



ENVIRONMENTAL ENGINEERING

Discipline Guide

Introduction

The University of British Columbia (UBC) offers a top-tier undergraduate environmental engineering program (ENVL) in Canada. The program focuses on collaborative, team-based learning, preparing students with the skills and knowledge to pursue fulfilling careers as environmental stewards. It is a world-class degree, developed through a strong partnership between UBC's Departments of Chemical & Biological Engineering and Civil Engineering. Environmental Engineering graduates help solve many of the most pressing issues facing humankind in the 21st century, including: the provision of a safe and potable water supply; the design and management of processes to minimize or eliminate pollution, promote sustainability and protect human and ecosystem health; and overcoming and eliminating the challenges posed by climate change.

This guide is meant to act as a resource for potential career paths of an environmental engineer upon graduation. This document is meant to provide an overview of the industries and companies that chemical engineers may work for. This is not a comprehensive list, and the descriptions of each industry provided below are also generalized and are the opinion of a single or a few individuals, and some statements may be anecdotal. The information here has been gathered through personal experience, discussion with members of industry, or online research. They may not necessarily apply to every company in that industry.

Industries

There are many industries that environmental engineers can work in based on their interests and passion. This section is meant to provide an overview of the industries that environmental engineers may work for.

CONSULTING FIRMS

Consulting firms are organizations contracted by other companies to design, research, and solve problems. A term you may hear frequently in the consulting industry is EPC: Engineering, Procurement, Construction. The scope of work that consulting firms complete varies depending on the client's needs. Projects could involve detailed design, high-level proof of concept, financial feasibility, and everything in between. People tend to gravitate towards consulting if they are interested in working on a broad range of projects that continuously evolve and change on a case-by-case basis. If you choose to work in consulting, be prepared to work in multi-disciplinary teams comprised of engineers from various backgrounds and non-engineers. In general, consulting roles will involve occasional site visits (potentially international) and frequent stakeholder discussions.

ENVIRONMENTAL ENGINEERING

GOVERNMENT AGENCIES

Environmental engineers frequently secure positions within government agencies, operating at the local, provincial, or federal levels. In these roles, they actively contribute to the formulation and execution of comprehensive environmental policies, regulations, and programs. Beyond policy-related responsibilities, environmental engineers may find themselves engaged in diverse aspects of project management, design, and procurement processes. Their expertise extends across various sectors, including water management, air quality enhancement, and sustainable land development. This multifaceted involvement underscores the significance of environmental engineers in overseeing the practical implementation of regulatory frameworks while ensuring the integration of sustainable practices across different domains of environmental management.

RENEWABLE ENERGY

Environmental engineers in the energy sector are instrumental in addressing environmental concerns related to energy production and consumption. They actively contribute to renewable energy projects, conducting thorough Environmental Impact Assessments (EIAs) to identify and mitigate potential adverse effects on ecosystems, air, and water quality. Their responsibilities extend to managing air emissions, optimizing energy efficiency, and implementing technologies like Carbon Capture and Storage (CCS) to reduce carbon footprints. Environmental engineers also ensure compliance with environmental regulations, manage water resources sustainably, and engage with local communities to address concerns. Biodiversity conservation, research and development, and emergency response planning are additional aspects of their multifaceted role. Through their efforts, environmental engineers in the energy sector aim to strike a balance between meeting energy demands and promoting sustainability while minimizing environmental impact.

WATER AND WASTEWATER TREATMENT

Environmental engineers specializing in water and wastewater treatment play a critical role in safeguarding water resources and public health. They design, implement, and optimize treatment processes to ensure the provision of safe and clean water for communities. Their responsibilities include developing strategies for the sustainable management of water supplies, addressing water pollution issues, and managing wastewater treatment systems. Environmental engineers in this sector focus on removing contaminants, such as chemicals and pathogens, from water sources, implementing innovative technologies, and ensuring compliance with environmental standards. They may also engage in the design and maintenance of infrastructure for water distribution and sewage systems. Additionally, these professionals contribute to research and development initiatives aimed at advancing water treatment technologies and promoting efficient and environmentally friendly practices within the water and wastewater treatment sector.

MINING INDUSTRY

Environmental engineers play a crucial role in the mining industry by addressing environmental challenges associated with extraction and resource utilization. Their responsibilities encompass designing and implementing sustainable mining practices that minimize environmental impact, including soil erosion, water contamination, and habitat disruption. Environmental engineers collaborate with mining companies to develop and execute environmental management plans, ensuring compliance with regulations and mitigating the effects of mining operations on ecosystems. They employ innovative technologies for waste management, tailings disposal, and pollution control, contributing to the responsible and environmentally conscious extraction of minerals. Additionally, environmental engineers conduct environmental impact assessments to evaluate the potential consequences of mining activities, and they work towards implementing strategies for land reclamation and ecosystem restoration after mining operations conclude. Through their expertise, environmental engineers aim to strike a balance between resource extraction and environmental conservation in the mining sector.



ENVIRONMENTAL ENGINEERING

TRANSPORTATION INDUSTRY

Environmental engineers are integral to the transportation sector, where they focus on addressing environmental challenges associated with various modes of transportation. They contribute to the development and implementation of sustainable transportation solutions by working on projects aimed at reducing air and noise pollution, improving fuel efficiency, and minimizing environmental impact. Environmental engineers design and implement strategies for enhancing public transportation systems, promoting the use of electric and hybrid vehicles, and optimizing traffic flow to reduce emissions. They are involved in air quality management around transportation hubs, implementing green infrastructure, and developing environmentally friendly technologies. Additionally, environmental engineers collaborate with urban planners and policymakers to integrate sustainable practices into transportation infrastructure, contributing to the overall goal of creating more eco-friendly and efficient transportation systems. Through their efforts, they play a key role in mitigating the environmental footprint of the transportation sector.

Career Paths

Environmental engineers have various career paths available to them, as they play a crucial role in addressing environmental challenges. Some of the career paths for environmental engineers have been outlined here.



WATER RESOURCE ENGINEER

- Responsibility: to effectively manage, develop, and protect water resources to meet the needs of society while preserving the health of ecosystems and the environment. Water resources engineering encompasses a wide range of activities and objectives aimed at ensuring the sustainable use and management of water.

Water resource engineers work on projects related to water supply, distribution, treatment, and wastewater management. They design systems to ensure clean and safe drinking water and proper disposal of wastewater.

WASTE-WATER MANAGEMENT ENGINEER

- Responsibility: to protect public health, the environment, and water resources by effectively and safely removing contaminants and pollutants from sewage and wastewater.

Waste-water management engineers focus on the collection, treatment, and disposal of wastewater or sewage. Wastewater engineering is essential for protecting public health and the environment by managing and purifying the water that is contaminated by human activities before it is released back into natural water bodies or returned to the environment.

AIR POLLUTION CONTROL ENGINEER

- Responsibility: to improve air quality, reduce the emissions of harmful pollutants into the atmosphere, and protect public health and the environment

An air quality engineers focus on managing and improving air quality. They work on projects related to air pollution control, emissions reduction, and monitoring air quality standards.

CONTAMINATED SOIL REMEDIATION AND TRANSPORT ENGINEER

- Responsibility: primarily revolves around protecting human health, safeguarding the environment, and restoring contaminated sites to safe and functional conditions.

Contaminated soil remediation and contaminant transport engineers are professionals who specialize in addressing soil and groundwater contamination issues. Their work involves assessing, mitigating, and remediating contaminated sites to protect human health and the environment.



ENVIRONMENTAL ENGINEERING

ENVIRONMENTAL ASSESSMENT AND ENVIRONMENTAL LAW ENGINEER

- Responsibility: to evaluate the potential environmental, social, and economic impacts of proposed projects, policies, or activities before they are carried out.

Environmental consultants work for consulting firms or as independent contractors. They provide expertise to organizations and government agencies, helping them comply with environmental regulations, assess environmental impacts, and develop strategies for sustainability and pollution prevention.

RECYCLING AND RESOURCE RECOVERY ENGINEER

- Responsibility: To develop and implement innovative and sustainable technologies and processes that extract valuable resources from waste and wastewater streams while minimizing environmental impacts and promoting resource conservation. This field focuses on converting waste materials into valuable products, energy, or materials that can be reused or repurposed.

Resource recovery engineers are professionals who specialize in developing and implementing technologies and strategies to recover valuable resources from waste and wastewater streams. Their work focuses on maximizing the efficient and sustainable extraction of materials, energy, and other resources from various waste sources.

Skills for Development

Since environmental engineering is a broad program with various career paths, it is hard to pin down exactly what skills each student will learn by the time they graduate, as that heavily relies on the student's interest, co-op experience, and individual effort. Here are some of the more common skills beyond technical communication that is common within the field of environmental engineering.

PROFICIENCY IN MICROSOFT EXCEL

Proficiency in Excel is crucial for environmental engineers due to its versatile applications in data analysis, modeling, and project management within the field. Excel enables engineers to organize and manipulate large datasets efficiently, facilitating the analysis of environmental parameters, monitoring trends, and assessing the impact of various factors. Environmental engineers often use Excel to create complex models for environmental simulations, allowing them to predict and evaluate potential outcomes, such as pollutant dispersion.

Excel is an invaluable tool for managing project timelines, budgets, and resource allocations, helping environmental engineers streamline their workflow and enhance overall project efficiency. In essence, Excel proficiency enhances the capacity of environmental engineers to make informed decisions, improve the accuracy of their analyses, and contribute effectively to the planning and execution of environmental projects.



ENVIRONMENTAL ENGINEERING

PROFICIENCY IN CODING (Python, MATLAB, R)

Proficiency in coding languages such as Python, MATLAB, R, or others is becoming increasingly vital for environmental engineers as the field adopts more data-driven and modeling-centric approaches. These languages offer a range of benefits, including efficient data analysis, modeling, and simulation capabilities. With large datasets common in environmental monitoring, coding facilitates streamlined data processing and insightful visualizations.

Environmental engineers can create sophisticated models to simulate scenarios and predict outcomes, while automation capabilities help in task efficiency. Coding proficiency also enables statistical analysis of environmental data, customization of tools and applications for specific projects, and integration with Geographic Information Systems (GIS). Open-source nature and adaptability of coding languages contribute to collaborative interdisciplinary efforts and keep environmental engineers abreast of evolving technologies.



ArcGIS

ArcGIS is a highly valuable software for environmental engineers due to its robust capabilities in geographic information systems (GIS) and spatial analysis. Environmental engineers frequently work with geospatial data to understand and manage the complex interactions between human activities and the environment.

ArcGIS provides a comprehensive platform for mapping, visualizing, and analyzing spatial data, allowing engineers to identify patterns, assess environmental changes, and make informed decisions. With tools for overlay analysis, proximity analysis, and terrain modeling, ArcGIS enables environmental engineers to address a wide range of challenges, including land-use planning, habitat conservation, water resource management, and disaster response. Its user-friendly interface and extensive geoprocessing functionalities make it accessible for professionals without extensive GIS expertise, while also offering advanced capabilities for those with more advanced skills.

As GIS becomes increasingly integral to environmental assessments and planning, proficiency in ArcGIS equips environmental engineers with a versatile toolset to enhance their analytical capabilities and contribute to sustainable and informed decision-making in the field.

Other Resources

- Your degree in Environmental Engineering
students.ubc.ca/career/your-degree/engineering/environmental-engineering
- UBC's ENVL Website
you.ubc.ca/ubc_programs/engineering-environmental/

