In a previous editorial (Elements, December 2011), I discussed how difficult it is to predict with certainty the environmental impact of activities such as mining, energy production, and radioactive waste disposal. Here I shall continue on this theme with some musings on how regulatory decisions are made—particularly in the United States, the country with which I am most familiar. The first obvious point is that any activity such as mining or energy production will have an impact on the environment. Generally speaking the impact will be negative—loss of wildlife habitat, visual disturbance, air and water pollution. On the other hand there are benefits to society—we need energy and we need mineral resources. Ideally, conservation, substitution, and recycling will reduce these requirements, but they will not be eliminated, at least in the short term. We thus need to perform some sort of cost-benefit analysis. It is relatively easy to quantify the benefits but quite difficult to put an economic value on the costs. What is a scenic view worth? Wildlife habitat? Endangered species? These really come down to personal value judgments: regulations reflect some sort of consensus, although individuals often hold strongly differing opinions. And what about possible hazards that are not part of the normal operation of a project: how do we assign a probability (and hence a cost) that a pipeline will burst or that a major earthquake will occur? And who should bear this cost? The Fukushima Dai-ichi disaster made us all more sensitive to these questions.

There is also the question of how we make the decision, in particular, who are the “we”? Typically, the benefits of a major project such as the (now-cancelled) Yucca Mountain radioactive waste repository and the (now-suspended) Keystone XL oil pipeline from Alberta to the US Gulf Coast are widely distributed across society, whereas the costs (or at least some of them, thinking of possible water pollution and disturbance of the landscape) are much more localized. Whose voice should be decisive in determining whether a project should be authorized? I have been reading editorials recently arguing that such decisions should be local—or at least affected by the community and the public on some of these important issues. We are making some progress in reducing the environmental impact of energy and mining projects. The planning process is including more sensitivity to environmental concerns, and our understanding of how to control the movement of contaminants and how to reclaim disturbed land is constantly improving. The public is also becoming more informed about the tradeoffs. Microbiological approaches, as discussed in this issue, are really in their infancy, but they are becoming increasingly important in reclamation and are contributing to an overall reduction in the impact of mining on the environment. We hope that the potential of these methods will be realized and that this will reduce some of the conflicts between economic and environmental priorities.

James I. Drever* (drever@uwyo.edu) University of Wyoming

* Principal editor in charge of this issue