

1.011 Project Evaluation

Carl D. Martland

Assignment 4 Comparing Alternatives

Assigned: March 3, 2003

Due: March 10, 2003

1. Practice Problems

As usual try enough problems to be sure that you understand the basic issues of the chapter, in this case, ranking a set of mutually exclusive alternatives. Ones that relate to CEE topics include 5-4, 5-13, 5-19, 5-27, 5-36, and 5-38.

2. Does Discounting Hurt Future Generations?

Background

The US Department of Transportation frequently conducts analyses of ways to reduce the risks associated with transportation systems. In studies ranging from the benefits of airbags in autos to the benefits improvements in wind shear detection systems for airports, the DOT uses a figure of approximately \$2,400,000 as a limit on what they would require or recommend to be spent to reduce the expected number of transportation fatalities by 1.

Contamination of water supplies is a major health risk, and protection of the water supply is a fundamental concern of civil & environmental engineers. In Philadelphia, New York City, and many other major cities around the world, 10% of the population died in cholera epidemics prior to the development of water purification facilities. More recently, thousands have died in Central America, Turkey, Bangladesh, and elsewhere following natural disasters (earthquakes, hurricanes, floods). In metropolitan Boston, a dozen or more deaths from leukemia have been traced to toxic chemicals, as documented in the film and book "A Civil Action". Arsenic poisoning threatens thousands in Bangladesh through contamination of groundwater used for wells.

Questions

Suppose that environmental engineers discover a plume of toxic chemicals moving through ground water and approaching a nearby town's water supply. Suppose that the plume is projected to reach the water supply in 60 years, plus or minus 10 years. Suppose that the number of fatalities is in fact the major health concern. Assuming no inflation and continued application of the DOT risk assessment guidelines, what would the future costs be of the following events occurring in 2060:

- a. 10 additional deaths from illnesses related to the toxic plume
- b. 1000 additional deaths from illnesses related to the toxic plume

Part 1 (25%)

Clearly, these would be serious concerns to future citizens of the town. If we used the methods developed in this subject to discount these costs to the present, would they be serious problems to us? To address this question, select (and defend the use of) a discount rate for the following calculations:

- a. What is the present worth of eliminating the threats described in a? in b?
- b. What is the present worth of slowing down the plume so that the potential health threats are pushed back another 10 years? Another 50 years?

Part 2 (50%)

Identify at least 10 strategies that are available for dealing with the future threat. Describe the type and magnitude of the costs associated with each strategy and indicate which ones are likely to be justifiable for the threat described in (a) and in (b).

Part 3 (25%)

How serious are the risks addressed in this assignment? How does this analysis of contaminated water supplies near Boston relate to the other threats alluded to above (cholera epidemics and contaminated water supplies following natural disasters)? Name at two other threats or risks, one that is equivalent to threat (a) and one that is equivalent to threat (b).

Be prepared to discuss this question in class.