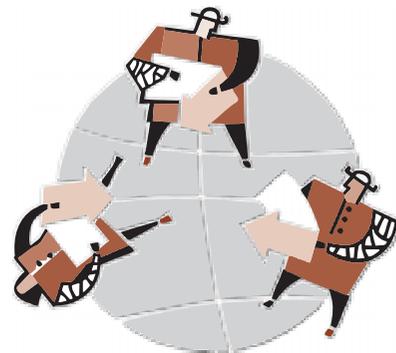


Environmental

Safeguarding
our planet's
resources is their
occupational
aim.



engineers



by Azure Reaser

Some workers get dirty to keep the environment clean. Environmental engineers are among those who get to the bottom—sometimes literally—of all types of problems afflicting the environment. Using theories they have learned, samples they have taken, and results they have analyzed, environmental engineers are at the forefront of environmental protection.

Not all environmental engineering tasks are mired in muck, however. Research, design, project management, and other responsibilities demand much of an environmental engineer's attention. As a result, few, if any, environmental engineers work exclusively outdoors. Some may spend a portion of their time out of the office, perhaps to survey or monitor a contaminated site, but are inside for most of the day. Others find that their job duties rarely take them into the nature they are working to protect.

This article will highlight what makes environmental engineers champions of clean. It describes their duties, employment and job outlook, earnings, and education and training requirements. Sources of additional information are provided at the end.

Keeping it clean

Using principles of biology and chemistry, environmental engineers develop ways to solve problems related to the environment. They are involved in both local and global environmental protection

efforts such as air and water pollution control, recycling, and waste disposal.

Environmental engineers' job duties include collecting soil or groundwater samples and testing them for contamination; designing municipal sewage and industrial wastewater systems; analyzing scientific data; researching controversial projects; and performing quality control checks. They also may conduct special studies, such as those for hazardous waste management, in which they evaluate the significance of a hazard, offer analysis on treatment and containment, and develop regulations to safeguard against mishaps. Or they may study and attempt to minimize the effects of large-scale problems such as acid rain, global warming, and ozone depletion.

Many environmental engineers work as consultants, helping their clients comply with regulations and the cleanup of hazardous waste sites. According to Environmental Engineer Klaus Peter Albertin of Research Triangle Park, North Carolina, an organization usually hires consultants when it is interested in developing or implementing a plan and does not have the resources or expertise to perform the task effectively. The current emphasis in environmental engineering consulting is on brownfields—land areas that are abandoned because of contamination by hazardous substances. Environmental engineers help clients clean up the brownfields for reuse in place of premium land, minimizing the liabilities and the costs of infrastructure or building projects. "It is a big, emerging field for consulting," says Staff Scientist Matt Findley of Fort Collins, Colorado.

The type of job environmental engineers have often determines whether they work inside or outside. However, most work inside a majority of the time. When working in offices, environmental engineers use standard equipment, including computers for word processing, facility design, and data analysis. A rapidly growing area in engineering computing is the use of Geographical Information Systems (GIS), which diagram layers of the earth through airplane and satellite photos to help environmental engineers pinpoint target areas. Albertin says that the analysis of GIS data is becoming an integral part of environmental engineering.

Environmental engineers whose tasks require site visits—for purposes such as collecting samples, checking quality control, and investigating sites for possible contamination—spend at least part of their time away from the office. Site visits are more likely to take environmental engineers to unpleasant surroundings than to pristine ones, but they also give engineers a chance to turn theory into reality. And working outside the office allows some environmental engineers to interact with people their work affects.

Green data: Earnings, employment, and outlook

Median annual earnings of environmental engineers were \$54,890 in 1999. The middle 50 percent earned between \$43,210 and \$68,080. The lowest 10 percent earned less than \$35,790, and the highest 10 percent earned more than \$83,730.

Environmental engineers held about 51,450 jobs in 1999. Most worked for

Azure Reaser is an economist in the Office of Occupational Statistics and Employment Projections, BLS, (202) 691-5682.

Federal, State, or local governments. Others worked in industries such as engineering, architecture, and surveying; management and public relations; and research, development, and testing.

Employment of environmental engineers is expected to increase through

Opportunities for environmental engineers fluctuate, in part, with trends in regulations.

2008. As the population grows, causing further stress on the environment, there will be an increasing need for intervention by environmental engineers. More environmental engineers also will be needed to help their clients meet environmental regulations, to develop methods of cleaning up existing hazards, and to research and develop new methods of solid waste disposal.

Opportunities in solid waste disposal are growing more slowly, however, because industries are starting to reduce the amount of waste they produce. As the



trend of regulation changes from pollution cleanup to prevention, environmental engineers will be able to shift their focus to public health, an area of growing concern. But trends in environmental protection and regulation constantly change, so environmental engineers keep abreast of a range of environmental issues to ensure steady employment.

Regulation is not the only thing affecting employment of environmental engineers. Their employment is expected to be less affected by economic conditions than that of most other types of engineers, but a significant economic downturn could reduce emphasis on environmental protection, thus reducing opportunities for environmental engineers. The cost of raw materials and disposal of waste and the economic returns from cleanups of contaminated sites and waste reduction also affect environmental engineering employment opportunities. In addition, political factors are more likely to determine the job outlook for environmental engineers than for other engineers: looser environmental regulations would reduce job opportunities, stricter regulations enhance them.

Preparing for Earth work

Environmental engineers should be creative, inquisitive, analytical, and detail oriented. They must have a strong grasp of mathematics, including algebra, geometry, trigonometry, and calculus; sciences, such as biology, chemistry, and physics; and computer systems. Abilities to work as part of a team and to communicate well also will be important as environmental engineers' jobs become more diversified and require interaction with specialists outside engineering. To hone these skills, recommended coursework includes English, social studies, and humanities.

A bachelor's degree in environmental or civil engineering is generally required for entry-level environmental engineering jobs. Of the 330 colleges and universities offering accredited bachelor's degree



programs in engineering, 34 offer programs in environmental engineering or related fields, such as environmental resources or systems engineering. Program accreditation, by the Accreditation Board for Engineering and Technology, is based on an engineering program's student achievement, program improvement, faculty, curriculum, facilities, and institutional commitment.

Bachelor's degree programs in engineering usually are designed to last 4 years, but many students take between 4 and 5 years to complete their studies. In a typical 4-year curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, humanities, and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. For example, the last 2 years of an environmental program might include courses in solid waste management, treatment plant design, hydraulic design, and hazardous waste management.

Some 4-year engineering programs admit students for the final 2 years of study after they have completed engineering studies at a 2-year college. Other engineering schools have consortium agreements with liberal arts colleges and universities. Students in these programs spend 3 years studying general subjects at a liberal arts school and 2 years studying core engineering subjects at an engineering school. Several colleges and universities offer 5-year master's degree programs;



others have 5- or 6-year cooperative plans that combine classroom study with practical work so that students can gain experience and earn money while in school.

Beginning environmental engineering graduates usually work under the supervision of experienced engineers and, in large companies, may receive formal

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classroom or seminar training. As new engineers gain knowledge and experience, they are assigned more difficult projects with greater independence to develop designs, solve problems, and make decisions. Environmental engineers may advance to become technical specialists or to supervise a team of engineers and technicians.

All 50 States and the District of Columbia require licensure for engineers whose work affects life, health, or property or who offer their services to the public. Several States also have imposed mandatory continuing education requirements for relicensure. Licensed engineers receive the designation of Professional Engineer and generally are required to have a degree from an accredited engineering

program, 4 years of relevant work experience, and a passing score on the State examination. Professional Engineers must be licensed in each State in which they practice, but most States recognize licenses from other States. As part of a two-stage process, recent graduates who pass an initial examination receive the certification of engineers in training or engineer interns, usually valid for 10 years. Then, after acquiring suitable work experience, these certified engineers take a second examination to complete the licensing process.

Exploring environmental resources

Reading this article is a good start for learning about opportunities in environmental engineering. Visit your local library or career counselor for periodicals and books, including the 2000-01 *Occupational Outlook Handbook*, that describe careers in environmental engineering and other environmental occupations. The *Handbook* also is available online at <http://www.bls.gov/ocohome.htm>.

For specific information on the occupation of environmental engineer, contact:

American Academy of Environmental Engineers

130 Holiday Court, Suite 100

Annapolis, MD 21401

(410) 266-3311

<http://www.enviro-engrs.org>

For general information about a variety of engineering disciplines, including environmental engineering, contact the Junior Engineering Technical Society. Send a self-addressed, business-size envelope affixed with six first-class stamps to:

JETS, Inc.

1420 King St., Suite 405

Alexandria, VA 22314-2794

(703) 548-5387

<http://www.jets.org>

For information about accredited engineering programs, contact:

Accreditation Board for Engineering and Technology, Inc.

111 Market Place, Suite 1050

Baltimore, MD 21202-4012

(410) 347-7700

<http://www.abet.org>

For information about Professional Engineer licensure, contact:

National Society of Professional Engineers

1420 King St.

Alexandria, VA 22314-2794

(703) 684-2800

<http://www.nspe.org>

For information about general engineering education and engineering careers, contact:

American Society for Engineering Education

1818 N St. NW., Suite 600

Washington, DC 20036-2479

(202) 331-3500

<http://www.asee.org>

Information about engineering jobs in the Federal Government is available from the Office of Personnel Management. Check your telephone directory under U.S. Government for a local number, or call (912) 757-3000; persons with hearing impairments may call the Federal Relay Service's TTY line, 1 (800) 877-8339. Information about Federal Government jobs also is available online at <http://www.usajobs.opm.gov>.

