

Acid Rains

The term acid rain refers to what scientists call acid deposition. It is caused by airborne acidic pollutants and has highly destructive results. Scientists first discovered acid rain in 1852, when the English chemist Robert Agnus invented the term. From then until now, acid rain has been an issue of intense debate among scientists and policy makers. Acid rain, one of the most important environmental problems of all, cannot be seen. The invisible gases that cause acid rain usually come from automobiles or coal-burning power plants. Acid rain moves easily, affecting locations far beyond those that let out the pollution. As a result, this global pollution issue causes great debates between countries that fight over polluting each other's environments. For years, science studied the true [causes](#) of acid rain. Some scientists concluded that human production was primarily responsible, while others cited natural causes as well. Recently, more intensive research has been done so that countries have the information they need to prevent acid rain and its dangerous effects. The levels of acid rain vary from region to region. In Third World nations without pollution restrictions, acid rain tends to be very high. In Eastern [Europe](#), China, and the Soviet Union, acid rain levels have also risen greatly. However, because acid rain can move about so easily, the problem is definitely a global one.

Causes

For many years, there was considerable debate and disagreement over what caused acid rain. Recent scientific work, however, has helped to clarify this. The primary causes of acid rain are sulfur dioxide and nitrogen oxides. These chemicals are released by certain industrial processes, and as a result, the more industrialized nations of [Europe](#) as well as the US suffer severely from acid rain. Most sulfur dioxide comes from power plants that use coal as their fuel. These plants emit 100 million tons of sulfur dioxide, 70% of that in the world. Automobiles produce about half of the world's nitrogen oxide. As the number of automobiles in use increases, so does the amount of acid rain. Power plants that burn [fossil fuels](#) also contribute significantly to nitrogen oxide emission. Though human causes are primarily responsible for acid rain, natural causes exist as well. Fires, volcanic eruptions, bacterial decomposition, and lightening also greatly increase the amount of nitrogen oxide on the planet. However, even the gigantic explosion of [Mt. St. Helens](#) released only about what one coal power plant emits in a year. Once the tiny pollutant molecules have entered the atmosphere, they can travel for thousands of miles. Eventually, the particles will combine with other compounds to produce new, often harmful, chemicals. Acid rain comes down to the earth in the form of rain, snow, hail, fog, frost, or dew. Once it reaches the ground, the acidity in the substance can harm and even destroy both natural [ecosystems](#) and man-made products, such as car finishes.

Effects

Acid rain is having harmful effects both on people and on the natural ecosystems of the world. Scientists today are convinced that acid rain is severe in many areas, and that it is having an adverse effect on the environments of those locations. The problem of acid rain is rapidly spreading. Because it is mainly caused by industrial processes, automobiles, and power plants, those countries that are developed have the most severe acid rain problems. However, as the undeveloped nations begin to industrialize, acid rain will increase greatly. Determining just how much the planet is being hurt by acid rain is very difficult because the [ecosystems](#) that it affects are so diverse and complex. Many ecosystems are affected by acid rain. Bodies of water, such as lakes and rivers, see many of their inhabitants die off due to rising acidity levels. Acidic water also ruins plant nutrients, hurting plants' ability to survive and to give life to other organisms. Human-made products are also experiencing degradation from acid rain. Cars can lose their finishes, and outdoor statues are beginning to rust. Acid rain's effects are destructive and long lasting. Though scientists have studied lakes, streams, and many other natural ecosystems to prove its negative effects, acid rain continues to be produced and is increasing in many parts of the world.

Solutions

Modern science has proven that acid rain is a dangerous and highly destructive problem. As a result, various ways to limit acid rain have been invented, and some are now being used. Debate over acid rain and ways of preventing it have raged between environmentalists and corporations. Businesses such as power companies and car makers oppose controlling acid rain because they fear the effects on their profits. But in some cases, industries have attempted to curb acid rain production. The Northern States Power company began working to reduce acid rain in the 1980s, and has invested over a billion dollars to that end. There are many ways that power plant companies like Northern States can reduce acid rain creation. They can use coal with a low sulfur content, they can remove the sulfur from smoke their plants release, and they can limit processes known to generate high levels of acid rain. Policy makers and environmental experts are now looking into the best methods to limit acid rain. Environmentalists advocate the installation of sulfur cleaning scrubbers in factories, washing sulfur out of coal, and finding new methods of burning coal. Power plant operators are looking for less expensive solutions to the problem. Individuals can help by conserving energy or driving their cars less. Governments can pass laws restricting pollution levels, or can use a variety of methods such as [tradable emission permits](#) to reduce acid rain. Whatever way it is done, acid rain will certainly have to be limited in the future.

Air Pollution

Every day, the average person inhales about 20,000 liters of air. Every time we breathe, we risk inhaling dangerous chemicals that have found their way into the air. Air pollution includes all contaminants found in the atmosphere. These dangerous substances can be either in the form of gases or particles. Air pollution can be found both outdoors and indoors. Pollutants can be trapped inside buildings, causing indoor pollution that lasts for a long time. The sources of air pollution are both natural and human-based. As one might expect, humans have been producing increasing amounts of pollution as time has progressed, and they now account for the majority of pollutants released into the air. Air pollution has been a problem throughout history. Even in [Ancient Rome](#) people complained about smoke put into the atmosphere. The effects of air pollution are diverse and numerous. Air pollution can have serious consequences for the health of human beings, and also severely affects natural [ecosystems](#). Because it is located in the atmosphere, air pollution is able to travel easily. As a result, air pollution is a global problem and has been the subject of global cooperation and conflict. Some areas now suffer more than others from air pollution. Cities with large numbers of automobiles or those that use great quantities of coal often suffer most severely from problems of air pollution.

Causes

There are many different chemical substances that contribute to air pollution. These chemicals come from a variety of sources. Among the many types of air pollutants are nitrogen oxides, carbon monoxides, and organic compounds that can evaporate and enter the atmosphere. Air pollutants have sources that are both natural and human. Now, humans contribute substantially more to the air pollution problem. Forest fires, volcanic eruptions, wind erosion, pollen dispersal, evaporation of organic compounds, and natural radioactivity are all among the natural causes of air pollution. Usually, natural air pollution does not occur in abundance in particular locations. The pollution is spread around throughout the world, and as a result, poses little threat to the [health](#) of people and [ecosystems](#). Though some pollution comes from these natural sources, most pollution is the result of human activity. The biggest causes are the operation of [fossil fuel](#)-burning power plants and automobiles that combust fuel. Combined, these two sources are responsible for about 90% of all air pollution in the United States. Some cities suffer severely because of heavy industrial use of chemicals that cause air pollution. Places like Mexico City and Sao Paulo have some of the most deadly pollution levels in the world.

Effects

Air pollution is responsible for major health effects. Every year, the health of countless people is ruined or endangered by air pollution. Many different chemicals in the

air affect the human body in negative ways. Just how sick people will get depends on what chemicals they are exposed to, in what concentrations, and for how long. Studies have estimated that the number of people killed annually in the US alone could be over 50,000. Older people are highly vulnerable to diseases induced by air pollution. Those with heart or lung disorders are under additional risk. Children and infants are also at serious risk. Because people are exposed to so many potentially dangerous pollutants, it is often hard to know exactly which pollutants are responsible for causing sickness. Also, because a mixture of different pollutants can intensify sickness, it is often difficult to isolate those pollutants that are at fault. Many diseases could be caused by air pollution without their becoming apparent for a long time. Diseases such as bronchitis, lung cancer, and heart disease may all eventually appear in people exposed to air pollution. Air pollutants such as ozone, nitrogen oxides, and sulfur dioxide also have harmful effects on natural [ecosystems](#). They can kill plants and trees by destroying their leaves, and can kill animals, especially fish in highly polluted rivers.

Solutions

Air pollution has many disastrous effects that need to be curbed. In order to accomplish this, governments, scientists and environmentalists are using or testing a variety of methods aimed at reducing pollution. There are two main types of pollution control. Input control involves preventing a problem before it occurs, or at least limiting the effects the process will produce. Five major input control methods exist. People may try to restrict [population growth](#), use less energy, improve [energy efficiency](#), reduce waste, and move to non-polluting [renewable forms of energy production](#). Also, automobile-produced pollution can be decreased with highly beneficial results. Output control, the opposite method, seeks to fix the problems caused by air pollution. This usually means cleaning up an area that has been damaged by pollution. Input controls are usually more effective than output controls. Output controls are also more expensive, making them less desirable to tax payers and polluting industries. Current air pollution control efforts are not all highly effective. In wealthier countries, industries are often able to shift to methods that decrease air pollution. In the United States, for example, air pollution control laws have been successful in stopping air pollution levels from rising. However, in developing countries and even in countries where pollution is strictly regulated, much more needs to be done.

Global Warming

On June 23, 1988, James Hansen, the director of the Goddard Institute at NASA, told the Senate Committee on Energy and Natural Resources that global warming was a reality and that it was extremely dangerous. Global warming, also known as the greenhouse effect, immediately received international attention. Scientists, environmentalists, and governments around the world took an interest in the subject. Global warming is called the greenhouse effect because the gases that are gathering above the earth make the planet comparable to a greenhouse. By trapping heat near the surface of the earth, the greenhouse effect is warming the planet and threatening the environment. Many scientists criticized Mr. Hansen's report, and the debate over global warming continues today. Current fears stem largely from the fact that global warming is occurring at such a rapid pace. Models are predicting that over the next century, the global temperature will rise by several degrees. Some scientists still do not think that the [effects](#) of global warming are as severe as some people say. They think that droughts, hurricanes, and floods often blamed on global warming might actually have other causes. One major difficulty in studying global warming is the fact that weather data only exists for the last century and a half. As a result, understanding the present and predicting the future are very difficult.

Causes

Global warming has a variety of causes. One of the largest factors contributing to global warming is the general problem of [overpopulation](#) and its many effects. The greater number of people consume more items which take more energy to make, they drive more cars, and create larger amounts of garbage. These factors all increase the global warming

problem. Many different gases can increase the planet's temperature. The number of different products and human activities that contribute to global warming are so numerous that finding solutions to the problem is very difficult. Using a refrigerator releases dangerous gases, turning on the lights requires energy from a power plant, and driving to work causes gas [emissions](#) from the car. Countless other normal activities lead to global warming. Though having an atmosphere is important, the greenhouse effect may be making it excessively thick. The levels of gases covering the Earth have soared with [industrialization](#), and developed countries now produce about 75% of greenhouse gases. The most common gas is carbon dioxide, accounting for about 50% of all greenhouse gases. Other gases, including methane, CFCs, nitrogen oxides, and ozone, also contribute to forming the greenhouse layer. Because these gases are produced by so many important and common processes, limiting their production to prevent global warming will be difficult. As population increases and Third World countries begin to use greater amounts of energy, the problem may expand rather than contract.

Effects

To know just what the effects of global warming will be in the future is extremely difficult, if not impossible. Scientists use computer models to study the effects of global warming. These computer models have been fairly consistent in predicting general future trends, but often differ greatly when looking at the specifics. Some scientists say global warming has already been going on for a while. Others say that we do not have enough information now to know for sure. Despite the disagreements, most scientists are convinced that greenhouse gases are warming the Earth. What they are still trying to figure out is how quickly temperatures are rising, and what will happen as a result. The climate changes that will result from global warming are extremely difficult to predict. The weather is determined by so many factors that it is often compared to chaos by scientists. Changing the temperature will likely have some effect on the planet's weather, but just what that effect will be is nearly impossible to predict. If temperatures do indeed rise significantly, the most important result would be that some portion of the polar icecaps would melt, raising global sea levels. The rise in sea levels would be disastrous for some places. Islands would disappear, meaning their millions of inhabitants would have to relocate. Flooding would occur along coastlines all over the world, displacing more people and ruining cropland. In the case of major global warming and melted ice caps, some countries might simply cease to exist. Global warming, if uncontrolled, could cause a major catastrophe.

Solutions

The threat of global warming is among the most important of all modern environmental problems. There are a variety of ways of dealing with it, each attempting to combat one of the many causes of global warming. The problems that cause global warming include [overpopulation](#), [deforestation](#), [ozone depletion](#), garbage dumping, and many others. These all have unique solutions which are now being promoted by environmentalists. Certain laws and treaties are aimed at reducing the emission of pollutants that result in global warming. In 1988, the International Conference on the Changing Atmosphere drew scientists and decision makers from 48 countries. Some policies could successfully reduce global warming. Raising [fossil fuel](#) prices, [taxing emissions](#), and encouraging people to take environmentally friendly action through such activities as planting trees will all help. Because many problems leading to global warming are caused or contributed to by overpopulation, people are beginning to work to reduce family sizes. Family planning services actually help in the fight against global warming. Education is a key method of reducing the greenhouse effect. By teaching people about such things as deforestation, environmental activists hope to prevent the problems that ultimately lead to global warming. Widespread media attention to the global warming problem is also increasing awareness. This is causing both individuals and governments to act more responsibly towards the environment.

Hazardous Waste

In addition to releasing gases and particles into the atmosphere, humans produce waste that is dumped on the environment. Often, this waste is hazardous and dangerous to both nature and human life. The levels of dangerous wastes continue to grow. Industries and individuals continue to be largely unaware of this major environmental problem. As a result, many people and industries are failing to prevent the creation of hazardous waste or to limit the negative effects it produces. Individuals often throw out goods without realizing that they are headed for a landfill and could be dangerous for the environment. No matter where people put these hazardous waste materials, there is always a chance that they could find their way into the ground, and eventually into our bodies. Corporations usually want to avoid the costs associated with having to limit creation of hazardous waste. Consequently, they build [landfills](#) on site and fill them with waste, or sometimes pay to have their waste removed. Often, hazardous materials are transported to areas that accept money to take the waste. It may prove very difficult to reduce hazardous waste in the future. Unlike many other environmental problems, waste creation is something people do not often think about. In the future, people may have to reduce not only their generation of hazardous waste, but also their consumption of many products that end up in landfills.

Causes

Hazardous waste is produced both on a huge scale by major industries and on a relatively tiny scale by individuals. No matter where it comes from, waste can be dangerous. One of the main causes of the abundance of hazardous waste is that people do not realize how large a problem it is. Because it can be simply removed and sent to a [landfill](#), it is often assumed that the problem ends there. Industries have often displayed an unwillingness to find ways to deal with hazardous waste because of the expenses associated with it. Many industries and governments create crude landfills to store waste, and often just dump waste chemicals into nearby bodies of water. Chemicals used for industrial processes often create dangerous forms of waste. The amount of these chemicals has risen heavily in the past, as more areas of the world [industrialize](#) and new products are produced. Over 80,000 different chemicals are used in industries worldwide. Often, it is difficult and expensive to get rid of these chemicals and to store them in a way that does not endanger human life or the environment. Obviously, not all of these chemicals are dangerous, but many are and they do create serious problems. Around the world, hundreds of millions of tons of hazardous waste are produced annually. Rather than cleaning up or storing waste more carefully, one method of reducing the hazardous waste problem may be to simply stop producing so much of it.

Effects

Every year, major health problems result from hazardous waste. Increasing amounts of hazardous waste have caused increasing health problems. There are over 80,000 chemicals in existence, and many are used commonly in industrial processes. Often, these chemicals find themselves in places where they are able to harm human health. Insufficient research has been done to provide data on the effects of every chemical. Because waste chemicals often mix together, it will also be necessary to learn how combinations of these chemicals affect human health. To compound the problem created by a lack of knowledge, 1,500 new chemicals are invented every year and many are introduced into industrial processes. Though the health problems being created are uncertain, they definitely do exist. In 1989, a school in New Jersey had to be closed because students there had suffered excessive exposure to chromium. It was later learned that large amounts of chromium had been dumped nearby, and had blown over to the school area. Often, the lack of knowledge and certainty about what chemicals are dangerous reduces the possibilities of restricting their use. Sadly, it is often only after someone has died or become seriously ill that governments will intervene and reduce levels of dumped hazardous waste.

Solutions

Hazardous waste has created many problems and dangers that have not gone unnoticed. Despite the fact that the problem receives less attention than many other

environmental threats, some successful solutions to the problem of hazardous waste have been suggested and used. As with [air pollution](#) and many other environmental problems, hazardous waste can be controlled through input and output controls. The government can increase regulations on the disposal of hazardous waste to ensure that problems do not occur. It could also limit the amount of waste industries are allowed to produce, or provide incentives to create less waste. After hazardous waste has been created, there are several actions that can be taken. Industries can break down chemical compounds into less dangerous forms, or store waste in ways that protect the environment from being exposed to the waste. Not only major industries but individuals as well must form part of the solution. They can choose not to buy those products which require the production of hazardous waste, attempt to influence policymakers, and produce less hazardous waste themselves. Many scientists think that waste production can be cut. Experts say that waste can be reduced by at least one-third using existing technologies and methods. Some countries, including many in [Europe](#), are working to reduce waste levels. A great deal of success is being achieved in eliminating this serious problem.

Ozone Depletion

The ozone layer protects the Earth from the ultraviolet rays sent down by the sun. If the ozone layer is depleted by human action, the effects on the planet could be catastrophic. Ozone is present in the stratosphere. The stratosphere reaches 30 miles above the Earth, and at the very top it contains ozone. The sun's rays are absorbed by the ozone in the stratosphere and thus do not reach the Earth. Ozone is a bluish gas that is formed by three atoms of oxygen. The form of oxygen that humans breathe in consists of two oxygen atoms, O₂. When found on the surface of the planet, ozone is considered a dangerous pollutant and is one substance responsible for producing the greenhouse effect. The highest regions of the stratosphere contain about 90% of all ozone. In recent years, the ozone layer has been the subject of much discussion. And rightly so, because the ozone layer protects both plant and animal life on the planet. The fact that the ozone layer was being depleted was discovered in the mid-1980s. The main cause of this is the release of CFCs, chlorofluorocarbons. Antarctica was an early victim of ozone destruction. A massive hole in the ozone layer right above Antarctica now threatens not only that continent, but many others that could be the victims of Antarctica's melting icecaps. In the future, the ozone problem will have to be solved so that the protective layer can be conserved.

Causes

Only a few factors combine to create the problem of ozone layer depletion. The production and emission of CFCs, chlorofluorocarbons, is by far the leading cause. Many countries have called for the end of CFC production because only a few produce the chemical. However, those industries that do use CFCs do not want to discontinue usage of this highly valuable industrial chemical. CFCs are used in industry in a variety of ways and have been amazingly useful in many products. Discovered in the 1930s by American chemist Thomas Midgley, CFCs came to be used in refrigerators, home insulation, plastic foam, and throwaway food containers. Only later did people realize the disaster CFCs caused in the stratosphere. There, the chlorine atom is removed from the CFC and attracts one of the three oxygen atoms in the ozone molecule. The process continues, and a single chlorine atom can destroy over 100,000 molecules of ozone. In 1974, Sherwood Rowland and Mario Molina followed the path of CFCs. Their research proved that CFCs were entering the atmosphere, and they concluded that 99% of all CFC molecules would end up in the stratosphere. Only in 1984, when the ozone layer hole was discovered over Antarctica, was the proof truly conclusive. At that point, it was hard to question the destructive capabilities of CFCs. Even if CFCs were banned, problems would remain. There would still be no way to remove the CFCs that are now present in the environment. Clearly though, something must be done to limit this international problem in the future.

Effects

Even minor problems of ozone depletion can have major effects. Every time even a

small amount of the ozone layer is lost, more ultraviolet light from the sun can reach the Earth. Every time 1% of the ozone layer is depleted, 2% more UV-B is able to reach the surface of the planet. UV-B increase is one of the most harmful consequences of ozone depletion because it can cause skin cancer. The increased cancer levels caused by exposure to this ultraviolet light could be enormous. The EPA estimates that 60 million Americans born by the year 2075 will get skin cancer because of ozone depletion. About one million of these people will die. In addition to cancer, some research shows that a decreased ozone layer will increase rates of malaria and other infectious diseases. According to the EPA, 17 million more cases of cataracts can also be expected. The environment will also be negatively affected by ozone depletion. The life cycles of plants will change, disrupting the food chain. Effects on animals will also be severe, and are very difficult to foresee. Oceans will be hit hard as well. The most basic microscopic organisms such as plankton may not be able to survive. If that happened, it would mean that all of the other animals that are above plankton in the food chain would also die out. Other ecosystems such as forests and deserts will also be harmed. The planet's climate could also be affected by depletion of the ozone layer. Wind patterns could change, resulting in climatic changes throughout the world.

Solutions

The discovery of the ozone depletion problem came as a great surprise. Now, action must be taken to ensure that the ozone layer is not destroyed. Because CFCs are so widespread and used in such a great variety of products, limiting their use is hard. Also, since many products already contain components that use CFCs, it would be difficult if not impossible to eliminate those CFCs already in existence. The CFC problem may be hard to solve because there are already great quantities of CFCs in the environment. CFCs would remain in the stratosphere for another 100 years even if none were ever produced again. Despite the difficulties, international action has been taken to limit CFCs. In the Montreal Protocol, 30 nations worldwide agreed to reduce usage of CFCs and encouraged other countries to do so as well. However, many environmentalists felt the treaty did "too little, too late", as the [Natural Resources Defense Council](#) put it. The treaty asked for CFC makers to only eliminate half of their CFC production, making some people feel it was inadequate. By the year 2000, the US and twelve nations in [Europe](#) have agreed to ban all use and production of CFCs. This will be highly significant, because these countries produce three quarters of the CFCs in the world. Many other countries have signed treaties and written laws restricting the use of CFCs. Companies are finding substitutes for CFCs, and people in general are becoming more aware of the dangers of ozone depletion.

Smog

In many areas around the world, smog has reached extraordinary levels. Some governments have quickly reacted with severe measures in response to the problem. The word smog is a combination of the words smoke and fog. The term was invented by a Glasgow public health official, Des Voeux. Smog causes a smoky dark atmosphere to arise over cities. It decreases visibility, and creates a haze throughout the area. Numerous studies have monitored smog throughout the world. Some of the world's dirtiest cities have millions of inhabitants, all of whom are threatened by the smog. Modern Los Angeles suffers severely from smog, as London did in the 19th century. These two areas released certain chemicals into the air and created a foggy atmosphere. In London, where fog levels have now fallen far below those of years ago, people were often unable to see their hands and sometimes could not walk around. It took a long time for governments to act to control smog. The [Clean Air Act of 1970](#) in the United States limited legal smog levels. The Environmental Protection Agency now measures levels of smog and regulates smog producers. Despite government action to reduce them, smog levels remain very high in many cities. Even those areas that do successfully reduce smog may be the victims of smog blown in from other locations.

Causes

Smog is caused by many factors. The smog that enters the atmosphere consists of over

100 chemicals, many coming from different sources. Particulates present in smog include carbon monoxide, dirt, soot, dust, and ozone. To really create the smog effect, sunlight, hydrocarbons, and nitrogen oxides have to mix together. Major producers of smog include automobiles, fires, waste treatment, oil production, industrial solvents, paints, and coatings. Car engines, especially diesel engines, as well as gas stations that allow gas to be leaked out are huge contributors to the smog problem. Gas vapor that gets away from gas pumps contributes to the hydrocarbons needed to form smog. Diesel engines emit particles of soot that enter the atmosphere. Lead is also a major problem, especially when found in gasoline that is combusted in automobiles. Though the US now uses unleaded gas, [Third World](#) nations remain dependent upon cheaper leaded gas. Today, the smog problems created by cars are becoming increasingly severe. As gas prices decline, consumers are buying cars that use more gas, and hence pollute the atmosphere to a greater extent.

Effects

When an area becomes covered in smog, the people feel the effects immediately. Unlike other problems, which may be harder to understand and visualize, smog creates immediate problems that everyone will experience. Smog creates many harmful [health effects](#). It can cause anything from minor pain to deadly diseases such as lung cancer. Smog slowly ruins people's lungs to an extent as great as that of cigarettes. The human body has difficulty defending itself against the harms of smog. Smog can irritate and inflame pulmonary membranes, causing chest pains, coughing, and throat irritation. Other illnesses such as colds and pneumonia can also be brought on by exposure to smog. People with asthma problems are under an even greater threat. Even minor exposure to smog may cause these people to get asthma attacks. Mexico City has the world's worst levels of smog. As a result, children and the elderly are advised not to live in the city. The heavy smog levels have had serious health effects in the city, though many poorer people who need city jobs have to live there and suffer from the smog. Smog is not only a city problem. As smog levels increase, winds are carrying smog away from urban areas and harming people and [ecosystems](#) far away. Agriculture is also hurt by smog. Soybeans, wheat, tomatoes, peanuts, lettuce, and cotton are all subject to infection when exposed to smog.

Solutions

Smog can be decreased by limiting those processes that create it. In the United States, where huge amounts of smog are produced, action is being taken to reduce smog levels. Governments are combating smog in several ways. Laws are encouraging producers of automobiles to develop cars that produce less smog, and chemical companies are being watched over and restricted from producing certain harmful substances. In addition to national solutions which often deal with large plants that produce smog, local and individual efforts are underway as well. Many communities and their governments are attempting to restrict usage of dangerous products such as barbecues, house paint, and kitchen cleaners. In Denver, Colorado, the second most polluted US city after Los Angeles, several innovative measures have been taken in an attempt to decrease smog. The government has requested that people not drive to work at least one day a week, encouraged use of oxygenated fuels, and experimented with fuels that create less smog. Not to be outdone, Los Angeles' city council came up with a long list of measures aimed at reducing smog. They decided to require carpooling, offer free bus services, and create many environmentally-friendly regulations for homes. Research is being done to find less harmful alternatives for many smog-producing processes. Scientists and corporations are testing new fuels from new sources and trying to replace other products that create problems as well. In the future, many cities and countries will realize that they need to follow the examples set by cities like Denver and Los Angeles. Hopefully, they will not have to acquire those cities' high smog levels before taking action.

Water Pollution

Attention for water pollution exploded in the 1980s. The oil spill of the [Exxon Valdez](#) showed many around the world just how horrible the effects of water pollution could be.

However, even the *Exxon Valdez* spill barely touched the surface of the problem of water pollution. The ship spilt only 5% of the oil spilt that year, and oil is just one of many pollutants that people dump into the water every year. Every year, 14 billions pounds of sewage, sludge, and garbage are dumped into the world's oceans. 19 trillion gallons of waste also enter the water annually. The problem of ocean pollution affects every nation around the world. This is especially true because water is able to transport pollution from one location to another. For many years, chemicals were dumped into bodies of water without concern. While many countries have now banned such behavior, it continues to go on today. As the world has industrialized and its population has grown, the problem of water pollution has intensified. The simple fact that millions of people live along coastlines and near rivers means that these bodies of water are likely candidates for heavy and destructive pollution. It is hard to know now what our oceans will look like in the future. Just how damaged they will be by pollution is uncertain.

Causes

One of the reasons that the water pollution problem is so severe is that it is not actually illegal to dump pollutants into water bodies. Sewage, sludge, garbage, and even toxic pollutants are all dumped into the water. Often, governments either do not care or simply look the other way. Across the world, about half of all sewage is dumped into water bodies in its original form. No efforts are made to disinfect the sewage or to remove especially harmful pollutants. Even if sewage is treated, problems still arise. Treated sewage forms sludge, which is sent out into the sea and dumped. Many cities and countries dump sewage out at sea. Often, they place it not far from their own coastline, often killing all the sea wildlife in the dumping area. In addition to sewage, chemicals dumped by industries and governments are another major source of water pollution. Oil, such as that spilled by transport ships, has been dumped into the water since the US Civil War. Every year, between 1 and 10 billion tons of oil are spilt, killing many species and destroying the ecosystem in the area. Cleanup efforts have been weak, as only about 10% of the oil is removed by the most successful efforts.

Effects

The effects of water pollution are varied and depend on what chemicals are dumped and in what locations. Boston Harbor is a strong example of how badly pollution can damage bodies of water. The water is filled with toxic waste and sewage, and routinely receives more waste when rainfall pushes it into the harbor. Many bodies of water near urban areas are highly polluted. This is the result of both garbage dumped by individuals and dangerous chemicals legally or illegally dumped by industries. The main problem caused by water pollution is that it kills life that inhabits water-based ecosystems. Dead fish, birds, dolphins, and many other animals often wind up on beaches, killed by pollutants in their habitat. Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish, and the food chain continues to be disrupted at all higher levels. Eventually, humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. Ecosystems can be severely changed or destroyed by water pollution. Many areas are now being affected by careless human pollution, and this pollution is coming back to hurt humans.

Solutions

Many laws have been created to restrict industries from dumping materials into the water. However, many laws remain weak, and many countries do not restrict water pollution. In the United States, the [Clean Water Act](#) was written to completely put an end to all dumping of pollutants into water. The law has not been that effective in many areas, but in other locations, it has achieved its goals. Since the Clean Water Act, other legislation has been enacted as well. Now, eleven different federal government agencies and 21 federal government programs all monitor the quality of water and regulate pollution. The world has spent tremendous sums of money trying to clean up water. From 1972-1990, the US spent

over \$250 billion. Many non-governmental projects are also being carry out in an effort to clean up the water. Industries are beginning to reduce the amount of chemicals they dump into water, and environmental groups are participating in cleanup projects. The plastics industry, blamed for some of the worst pollution of the water, is making its products degradable. However, many environmentalists think this is hardly enough. Public reaction to the water pollution problem has also been influential. Governments have responded when public anger has risen, such as after the [Exxon Valdez](#) accident.

Overpopulation

The world's population has been booming for years. The population is now threatening to reach the stage where there are simply too many people for the planet to support. Around 1850, the world population reached one billion. By 1987, it was at five billion and still rising rapidly. Third World nations are responsible for a great deal of the population growth. In 1989, about 90% of the people being born were in developing countries. The populations of Third World countries are expected to continue to boom. The United Nations Population Fund predicts that by the middle of the next century, the world's population will stabilize at about 14 million people. If fertility rates were decreased to 2.1 births per woman, population stabilization could be achieved sooner. In 1968, Paul Ehrlich published *The Population Bomb*. The book described how the world population had risen, citing the discovery of agriculture as the cause. The book predicted that population growth would result in widespread famine and even nuclear war. While some of his predictions turned out to be false, [famine](#) did occur at high levels in later years. Overpopulation has been disastrous for the planet. Greater populations have polluted and consumed more, ruining the environment and creating or intensifying a variety of problems. Also, with the food supply limited, increases in population make shortages in many parts of the world even worse.

Rain Forest Destruction

The atmosphere and oceans are not the only parts of the environment being damaged. Rain forests are being quickly destroyed as well, and their survival is questionable. E.O. Wilson, a biologist at Harvard, called the depletion of rain forest areas "the greatest extinction since the end of the age of dinosaurs." Unlike some environmental issues, rain forest depletion has fortunately received significant public and media attention. Despite the opposition to the cutting down of rain forests, the problem continues. Every year, Brazil chops down an area of forest the size of the state of Nebraska. In addition to the Amazon's rain forests, many other forests are being cut down as well. In Indonesia, Zaire, Papua-New Guinea, Malaysia, Burma, the Philippines, Peru, Colombia, Bolivia, and Venezuela, rain forests that were once great have been lost. According to some estimates, 50 million acres of rain forest are cut down every year. The United Nations says the figure is closer to 17 million acres. The [World Wildlife Fund](#) says that every minute, 25 to 50 acres are cut or burned to the ground. The world's growing population has been a primary cause of rain forest destruction. More people need land to live on and wood products to consume. Limiting [population growth](#) may be the first in a series of steps that would limit the destruction of the rain forests.