

Course Learning Outcomes for Unit I

Upon completion of this unit, students should be able to:

6. Assess the impact of industrial and hazardous waste on human populations.
 - 6.1 Appraise laws to reduce impacts of environmental hazards on human populations.
 - 6.2 Determine the impact of toxic substances on human populations.

Course/Unit Learning Outcomes	Learning Activity
6.1	Unit Lesson Article: "Realist Review of Policy Intervention Studies Aimed at Reducing Exposures to Environmental Hazards in the United States" Unit I Essay
6.2	Unit Lesson Article: "Resetting the TSCA Inventory: Why This Is Important" Unit I Essay

Required Unit Resources

In order to access the following resources, click the links below.

Apollonio, D. E., Wolfe, N., & Bero, L. A. (2016). [Realist review of policy intervention studies aimed at reducing exposures to environmental hazards in the United States](https://search.ebscohost.com/login.aspx?direct=true&db=asn&AN=117563620&site=ehost-live&scope=site). *BMC Public Health*, 16(1), 1–15. Retrieved from <https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=asn&AN=117563620&site=ehost-live&scope=site>

Bergeson, L. L. (2017). [Resetting the TSCA inventory: Why this is important](https://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=127191157&site=ehost-live&scope=site). *Environmental Quality Management*, 27(1), 121–126. Retrieved from <https://libraryresources.columbiasouthern.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bsu&AN=127191157&site=ehost-live&scope=site>

Unit Lesson

Introduction

Welcome! This graduate class serves to strengthen your knowledge of industrial and hazardous waste management. If you are already working in the industrial and hazardous waste discipline, it serves to broaden and deepen your knowledge base. If you are working in a related discipline, it exposes you to new material that can help at your current job or provide you with knowledge to enable a transition into the industrial and hazardous waste field.

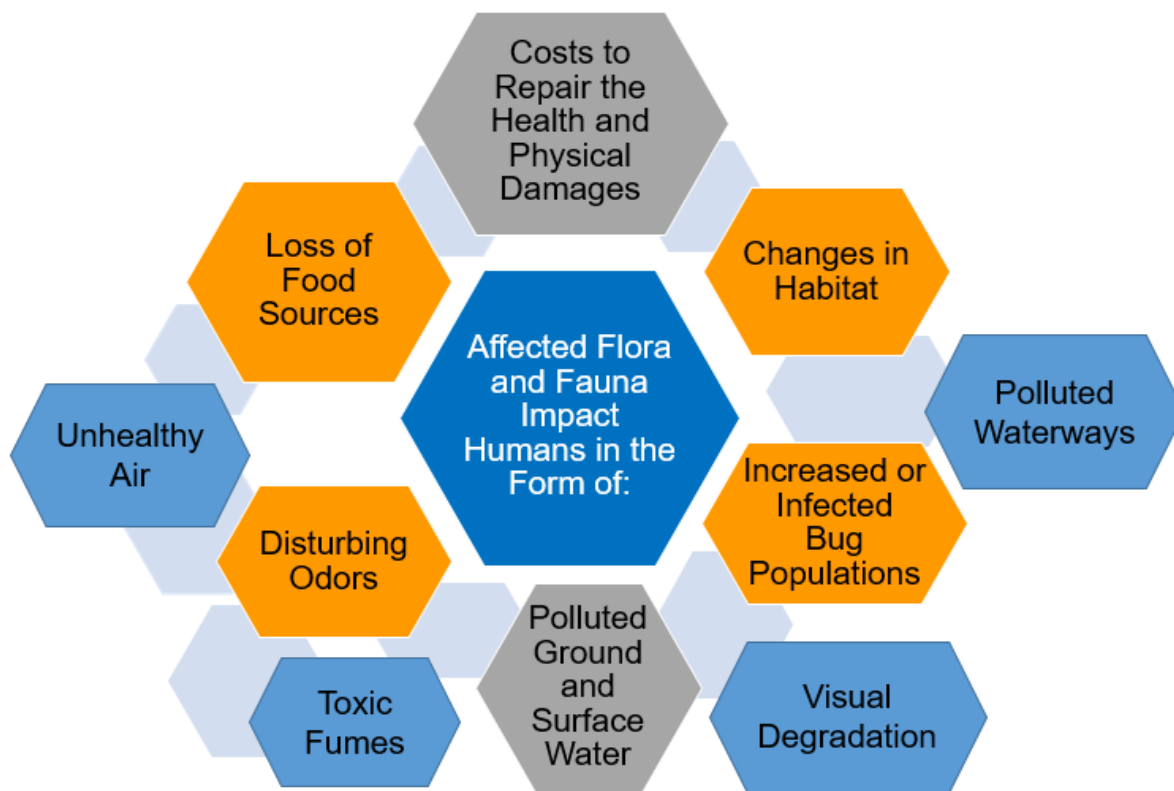
Regarding the discipline of industrial and hazardous waste, the United States Environmental Protection Agency (EPA) is one of the main purveyors of information about the topic. It is by far the main governmental agency providing guidance on industrial and hazardous waste. In the *Guide for Industrial Waste Management*, the document describes facility siting, characterizing waste, working with the public, monitoring chemicals, and considering property closures (EPA, 2016).

It is important to recognize that not all industrial wastes are hazardous. If a waste is determined to be hazardous, then a much larger set of rules must be followed. Solid and hazardous wastes were initially defined by the passage of the Resource Conservation and Recovery Act (RCRA), often pronounced as *rick-rah*. This seminal U.S. law was passed in 1976. It defined hazardous waste as:

A solid waste is a hazardous waste if it is specifically listed as a known hazardous waste or meets the characteristics of a hazardous waste. Listed wastes are wastes from common manufacturing and industrial processes, specific industries and can be generated from discarded commercial products. Characteristic wastes are wastes that exhibit any one or more of the following characteristic properties: ignitability, corrosivity, reactivity or toxicity. (EPA, 2015a, para. 1)

Impact of Industrial and Hazardous Waste on Human Populations

Industrial and hazardous waste has a large impact on human populations. Obvious impacts include those to human health. Less obvious are impacts to the environment. When flora and fauna are affected by hazardous waste, the impact is felt by humans.



There are laws to reduce impacts of environmental hazards on human populations. Though RCRA, as mentioned above, is the main U.S. law most often associated with solid and hazardous waste, other federal laws also apply to industrial and hazardous waste. The most common of these circumjacent laws are as follows.

- The Toxic Substances Control Act (TSCA) specifically regulates chemicals and maintains a database of their toxicity. TSCA will be discussed in more detail later.
- The Clean Water Act (CWA) regulates activities that impact surface waters of the United States. For instance, if an industrial waste treatment facility discharges its treated effluent to a river or lake, then CWA regulations must be followed, and permits must be obtained (EPA, 2013b).



Smoke stacks from industrial businesses cause atmospheric air pollution.
(Esolex, n.d.)

- The Clean Air Act (CAA) regulates atmospheric discharges such as industrial facilities that have smoke stacks. One of the main items promulgated by the EPA under the CAA are the National Ambient Air Quality Standards (NAAQS)—often pronounced as *nakz*. The NAAQS is a list of air quality concentrations that cannot be exceeded at monitoring locations. The chemicals include nitrogen dioxide, sulfur dioxide, particulate matter, carbon monoxide, ozone, and lead. If a region of the country has been recognized by the EPA as a *nonattainment area*, then the region does not meet one or more of the criteria in the NAAQS. If a new industrial facility is planned within the region, then its output of air pollution must result in lower concentrations of the chemicals that are in nonattainment. How can a company possibly build under such strict conditions? The solution is that other polluting facilities in the region can close or be modernized with the overall impact (including the impact of the new facility), resulting in less air pollution than before (EPA, 2013a).



Drums of unknown wastes floating in a body of water is a form of pollution
(Botas, n.d.)

- Continuing with the discussion of relevant laws, the Safe Drinking Water Act (SDWA) regulates drinking-water sources. Drinking water sources are typically groundwater or surface water sources. Regarding groundwater sources, the SDWA, through the EPA, requires water companies that utilize groundwater to identify a groundwater protection area (GWPA). A GWPA is a protected surface region to ensure that the groundwater aquifer is not contaminated. For instance, industrial activities (including agriculture, mining, trains, or roads) are limited within the area. For surface water sources such as lakes, there are limits and regular monitoring of the point sources (e.g., industrial discharge) and nonpoint sources (e.g., diffuse agricultural runoff) of contamination that enters the lake (EPA, 2015b).
- Though not the least or the last, the other main law impacting industrial and hazardous waste is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It is also known as *Superfund*. This law specifically governs past practices of industrial wastes. It was passed in 1980 with the realization that the 1976 RCRA only governs current practices. Back in 1980 (and still today), there were many sites contaminated with hazardous wastes. Since the contamination occurred prior to 1976, there were not strong laws regulating industrial and hazardous wastes. Thus, CERCLA was passed and funded with hundreds of millions of dollars to clean up existing hazardous waste sites. Over the years, CERCLA continues to be taxpayer funded, but it is supplemented by industry taxes and by the principally responsible parties (PRP)—a CERCLA term. The primary parties responsible for the waste sites are determined through lawsuits. As might be expected, many of the polluting companies went out of business prior to being identified by the EPA as PRPs (EPA, 2015c).

Impact of Toxic Substances on Human Populations

The toxicity of a substance is one criterion used in the RCRA definition of a hazardous waste to determine whether a solid waste is classified as hazardous. In addition to RCRA using toxicity in its classification, there is another federal law dedicated to maintaining a list of toxic chemicals. It is the Toxic Substances Control Act (TSCA), typically pronounced *tos-kuh*, which was passed in 1976. TSCA requires the EPA to keep an inventory of toxic substances (EPA, 2013c). The inventory is updated to reflect new chemicals and to drop chemicals that are no longer used. Bergeson (2017) explains that the TSCA chemical inventory is updated to reflect that many of the approximately 85,000 chemicals in the inventory are no longer in commercial use. The current list of chemicals can be found at the EPA website (2014).

Toxic substances can cause a wide range of health effects on humans. There can be sudden effects or long-term, *chronic* effects. Cancer would be a long-term effect that usually requires years of exposure to appear. There can be short- and long-term impacts to brain function, skin lesions, nervous system disorders, headaches, loss of vision, coughing, asthma, fatigue, heart disease, and many others. In general, there can be impacts to the respiratory system, renal system, cardiovascular system, reproductive system, nervous system, immune system, skin, or hepatic system (Agency for Toxic Substances and Disease Registry, 2011). The hepatic system is responsible for breaking down food.



The Cancer Institute is an important research institute because cancer is a major health concern. (Igokapil, n.d.)

Toxic substances injure the body by binding to enzymes. *Enzymes* are catalysts for reactions within the body. If a toxic substance binds to an enzyme, the enzyme may not be able to perform its intended function in the normal manner. A common toxic substance is carbon monoxide (CO), which results from incomplete combustion of carbon-based fuels. CO binds to the enzyme hemoglobin, which decreases the body's ability to move oxygen through the body. This can cause fainting and death if the person is not treated soon enough (Chiras, 2016).

With industry comes industrial and hazardous waste. What are the best ways for a society to limit the negative human health impacts of industrial activities? Apollonio, Wolfe, and Bero (2016) discuss the value of regulatory bans on specific substances, the value of implementing educational programs, and the value of monetary incentives for reducing particularly harmful practices. Each of the methods was evaluated based on an analysis of human tissue samples; human chemical exposures; and samples of air, water, and soil. The study found that outright bans of hazardous substances were most effective in improving human health and environmental conditions. Educating people to change harmful behaviors was helpful during the education period, but people often went back to their old ways after the education period ended. Economic interventions where monetary incentives were provided to encourage people to switch to safer alternatives were of marginal benefit.

The Apollonio et al. (2016) study provides a backdrop to this course. As you progress through the course, think of the best way to minimize environmental and health impacts of industrial and hazardous waste. Not only does the course show technological means for treating or reducing wastes and using alternative processes, but the course also evaluates laws that are intended to encourage best practices.

Conclusion

This lesson has provided a look into the impact of industrial and hazardous waste on human populations. The main law governing industrial and hazardous waste in the United States is the RCRA. This act aims to protect the public and the environment from harm due to industrial waste. Many other laws also impact industrial and hazardous waste. Of particular importance is the TSCA, which requires the EPA to keep a list of commercial toxic substances. Due to the many chemicals being developed by industries, it is difficult to know if a human symptom is due to exposure to a particular chemical. Commercial chemicals are generally developed to improve the human condition, but they must be used and stored safely, and companies must be mindful of waste generation.

References

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Suggested Unit Resources

In order to access the following resources, click the links below.

This video segment from the program *Regionalization/Solid Waste Management Success Stories* gives good insight on how per capita waste generation and population has increased over the past decades.

Wild Hare Productions (Producer). (1999). [Per capita and industrial waste generation \(Segment 8 of 15\)](#) [Video file]. Retrieved from <https://libraryresources.columbiasouthern.edu/login?auth=CAS&url=https://fod.infobase.com/PortalPlayer/aylists.aspx?wID=273866&xtid=11473&luid=59508>

The transcript for this video can be found by clicking on “Transcript” in the gray bar to the right of the video in the Films on Demand database.

To learn more about the toxic chemical substances inventory, please visit the following web page.

United States Environmental Protection Agency. (2014). [TSCA chemical substance inventory](#). Retrieved from <https://www.epa.gov/tsca-inventory>

To learn more about the definition of a hazardous waste, please visit this web page.

United States Environmental Protection Agency. (2014). [Defining hazardous waste: Listed, characteristic and mixed radiological wastes](https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes). Retrieved from <https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes>

The following website links to the 478-page document *Guide for Industrial Waste Management*. It is helpful for industry, government, and citizens who are interested in, or work with, industrial wastes.

United States Environmental Protection Agency. (2016). [Guide for industrial waste management](https://www.epa.gov/sites/production/files/2016-03/documents/industrial-waste-guide.pdf). Retrieved from <https://www.epa.gov/sites/production/files/2016-03/documents/industrial-waste-guide.pdf>

Learning Activities (Nongraded)

Nongraded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions, contact your instructor for further guidance and information.

This [Unit I EPA Characteristics of Waste interactive activity](#) relates to some of the terms mentioned in the unit lesson and required readings. Complete the activity to reinforce your understanding of the terms for this unit. ([PDF of Unit I EPA activity](#))