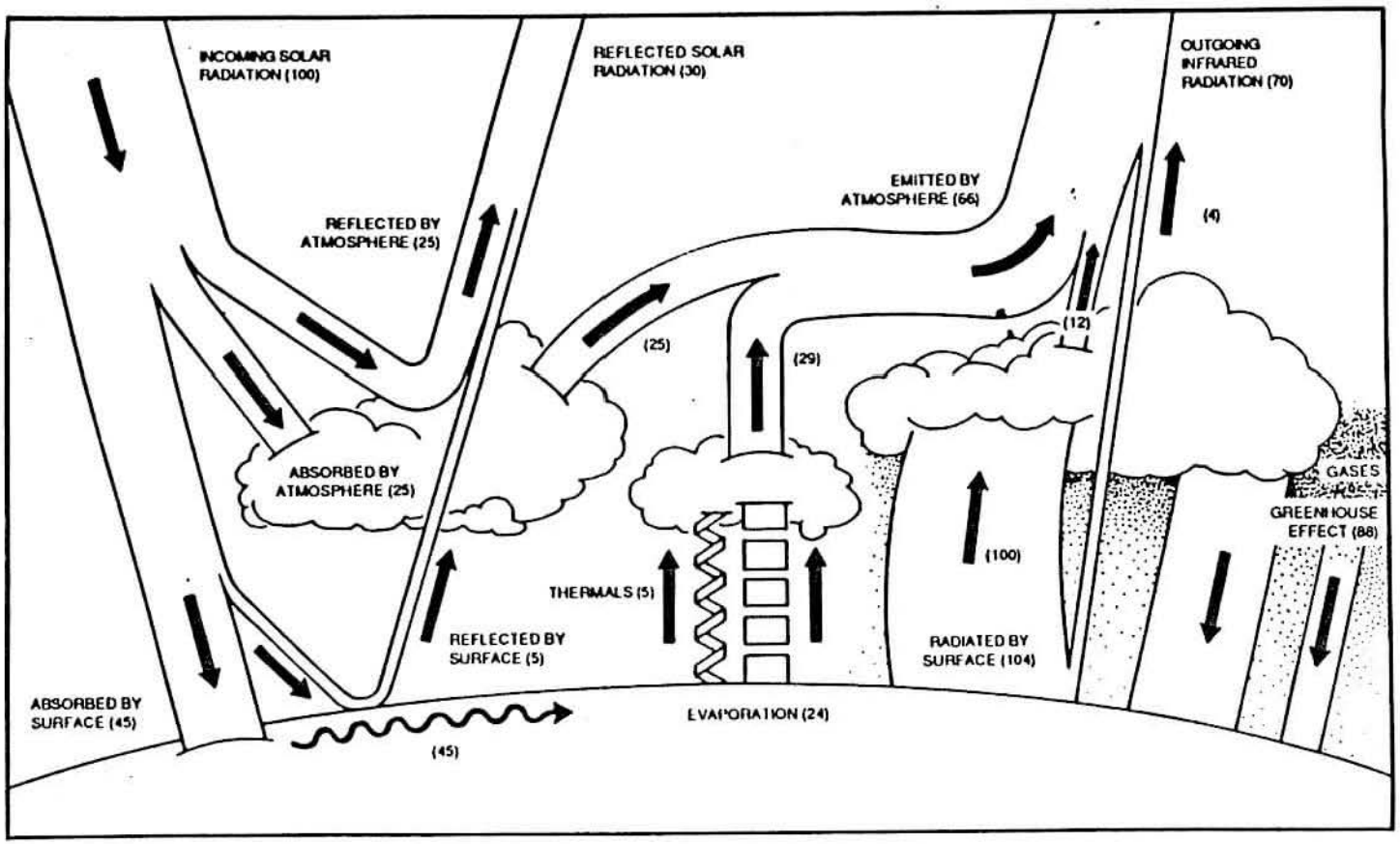
### Greenhouse Theory

Air pollution in the context of this study will pertain to three theories - Greenhouse, CFC-Ozone and Acid rain. The "Greenhouse Theory" was first developed by scientists before the turn of the century. The basic premise behind this theory is that increases in carbon dioxide will warm the earth. This is done by "greenhouse gases" in the atmosphere which allow the sun's ultraviolet (UV) rays and visible radiation to

penetrate and warm the earth. These gases then absorb the infrared energy that radiates back into the atmosphere, then forms a thermal blanket around the earth which does not permit this radiation to escape. The Greenhouse theory conceptually parallels what a regular plant greenhouse does - permits the sunlight in and retains some of the sunlights energy as heat (Seidel 1-2). The earth's radiation energy balance, which controls the way the greenhouse effect works, can be seen graphically in figure 1 on the next page. The numbers in parenthesis represents energy as a percentage of the average solar constant - about 340 watts per square meter - at the top of the atmosphere. Note that nearly half the incoming solar radiation penetrates the clouds and greenhouse gases to the earth's surface. These gases and clouds re-radiate most (i.e., 88 units) of the absorbed energy back down toward the surface. This is the mechanism of the greenhouse effect.

The main culprits of this theory are carbon dioxide (CO2) emitted when fossil fuels like coal and oil are burned and chlorofluorocarbons (CFCs), which are used in air conditioning and plastic foams. The idea of CO2 levels increasing is now indisputable, due to two different pieces of experimental evidence, one short term and one long term. The short term work began in

Figure 1 Mechanism of the Greenhouse Effect




Source: Schneider, S.H., "Climate Modeling," Scientific American 1987: 15.

1958 when Charles D. Keeling of the Scripps Institution of Oceanography in LaJolla, California, began monitoring atmospheric CO2 levels atop an extinct volcano near Mauna Loa in Hawaii. The thirty years of record keeping shows the CO2 level has gone from 315 parts per million (ppm) thirty years ago to 348 ppm today. In essence, a 4 percent increase per decade. The long term (160,000 years) evidence indicates that the CO2 level has never been as high as it is now. Going back 160,000 years in time to determine the CO2 level was done by analyzing bubbles of air trapped in core samples drilled from immensely thick sheets of ice from Greenland and Antarctica. When the snow turns to ice it traps ten percent of it's volume of air (Fisher 64-49).

Michael McElroy, chairman of the department of Earth and planetary Sciences at Harvard University, during a conference on the changing atmosphere, stated that "approximately half the carbon since the Industrial Revolution persists in the atmosphere today" (64-69).

One of the reasons for the increase in carbon is deforestation. The natural control mechanisms for CO2 are living trees and plants which consumes CO2 from the air through photosynthesis. This natural control is becoming less effective due to a constant loss of forest

since the dawn of agriculture (Morain 31). The magnitude of deforestation, according to Stanford University Center for Conservation Biology, is estimated at 74,000 acres per day and speeds the process of CO2 build-up (Newsweek 68). Another major obstacle is that newly industrializing countries are increasing CO2 emissions and regard industrial development, powered by fossil fuels, as their right. In order for the United States to compensate, whose five percent of the world population accounts for more than twenty percent of the CO2 emissions, would have to cut back even more. This can be achieved by developing better fuel-efficient cars and appliances, develop less reliance on fossil fuels and initiate tree planting programs (Begley 79).

Some scientists are forecasting a global warming of 2-9 degrees Farenheit by the middle of the next century. This then impacts wind and rainfall patterns which would pose agricultural concerns. Sea levels would rise due to the melting of ice caps and inundate coastlines. Droughts would get worse and storms would get more violent (Begley 79,80). In order to better understand the impact of a 2-9 degree warming trend, the last ice age (approximately 100,000 years ago) ended with a 2-3 degree increase in temperature. In the past decade alone, the U.S. has seen three of the coldest winters

and four of the warmest average years ever recorded, which by chance would occur less than once in a thousand years (Ponte 73).

CFC-Ozone Theory

Seven miles above the earth in an atmospheric region known as the stratosphere, a layer of slightly bluish gas called ozone - a form of oxygen - protects the planet from more than 90 percent of the suns destructive UV rays (Steacy 52).

CFCs are man-made chemicals which are used in products such as refrigerators, air conditioners, food packaging, foam insulation and aerosol propellants (LJB 191). Approximately one billion kilograms of CFCs are produced annually, a great deal of the CFCs gradually drift into the stratosphere. There, the UV radiation breaks apart the normally stable CFCs, releasing chlorine, which acts as a catalyst in the destruction of ozone. It takes up to ten years for CFCs to drift up to the stratosphere, but when they reach their destination CFCs can remain aloft causing damage for more than 100 years (Steacy 52).

In December 1973, Mario Molina and Sherwood Rowland discovered that CFCs can destroy the ozone in the

stratosphere (Roan 13). In a recent report, NASA confirmed that the ozone shield is declining worldwide. According to Robert Watson, Chief of Ozone research at NASA, Ozone is the only atmospheric gas that effectively absorbs these harmful UV sun rays. Watson expects the ozone in the next thirty to fourty years to be depleted another one to five percent as levels of CFCs increase.

For the last decade CFCs and unique meteorological conditions related to extreme cold have created large sudden decreases in ozone every spring over the Antartic (LJB 191). In mid March of 1988, an international team led by NASA reported that newly analyzed data has revealed that since 1969 the ozone layer has thinned by as much as three percent in the latitudes spanning much of the U.S., Canada, Western Europe, the Soviet Union, China and Japan, the findings were three times worse than expected (Beck 63).

Some scientists are predicting that as the ozone diminishes, skin cancers and cataracts will become more prevalent, and that now fertile regions will become arid and uninhabitable (Roan 150).

Experts are warning of damages to the aquatic system. According to R.C. Worrest of Oregon State University, experiments have demonstrated that radiation causes damage to fish larvae and other juveniles that

are essential to the aquatic food chain. In addition, Edward Emmett of the Johns Hopkins Medical School reported that UV was suspected to cause DNA damage in humans, perphaps triggering changes in the human system (5Ø).

Acid Rain

Rain has always been slightly acidic. On a pH scale the acidity of normal rain is 5.6. That's mild enough to be quickly neutralized on the earth's surface. The pH scale runs from zero to fourteen, with seven being neutral. PH is logarithmic - meaning slight changes can have significant impact on acidity. For example, according to EPA congressional testimony in mid-1984, rain falling on the northeastern U.S. and southeastern Canada has an average pH of 4.2, which means it may be 3Ø times as acidic as natural or normal rain (Gannon 71). Nine-tenths of acid-rain in the northeastern United States and Canada is man-made according to a major white house requested report released in June of 1983.

According to a National Research Council committee, pH factors stronger than 4.6 or 4.7 can effect lake plant and animal life. Lakes in the U.S. and Canada, in

what is called the "acid corridor" often are at least twice as acidic as the council deems critical (Peterson 39). In 1976, David W. Schindler and his colleagues at the Canadian government's Freshwater Institute in Winnipeg, Manitoba, initiated an unusual experiment. Over eight years, they systematically added sulfuric acid to a small Canadian lake. This lowered the lakes pH from a 6.8 to a 5. The researchers found that crustaceans and many phytoplankton disappeared, fish ceased to reproduce and new algae appeared (Raloff 311).

The ingredients of acid rain begin as sulfur dioxide, and a variety of nitrogen oxides brought to life in smelters, automobile engines and primarily high sulfur coal and oil burning power plants. Sulfur dioxide is the chief acid-rain precursor. Mid-Western power plants smoke stacks that jettison hundreds of feet into the sky coupled with the prevailing winds, produce acid rain in the Northeast and Canada (Peterson 39). In order to get a better comprehension of what prevailing winds coupled with a pollutant can do, the following illustration is provided: Lapland is a vast region extending across the northern parts of Norway, Sweden, Finland and the extreme northwest Soviet Union. April 26, 1986 the Chernobyl reactor exploded and an easterly wind carried radiation over Lapland 1,100 miles away in

the form of radioactive spring rains. Lapland received as much radioactive cesium as the Soviet city Kiev, which is only sixty miles from Chernobyl (Ruby 55).

Not only does acid rain effect the lakes of the Northeast and Canada but there is also evidence that points to trees that are dying due to acid downpours. For example, in Germany one-half of the trees in the famous Black Forest have turned from green to yellow, according to German studies cited by Worldwatch (Gannon 7Ø).

Groundwater

Groundwater, within the purview of this study, will be the only type of water discussed.

Underground geological formations called aquifers are the main - or sole - source of drinking water for nearly half the United States population (Foegen 22). Four percent of the fresh water in the U.S. is made up of "surface water," which consists of reservoirs, streams, lakes and rivers. The other ninety-six percent of our existing freshwater comes from groundwater or aquifers (Castleman 91). However, aquifers are increasingly threatened by contamination from hazardous waste dumps, landfills, pesticides, industrial

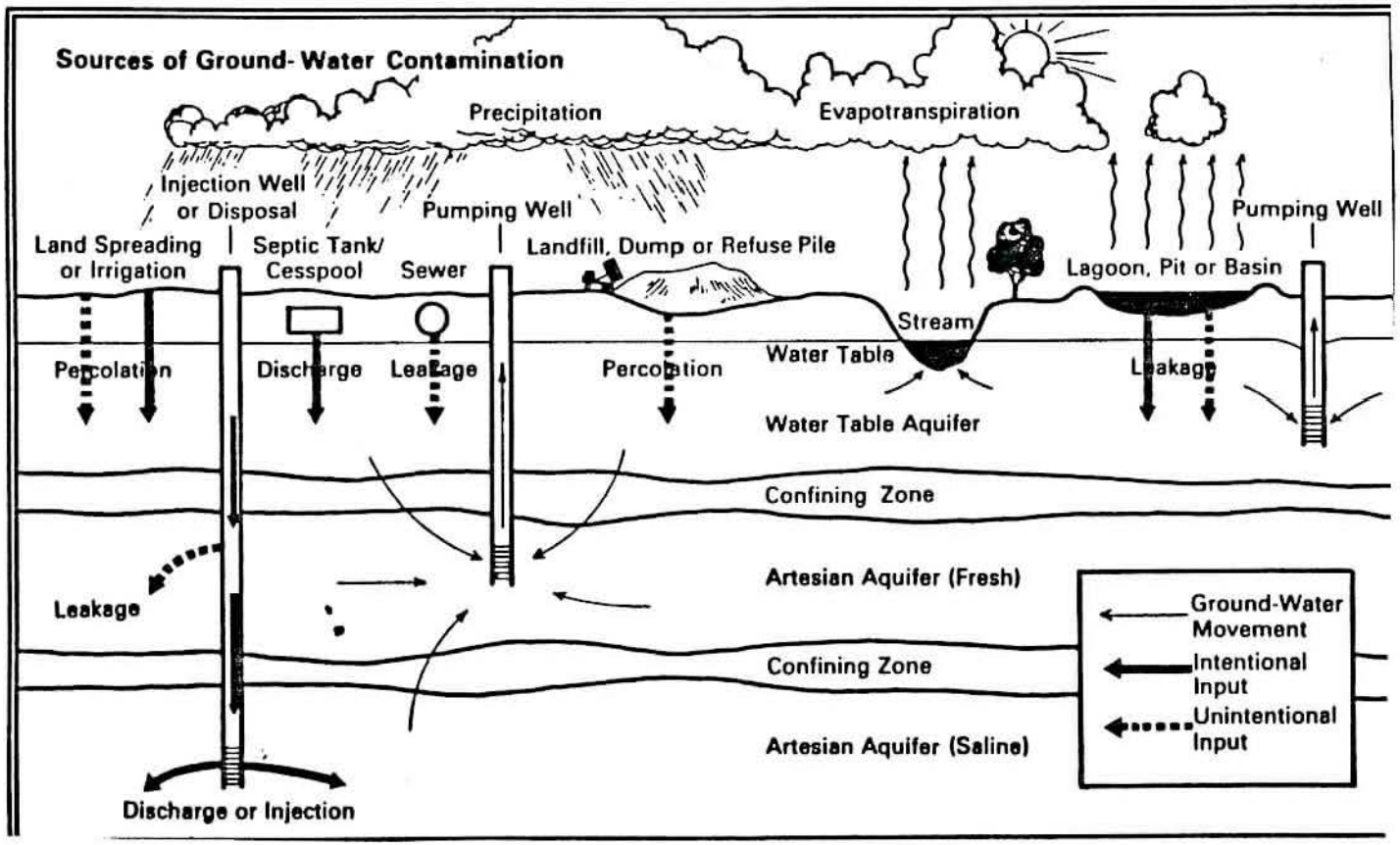
discharge, local gas stations, residential septic tanks and other pollution sources (Foegen 22). The most insidious threat comes from organic chemicals, suspected of causing five to twenty percent of all cancers in the U.S. (Begley 89).

Until the mid-197Ø's, groundwater was believed to be protected from pollution by the soil, where microbes and the soil itself filtered out traditional pollutants such as sewage. The belief of the times can be summated by Andrew Hogarth of Michigan's Department of Natural Resources, "A lot of people were doing a lot of dumping because they thought there was a magical filtration system in the ground" (Begley 89). This process is depicted in figure 2 on the next page.

If underground water is polluted it can remain dangerous for centuries since unlike surface water, underground water cannot capitalize on self-cleaning due to dilution, circulation, and the effects of sunlight and water-dwelling organisms (Foegen 23).

There are a variety of different organic and inorganic substances that pollute groundwater. The U.S. manufacturing and mining industries use in excess of sixty-thousand toxic substances (Castleman 91). More than seven hundred organic chemicals used in industrial processes have been detected in our underground water

Figure 2 Sources of Groundwater Contamination




Source: McCuen, Gary E. Protecting Water Quality 1986: 128.

supplies, including twenty-two known cancer-causing agents (McCuen 12). Carcinogenic pesticides used on many food crops have contaminated thousands of water wells. Microorganisms also pose threats to drinking water. One prime example is Giardia which is a microorganism that can cause diarrhea, naseau, vomiting and cramps; symptoms can persist for months. Twenty-thousand Americans have been infected since 1972 with Giardia. Homes built before 1930 impose additional problems due to the fact that the pipes within the homes are more than likely made of solid lead. The EPA's Jeanne Briskin states that the EPA estimates that fourty-two million Americans receive water with lead levels of twenty parts per billion (ppb). A ppb is equivalent to dissolving one teaspoon of salt in an olympic-size swimming pool (Castleman 91). Many researchers believe that drinking water is becoming the main cause of lead in the bloodstream. In order to better understand what excessive lead consumption can do, the EPA estimates that every year lead poisoning slightly lowers intelligence - up to five IQ points - in 143,000 children (Wellborn 70). Many health professionals say bad water is the primary source of disease in the United States today (Coffel 14). If all

this wasn't enough, pollutants from treatment and distribution systems can enter the water supply. For example, toxic elements are formed as a result of reactions between treatment chemicals and impurities in the water, these elements can enter the water as it passes through the distribution system. Of course, polluted runoff and salt water intrusion can not be left out as contributing factors of contaminants entering the water supply (98). Salt water enters into aquifers as the groundwater is exhausted faster than it is replenished and the pressure exerted by the sea forces salt water into the groundwater (McCuen 12).

The following two examples will illustrate that small amounts of contamination have a tremendous overall impact. EPA experts feel that underground gasoline tanks (approximately 100,000) are losing tens of millions of gallons of gasoline each year. It only takes one gallon of gasoline a day, going into a groundwater source to foul the supply of a community of fifty-thousand people (Foegen 23). Another example of how simple it is to cause wide spread damage to groundwater for an entire community is as follows: five gallons of ubiquitous dry-cleaning agent trichloroethylene (TCE) flushed down a septic tank can render all the well water used by fifty-thousand

households unsafe for a year (Begley).

A 1980 Congressional report listed 250 hazardous waste dumpsites in thirty-five states. These dumpsites are located within one mile of potential drinking-water sources (U.S. News 65).

In 1981, researchers led by Joe Francis of Cornell University reported that two-thirds of the private wells they surveyed are tainted, most commonly with bacteria and heavy metals such as toxic lead and mercury (Begley 89). Jonathan King, author of Troubled Water, a study of the nation's water quality states, "If you live near a military base, industrial factory, electronics plant, mine, airport , farmland or any kind of dumpsite, your water could be seriously contaminated." To further illustrate what Mr. King has stated, approximately twelve hazardous chemicals have been identified in the drinking water around Castle Air Force base in Atwater, California (Castleman 91). The EPA estimates that nearly two-thirds of rural Americans drink from wells contaminated largely by seepage from toxic waste dumps and runoff of agricultural pesticides (Wellborn 90).

According to a 1984 report by the U.S. Congress Office of Technology Assessment, chemical contamination of underground water supplies has already closed more

than 1,100 wells nationwide and affects every state. State officials and the EPA during the decade spanning 1976-1986 have found more than 7,700 sites where underground water has been fouled. During the spring of 1983, 466 sites were checked and twenty-eight percent of those sites showed cause for concern (Foegen 23).

The U.S. Geological Survey (USGS) estimates that six billion tons of hazardous wastes have already been dumped on U.S. land nationwide, and forty million additonal tons are being added every year. The USGS says there are approximately seven-thousand hazardous-waste dump sites, another two-hundred thousand chemical disposal sites, two-hundred thousand municipal landfills and countless septic tanks, chemical spills and other threats to clean water across the country (McCuen 12). Of the industrial sites evaluated in an EPA Surface Impoundment Assessment conducted in 1980, seventy percent were found to be unlined, fifty percent were sitting directly on top of aquifers used as sources of drinking water and ninety-eight percent were located within one mile of water supply wells. Considering the gravity of the potential harm, these facts are cause for serious concern.

The National Well Water Association and the USGS state that approximately one percent of all U.S

groundwater sources which provide drinking water to half the nation has been contaminated. According to the chief of USGS water resource division, Philip Cohen, even though the percentage is small, the groundwater contamination is found in areas of the densest population and industrial activity (McCuen 12). The population density issue is of utmost concern, due to approximately seventy-five percent of the U.S.' population lives on two percent of the land (10).

Compounding the contamination problem is the fact that we are facing a future of inadequate supply. Aquifer depletion, falling water tables and streamflows diminished to ecologically damaging levels are increasingly widespread. Water planners throughout the world are projecting that within two decades water supplies will fall short of needs. The United States Congressional Budget Office estimates that, of the nations 756 largest urban water systems (those serving more than 50,000 people), 170 will need a supplemental water supply by 1990 (Shirk 21-28).

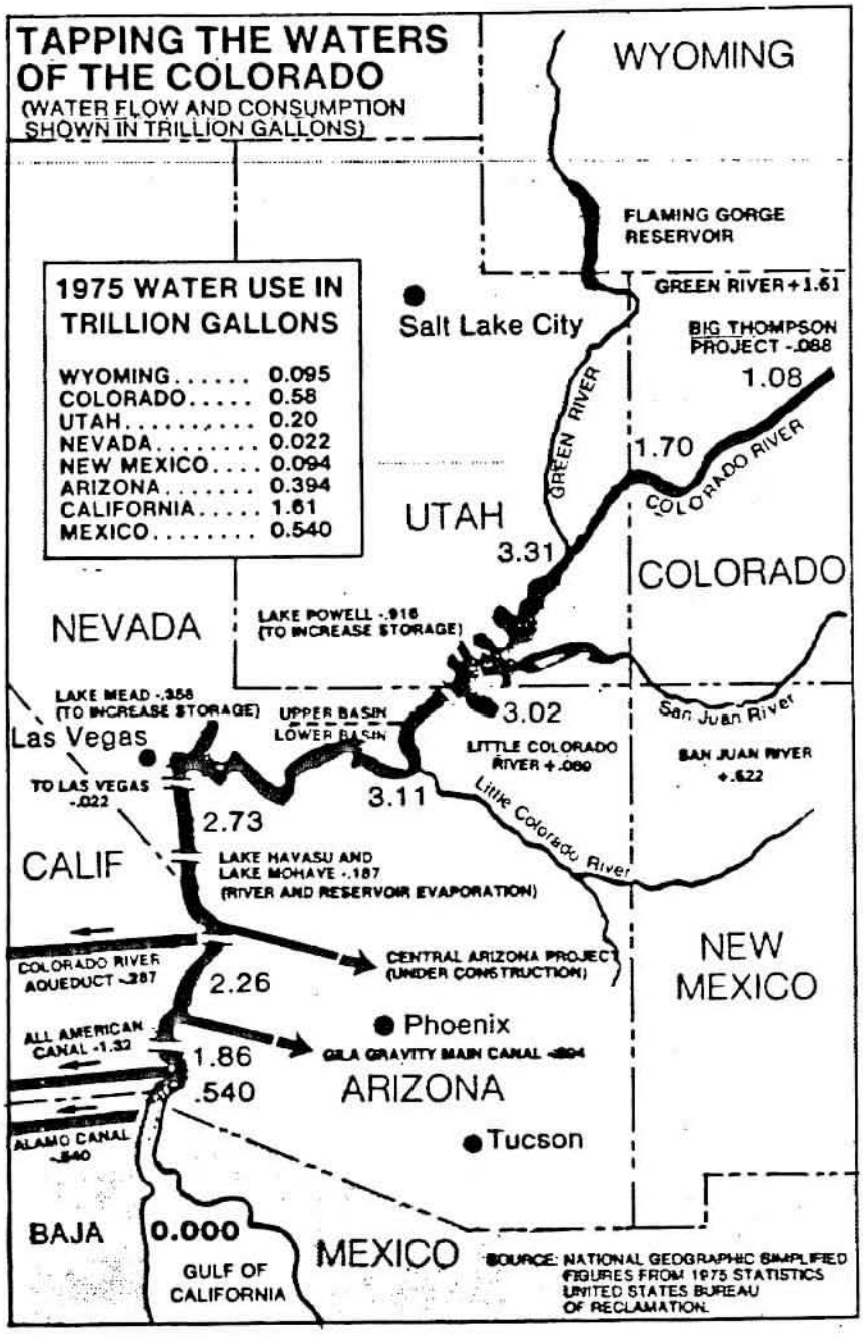
The Colorado River is one example of how we divert water due to an inadequate supply. In 1982 Senator William Armstrong (R-Colorado) warned: "The 1,400-mile Colorado river is the life blood of 17 million people,

from Denver to San Diego. This river has made America's western desert bloom; in fact, 1.5 million acres of prime farmland are irrigated by it today. And yet, this magnificent river is being slowly poisoned as it's waters become more and more saline; that is, adultered by dissolved solids.

"At it's headwaters, the Colorado River has less than fifty milligrams of salt in every liter of water; at Imperial Dam near the Mexican border, the number leaps to over eight hundred milligrams and is predicted to increase to twelve-hundred milligrams by the turn of the century." The EPA's maximum safe-level for drinking water is five-hundred milligrams (McCuen 10-15). Diversion from one part of the Colorado river via the eighty mile long American Canal, which cuts through the desert, provides irrigation to the California's Imperial Valley, 509,000 acres, one of the largest areas of irrigated lands in the world (Shirk 22). Figure 3 on the next page shows how the Colorado River is prone to adulteration because of diversion.

The amount of water waste attributed to agricultural irrigation according to the General Accounting Office, the investigative arm of Congress, is fifty percent. Meaning, that fifty percent of crops being irrigated by conventional means (sprinklers) waste

Figure 3




Source: "National Geographic Simplified Figures," 1975 Statistics United States Bureau of Reclamation 1975.

or misuse fifty percent of the water available (2).

Irrigation is a major waste of water but, so is the deterioration of our municipal water systems. Many of the water systems throughout the U.S. contribute to wasting additional water due to obsolescence. A presidential task force puts the cost of repairing municipal water systems in the Northeast at $75 billion. Some estimates have Boston losing approximately fourty percent of its water every day because of leaks. Washington loses two and a half billion gallons per year. Cities like New York and St. Louis cannot measure the impact due to the lack of water meters on buildings (Shirk 2).

The Ogallala aquifer is a vast underground aquifer that provides almost all of the necessary water for a 225,000 square mile area of the following eight High Plains states: South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico and Texas. The Ogallala is a non-replenishable aquifer meaning, when water is extracted from the aquifer it is not replaced. A report by a Boston engineering firm, Camp, Dresser and McKee, estimates that by the year 2020 some 5.1 million acres of irrigated land will dry up due to the Ogallala aquifer being depleted of it's contents. It is

predicted that Texas, Kansas and eastern New Mexico will be hardest hit (Shirk 5). The availability of water in the High Plains is important not just to the region, but to the entire nation (6). The Ogallala helps irrigate nearly twelve percent of our cotton, corn, grain, sorghum, wheat and almost half the nation's beef cattle are fattened on high plains feedlots (McCuen 19).

Thus, groundwater is being polluted, diverted, and wasted throughout the United States in a variety of different ways. A little groundwater contamination, can significantly impact the quality of drinking water for thousands. Drastic changes are being predicted for parts of the country that are exhausting limited water resources. Without intervention by man experts see these clouds on the horizon:

- Approximately six million of the sixteen million irrigated acres in the region will revert to dry land farming by 2020. Several million acres more will revert a few years later.

- The impacts will vary in severity, analysts say that Texas, Kansas and Eastern New Mexico will be hardest hit. On the Texas High Plains, the six million irrigated acres will drop by fourty-five percent by the year 2000. Irrigation in western Kansas virtually will cease by then.

- South of Nebraska, there will be a steady shift in crops from corn and milo to cotton, wheat and sorghum, which make do with less water. Corn will disappear from northern Texas and Western Kansas. In subregions within the High Plains the income will plunge.

- Beef prices will rise with the end of cheap feed grains and limitless free water.

- Nonetheless, despite severe economic impacts production in the region will increase if ranch land in Nebraska is converted to irrigated crop land. Nebraska's part of the Ogallala has centuries worth of water left. Also contributing to the overall increase would be improved technologies for dryland farming and better use of remaining water. Take away Nebraska and the outlook is grim (Shirk 5,6).

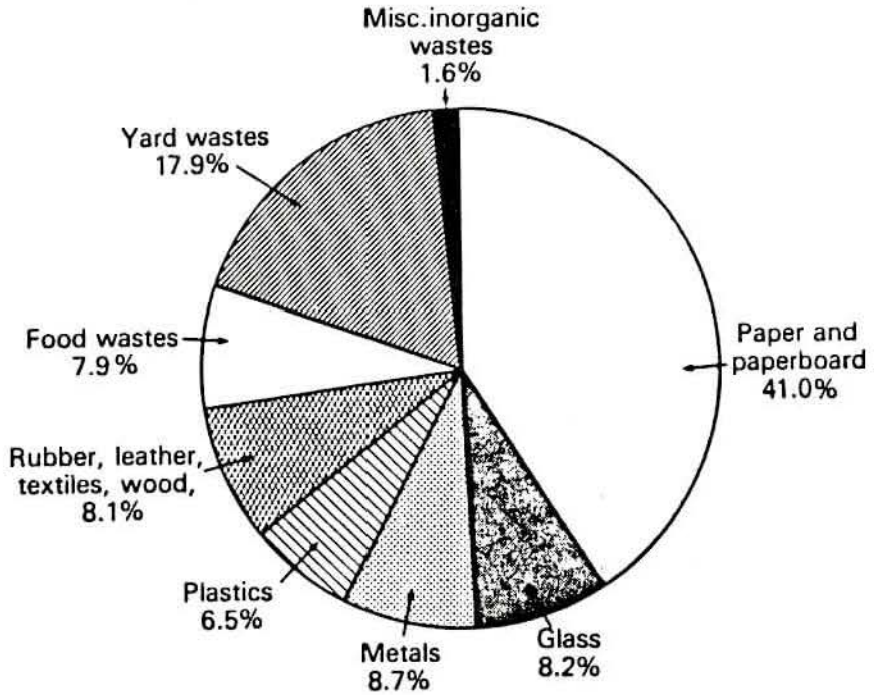
## Landfills

According to the National Solid Wastes Management Association, Americans dispose of approximately 1,547 pounds of garbage per person per year. This excludes industrial wastes. If industrial wastes were included the amount of garbage disposed of per person would amount to approximately two thousand pounds or one ton

per year (Rice 98).

The volume of waste Americans have produced has increased approximately ten percent since 1980. This can be attributed to working couples. As the number of working couples increase the amount of packaged and frozen convenience foods increases and, in turn, the amount of packaging thrown out increases (Kindel 48, 50). The quantity of packaging thrown into the waste stream has increased eighty percent since 1960 and accounts for nearly thirty-three percent of all household trash (Rice 100). Paper and yard waste accounts for approxiamtely fifty-nine percent of the waste stream (forty-one and eighteen percent respectively) (Cook 174, 176). Plastics account for seven percent of all municipal solid waste by weight, accounting for about twenty percent of the volume are the fastest-growing component of the waste stream (Beardsley 135). Figure 4 on the next page shows the breakdown of our waste stream. No more than .5 percent of all U.S. plastic products are degradable (Rudolph 84). The significance of this last statement is the more a product is refined or processed the harder it is to break down or deteriorate. The following example should illustrate the length of time needed to break down a container made of wood and one made of plastic.

Figure 4 Gross Discards of Municipal Solid Waste Materials, 1986, by percentages




Source: "Charaterization of Municipal Solid Waste in the United States, 1960 to 2000" U.S. Environmental Protection Agency, Office of Solid Waste 1988.

The container made of wood is made from a tree that processed some small part of the sun's energy, and could decompose after thirty years, while the container made of plastic is highly processed and contains many more Btus (British thermal units) per pound, which could take ten-thousand years to break down to it's component parts (Kindel 51).

All this waste goes into our Nations landfills. Nationwide, the number of landfills has dropped from an estimated ten-thousands in 1980 to six-thousand five hundred (Rice 96). In the past ten years more than seventy percent of the landfills have been lost. Approximately fourteen-thousand landfills have been closed. According to EPA estimates, another 2,275 will close in the next five years. New Jersey already exports fifty-two percent of it's waste and is almost certain to export more (Cook 172). The National Solid Waste Management Association issued a report in early May 1989 saying that all the landfills in both Missouri and Illinois will be full before the turn of the century (McWhorter B1).

Chicago has only four years before it's thrity-three dumps will be at capacity. It is estimated that the dumps in Los Angeles will be full by 1995. Many

cities ship their trash. Some New England towns run trucks twenty-four hours a day to dispose of their trash in Ohio and Pennsylvania. In Miami, county officials have considered sending their trash to Curacao, which is off of Venezuela's coast. New York City's Fresh Kills landfill on Staten Island is expected to come to a close in the next decade and is expected to reach a peak of five-hundred feet high (Budiensky and Black 58). To put five-hundred feet into perspective, Fresh Kills would be the highest point on the eastern seaboard South of Maine, half as high as the Statue of Liberty. Fresh Kills is the worlds largest landfill consisting of thirty-thousand acres and is the disposal point for the majority of the 27,750 tons of garbage generated by New York city. If New York had to ship it's waste to Ohio, like many of it's neighbors do at one-hundred and twenty dollars per ton, it would cost the city a staggering one billion dollars a year, twice the city's current sanitation budget (Cook 172-173). The EPA estimates that more than twenty-five states will run out of landfill space in the next ten to fifteen years (Vogel 76). Additional problems arise when townships rely on private haulers to dispose of their waste. The town supervisor of Babylon, New York, Anthony Noto, had one hauler arrested and convicted when he was hauling other

townships waste and disposing of that waste in Babylon's dump late at night. Thomas Marturano, director of waste at the Meadowlands landfill in New Jersey, has fifteen individuals who do nothing but pick through garbage all day looking for envelopes, letterheads etc. to determine if haulers are bringing in trash from outside the state. Now that the number of landfills is decreasing and the amount of waste increasing it is only expected that dumping fees go up. Until 1978, Summit, New Jersey paid two dollars and sixty cents per ton to dump it's garbage at a landfill. A decade later the town was paying seventy-four dollars per ton (Budiensky and Black 60). Annual collection and dumping costs for a household in suburban Union county near New York city have leaped from seventy dollars to four-hundred dollars from April 87 to April 88. In Philadelphia, disposal costs per ton have nearly tripled since 1983 (Rice 96). All in all household disposal costs have risen during the 1983 through 1988 time frame from an average of one-hundred thirty dollars per year to more than twice that. As of 1990, ocean dumping, now a common method, will be outlawed by federal law, further escalating disposal fees for the East Coast (Kindel 51).

Now that it has been established that the number of

landfills is decreasing and waste disposal is becoming more expensive, environmental concerns have to be taken into account. Half the dumps that remain open are operating illegally, failing to meet environmental regulations at the state and federal level (Cook 172). One study indicates that all but four states are running out of suitable locations (Rice 96). It is estimated that two-hundred and sixty pounds of toxic chemicals are disposed of in unregulated ways across the nation (Foegen 22). Paul Montrone, chairman of Wheelabrator Technologies, the U.S.' number two waste-to-energy company says, 'the states keep them open because there's no other place to put the garbage (Cook 172). Without proper monitoring devices (i.e. groundwater contamination devices), lined landfills, drainage systems, etc. these landfills leak contaminants into groundwater posing dangers to drinking water. Landfills leak contaminants when old paint cans are disposed of with paint still in them, rotting food waste, used oil and household sprays drip out of their containers coupled with rain permeate into groundwater. The Meadowlands landfill in New Jersey now stands in forty feet of toxic liquid leached out from it's contents. Fresh Kills leaks four million gallons of toxic fluids a day into nearby streams. Ooze from Michigan landfills

has caused at least 139 cases of groundwater contamination (Budiensky and Black 58).

According to Roger Carrier, V.P. of engineering at Chambers Development of Pittsburgh, says, "there is no such thing as an impermeable liner," the real issue is the rate of leakage.

Many states (i.e. New Jersey, Pennsylvania, Florida and California) are looking into and some have or are implementing programs to reduce the amount of waste being disposed of in landfills by recycling and incineration. These programs require the cooperation of it's residents and businesses to pre-sort waste prior to pick-up. The U.S. is learning that we do not have limitless resources and are learning lessons from countries that are smaller to use recycling and incineration in conjunction with landfill management (Rice 100). As an aside, a major concern of incineration is that the ash turns out to be as toxic as hazardous waste from industry, which must be buried in double-lined landfills.

Allen Hershkowitz, author of a book on disposal programs in land-poor Japan, illustrates what another country does with it's waste - fifty percent of Japan's household and commercial waste is recycled, thirty-four

percent is incinerated and sixteen percent goes into landfills compared to eighty-six percent of U.S. waste goes into landfills (Rice 100).

Corporate and Environmental Interaction

This section will provide the reader with examples of how corporations today are reacting to, and making the best of, our environmental situation.

When the first scientific research was published concerning the destructive impact of fluorocarbons on the atmosphere's ozone layer, Johnson Wax immediately withdrew all of its fluorocarbons products worldwide, years before the FDA banned fluorocarbon use. Company officials report that they initially lost business and angered some manufacturers; however, the organization chose to act quickly because it believed the product withdrawal was in society's best interests (Talueja 78).

Atlantic Richfield in mid-August 1989 became the first oil company to introduce an unleaded gasoline designed to run effectively in older vehicles that were built to use leaded fuel. This fuel will eliminate up to fifteen percent of the pollution caused by cars built before 1975 and trucks before 1980. This fuel will be priced the same as leaded fuel. Besides containing no lead, the new Arco fuel has fifty percent less benzene,

a major source of smog, and eighty percent less sulfur (Time 56).

Monsanto recently revealed that in 1987 it released 19.5 million pounds of toxics into the air. After seeing those numbers chairman Richard Mahoney decreed his company would, "voluntarily cut air emissions by ninety percent, while establishing a corporate goal of zero emissions." Monsanto says it can achieve the reduction within current capital budgets. Mahoney says, "we don't think our emissions represent any hazard. But the public has spoken, and it's unmistakable they will no longer tolerate toxic emissions. Might as well get on with it."

Monsanto is not the only company to take the pledge. Union Carbide and Hoffman LaRoche have voluntarily committed themselves to dramatic reduction. In essence, corporations are taking heed to public opinion and making the necessary adjustments (Easterbrook 34-35).

Small firms as well as giants like DuPont have put microbes (Bioremediation) on the payroll. Bioremediation, is the use of nature's creatures - bacteria, fungi and similar primitive microbes on the most complex toxic chemicals spewed out by industrial

society. These creatures either evolve metabolic machinery to turn toxics into food or evolve enzymes that literally cut apart the chemicals. Scientists are harnessing this microbial talent to clean up aquifers, chemical spills and Superfund sites, the nations worst toxic dumps. Bioremediation appeals to both dollars and sense: it is cheaper than incineration, the only other way to get rid of chemicals completely, and does not produce the toxic ash that burning does (Begley 56-57).

According to John Abrams, a spokesman for Corning stated "before Corning began producing optical glass, Corning had to devise a way to neutralize the large quantities of hydrochloric acid that are produced when the raw materials for the fiber-silicon tetrachloride, SICL4 reacts with water. We collect and sell it to picklers or neutralize it. But we don't let it into the water supply untreated. This is another example of knowing how to do it right, before going from the laboratory to mass production" (kindel 54).

Exxon, excluding the Valdez disaster, has taken the initiative as a pacesetter in conducting leak-prevention programs since the 196Ø's. Owning tankage at some seven thousand locations, it has upgraded or replaced underground storage facilities (as of 1986) at approximately five thousand sites ranging up to seventy

thousand dollars per site (Foegen 23).

The Innskeep project was spearheaded by Amoco, using discarded plastics collected from Portland Public Schools, local McDonald's restaurants and the area Meals-On-Wheels Program. It is only one of a growing number of programs to recycle post-consumer polystyrene foam into permanent outdoor installations (i.e. beach benches, plastic lumber.)

Proctor and Gamble company announced that recycled high density polyethylene (HDPE), used milk and juice jugs, will be used to make containers for others in P&G's family of products, including Tide, Cheer and Downy.

DuPont, Dow, Amoco, Mobil and Occidental have all begun joint-venture projects aimed at making the recycling of post-consumer plastics possible on a broad, national scale (Time Special Advertising Section)

The Waste Management industry is beginning to separate trash which can be recycled. This permits the efficient use of landfill space and enables waste to be utilized in a more productive manner (Rice 100).

The United States Department of Energy is looking into using natural resources and has armed the scientists at the Sandia National Laboratories with an

eight million dollar federal grant and plenty of drill bits. Their mission is to begin boring a twenty thousand foot hole in order to determine whether the solution to our energy needs can be found in the heat beneath the earth's crust.

Companies are beginning to focus their advertising dollars on environmentalism. For example, MAACO commercials on prime time television during the July 1989 time frame began their advertisement with a plug towards environmental consciousness; "If you're looking for a company that cares as much about your environment, as they do about your car..." and then a quick view of drums appropriatley marked for hazardous waste disposal.

ICI has adopted the slogan of "World Problems World Solutions". In the July 31, 1989 issue of Newsweek they bought a two full-page advertisement on the inside front cover to promote their corporate philosophy. Headlining the attention-getting advertisement was "Protecting the ozone layer took a really cool idea", which then goes on to explain in laymen's terms about CFC's and their devotion to developing ozone-friendly fluorocarbons, among other issues.

In August of 1989 a product named "Clear Magic," a biodegradable non-toxic engine cleaner, was introduced and marketed as a product that is environmentally safe.

Based on the information provided in the Literature Review, the reader can clearly see that corporations are gearing their thinking towards an interactive relationship with the environment. The corporations harmonious interaction with the environment is being used in advertising and image promotion among more and more corporations.

## Hypothesis

Corporate decision makers who fail to comply with environmental laws will experience a loss in revenues.

Chapter III

RESEARCH METHODOLOGY

## Subjects

The subjects in the context of this study will be any corporation, regardless of industry, that has been recently cited (within the past three years) for damage to the environment. Current data is being used in order to portray what is happening now versus ten years ago.

## Instruments

The instrument being used will be custom designed. Data will be gleaned from a variety of different periodicals in order to determine the monetary impact of civil penalties imposed by the Environmental Protection Agency to businesses that have been found guilty of environmental infractions. The data will be compiled in a matrix format in order to summate the monetary damages awarded by the courts from the corporate sector.

The x-axis of the matrix will consist of four data elements and will be refered to as data elements throughout this study. The format of the data elements within the matrix is as follows:

| Name of corporation | Type of infraction | Amount of Fines/ Additional Penalties levied |
|---|---|---|

Not every example will contain all data elements when information is not available.

## Materials

The matrix will be developed and tabulated on Lotus 123 using a Zenith ZVM138Ø micro-computer and an ALPS P2ØØØG printer.

## Procedure

The data will be compiled from a variety of different periodicals. For example, journals, Environmental Protection Agency Reports and magazines. It cannot be assumed that this study includes every corporation cited for environmental infractions.

| NAME OF CORPORATION | TYPE OF INFRACTION | AMOUNT OF FINES/ ADDITIONAL PENALTIES LEVIED |
|---|---|---|
| Big Apple Wrecking 19 May 88 | Repeated violations of the Asbestos NESHAP standard. Largest penalty in any asbestos NESHAP case. | $ 260,000 |
| Borden Chemical 4 Mar. 88 | Violated several different sections of the vinyl chloride NESHAP. | $ 1,250,000 |
| Conoco, Inc | Failure to control sulfur dioxide emissions. | $ 750,000/ $ 750,000 For Installation of equipment that removes sulfur dioxide emissions. |
| Ford Motor Company 9 May 88 | Largest penalty paid for violation of volatile organic compound emission limits. | $ 1,750,000/ Ford cannot resume operation of their lines until they have obtained state operating permits. |
| New York City Human Resources Administration | Violation of the asbestos NESHAP standard. | $ 200,000 |
| Shell Oil | Violation of shut down rules for the Sulfur Recovery unit (SRU) in Carson, Ca. | $ 66,900/ $15,000,000 to install a redundant SRU. |
| Southern Coke Corp. | Violations of battery emissions. | $ 100,000 Representing almost all of the remaining assets. |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| Bulk Oil Dec. 87 | This was the largest penalty collected for misreporting unleaded gasoline as leaded. | $ 1,200,000/ $ 1,500,000 to $ 2,500,000 for the purchase of 50 million grams of lead rights. |
| Ford | Failure to design warning light to remind the owner to replace the exhaust gas recirculation valve @ 60,000 miles. | $ 60,000/ Recall of over 103,000 1985-1987 light-duty trucks. |
| Mercedes Benz | Violations involving failure to report defects. | $ 148,000/ Implement a compliance manual and employee education program. |
| Alaska Gold Co. 3 Nov. 87 | Violation of Clean Water Act. Largest penalty ever assessed in a placer mine case. | $ 100,000 + interest |
| Arco Oil & Gas Co. 25 Jun. 88 | Unauthorized construstion of an underground injection well near Ignacio, California. | $ 47,000 |
| Atlas Powder | Violation of Clean Water Act National Pollutant Discharge Elimination Systems (NPDES) permit. | $ 840,000 |
| Chevron Refinery | Violations of NPDES permit effluent limitations. | $ 1,500,000 |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| Devon Energy Corp. 7 Oct. 87 | Failure to notify EPA of its transfer of certain underground injection wells to another party. | $ 5,000 |
| Inland Steel 9 Mar. 88 | Violating the submission of reporting accurate effluent information. This was the first civil action initiated to address laboratory procedure violations. | $ 100,000 |
| Kerbert Construc. Company Sept. 88 | Filled 3.5 to 7 acres of wetlands without a Section 404 permit. | $ 5,000/ Restoration of 6.6 acres of wetlands. |
| LTV Steel | Failure to meet categorical pretreatment requirements. | $ 450,000/ Currently in bankruptcy proceedings. |
| Edward Lunn Tull Real Estate Developer | Filling wetland on the Chincoteague Island. | $ 25,000/ Reconnection of a blocked waterway, the removal of tide gates blocking tidal flow into wetlands, the creation of new wetlands, and partial restoration of a filled site. |
| City of Baton Rouge Louisianna | Failure to meet the statutory deadline for secondary treatment as required by NPDES. This is the largest penalty assessed to date under the National Municipal Policy. | $ 750,000/ $288,000,000 For the construction of treatment facilities. |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| Boston Harbor Cleanup | Non-compliance of sludge management and staging areas for new treatment facility. | $ 425,000/ $ 2,000,000 Placed in a trust fund for mitigation projects. |
| Hudson County, NJ 2 June 88. | Violation of the Clean Water Act for discharge of untreated and undertreated sewage. | $ 500,000/ Diversion of wastewater flows by Dec. 88. |
| Key West, Fl. 18 Jul. 88 | Discharging 6 million gallons a day of raw sewage into the Atlantic. | $ 600,000/ The city must select a site, complete design and construction of a primary and secondary treatment facility and achieve compliance with applicable pollution discharge limits as well as to rehabilitate various parts of the sewer system. |
| PRASA Puerto Rico Aqueduct Authority | Violations of Federal water pollution control requirements. | $ 2,000,000/ $ 7,900,000 Deposited in an escrow account to fund various corrective action projects to address deficiencies. |
| BFI-CECOS 12 Aug. 88 | Violations of commercial hazardous waste treatment, storage, and disposal facility at Livingston, LA. This settlement represents the highest penalty ever | $ 2,500,000/ Must comply with the Resource Conservation and Recovery Act (RCRA), installation of a number of ground water monitoring wells and conduct an environmental audit |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| | obtained in a RCRA judicial action. | for the facility. |
| Stanley Plating | Violation of the RCRA which focuses on land disposal facilities. | $ 230,000/ Closure of land disposal facility. |
| Susan Bates | Violation of the RCRA. | $ 197,000/ Implement groundwater monitoring devices at its previously-closed surface impoundments. |
| Plainville Electro-plating | Violation of the RCRA. | $ 230,000/ Closure of the facilities surface impoundments. |
| Conserv-ation Chemical Company | Violation of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). | $ 2,100,000/ $20,000,000 for site remediation, involving site surface cleanup and construction of a groundwater extraction and treatment system. |
| Hudson Refining Company | Violation of the RCRA. | $ 100,000/ Complete an investigation of its entire Cushing, Oklahoma facility. A mechanism to guarantee payment of up to $1,000,000 and provides Hudson an ongoing obligation to meet RCRA financial assurance requirements. Hudson is currently in a bankrupt status and has committed over $2,000,000 for investigation of the facility. This represents an |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| | | important prioritization of environmental claims and liabilities in a bankruptcy proceeding. |
| Inmar Assoc. Inc. | Failure to comply with CERCLA. This is the largest penalty upon any party of CERCLA to date. | $ 545,000 |
| IT Corp. | Violation of the RCRA. | $ 260,000/ Required to close several non-complying surface impoundments. |
| Manville Sales Corp. 18 Mar. 88 | Must implement Remedial Design/ Remedial Action (RD/RA) for their 56 acre, 30 feet high asbestos scrap pile on the manufacturing plant's premises. | $ 5,000,000/ $ 100,000 For past EPA indirect costs. |
| Rocky Mountain Arsenal, Denver, Colorado 1 Feb. 88 | Violation of 13 interim response actions. | $ 750,000,000 to $1,000,000,000 is estimated for cleanup costs. |
| Seymour Recycling Corp. 17 Aug. 88 | Violation of CERCLA. | $ 6,500,000/ $15.5-$18,000,000 In order to perform remedial actions at Seymour, IN site. |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| Smith International | Violation of CERCLA at several sites. | $ 100,350 payment immediately and a total of:<br><br>$ 5,000,000 over time. This is the first CERCLA case in which the U.S. has settled with a bankrupt generator for future costs. |
| T & S Brass and Bronze works | Violation of the RCRA. | $ 194,000/ To comply with all applicable RCRA closure and post-closure requirements. |
| TWA, Inc. | Violation of the RCRA. | $ 100,000/ Submit closure and post-closure plans; install and operate groundwater monitoring; perform environmental audits at TWA's major facilities; assess compliance with applicable federal, state and local environmental laws; and engage in specified environmental enhancements. |
| BASF Corp. | Importation or processing of eleven new chemical substances without notifying EPA. | $ 1,300,000/ BASF also needs to conduct a comprehensive TSCA compliance audit of 151 of its facilities and to conduct training sessions in the U.S. and West Germany. |

| Name of Corporation | Type of Infraction | Amount of Fines/ Additional Penalties Levied |
|---|---|---|
| DeLonghi America, Inc. 8 June 88 | Space heaters that contained oil contaminated with high levels of PCBs. | $ 500,000/ Send out 70,000 notices informing customers that certain heaters may contain PCBs. DeLonghi will pay for the disposal of units returned to the retailer. A toll free phone number to assist consumers and retailers. A quality assurance program to ensure that future imports are free of PCBs. |
| Texas Eastern Trans-mission 6 June 88. | PCB rule violations. This is the largest single settlement ever obtained by the United States against one entity for violation of an environmental statute. | $15,000,000/ $450,000,000 estimated cost in order to remediate 89 sites located in 14 states. In addition, reimburse the Agency for past and future costs related to the investigation and cleanup, and to conduct a company-wide audit of pipeline facilities. |

# Chapter 5

# DISCUSSION

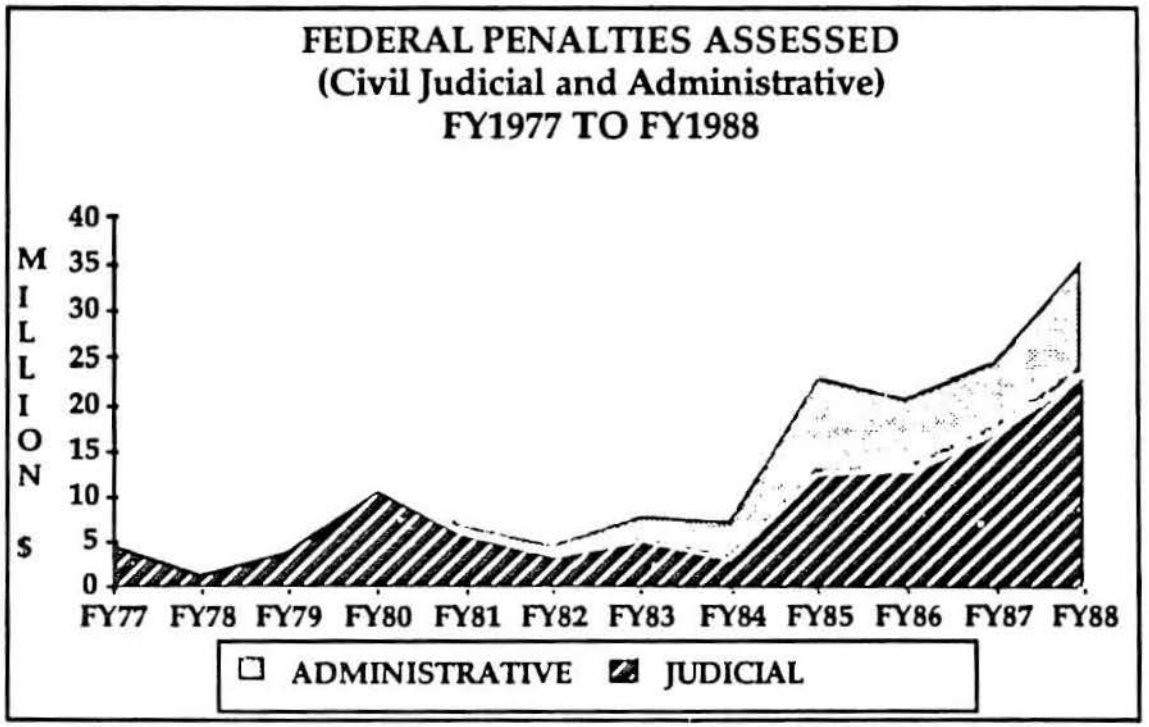
## Summary

It became apparent very early in the analysis that the fines imposed for environmental infractions are the least of the violating corporations worries if additional penalties were recommended. Additional penalties could take the form of administrative costs, legal fees, investigative fees and costs of compliance.

From the information derived within the matrix it seemed obvious, when a quantifiable figure was not published as a penalty, that it would take a great deal of assets in order to comply with most of the EPAs directives when penalties were levied for reparations. This figure was not published all the times because the actual cost of implementing the retribution could not be accurately determined.

Fines are becoming larger and FY 1988 proved to be the EPAs biggest year (to date) on imposing civil judicial and administrative penalties as is depicted in figure 5 on the next page. It should be brought out that criminal charges were not even discussed within the context of this study and is definately another major consideration for corporations.

Figure 5




Source: Compliance Evaluation Branch, "Federal Penalties Assessed," FY 1988 Enforcement Accomplishments Report Dec 88: 4.

The trend seems to be larger fines, but as stated earlier, the penalty for bringing a corporations facilities, operations or disposal to compliance often has a greater monetary significance. Let's take for example the most significant case within the matrix and illustrate the difference between the fine and the penalty in order to clarify any misunderstanding of the two terms. The Texas Eastern Transmission Corporation case represented the largest single settlement ever obtained by the United States against one entity for violation of an environmental statute. "The consent decree requires Texas Eastern to pay a civil penalty of fifteen million dollars and to characterize and remediate eighty nine sites located in fourteen states at an estimated cost of four-hundred and fifty million dollars. Texas Eastern is also required to reimburse the Agency for past and future costs related to the investigation and cleanup, and to conduct a company-wide audit of pipeline facilities to correct PCB Rule violations (Duffy 15,16)." The fine within the context of this study is the civil penalty of fifteen million dollars. Whereas the penalty consists of the characterizing and remediating of the eighty nine sites in fourteen states at an estimated cost of four-hundred

and fifty million dollars, the reimbursing of the Agency for past and future costs related to the investigation and cleanup, and to conduct a company-wide audit of pipeline facilities in order to correct PCB Rule violations. The last three occurences show non-quantitative criteria that needs remediation but, have no associated costs because they have yet to be determined.

The fines imposed by the EPA are not always significant deterrents for compliance. The penalties for non-compliance can be much more eye opening and should make the corporate decision maker more cautious when projecting future environmental programs.

It was interesting to note that corporations undergoing bankruptcy had no immunity from paying off their fines. This brings a new light to corporations that violate environmental standards that go bankrupt. They can still be held responsible for paying fines and reparations.

This takes the study to either support or refute the hypothesis, which was, corporate decision makers who fail to comply with environmental laws will experience a loss in revenues. The hypothesis was supported in the context of losing revenues when caught not complying

with environmental laws and brought to and lost in court. This will be further elaborated on in the limitations section below.

Limitations

There are a multitiude of variables that limit this study that are very difficult if not impossible to measure and quantify. These variables that can't be measured and quantified are necessary to give an accurate assessment of the total impact. The following will illustrate some of those limitations:

Corporate decision makers by electing to not comply with environmental standards could have, in essence, saved money. To determine if the corporations within the purview of this study lost revenue is a presumption that they did not save more money than they expended in fines and penalties by non-compliance. The costs of non-compliance should be factored into the study and compared to the costs of compliance. Thus, it is not necessarily cost effective from a business stand point to comply with the standards until caught.

How can one measure the cost to society for a corporation polluting a stream or river with heavy metals? Assuming theses contaminants passed into the

consumers drinking water, what are the associated health costs? Or air that is polluted by cars and industry producing smog which prevents asthma sufferers from breathing correctly? Mid-Western utilities that spew the contents of burning high sulfur coal in the wind currents that produce acid rain in the Northeast and Canada and the respective damage to lake aquatic life and trees?

An additional limitation was accurate statistics. An environmental periodical would quote different data than a business periodical on the same issue. It should be noted that the data was not from two different extremes but noticeable deviations. There was even one situation that the same source was quoted in two different periodicals with different data. The environmental periodical would take an environmental stand and the business periodical would take a business stand. In essence, a number of the articles seemed subjective.

That brings up another interesting dilemma, one of taking into account public opinion. The media is making the public more aware of environmental issues. The education process has made the public more aware of what they drink, eat, breathe and dispose of. Now more than

ever before, people are willing to pay extra for bottled water, organic foods, sunscreen and a multitude of other products to ensure their quality of life. Due to public pressure politicians are finally attempting to take a proactive approach to what scientists and environmentalists have been warning for years. How could public opinion be measured in costs to a corporation for polluting or not polluting?

Another associated cost that can't be measured and could be related to public opinion is one of perception. If society percieves an environmental violation to be significant, even if it is not, how much will this cost business? In essence, do we really have an environmental problem or is it a natural cyclical change that would have occurred because of time and factors beyond our comprehension? What about the relative cost of change when a stricter environmental law is enacted? For example, if President Bushs' law for cleaner air is enacted, how can a cost be put on the changes in the auto, petroleum, high-sulfur coal and energy industries? What about the cost to society and business for displaced workers from the high-sulfur coal industry who will need retraining; the layed off; loss of wages and benefits; the new technology that is needed to

comply with the stricter law; changes in operating procedures etc.? Is the change really needed or is it hyped up and percieved as needed? How much emphasis and what is the cost of that perception?

Technological advances have posed new areas of concern. More accurate ways of measuring temperatures and ozone depletion, to name a few, have been developed and will continue to be fine tuned in order to develop a more accurate historical base. This brings to question how accurate is our current historical base that gives us temperature changes for the last century? The knowledge and technology that meteorologists had to work with one hundred years ago has definatly been refined a great deal since then. They did not have the assistance of such technological advances as satellites, which our meteorologists and scientists have today.

## Suggestions for Future Research

Future studies could take into account a variety of different scenarios. The following will give a few suggestions for future studies:

The criminal ramifications of not complying with environmental laws. Who is liable for non-compliance when lives are lost? Are the top executives held

personally liable? Is there a trend for holding the "Man in Charge" accountable? Is this a concern for top executives?

A questionnaire could be administered to a number of Fortune 500 companies in different industries, asking them a variety of questions on their company's priority on environmental compliance and what they are doing or forecasting to do to come into compliance? Do they feel that compliance is a necessary evil or a necessity? Is the media making a so called mountain of a mole hill at industries expense? The aforementioned questions are just a few questions that might be asked of corporations.

Another option could be the impact on companies when environmental laws are made more stringent. Taking a stand either for industry or the environment.

A study on consumer buying trends which would consist of a questionnaire that would ask the consumer questions pertaining to their puchasing habits in relationship to the environment. For example, how many purchase environmentally safe products or do not purchase from companies that have not been adhering to environmental standards.

Take the Valdez disaster and do an economic impact

on what the disaster has cost Exxon. Taking into account the cleanup effort, loss in revenues from Exxon consumers purchasing petroleum products from competitors to show their dissatisfaction, EPA fines and penalties, public relations and advertising costs to improve their image, legal fees, etc. Or take the Valdez disaster and do an economic impact on Prince William Sound and the fishing industry.

How much impact do magazines such as Time, Newsweek and U.S. News & World Report have when stating the status of the environment? If a commonly read magazine does report a company to have polluted an area, does it impact the companies sales and ultimately the shareholders wealth? A questionnaire to people that read one of the more popular magazines could give the researcher more insight into how much validity and degree of impact the reader gives the article. Companies could also be asked how much impact they percieve a negative article in a popular magazine to be.

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