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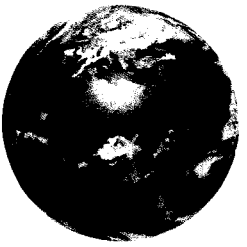

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GENERAL EDITOR

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key provisioner of permits for dredging and filling wetlands, and an agency increasingly associated with conservation efforts. Indeed, the U.S. Army Corps of Engineers has come to be a specialist in ecosystem restoration, environmental stewardship such as protecting wildlife habitats from pollution and wetlands and waterway regulation. The corps also assists in the cleanup of sites that are contaminated with hazardous and radioactive waste.

The U.S. Army Corps of Engineers is currently made up of approximately 34,600 civilian members and 650 military members. Some of these people include biologists, hydrologists, geologists, engineers, and scientists. The corps headquarters is in Washington, D.C., and there is another satellite headquarters in Alexandria, VA. The corps is separated into eight divisions and is supported by 41 local districts.

SEE ALSO: Clean Water Act; Dams; Floods and Flood Control; NEPA; Recreation and Recreationists; Waste; Wetlands; Nuclear.

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Arsenic

ARSENIC IS AN elemental metalloid that has an atomic number of 33 and symbol "As" in the periodic table. Its name originates from the Greek word *Arsenikon* (meaning potent). It is a common element found in nature, although not in its pure elemental form but rather in ores and sulfides. Arsenic is commonly found in geologic sediments and rocks, generally in the forms of arsenopyrite, orpiment, realgar, lollingite, and tennantite. Arsenic is usually a grayish or yellowish element, and it sublimes into its oxide form upon heating.

Arsenic occurs in high amounts in the sediments of many countries, most notably Bangladesh, India, Cambodia, Laos, Vietnam, China, the United States (primarily the southwest), and Argentina.

Arsenic is commonly used in pesticides, herbicides, alloys, and semiconductor material. It has historically has been used in paint (e.g., Paris Green), pressure-treated wood, cosmetics, and antibiotics (among various other medicinal purposes). However, such uses have largely been discontinued due to the toxic nature of arsenic. Arsenic is extremely poisonous, and small quantities can kill instantly. As such, arsenic has often been called the "king of poisons" and the "poison of kings," due to its historical use in alleged and real deaths and murders, and difficulty of detection. Arsenic has been linked to the deaths of famous figures, such as Napoleon Bonaparte and King George III.

ARSENIC CONTAMINATION

In recent years, concerns about arsenic in groundwater and drinking water supplies have become a major concern. The World Health Organization (WHO) advises that drinking water should not have more than 10 microgram/liter (or parts per billion, ppb) of arsenic, as higher doses can prove to be cumulatively toxic. Arsenic ingestion can lead to gastrointestinal problems, headaches, and nausea when in smaller doses, but higher doses and chronic poisoning can lead to melanosis and keratosis of the skin, liver and kidney failure, heart problems, gangrenes, cancer, and eventually death. As such, small quantities of arsenic in drinking water (from naturally occurring arsenic in the geology or from agricultural and industrial pollution) can lead to various health symptoms of arsenic poisoning (also often called arsenicosis) over numbers of years.

One of the worst cases of arsenic poisoning is in Bangladesh, where over 35 million people are consuming well water with high concentrations of arsenic. The arsenic in geologic deposits has shown up in high concentrations in groundwater that is predominantly used for drinking water and irrigation purposes. Tests of well water have shown that over

2 million tubewells contain arsenic that is greater than the Bangladesh government's standards of allowable arsenic (at 50 microgram/liter or 50 ppb); note that this standard is not the same as the WHO's standard. Drinking water with more than 50 ppb of arsenic generally means that the person has one in 100 chance of getting cancer; presently there are over 40,000 arsenicosis patients in Bangladesh; the figures are expected to rise as more patients are identified, and because symptoms can take 5 to 15 years to fully manifest themselves. Given the large number of people currently consuming poisoned water with inadequate alternative water sources, the WHO has termed the case the "worst mass poisoning of a people in history." Present attempts to provide safe water include removing arsenic from contaminated water and nongroundwater-based water options.

In the United States, arsenic in drinking water supplies caused considerable debate in the last few years. The change of government standards from 50 ppb to 10 ppb meant a greater investment in removal costs. Some politicians argued that the standard should have been below 10 ppb, in order to make water more arsenic-free; the costs involved as well as the lack of compelling need to do so are generally argued to be reasons of retaining the WHO's recommended standard. How much arsenic is deemed safe is thus both a scientific and technological issue as well as an economic and political one.

SEE ALSO: Bangladesh; Drinking Water; Groundwater; Herbicides; Pesticides.

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Asbestos

ASBESTOS IS A mineral that is separable into long and thin fibers and was used extensively in building work. Because of its toxic effects, asbestos has subsequently been phased out of uses in which it comes into contact with people, although lingering health impacts remain, as do issues concerning litigation and liability.

Although there are several different minerals that can be considered to be asbestos, the overwhelming proportion is in the form of Chrysotile ($Mg_3Si_2O_5(OH)_4$), which is a hydrous magnesium silicate known for thousands of years to be resistant to fire and also possibly injurious to health. Asbestos appears in its chrysotile form as a white fibrous mineral. Two other forms of asbestos, blue asbestos (Crocidolite) and brown asbestos (Amosite) are also important in industry and are known to be more dangerous than white asbestos.

Asbestos-bearing rock is quarried from mines and then crushed and blown to free the fibers from the accompanying rock. The longest fibers are spun into yarn, while the shorter ones are converted into various building materials, some mixed with concrete. It is the qualities of resistance to flame and chemicals that makes asbestos usage so popular with building materials and thousands of other applications. Although in itself it is difficult to work with, because of its physical characteristics, asbestos does mix well with other substances, which makes it much more versatile. Together with cotton, it has been used to form fabrics for applications such as brake linings, insulation, and safety clothing. Public buildings in many countries have been lined with asbestos for flame retardant purposes, as too were many public housing units.

PRODUCTION

Industrial-scale production began in Italy during the nineteenth century, with mines subsequently opened in many countries. The principal producers of asbestos became Canada, particularly Quebec and the Urals region of Russia. Production has subsequently declined as new health and safety regulations have restricted its use in most countries. Mine production of 3.5 million tons of asbestos in 1996 is not likely to

Nutrient-demanding banana monocultures are typically maintained with massive inputs of synthetic fertilizers, fungicides, herbicides, and pesticides (pesticides alone can account for up to 35 percent of plantation production costs). Often applied aerially, chemical misuse has damaged plantation-edge forests, and caused the build-up of nematode populations and toxic chemicals in soils. Further, bananas require constant, but not excessive moisture. On plantations, channels are dug to drain water in the rainy season and irrigate in the dry season.

This greatly enhances soil erosion, as well as the delivery of silt and agrochemicals to local waterways. Due to their coastal locations, banana plantations have been blamed for considerable estuarine and coral reef pollution in the Caribbean. In addition, the on-site washing of harvested bananas adds to water demand and contaminated runoff. During the sorting process, up to 35 percent of bananas are rejected (mainly due to blemishes), and may be dumped along with cut stems into nearby streams, where their decomposition starves the water of oxygen; it is estimated the volume of this waste is equal to that of shipped fruit.

Serious human-rights abuses are also associated with the banana export industry. In the 20th century, violent and deadly repression of labor unions, denial of basic workers' rights, and the abuse of migrant laborers have been rife. Banana companies proved so meddlesome in the domestic policies of Central American nations that the latter became known as Banana Republics. For example, in 1954, the United States-based United Fruit Co. encouraged the CIA and U.S. State Department to back the coup and exile of democratically elected Guatemalan president Arbenz, who had championed the redistribution of idle banana holdings to landless peasants. In 1992, Chiquita's threat to withdraw grower contracts caused the government of Panama to cancel a planned increase in the national minimum wage. Today, banana workers continue to struggle for adequate protection from toxic agrochemicals, the right to unionize, better living conditions, and wages commensurate with rising company profits (contract growers currently earn an estimated five to 10 percent of a banana's final retail value; plantation workers, one to three percent). They accuse banana companies of keeping prices artificially low, and of rotating their operations internationally to avoid accountability to labor and environmental laws.

Since the 1990s, organic and Fair Trade initiatives, targeting environmental and social conditions in the banana industry, have met with modest success. Chiquita and other companies are now experimenting with sustainable farming methods to lessen the environmental impact of cultivation, including continuous cultivation, integrated pest management, crop rotation, and the reuse and recycling of wastes. Bananas too blemished for store shelves are processed into juices and baby food. Contract farmers, especially in the Caribbean, are also organizing into certified Fair Trade cooperatives that work with alternative distributors to sell their sustainably grown fruits for a living wage. Their success relies on the willingness of consumers to pay a premium for fairly traded organic bananas. To date, the movement has had greater success penetrating European than North American markets.

SEE ALSO: Ecuador; Monoculture; Plantation; Plantation Forestry.

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Bangladesh

BANGLADESH IS FORMALLY called the People's Republic of Bangladesh. It is a small, deltaic country located in South Asia, with India to the north, west, and east, Myanmar to the southeast, and the Bay of Bengal (Indian Ocean) to the south. Bangladesh's land area of about 144,000 square kilometers with

147 million people (2006 estimate) makes it one of the most densely populated countries in the world. Agriculture forms the mainstay of the economy, and the majority of the population lives in rural areas, with increasing urban growth. The capital, Dhaka, is one of the fastest urbanizing cities in the world.

Bangladesh was a part of Pakistan after the Partition by British colonial rule in 1947. In 1971 it won its independence from Pakistan. Bangladesh has a parliamentary democracy, although several factors plague its rule: political instability, corruption, and poor governance. Economically, the country has made strides in developing a manufacturing base in ready-made garments (by exploiting cheap labor), along with production of other export items (such as shrimp, jute, and tea). As one of the poorest countries in the world (in terms of per capita income), development in areas of human resources, economy, literacy, and health remain enormous challenges for the government. Gender disparities in most arenas remain high, despite the country being one of the few in the world with a female head of state.

Three major rivers (Ganges, Brahmaputra, and Meghna) and numerous smaller rivers and tributaries make the country very lush and flood-prone. The country is largely flat; most landmass is one to 10 feet above sea level. The monsoon climate also means that annual rainfall in the summer months is fairly high, which contributes to the floods. In addition, tropical cyclones that form seasonally in the Bay of Bengal also cause considerable flooding from storm surges. Such natural hazards are compounded by the extreme poverty and high density of dwellings, where the social and economic outfalls are considerable for a struggling population. Marginalization of poorer people into floodplains and coastal areas further increases their vulnerability to such hazards.

Environmental problems from deforestation and loss of biodiversity are also concerns in Bangladesh, as large tracts of land are often converted to agriculture as well as to support the illegal timber trade. Recent growth of shrimp aquaculture has resulted in the loss of areas of the Sundarban mangrove forest, which is a World Heritage Site and home of the Royal Bengal Tiger. Surface water pollution has historically led to water-borne illnesses and high infant mortality rates from consumption of contaminated water. Recent changes to drinking groundwater has also come under threat from naturally occurring arsenic in the aquifer, thereby exposing over 30 million people to arsenic poisoning. Beyond water quality, water quantity also poses a problem in many areas with fluctuating groundwater tables, as well as seasonal water shortages. Disputes with neighboring India over controlling river flow remain politically contentious as a result. Air pollution from a growing number of vehicles and industries are also increasing in urban areas. As a result, many development projects in Bangladesh are focusing on the numerous environmental issues as part of overall development endeavors.

SEE ALSO: Arsenic; India; Monsoon.

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Basel Convention

ONE OF THE legacies of the industrial revolution has been the production of large quantities of hazardous waste, which over the last century has presented a serious challenge for disposal. Moreover, tightening of environmental regulation in industrialized countries in the late 1970s and early 80s led to a dramatic increase in the cost of disposing of hazardous waste. Producers and traders started looking for cheaper ways to get rid of "toxic" waste, such as shipping it to developing countries and to eastern Europe, which lack the technical capability, knowledge, and/or regulatory framework to treat this waste in an environmentally safe manner. Poorer countries were likely to accept exported wastes because their high international debt loads and weak economies positioned them poorly to reject any income-generating activities. As the

and academic institutions. Long-standing support from some members of academia lends legitimacy to Monsanto's GM seeds and chemical packages.

Monsanto's herbicide called Roundup® was the world's highest selling until the patent approval expired on the original generation. Subsequent generations of Roundup® Ready crops continue to be developed. Other well-known Monsanto products include recombinant bovine growth hormone (rBST) and the artificial sweetener Nutrasweet. Monsanto was also previously one of the producers of the defoliant Agent Orange and paid medical compensation to thousands of victims in South Korea. The company also paid to clean up dioxin and PCBs surrounding U.S. factories that produced the defoliant.

SEE ALSO: Agent Orange; Biodiversity; Biopiracy; Bovine Growth Hormone; Dioxins; Farming Systems; Genetic Patents and Seeds; Genetically Modified Organisms; Genetics and Genetic Engineering; Herbicides; Litigation, Environmental; Lobbyists; Pesticides; Polychlorinated Biphenyls; Undeveloped ("Third") World.

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Monsoon

THE WORD MONSOON originates in the Arabic term *mausem*, which means season. Monsoon is generally used to refer to the seasonal change in wind patterns between land and ocean, usually associated with well-defined periods of heavy rainfall. While monsoons can occur in North America and Asia, the dramatic weather pattern in the Indian subcontinent (South Asia) is the more well-known monsoon; it largely affects India, Bangladesh, Pakistan, and Sri Lanka. These seasonal changes in wind and rain patterns are very distinct and the South Asian monsoon is generally associated with heavy rainfall in the summer (often accompanied by floods) and dry spells in the winter months. The spatial coverage and intensity of the South Asian monsoon is not seen in the other monsoons. Rainfall of up to 10,000 millimeters can be experienced in parts of India, and most of the annual rainfall occurs during the summer monsoon season.

Monsoons occur due to the difference in specific heat of landmasses compared to oceans. In the summer, as land heats up faster than ocean water, the heat causes air to rise above landmasses, producing a system of low pressure. Air from the ocean moves in, and brings with it high moisture content. The difference in temperature between land and sea can be up to 20 degrees C. In the winter, as oceans retain more warmth and land cools down faster, the reverse occurs and wind blows from land to sea. In the South Asian monsoon, the summer monsoon (June–September) involves winds blowing landward from the southwest (Arabian Sea, Indian Ocean, Bay of Bengal) bringing considerable cloud cover and rainfall; while the winter monsoon (December–March) is a dry period with winds blowing in the opposite direction from the northeast toward the ocean. Monsoons can thus be thought of as very large, constant, and powerful sea breezes, involving large landmasses and oceans, forming one of the more enduring weather patterns seen.

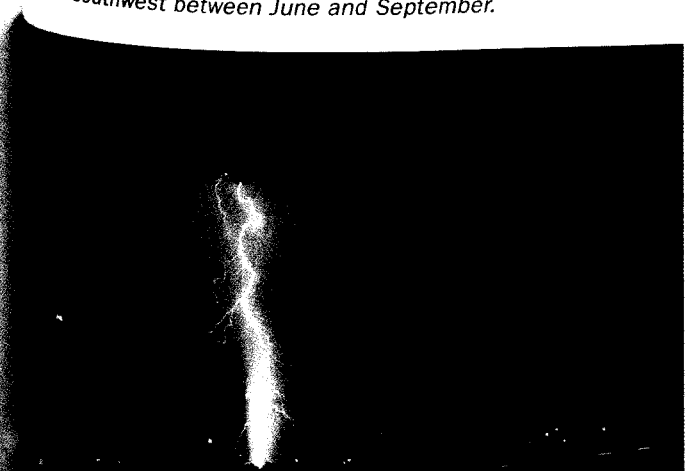
Forecasting the arrival and retreat of monsoon fronts is important for societies in monsoon-dependent areas. It is important to understand regional differences and specificities in order to analyze, model, and forecast local weather patterns and implications of climate shifts. Monsoons can vary by time of onset and withdrawal, frequencies and intensities of storms, spatio-temporal variability of rainfall, duration and timing of monsoon "breaks" (i.e., days without rain), and tele-connection to larger systems of the El Nino Southern Oscillation (ENSO). Monsoons are thus linked to broader

patterns such as the ENSO, but also to more local patterns such as the formation of tropical cyclones (typhoons or hurricanes), which are most common in the pre- and post-monsoon times (i.e., just before the monsoon front moves in and after it retreats, in the months of April–May and October–November, respectively). Tropical cyclones form over oceans and move landward, often bringing with them heavy rainfall, gusts, and storm surges.

The advent of monsoons in South Asia is generally associated with much-needed rain as a welcome relief from the dry heat, as well as for agricultural production that depends on the rains. Monsoons have inspired poetry and literature, and the seasons are an integral part of life and culture. As clouds roll in, rain is often welcomed with ceremonies.

Drought can seriously affect agricultural production, which is the mainstay of livelihoods of much of the South Asian population. The prolonged and heavy rainfall, however, can also lead to floods and ensuing damage and destruction. Rainfall and swollen rivers (from both rainfall and increased summer melting of Himalayan glaciers that feed the rivers) can result in devastating floods that cause damage to lives and property and displace millions of people. For instance, the devastating floods in Bangladesh in 1987 and 1988 resulted in most of the country being submerged under water for months, causing considerable suffering and loss to agriculture, industry, and homes, as well as to the economy. Heavy rainfall in general can also make life and business come to a standstill for days in most parts of South Asia. Monsoonal climates generally result in some levels of adaptation, but the inherent variability of the system means that it is difficult to predict when rain will occur or when floods may ensue and with what intensity. As such, South Asian societies are heavily dependent on and influenced by the monsoonal climatic system.

In the United States, the monsoon season affects the southwest between June and September.



In the United States, the monsoon season is generally between June–September, and affects the southwestern part of the country. It is generally known as the North American monsoon, but is often also called the southwest monsoon. The moist air coming up from the Gulf of Mexico brings with it rainfall, and there are associated thunderstorms in the southwestern deserts as well as the areas around the Rocky Mountains. While this monsoonal system is less pronounced and intense than the South Asian monsoon, it is still a distinct seasonal climatic system.

According to scientists, climate change is likely to affect monsoon systems. Climate simulation models predict that climate change from global warming will lead to increased rainfall; heavier storms; floods from rain and melting snowcaps/glaciers; increasing intensity of tropical cyclones; and changes in the monsoon-ENSO connection. Such changes are likely to affect localized weather patterns considerably in monsoonal zones. The increased sea surface temperature, as well as mean air temperature, will likely lead to greater events of extreme tropical cyclones (and associated storm surges) as well as flooding in the Indian subcontinent. This is assumed to be a result of greater temperatures leading to greater moisture, which will lead to a more intense hydrological cycle, and thus greater monsoons. Climate variability is thus likely to result in greater floods and droughts that may make short-term forecasts difficult and adaptation harder. Climate forecast models can predict certain trends but both short- and medium-term changes can be unpredictable.

With large populations in the tropical and temperate monsoon areas directly dependent on land and water resources for lives and livelihoods, changes in monsoonal patterns thus pose a greater concern to these societies. A dramatic change in monsoon cycles, or advent of monsoon rains themselves, can result in failures of the agricultural production cycle dependent on the monsoons. Increasing floods and tropical cyclones also pose threats to people living

in coastal areas and floodplains along the hundreds of rivers that exist in South Asia; and high levels of poverty and lack of access to forecast information further compound the ways by which monsoonal unpredictability can affect lives and livelihoods.

SEE ALSO: Bangladesh; Climate, Humid Subtropical; Climate, Tropical; El Niño—Southern Oscillation (ENSO); Floods and Flood Control; Global Warming; India; Pakistan.

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Montreal Protocol

THE MONTREAL Protocol on Substances that Deplete the Ozone Layer is the international environmental agreement designed to protect the stratospheric ozone layer, which shields the earth's surface from radiation in the ultraviolet spectrum. An increase in the intensity of UV-B rays reaching the surface may augment skin cancer rates in humans, decrease plankton production in the oceans, and negatively affect agricultural production throughout the world.

The Montreal Protocol, as it is often referred to in short, provided the framework for phasing out the production of the main ozone depleting chemicals (chlorofluorocarbons [CFCs], halons, carbon tetrachloride, methyl chloroform, hydrofluorocarbons, and methyl bromide). These chemicals were widely used as refrigerants, coolants, aerosol propellants, and industrial solvents.

CFCs were invented in 1928 by Thomas Midgley, Jr. (who also invented the lead additive to gasoline) and were applied widely due to their low costs of production and desirable chemical properties. Global annual reported production of CFCs rose from 544 tons in 1934 to 812,522 metric tons at the height of their use. In 1974, Mario J. Molina and F. Sherwood Rowland published a research paper highlighting the threat of CFCs to the ozone layer in the stratosphere. Their testimony before the U.S. House of Representatives in December 1974 led to a review by the National Academy of Sciences that confirmed the scientific validity of their CFC hypothesis.

In March 1978 the United States, followed by Canada, Norway, and Sweden, banned the use of nonessential aerosols. A number of international scientific conferences were held to study the consequences of ozone depletion. Under the leadership of the United Nations Environmental Programme (UNEP), an ad hoc working group began to negotiate a convention on research, monitoring, and data exchange in 1982.

In March 1985, 43 nations convened in Vienna to complete work on the first international ozone convention, which was later titled the "Vienna Convention." This nonbinding convention requested participating nations to "take appropriate measures" to protect the ozone layer, but more importantly called for renegotiations for a binding agreement.

Two months later, British scientists published data that showed a seasonal "hole" in the ozone layer over Antarctica. The first round of negotiations for a binding protocol were held in Geneva in December 1986, and after two more rounds of negotiations in Vienna and Geneva, the final version of the protocol was opened for signature in Montreal on September 16, 1987. The document is widely recognized as setting a precedent for preventive instead of corrective environmental action on a global scale.

The Montreal Protocol is considered by many as "perhaps the single most successful international agreement to date" (Kofi Annan, Secretary General of the United Nations). What ultimately led to the tremendous success of the negotiations for the final

Water Quality

FRESHWATER IS A scarce but essential resource, and its quality is of utmost importance as increasing numbers of people and living organisms depend on it for survival. While water scarcity from lack of quantity often receives more attention, water quality becomes more critical than quantity when available water is degraded or polluted. Water quality is important in the ways that it affects human health, livelihoods, agriculture, industry, recreation, and ecosystem services.

Lack of water quality can thus jeopardize socioeconomic development and environmental sustainability, and the availability of clean and good quality water is increasingly recognized as a key factor for sustainable development. Water quality issues are a serious problem in much of the developing world, where lack of access to clean and safe water leads to high rates of morbidity and mortality (e.g., two million children die each year due to inadequate sanitation and clean water). Globally, 1.1 billion people do not have access to safe drinking water, making water quality a serious global concern.

Water can be polluted from a variety of sources, both human-made and natural. Important sources of water pollution can be microbial (viruses, bacteria), chemical (metals, salts, pesticides/herbicides, solid waste), and radiological. Water quality can be measured using a number of parameters: pH, salinity, oxygen content, turbidity, color, odor/taste, dissolved chemicals, total suspended solids, biochemical oxygen demand, and dissolved oxygen. Common water quality treatments include aeration, chemical treatment, filtration, and ultraviolet light treatment. Water quality can be degraded via point source pollution (e.g., oil spills) or diffuse pollution (e.g., agricultural wastewater seepage).

Due to the connectivity of groundwater and surface water sources, the pollution of one may threaten the water quality of another connected source. As such, water pollution containment and monitoring is challenged by the flow and connective nature of water, as well as by increasing numbers of sources and types of pollution. How water quality is managed thus reflects society's priorities in water use and management, and the value placed on water quality. Water that is safe for organisms (plants and animals) to survive in, as well as for human use, is at the center of much of the environment-development debates; poor quality water affects different groups of organisms and human society differently across temporal and spatial scales. Given the dialectical nature of human-environment relationships, poor water quality that affects ecosystems also affects society, and vice-versa.

What is deemed to be acceptable levels of pollution of a water source depends on its use, linkages to other water sources, and costs of alternative water usage as well as cleanup or reduction of polluting sources. For instance, agricultural wastewater and industrial effluents can pollute a variety of water sources, making them unsuitable for domestic water purposes as well as aquatic species survival. Pathogens and microbial quality issues are important to humans in drinking water and the spread of waterborne diseases that can affect human society; similarly, overloading of organic matter and chemicals can reduce the ability for aquatic species to survive (e.g., by increasing the biochemical oxygen demand [BOD] to break down pollution). Water quality is generally monitored and regulated through systems of permits and fines that can act as deterrents to pollution or degradation of water sources. Water quality issues become a problem when different uses of a water source are directly threatened. Drinking water quality usually receives the most attention in water quality discussions. When a water source that provides drinking water is contaminated or polluted, it generally becomes important to address that more quickly than nonconsumptive water.

Irrigation water's quality, however, also needs to be monitored and ensured to prevent crop and soil damage and contamination. Dependency of livelihoods directly on water quality is also an important factor in how people value and organize around water quality issues. For instance, farmers who need good quality water for agricultural production are more likely to be concerned than those whose livelihoods are not directly dependent on irrigation water quality. Similarly, recreationalists may place greater importance on clearer water in lakes or rivers, while governments may deem that it is economically not viable to maintain such quality levels.

Societal power relations are reflected in the ways water quality is assessed, monitored, and judged.

Different societies will place different priorities and valuations on the water quality desired, and thus in the different levels of allowable quantities of pollutants in the water. As such, there aren't universal water quality indicators that are enforced, but there are international guidelines on safe levels and degradation indicators. These guidelines generally are followed by national governments and water authorities in areas of drinking water, wastewater treatment, recreational water facilities, and agricultural production. For instance, the World Health Organization (WHO) provides details of safe and allowable limits of the many pollutants (biotic and abiotic) for drinking water quality in order to maintain human health.

There can be different interpretation of the same data and quality issues, however, depending on the position of the viewer as well as broader societal understandings of what is deemed safe or unsafe. Notions of acceptable risk come to the fore, as different societies and people will perceive risk or threat from water quality differently. As such, different countries may follow slightly different sets of guidelines in monitoring and evaluating water quality for the different uses. In the United States, the Environment Protection Agency (EPA) is largely responsible for monitoring and evaluating water quality and setting guidelines. The Clean Water Act of 1977 is an example of one of the important regulatory mechanisms by which the EPA monitors and control wastewater pollution from industrial sources.

Conflicts over water uses can stem from the different valuations of water. For instance, the same water source may provide drinking water supplies as well as receive industrial and agricultural wastewater, thus necessitating management of the water source so that its quality is maintained for multiple uses. Economics, as well as value systems, also influence water quality issues due to the costs involved in maintaining or returning to a certain level of quality. Similarly, the attention to scale is important, as the scale of a water quality problem will influence the scale of treatment or management needed, and the number of actors involves as well as ecosystems influenced. As such, water quality management necessitates sufficient flexibility and responsiveness in surveillance, quality control, and management mechanisms in order to address different societal and environmental needs.

Given the growing scarcity of good quality water, increasing focus is being given to reusing water and increasing productivity from limited quantities of water. While such technological solutions provide important ways to use scarce water more efficiently and productively, questions remain about social access to safe water and the role of water quality in the broader political economy of development. As such, water quality is as much an environmental and technological question as a political and developmental one.

SEE ALSO: Clean Water Act (U.S. 1972); Safe Drinking Water Act (U.S. 1974); Sewage and Sewer Systems; Wastewater; Water; Water Conservation; Water Demand; Water Law.

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Watershed Management

A WATERSHED IS the land from which water drains into a stream, river, lake, or other body of water. All land, and the humans and wildlife found on that land, are part of a watershed. The term *watershed* is commonly used in North America, and