The Role of Environmental Justice Issues in Environmental Engineering Ethics

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Abstract

The engineering accreditation agency, ABET regards engineering ethics as an important component of engineering education. ABET's Criterion 3(f) states that "Engineering Programs must demonstrate their graduates have an understanding of professional and ethical responsibilities." Limitations on credit hours in engineering programs often preclude ethics being taught in a separate course and engineering faculty must include ethics topics in traditional engineering courses.

Teaching engineering ethics to environmental engineering students in the context of solid and hazardous waste management classes poses unique challenges and opportunities for instructors. The role of environmental engineers in designing and especially in selecting sites for solid and hazardous waste facilities necessitates an engineering ethics education that addresses environmental justice issues. The author has successfully used case studies and hypothetical scenarios to teach engineering ethics in solid and hazardous waste management classes. These studies address environmental justice issues and current regulatory/social conditions with an emphasis on how these issues impact environmental engineers.

Introduction

The ethical and societal aspects of engineering practice are the subjects of several ABET 2000 outcomes. ABET 2000 criterion 3(f) states that "Engineering programs must demonstrate that their graduates have an understanding of professional and ethical responsibility." Criterion 3(h) states – "Engineering programs must demonstrate that their graduates have the broad education necessary to understand the impact of engineering solutions in a global and societal context." And, Criterion 4 requires that program graduates have design *experience*…that includes most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political"(Schimmel, 2000), (ABET, 1998). Notwithstanding ABET requirements, a recent survey indicates that 80% of engineering graduates attend schools that have no ethics-related course requirements. Even at schools that have courses with ethics-related content, the courses are usually in philosophy or religion and have no specific engineering ethics component (Stephan, 1998). The American Society for Engineering Education's **(**ASEE**)** Statement on Engineering Ethics Education states:

"…*To educate students to cope with ethical problems, the first task of the teacher is to make students aware of ethical problems and help them learn to recognize them. A*

second task is to help students understand that their projects affect people for good or ill, and that, as "moral agents" they need to understand and anticipate these effects. A third task is to help students see that, as moral agents, they are responsible for helping to develop solutions to the ethical problems they encounter…"

Engineering ethics are being taught to Environmental Engineering students at TSU in context with the broader aspects of environmental justice issues. In Environmental Engineering practice, ethical concerns are intrinsically tied to social and political environmental justice issues. In fact, environmental injustice is a major contributing factor to many ethical failures in environmental engineering practice. Environmental engineers often enter into the decision making process for the design and siting of solid and hazardous waste facilities after other public officials have already made decisions regarding the facilities. Even when engineers are involved in the early stages of the decision making process, engineering concerns may not prevail. In this context when bad decisions are made inexperienced environmental engineers often make the mistake of succumbing to peer pressure and trying to make the best of a bad situation. This can result in an ethical failure if engineers continue to participate in the design of a facility that is not protective of human health and the environment. This is not to suggest that engineers are ultimately responsible for environmental injustices. Environmental injustice is a failure of government and policy makers to enact and interpret laws that are protective of human health and the environment. Aside from the relationship between environmental justice issues and ethics issues, another benefit of combining the subjects is to increase the interest of students. Studies suggest that even though students may lack motivation to study ethics, they do have an interest in the social aspects of engineering that can be used to leverage an interest in ethics (Koehn,1997), (Herkert,1999).

Environmental Justice and Waste Management Facilities

There is a general consensus that people of color and low-income people experience disproportionate exposure to hazardous waste and pollution from waste management facilities. (Bullard, 1990; Costner and Thornton, 1990; Goldman and Fitton, 1994; Mohai and Bryant, 1992; United Church of Christ Commission for Racial Justice, 1987) . The intent behind environmental injustices aside, the fact is that the poor, working class, and people of color have historically born a disproportionably high share of environmental risks associated with waste facilities. This societal problem persists today in spite of Executive Order 12866 signed by President Clinton in 1993 officially incorporating risk assessment into the U.S. regulatory process. USEPA responded to the Executive Order 12866 with its own Environmental Justice initiative and the following definition of Environmental Justice:

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no one group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the

execution of Federal, State, local, and tribal environmental programs and policies. Meaningful involvement means that: (a) The potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (b) the public's contribution can influence the regulatory agency's decision; (c) the concerns of all participants involved will be considered in the decision-making process; and (d) the decision-makers seek out and facilitate the involvement of those potentially affected.

Parsing the "legal ease" of this definition reveals that community residents can influence regulatory decisions that will affect their environment or health by being meaningfully involved. This language only succeeds in codifying the concept that a segment of the population (the uninvolved in this case) could be negatively impacted even if a truly objective risk assessment indicated they where at a higher risk. Center et al, (1996) concisely describes this situation: "The social disparity of risk assessment is apparent when we spatially disaggregate the data used to support a specific siting proposal or exposure standard. Beyond the rhetorical question of for whom this increased risk of death is "acceptable," we have to consider who is likely to pay among the less-than-random sample in our population..." The question "who is to pay" is rhetorical here but, at a minimum environmental engineers must practice in an atmosphere where public relations concerns compete with objective risk assessment.

Teaching Environmental Justice and Ethics

A fair treatment of all the social and political aspects of environmental justice is not possible in the limited amount of time available in an engineering curriculum. At TSU environmental justice is presented to students in the context of how these issues can influence the ethical practice of Environmental Engineering with regard to the design and siting of hazardous and solid waste facilities. Two class assignments based on hypothetical scenarios demonstrate the nature of environmental injustice and how these occurrences impact decisions regarding waste facilities. A third assignment based on a case study presents a series of ethical failures leading to harm to human health and the environment and emphasizes the role of environmental justice concerns in precipitating the ethical failures. The assignments are briefly described below. The actual assignments are accompanied with a greater amount of detail, background material and data.

Assignment I - The statistics regarding the existence of environmental injustice related to waste facilities remain in contention, but there is an abundance of clear anecdotal evidence showing bias exists. One notorious example is the Cerrell Associates 1984 report to the California Waste Management Board, "Political Difficulties Facing Waste-to-Energy Conversion Plant Siting". The study was leaked to the public in 1988 and subsequently reported in the media. The study advises builders of waste incineration plants that they will face less opposition if they put the plants near poor neighborhoods instead of wealthy ones. The report says,

"All socioeconomic groupings tend to resent the nearby siting of major (waste disposal) facilities, but the middle and upper socioeconomic strata possess better resources to effectuate their opposition,"..."Middle and higher socioeconomic strata neighborhoods should not fall at least within (five miles)of the proposed site."

The report gives personality profiles of the most likely and least likely opponents of waste-to-energy plants, and suggests that trash incineration can be made more palatable by presenting it as part of a recycling program. The report outlines ways to defuse opposition. The report says waste-to-energy plant sites "can be suggested partly on the basis of neighborhoods least likely to express opposition-older, conservative and lower socioeconomic neighborhoods. Meanwhile the most likely opponents of a waste-to-energy project--residents in the vicinity, liberal, and higher-educated persons--can be targeted in a public participation program and public relations campaign.

Assignment I (Hazardous Waste Management Class)
• You are an Environmental Engineer serving on a planning board to select a site for a waste incinerator in California. • The planning board plans to use the 1984 Cerrell Associates report "Political Difficulties Facing Waste-to-Energy Conversion Plant Siting" (see below) in its analysis of potential sites for the facility. • Research the significance of the Cerrell report with regard to siting hazardous waste facilities. • Write an essay of at least 3000 words describing what actions you would take, what compromises you would require etc in order to serve on the board. Does your actions satisfy the National Society of Engineers Code of Ethics ?

Assignment II - In 1991, a report prepared for the Chatham County Board of Commissioners was released concerning the siting process for a "low-level" radioactive waste repository in the State of North Carolina. Here, through court discovery, the county's legal counsel uncovered a parallel siting process undertaken by the state's contractor for the project, which is designed to take radioactive waste from eight southern states The siting process portrayed to the public followed federal and state statutes, requiring the site be chosen on technical grounds alone. For the other agenda, hidden from public oversight, social and political site characteristics were paramount. The public relations staff of the contractor, in an attempt to disperse public opposition and maintain the perception that the siting process was open and devoid of political and land-ownership criteria, proposed that more than a dozen sites in numerous counties be floated to the public for consideration, even though there were only five-to-seven under serious internal discussion. The impressions recorded during a drive-by "windshield survey" of some of the potential sites by the economic development and public relations staff of the contractor were acquired by court order and are as follows:

Site Consideration at Meeting Disposition

Coleridge "houses fairly wealthy" out
Snow Camp "fairly affluent" out
Cherry Grove "residences of site minority-owned" in
Farmington 1 "fairly affluent" out
Gold Hill 1 "dynamite company--explosives/ munitions" out
Gold Hill 3 "very depressed area" in
Watson "poultry operations--impressive--Holly Farms" "some new homes--affluent" [5] out
Ghio "trailers everywhere" "forecloses then resells" "distressed county" in
Marston "distressed area" "buffer would have to be in game land" (which violates state criteria) out
Hoffman "distressed area" "major wetlands" in
Millstone Lake "Sheriff Goodman -- concerned about job loss" in
Slocumb "affluent" out
Berea "distressed county" in

With the public relations and economic development staff voting on an equal basis with technical personnel, the final site-selection screening presented to the state followed this format, though, understandably, absent the aforementioned comments. The classification was subsequently ratified by the state without public debate on the specific basis for this order (Farren, 1992).

Assignment II (Hazardous Waste Management Class)
• You are an Environmental Engineer serving on a technical team tasked with determining the best site for a "low-level" radioactive waste repository in the State of North Carolina. Statutes require that your teams decision must be based solely on an objective risk assessment and technical considerations such as hydrogeology, soil characteristics, and depth to water table. • Your team is to select the best site among six potential sites ratified by the state. The process leading to the selection of the six potential site by the states is described in a 1991 report prepared for the Chatham County, SC Board of Commissioners. (see below) • Answer the following questions in essay format: 1. Assume your team is unaware of the method of selection for the six potential sites. Explain how the actions by public officials in selecting the six potential sites influence the ability of your team to perform its job. 2. Assume your team becomes aware of the process by which public officials chose the six potential sites. What recommendations would you make to the team? What if the other team members don't agree with your recommendations?

Assignment III - Coffee County Landfill is a 97-acre inactive landfill located in the northwest corner of Arnold Air Force Base (AAFB)on State Route 55, in Manchester Tennessee. The landfill property was leased from the Air Force by the County during the period of landfill operation (January 1972 to February 1989). The landfill was sited within a few hundred feet of a blue collar residential neighborhood on the Old Tullahoma Highway that runs parallel to Highway 55. These residents relied upon wells for their

drinking water. In the late eighties, AAFB officials and regulators became aware that the groundwater beneath the landfill was contaminated with chlorinated solvents (suspected carcinogens) and that the contaminants were migrating offsite towards the homes on the Old Tullahoma Highway. Official documents presented to state and federal regulators indicated that the contamination had migrated beyond the residences and that several of the homes were located inside the projected contamination plumes. These same documents however also showed the location of drinking water wells in the area and the wells at the potentially impacted residences were (claimed inadvertently) left off the documents. In any case no one informed the residents that they were possibly being impacted and no effort was taken to sample their drinking water over a ten year period. AAFB did however take various actions during this period to mitigate the risks to nearby residents. A groundwater pump and treat system was implemented to try to stop future offsite migration of contaminated groundwater and efforts were underway to try to put the residents on an alternative municipal water supply.

In an effort to further reduce the offsite migration of contaminated ground water AAFB installed a landfill cap on the landfill in 1997. Even though evidence suggested that the landfill had received hazardous materials in excess of typical municipal solid waste, USEPA delegated the decision regarding the design of the cap to state regulators and the landfill was treated as a solid waste landfill. Consequently the landfill received a soil cap with "take offs" as much as 12 feet and no accommodation for landfill gas venting was implemented. On January 7, 1999 Oscar McCullough, one of the residents on Old Tullahoma Highway, was severely injured when methane from the landfill caused his well house to explode. To date AAFB has spent tens of millions of dollars to mitigate risks at the site and will continue to incur costs indefinitely. There is an effort currently underway to pass some of theses costs on local governments and subsequently local tax payers.

Assignment III (Solid Waste Management Class)
• Review the documents and data provided for the Coffee County Landfill Case Study. • Answer the following questions in essay format: 1. Who are the winners and losers in this scenario? (Who benefited? Who was harmed?) 2. What mistakes were made? By who? 3. Can a unlined landfill sited adjacent to a neighborhoods drinking water wells be protective of human health and the environment? 4. Why do you think the residents near the landfill were not informed about the contamination?

Conclusion

Case studies are a valuable resource for teaching ethics to engineering students. Experts say that when using case studies to teach, it is most effective to use studies that create a conflict within the students' minds. As a result of this, they will be prodded to resolve the conflict. Learning to handle ethical dilemmas and making ethical decisions are very important elements of being a professional engineer**.** The dilemma of reconciling environmental justice issues and engineering ethics not only provides conflict but also prepares students for dealing with a major societal issue. Another positive aspect of this approach to teaching ethics to environmental engineers is the level of interest and enthusiasm students have shown for the subject.

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