A neighboring state uses the following weighting scheme:

Fatality	9.5 PD
Injury	3.5 PD

2. Individuals within the two groups pay roughly the same transportation taxes (licenses, gasoline taxes, etc.).

Which of the two site improvements do you think David should recommend? What is your rationale for this recommendation?

CASE 16

Hurricane Katrina

As we have noted in the text, until approximately 1970 nearly all engineering codes of ethics held that the engineer's first duty is fidelity to his or her employer and clients. However, soon after 1970, most codes insisted that ''Engineers shall hold paramount the safety, health, and welfare of the public.'' Whatever may have precipitated this change in the early 1970s, recent events—ranging from the collapse of Manhattan's Twin Towers on September 11, 2001, to the collapse of a major bridge in Minneapolis/St. Paul on August 1, 2007—make apparent the vital importance of this principle. The devastation wreaked by Hurricane Katrina along the Gulf of Mexico coastline states of Louisiana, Mississippi, and Alabama in late August 2005 is also a dramatic case in point.

Hardest hit was Louisiana, which endured the loss of more than 1,000 lives, thousands of homes, damage to residential and nonresidential property of more than $20 billion, and damage to public infrastructure estimated at nearly $7 billion. Most severely damaged was the city of New Orleans, much of which had to be evacuated and which suffered the loss of more than 100,000 jobs. The city is still reeling, apparently having permanently lost much of its population and only slowly recovering previously habitable areas.

At the request of the U.S. Army Corp of Engineers (USACE), the ASCE formed the Hurricane Katrina External Review Panel to review the comprehensive work of USACE's Interagency Performance Evaluation Task Force. The resulting ASCE report, *The New Orleans Hurricane Protection System: What Went Wrong and Why,* is a detailed and eloquent statement of the ethical responsibilities of engineers to protect public safety, health, and welfare.[43]

The ASCE report documents engineering failures, organizational and policy failures, and lessons learned for the future. Chapter 7 of the report (''Direct Causes of the Catastrophe'') begins as follows:[44]

> What is unique about the devastation that befell the New Orleans area from Hurricane Katrina—compared to other natural disasters—is that much of the destruction was the result of engineering and engineering-related policy failures.

From an engineering standpoint, the panel asserts, there was an underestimation of soil strength that rendered the levees more vulnerable than they should have been, a failure to satisfy standard factors of safety in the original designs of the levees and pumps, and a failure to determine and communicate clearly to the public the level of hurricane risk to which the city and its residents were exposed. The panel concludes,[45]

> With the benefit of hindsight, we now see that questionable engineering decisions and management choices, and inadequate interfaces within and between organizations, all contributed to the problem.

This might suggest that blame-responsibility is in order. However, the panel chose not to pursue this line, pointing out instead the difficulty of assigning blame:[46]

> No one person or decision is to blame. The engineering failures were complex, and involved numerous decisions by many people within many organizations over a long period of time.

Rather than attempt to assign blame, the panel used the hindsight it acquired to make recommendations about the future. The report identifies a set of critical actions the panel regards as necessary. These

actions fall under one of four needed shifts in thought and approach:[47]

- Improve the understanding of risk and firmly commit to safety.
- Repair the hurricane protection system.
- Reorganize the management of the hurricane protection system.
- Insist on engineering quality.

The first recommended action is that safety be kept at the forefront of public priorities, preparing for the possibility of future hurricanes rather than allowing experts and citizens alike to fall into a complacency that can come from the relative unlikelihood of a repeat performance in the near future.

The second and third recommendations concern making clear and quantifiable risk estimates and communicating them to the public in ways that enable nonexperts to have a real voice in determining the acceptability or unacceptability of those risks.

The next set of recommendations concern replacing the haphazard, uncoordinated hurricane protection ''system'' with a truly organized, coherent system. This, the panel believes, calls for ''good leadership, management, and someone in charge.''[48] It is the panel's recommendation that a high-level licensed engineer, or a panel of highly qualified, licensed engineers, be appointed with full authority to oversee the system:[49]

> The authority's overarching responsibility will be to keep hurricane-related safety at the forefront of public priorities. The authority will provide leadership, strategic vision, definition of roles and responsibilities, formalized avenues of communication, prioritization of funding, and coordination of critical construction, maintenance, and operations.

The panel's seventh recommendation is to improve interagency coordination. The historical record thus far, the panel maintains, is disorganization and poor mechanisms for interagency communication:[50]

> Those responsible for maintenance of the hurricane protection system must collaborate with system designers and constructors to upgrade their inspection, repair, and operations to ensure that the system is hurricane-ready and flood-ready.

Recommendations 8 and 9 relate to the upgrading and review of design procedures. The panel points out that ''ASCE has a long-standing policy that recommends independent external peer review of public works projects where performance is critical to public safety, health, and welfare.''[51] This is especially so where reliability under emergency conditions is critical, as it clearly was when Hurricane Katrina struck. The effective operation of such an external review process, the panel concludes, could have resulted in a significant reduction in the amount of (but by no means all) destruction in the case of Hurricane Katrina.

The panel's final recommendation is essentially a reminder of our limitations and a consequent ethical imperative to ''place safety first'':[52]

> Although the conditions leading up to the New Orleans catastrophe are unique, the fundamental constraints placed on engineers for any project are not. Every project has funding and/or schedule limitations. Every project must integrate into the natural and manmade environment. Every major project has political ramifications.
>
> In the face of pressure to save money or to make up time, engineers must remain strong and hold true to the requirements of the profession's canon of ethics, never compromising the safety of the public.

The panel concludes with an appeal to a broader application of the first Fundamental Canon of ASCE's Code of Ethics. Not only must the commitment to protect public safety, health, and welfare be the guiding principle for New Orleans' hurricane protection system but also ''it must be applied with equal rigor to every aspect of an engineer's work—in New Orleans, in America, and throughout the world.''[53]

Reading the panel's report in its entirety would be a valuable exercise in thinking through what ASCE's first Fundamental Canon requires not only regarding the Hurricane Katrina disaster but also regarding other basic responsibilities to the public that are inherent in engineering practice.

A related reading is ''Leadership, Service Learning, and Executive Management in Engineering: The Rowan University Hurricane Katrina Recovery Team,'' by a team of engineering students and faculty advisors at Rowan University.[54] In their abstract, the authors identify three objectives for the Hurricane Katrina Recovery Team Project:

> The main objective is to help distressed communities in the Gulf Coast Region. Second, this project seeks to

> not only address broader social issues but also leave a tangible contribution or impact in the area while asking the following questions: What do we as professional engineers have as a responsibility to the communities we serve, and what do we leave in the community to make it a better, more equitable place to live? The last objective is the management team's successful assessment of the experience, including several logistical challenges. To this end, this article seeks to help other student-led projects by relaying our service learning experience in a coherent, user-friendly manner that serves as a model experience.

CORPORATE RESPONSES

Supportive corporate responses to the Katrina hurricane were swift. By mid-September 2005, more than $312 million worth of aid had been donated by major corporations, much of it by those with no plants or businesses in the afflicted areas.[55] Engineers have played a prominent role in these relief efforts, as they did after the 9/11 Twin Towers attack and the Asian tsunami disaster. Hafner and Deutsch comment,[56]

> With two disasters behind them, some companies are applying lessons they have learned to their hurricane-related philanthropy. GE is a case in point. During the tsunami, the company put together a team of 50 project engineers—experts in portable water purification, energy, health care, and medical equipment.
>
> After Hurricane Katrina, GE executives took their cues from Jeffrey R. Immelt, GE's chief executive, and reactivated the same tsunami team for New Orleans. ''Jeff told us, 'Don't let anything stand in the way of getting aid where it's needed,''' said Robert Corcoran, vice president for corporate citizenship.

Discuss how, with corporate backing, engineers who subscribe to Fred Cuny's ideas about effective disaster relief in his *Disasters and Development* (Oxford University Press, 1983) might approach the engineering challenges of Katrina.

CASE 17

Hyatt Regency Walkway Disaster

Approximately 4 years after its occurrence, the tragic 1981 Kansas City Hyatt Regency walkway collapse was in the news again. A November 16, 1985, *New York Times* article reported the decision of Judge James B. Deutsch, an administrative law judge for Missouri's administrative hearing commission. Judge Deutsch found two of the hotels structural engineers guilty of gross negligence, misconduct, and unprofessional conduct.

The ASCE may have influenced this court ruling. Just before the decision was made, ASCE announced a policy of holding structural engineers responsible for structural safety in their designs. This policy reflected the recommendations of an ASCE committee that convened in 1983 to examine the disaster.

The project manager, Judge Deutsch is quoted as saying, displayed ''a conscious indifference to his professional duties as the Hyatt project engineer who was primarily responsible for the preparation of design drawings and review of shop drawings for that project.'' The judge also cited the chief engineer's failure to closely monitor the project manager's work as ''a conscious indifference to his professional duties as an engineer of record.''

This court case shows that engineers can be held responsible not only for their own conduct but also for the conduct of others under their supervision. It also holds that engineers have special *professional* responsibilities.

Discuss the extent to which you think engineering societies should play the sort of role ASCE apparently did in this case. To what extent do you think practicing engineers should support (e.g., by becoming members) professional engineering societies' attempts to articulate and interpret the ethical responsibilities of engineers?

The Truesteel Affair is a fictionalized version of circumstances similar to those surrounding the Hyatt Regency walkway collapse. View this video and discuss the ethical issues it raises. (This film is available from Fanlight Productions, 47 Halifax St., Boston, MA 02130. 1-617-524-0980.)