BLS
U.S. BUREAU OF LABOR STATISTICS

Careers in Environmental Remediation

James Hamilton

September 2012 — Report 8

Cleaning up the environment is an important focus of the green economy. Sites that are polluted because of industrial activity, the use of pesticides and fertilizer, or the release of other pollutants must be cleaned up in order to redevelop them or return them to their natural state.

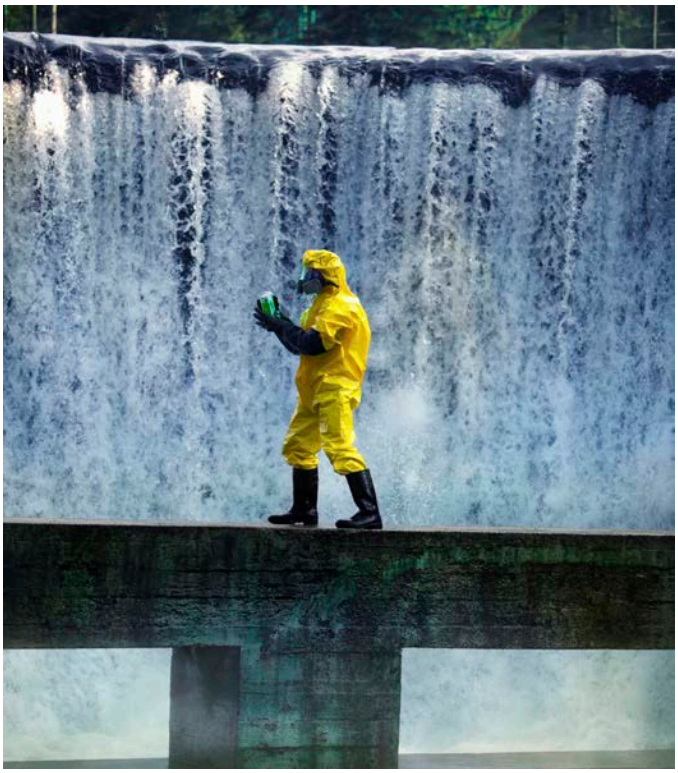
Prior to the enactment of modern environmental regulation, many companies simply released hazardous materials into the environment. They would dump chemicals and other pollutants onto unused land or into lakes, rivers, and streams. Sites also would become polluted through accidents or improperly functioning equipment. Polluted sites that can be cleaned and redeveloped are known as brownfield sites.[1]

Environmental professionals use a number of technologies to clean up polluted sites, a process known as environmental remediation. Many companies specialize in environmental remediation, and they employ a wide variety of workers. This report provides information on careers in environmental remediation. The first two sections describe types of remediation and some of the technologies used in the remediation process. The final section profiles key occupations in environmental remediation. The information for each occupation includes a brief job description; the credentials needed to work in these occupations, such as education, training, certification, or licensure; and wage data.

James Hamilton is an economist in the Office of Occupational Statistics and Employment Projections, BLS. James is available at (202) 691-7877 or **hamilton.james@bls.gov**.

What is environmental remediation?

Environmental remediation is the removal of pollution or contaminants from water (both ground water and surface water) and soil. These waste products are removed for the protection of human health, as well as to restore the environment. Remediation restores brownfield sites either for redevelopment or to return them to their natural state. Sites that have been used to dispose of hazardous waste



present a unique challenge to clean up. Many of these sites, known as Superfund sites, fall under federal regulations and are overseen by the Environmental Protection Agency (EPA). The EPA coordinates the cleanup of these sites, requiring the responsible party either to perform the cleanup or reimburse the government for EPA-led cleanups.[2] Environmental remediation is highly regulated and subject to an array of legal requirements, which are generally based on assessments of human health and environmental risks.

Remediation projects can range from large, expensive projects, on which a great deal of effort is spent to clean up contaminated sites, to smaller, less costly projects, such as cleaning up a highway accident in which oil is spilled. In some cases, a site is so contaminated that it can only be fenced off and isolated as much as possible from the rest of the environment. Remediation projects usually begin with a site assessment to determine the costs of the project, as well as the technology that would be the most appropriate for the particular site.

Types of environmental remediation

Environmental remediation is carried out on various environmental media, including soil, sediment, groundwater, and surface water. This article classifies remediation according to whether it is done on water or soil. Water remediation includes both groundwater and surface water, whereas soil remediation includes topsoil, subsoil, and sediment. Soil and water remediation may be conducted separately or together, depending on the type and extent of the pollution.

Water remediation is the process of removing contaminants from water. Surface water in lakes, streams, and rivers can be directly contaminated by pollutants released directly into the water or by runoff from the ground. Groundwater, which is the underground water that saturates porous material, can become polluted by contaminants seeping through the soil and sediment above it. The majority of the population of the United States depends upon groundwater as a source of drinking water and for agricultural use. Many areas have experienced groundwater pollution from waste materials that were disposed of or stored incorrectly on land, where they percolated into the soil and were eventually carried down into the groundwater. Groundwater pollution also has occurred as the result of industrial practices such as mining or drilling for natural gas and oil.

Soil remediation refers to strategies that are used to purify and revitalize the soil. Soil contamination is caused by many of the same factors that cause groundwater contamination. Often, the soil and groundwater are contaminated from the same source and both must be remediated at the same time. Soil contamination can result from chemical spills, industrial activity, and the use of certain fertilizers and pesticides.

Environmental remediation may also be classified as in-situ or ex-situ. In-situ remediation methods treat the contamination on the site without removing soil, while ex-situ remediation involves excavating soil or sediment and treating it, before returning it to its original state.

Environmental remediation methods

Environmental remediation uses a wide variety of technologies and methods for cleaning up contaminated areas. The methods used at a particular site depend on the type and extent of the pollution, as well as the characteristics of the site itself. Areas where pollution has seeped deep into the ground and groundwater require different methods than areas where a small amount of chemical has been spilled on the topsoil. There are many different remediation methods, and new technologies are regularly being developed. This section briefly describes a few of the technologies and methods of remediation.

Site assessment and mapping

Prior to beginning a remediation project, the site in question must be assessed to ascertain what types of contaminants are involved and to determine the most appropriate technologies for cleaning it up. Assessments must be made to identify any potential hazards to the workers who will be working on the project and to assess the impact that pollution might have on the local community, as well as its overall environmental impact. A site assessment also includes estimates of potential costs and needed resources.

In the assessment, the site is mapped to determine its physical characteristics, its overall size, and the location of contaminants. Once the site is thoroughly mapped and the scale of the cleanup operation is determined, the organization performing the cleanup must comply with local, state, and federal regulations, which typically

require a detailed plan for the operation of the site. Environmental remediation is heavily regulated by a number of government organizations, so cleanup crews must work closely with regulatory agencies to ensure that requirements are met.

Excavation and dredging

Excavation involves removing contaminated soil or other materials from a site. This is the most common form of soil remediation. The process can be as simple as hauling the soil away and replacing it with uncontaminated soil, or it might involve more complex processes such as aeration (the circulation of air through a substance) or bioremediation (described later in the bioremediation section). If soil is contaminated with pollutants that cannot be safely removed, such as radioactive or nuclear waste, the soil is excavated, placed into secure containers, and hauled off to a secure storage facility.

Dredging is the removal of underwater sediments. This is done with special equipment operated from the shoreline, or from barges and ships. A dredge is a device for scraping or pumping solid material from the bottom of rivers, lakes, and other bodies of fresh or salt water.

Pump and treat

Pump and treat involves pumping contaminated ground water out of the ground and purifying it before returning it to the ground. A vacuum pump brings water to the surface, where it is treated with a variety of techniques, depending on the type of contamination. If the water is contaminated with petroleum products, for example, the water is treated with activated carbon, which binds with the chemicals in a solid form and allows them to be separated from the water. The water might also be run through various types of filters to remove certain contaminants, or be treated with biological agents. Another technique used to clean polluted groundwater is air stripping, during which certain contaminants are vaporized and sucked into an airstream to be separated and removed.

Solidification and stabilization

Solidification involves adding materials to a site that bind to certain contaminants. Although this does not remove the contaminants from the environment, it prevents the contamination from spreading to a wider area or from potentially contaminating groundwater. For example, a remediation project would mix contaminated soil with cement to form a solid block, trapping pollutants and preventing rain from spreading contamination over a wider area.

Stabilization uses materials that react chemically with contaminants. These materials alter the makeup of the contaminant and make it either less hazardous or easier to contain or remove by binding with

contaminants and preventing their spread. Stabilization is often used on sites that are contaminated with heavy metals such as arsenic and mercury.

Oxidation

Oxidation technologies use strong oxidants, which increase the oxygen content of the soil or ground water. In this process, a chemical oxidant such as hydrogen peroxide is pumped into the ground, where it mixes with the groundwater and soil to break down certain chemicals before being pumped back to the surface. In some cases, oxidation is used to increase the oxygen content of the soil or groundwater, enhancing the growth of naturally occurring bacteria and other microbes. These organisms help to break down certain types of chemical pollution.

Soil vapor extraction

Soil vapor extraction is a remediation technique that purifies the soil and groundwater at the same time. Air or steam is injected into the ground by a system of blowers and injection wells. The vapors are then extracted and treated as necessary. Soil vapor extraction is used to treat a variety of contaminants, especially petroleum products.[3]

Bioremediation

Bioremediation is the use of microorganisms to remove pollutants from the soil or water. This is done either by treating contaminated materials at the site or by removing contaminated materials that are then treated elsewhere. Different microorganisms are used to remove contaminants and are usually uniquely suited for certain types of chemicals. Among these microorganisms may be fungi, bacteria, or certain plant species. Bioremediation is in common use for oil spills, because microorganisms are extremely effective in breaking down many of the chemicals found in oil. This technique is often much less expensive than other technologies, but usually takes longer to fully decontaminate a site.

These and other methods or technologies in environmental remediation are described in further detail in the Citizens Guide series from the Environmental Protection Agency.[4]

Environmental remediation occupations

Several types of workers are involved in each step of a remediation project. Managers oversee the project at each stage. Business specialists who work in environmental remediation are experts in regulation issues, cost estimation, or public relations. Cartographers and photogrammetrists create maps and charts of the contaminated areas. Scientists and engineers determine the most effective methods of cleaning up a site and perform tests to determine the extent of the contamination and to monitor the progress of the remediation project. Construction workers and operators of various types of heavy equipment carry out the day-to-day work on the project.

Workers in environmental remediation might be employed by companies in architectural, engineering, and related services industries; by management, scientific, and technical consulting firms; or by state, local, or federal government agencies.[5]

The Bureau of Labor Statistics (BLS) does not have data specifically for workers in environmental remediation. However, BLS does have information on jobs associated with producing green goods or providing green services from its Green Goods and Services (GGS) survey. The survey found that there were 284,889 GGS private sector workers in the Waste Management and Remediation Services Industry in the United States in 2010.[6] The data include waste management and recycling workers, in addition to those working solely in environmental remediation. An alternative study of green jobs by the Brookings Institution counted 56,241 jobs in remediation in 2010.[7]

Management and business specialist occupations

Management and business specialists handle the administrative work of an environmental remediation project. These people are typically office workers who plan and organize remediation projects, as well as those who supervise the workers cleaning up a site.

Compliance officers are specialists in the various local, state, and federal laws and regulations involved in environmental remediation. Remediation is highly regulated, so these specialists must be aware of pertinent regulations and ensure that whoever is managing the project is in compliance with them. In addition, remediation work can be hazardous, so the compliance officer must ensure that workers follow safety regulations.

Construction managers coordinate and supervise many of the on-site operations. They oversee construction workers and heavy-equipment operators to ensure a productive and safe work environment. They make sure that jobs are completed on time and on budget with the right amount of tools, equipment, and materials. Many managers also are responsible for obtaining necessary permits and licenses. They often are responsible for multiple projects at a time.

Cost estimators collect and analyze data to estimate the time, money, resources, and labor required for a remediation project. They make allowances for wasted material, bad weather, delays, and other factors that can increase the costs of the project. Cost estimators use sophisticated computer software, including databases, simulations, and mathematical programs. Frequently, a project is compared with similar projects to provide estimates.

Emergency management directors coordinate responses to emergencies. They might be called to manage the response to unforeseen events, such as an oil spill or a release of hazardous materials. They coordinate the emergency response to these incidents and begin planning for cleanup and management of the incident.

Natural sciences managers supervise scientific professionals involved in a remediation project. Because remediation involves a variety of technologies, many scientists from different disciplines might be involved in these projects. Natural science managers oversee and coordinate the efforts of these different scientists.

Public relations specialists are responsible for keeping the public informed about remediation projects. This is especially important if an accident such as an oil spill has caused an area to be polluted. Public relations specialists compile information given to them from others working on the project and present it to the public in a clear and concise way. They deal with members of the media and the general public to answer questions and provide information.

Credentials

Compliance officers have a bachelor's degree in business or a related field, plus knowledge of relevant laws and regulations. Compliance officers also typically undergo moderate-term on-the-job training lasting from 1 month to 1 year. Cost estimators usually enter the field with a bachelor's degree in math, accounting, or a related field. Public relations specialists also typically need a bachelor's degree, plus excellent written and verbal communications skills. They also need moderate-term on-the-job training.

Construction managers typically require an associate's or bachelor's degree in construction management, or business management with experience in construction. Other construction managers do not have a degree, but have moved into the position through work experience, though this is becoming less common. Natural sciences managers typically have a bachelor's, master's or doctoral degree in one of the natural sciences plus several years of work experience as a scientist. Emergency management directors typically need at least a bachelor's degree plus several years of relevant work experience. They also need a year or more of on-the-job training.

Emergency management directors typically need at least a bachelor's degree plus several years of relevant work experience. They also need a year or more of on-the-job training. Natural sciences managers typically have a bachelor's, master's, or doctoral degree in one of the natural sciences plus several years of work experience as a scientist.

Public relations specialists also typically need a bachelor's degree plus excellent written and verbal communications skills. They also need moderate-term on-the-job training.

Wages

BLS currently does not have wage data specific to the environmental remediation industry. The table that follows shows wages for selected management and business specialist occupations in the waste management and remediation services industry group for May 2011. The wages shown are median annual wages for the United States as a whole; wages vary by employer and location.

Selected management and business specialist occupations	Median annual wages, May 2011[1]
Compliance officers	$60,370
Construction managers	89,920
Cost estimators	67,680
Emergency management directors	77,690
Natural sciences managers	96,710
Public relations specialists	62,190

[1] Occupational Employment Statistics data are available at **www.bls.gov/oes**. The data do not include benefits.

Science occupations

Science workers perform studies of the areas that will be remediated and help to determine the best ways to conduct the remediation. They perform tests to see which pollutants are present at a remediation site and determine the most effective technology for removing or remediating each pollutant. These scientists might spend time outdoors studying the site or have technicians perform the site work. They might spend time in a laboratory testing soil or water samples collected at potential remediation sites.

Occupations in scientific research and development have become increasingly interdisciplinary, and as a result, it is common for scientists and engineers to work together as part of a team.

Biochemists and biophysicists study the chemical and physical composition of living things and biological processes such as cell development, growth, and heredity. They use laboratory instruments and equipment to conduct scientific experiments and analysis. Biochemists and biophysicists study the biological effects of pollutants and the effect of these pollutants on the local environment. They also study organisms that are used in bioremediation.

Chemists study the structures, compositions, reactions, and other properties of substances. They investigate the characteristics of chemicals that have caused a site to be contaminated and those used to remediate the site. When new chemicals are introduced into the soil or water for the purposes of remediation, chemists must ensure that those chemicals do not cause additional harm and will be effective in the removal of pollution.

Chemical technicians use special instruments and techniques to help chemists and chemical engineers in researching, developing, and producing chemical products and processes. They assist chemists and other scientists with testing chemical pollutants or with processes for cleaning them up. They might help with experiments on chemical processes, as well as helping to compile and interpret test results and analyses.

Conservation scientists oversee the overall land quality of remediation sites. They work with landowners and government agencies to devise ways to improve the land and safeguard the environment. They evaluate data on soil

and water quality and assess damage to the land from pollution. They help to monitor the remediation process.

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment. Environmental scientists have a broad knowledge of biology, chemistry, and physics. They work to reclaim lands and waters that have been contaminated by pollution and work with other scientists and engineers to determine the most effective and safest ways to clean up a site.

Environmental science and protection technicians conduct laboratory and field tests to monitor the environment and investigate sources of pollution. They also conduct tests during the process of remediation to determine the progress of the remediation project.

Geoscientists study the physical aspects of the land. They determine the makeup of the soil and the underlying geology of the area. They work with other scientists and specialists to determine the effects and extent of pollution and the techniques that would be the most economical for remediation.

Hydrologists study water and the water cycle. They determine the water cycle at a contaminated site and the overall effects of pollution on the local water supply. They study ground water, as well as local water sources such as rivers, lakes, and streams, to monitor the flow of contaminants across different bodies of water. Pollutants can seep into the ground and pollute the ground water and then can move into streams, rivers, and lakes, where they might eventually end up in sources of drinking water.

Microbiologists study the growth, development, and other characteristics of microscopic organisms such as bacteria, algae, and fungi. Bioremediation techniques require the use of microorganisms to remove contaminants, and microbiologists determine which organisms would be best for a particular site. They also monitor the progress of the site as the bioremediation is carried out, collecting samples and analyzing them.

Credentials

Entry-level education for scientist occupations varies from an associate's degree for technicians to a Ph.D. for biochemists and biophysicists. Hydrologists typically need a master's degree to enter the occupation. A bachelor's degree may be sufficient to enter some of the scientist occupations, but a master's or Ph.D. is typically required to conduct research. Scientists must have a variety of skills and important qualities. Computer skills are essential for the majority of scientists because computers are used heavily for data analysis and integration, digital mapping, remote sensing, and the construction of computer models. Scientists must also have excellent written and verbal communications skills, because they must present their findings to other members of a remediation team, including those without a science background.

Environmental science and protection technicians and chemical technicians typically need an associate's degree or comparable postsecondary education. Programs are offered at technical or community colleges and involve classes in mathematics, physics, biology, and chemistry, as well as a significant amount of laboratory time to learn how to use various instruments and techniques.

Wages

BLS currently does not have wage data specific to the environmental remediation industry. The table that follows shows wages for selected science occupations in the waste management and remediation services industry group for May 2011. The wages shown are median annual wages for the United States as a whole; wages vary by employer and location.

Selected science occupations	Median annual wages, May 2011[1]
Biochemists and biophysicists[2]	$79,230
Chemists	58,860
Chemical technicians	41,620
Conservation scientists[2]	59,530
Environmental scientists and specialists, including health	64,670
Environmental science and protection technicians, including health	45,720
Geoscientists, except hydrologists and geographers	67,030
Hydrologists[2]	75,680
Microbiologists[2]	65,230

[1] Occupational Employment Statistics data are available at **www.bls.gov/oes**. The data do not include benefits.

[2] Wage data for biochemists and biophysicists, conservation scientists, hydrologists, and microbiologists are not available for the waste management and remediation services industry group. The data here represent wages for the occupation as a whole.

Engineering and mapping occupations

Engineers who work in environmental remediation devise technical solutions for cleaning up pollution. They work closely with scientists and other remediation workers to implement the best methods for remediating polluted areas. They also might be responsible for developing methods to increase safety and to reduce the risk of illness and injury for a company's employees.

Engineers are employed by a variety of organizations, including businesses, government agencies, and consulting firms. Most work in offices or laboratories, but they might travel frequently to remediation sites.

Cartographers and photogrammetrists measure, analyze, and interpret geographic information to create maps and charts. The maps and charts detail areas of contamination, as well as the physical characteristics of the site where remediation will be carried out. Cartographers and photogrammetrists usually work in offices, but might also travel to the field to collect data.

Chemical engineers apply the principles of chemistry, biology, and physics to develop remediation techniques. Much contamination is chemical in nature, and many remediation technologies use chemical processes to deal with contaminants.

Environmental engineers use the principles of engineering, soil science, biology, and chemistry to solve environmental problems. They work to control pollution, clean up polluted areas, and monitor the progress of remediation projects.

Environmental engineering technicians carry out the plans that engineers develop. They test, operate, and, if necessary, modify equipment that is used for the cleanup of environmental pollution. They might collect samples for testing, or work to mitigate sources of environmental pollution. They might also assist in the inspection of the site for compliance with regulations.

Health and safety engineers develop procedures and design systems to keep people from getting sick or injured and to keep property from being damaged. They combine knowledge of health or safety with systems engineering techniques to make sure that chemicals and other products are not harmful. In remediation projects, they ensure that workers are safe from contaminants.

Mining and geological engineers use geology to evaluate potential remediation sites. They study the geology of the local area and work with geoscientists and other scientists and engineers to determine the most effective techniques for remediating a particular area.

Credentials

Cartographers and photogrammetrists require a bachelor's degree in geography, engineering, or physical science. Some states require cartographers and photogrammetrists to be licensed as surveyors, and some states have specific licenses for photogrammetrists.

Engineers must have at least a bachelor's degree in their specific engineering field. Many engineers are certified as a professional engineer (PE), a certification that requires several years of work experience as well as passing written exams. Employers also value practical experience, so many engineers start out assisting more senior engineers, and with experience, they take on more responsibility and more complex projects.

Environmental engineering technicians typically have an associate's degree from a technical or community college.

Wages

BLS currently does not have wage data specific to the environmental remediation industry. The table that follows

Selected engineering and mapping occupations	Median annual wages, May 2011[1]
Cartographers and photogrammetrists[2]	$55,970
Chemical engineers	101,040
Environmental engineers	81,970
Environmental engineering technicians	41,310
Health and safety engineers, except mining safety engineers and inspectors	75,770
Mining and geological engineers, including mining safety engineers[2]	84,300

[1] Occupational Employment Statistics data are available at **www.bls.gov/oes**. The data do not include benefits.

[2] Wage data for cartographers and photogrammetrists and for mining and geological engineers are not available for the waste management and remediation services industry group. The data here represent wages for the occupation as a whole.

shows wages for selected engineering and mapping occupations in the waste management and remediation services industry group for May 2011. The wages shown are median annual wages for the United States as a whole; wages vary by employer and location.

Construction and material-moving occupations

Construction and material-moving workers operate the machinery that is used onsite in a remediation project. These workers might be exposed to contaminants and might be required to wear safety gear such as chemical protective suits and breathing apparatus.

Construction laborers do many of the basic tasks on remediation sites. These workers do physically demanding work, such as removing debris and possible hazards, loading and unloading materials, digging trenches, and operating machinery. Construction laborers are used when there is no danger of exposure to dangerous chemicals or when the site has been made safe for them to work. If the site is contaminated to the point where it poses a health or safety hazard to other workers, it will be decontaminated by hazardous materials removal workers.

Dredge operators excavate waterways. They remove sand, gravel, or rock from bodies of water that have become contaminated. They might operate from land-based dredges or those mounted on barges or ships to remove material that is then either disposed of or treated to remove hazardous materials.

Earth drillers operate machinery that is used to drill into the earth. Because many remediation techniques involve drilling deep into the ground to remove pollution in the groundwater or below the top layers of soil, drills are used to reach the deep layers of rock and sediment underground. Drillers are needed for pump-and-treat techniques and are used occasionally for other techniques when the pollution has seeped deep underground.

Excavating and loading machine and dragline operators use machines equipped with scoops or shovels. They dig sand, earth, or other materials and load them onto conveyors or trucks for treatment or transport to disposal sites.

Hazardous materials removal workers identify and dispose of materials that are flammable, corrosive, reactive, or toxic. They are responsible for cleaning up sites that

are severely contaminated and must be made safe for other workers to enter. They might deal with sites that have chemical, biological, or even radioactive waste and must wear special suits and respirators to keep them safe from these materials. They must be familiar with the procedures for handling and disposing of certain types of hazardous waste.

Operating engineers and other construction equipment operators drive, maneuver, or control the heavy machinery used in remediation projects. They work with one or several types of power construction equipment and might operate excavation and loading machines equipped with scoops, shovels, or buckets that dig sand, earth, gravel, or similar materials.

Credentials

These construction and material-moving workers require on-the-job training to become competent in their occupations. Construction laborers and dredge operators generally undergo on-the-job training that lasts 1 month or less and do not need formal education. Excavating and loading machine operators also do not need formal education, but typically have prior work experience as construction laborers or construction equipment operators. They typically undergo moderate-term on-the-job training that can last between 1 month and 1 year. Equipment operators and earth drillers typically have a high school diploma or equivalent and also require moderate-term on-the-job training.

Hazardous materials removal workers typically enter the occupation with a high school diploma or the equivalent and are required by the federal government to complete formal training programs, such as an OSHA-certified HAZWOPER training course that lasts approximately 40 hours. They also need to be trained in the proper handling and disposal of hazardous materials and in any safety equipment they might be required to use, such as respirators or self-contained breathing apparatus.

Wages

BLS currently does not have wage data specific to the environmental remediation industry. The table that follows shows wages for selected construction and material moving occupations in the waste management and remediation services industry group for May 2011. The wages shown are median annual wages for the United States as a whole; wages vary by employer and location.

Selected construction and material moving occupations	Median annual wages, May 2011[1]
Construction laborers	$34,600
Dredge operators[2]	33,530
Earth drillers, except oil and gas	44,550
Excavating and loading machine and dragline operators	38,860
Hazardous materials removal workers	37,440
Operating engineers and other construction equipment operators	38,910

[1] Occupational Employment Statistics data are available at **www.bls.gov/oes**. The data do not include benefits.
[2] Wage data for dredge operators are not available for the waste management and remediation services industry group. The data here represent wages for the occupation as a whole.

Conclusion

Environmental remediation is an important sector of the green economy. Whether polluted through years of industrial activity or by inadvertent releases of contaminants, land areas and bodies of water must be remediated to restore them to their natural state or to make them suitable for redevelopment.

Remediation occupations require a broad range of education and experience levels. Although some of the occupations mentioned in this article require at least a bachelor's degree, there are many opportunities for individuals with less than a college degree and for those with a wide variety of work experience and knowledge.

As polluted sites continue to be identified, there will continue to be demand for remediation workers.

Notes

[1] *Brownfields and Land Revitalization* (U.S. Environmental Protection Agency, 2012), **http://www.epa.gov/brownfields/basic_info.htm**.

[2] *Basic Information, Superfund* (U.S. Environmental Protection Agency, 2012), **http://www.epa.gov/superfund/about.htm**.

[3] *Soil Vapor Extraction (SVE)* (U.S. Environmental Protection Agency, 2001), **http://www.epa.gov/oust/cat/SVE1.HTM**.

[4] *A Citizen's Guide to Soil Excavation* (U.S. Environmental Protection Agency, 2001), **http://www.clu-in.org/products/citguide**.

[5] *BLS Occupational Employment Statistics,* Bulletin 17-2081, Environmental Engineers (U.S. Bureau of Labor Statistics, May 2011), with collaborating data from other OES designations in environmental remediation.

[6] Green Goods and Services (GGS) Survey (U.S. Bureau of Labor Statistics, 2012), table 3, **http://www.bls.gov/news.release/ggqcew.t03.htm**.

[7] *Sizing the Clean Economy: A National and Regional Green Jobs Assessment* (Washington, DC, The Brookings Institution, 2011) p.20.