A Rich Vein? Mining and the Pursuit of Sustainability†

JAIME M. AMEZAGA*
TOBIAS S. ROTTINGM
PAUL L. YOUNGER
Newcastle Institute for Research on Sustainability, Newcastle University, U.K.

ROBERT W. NAIRN
CREW, University of Oklahoma, Norman, Oklahoma, United States

ANTHONY-JO NOLES
Asociación Civil Labor, Peru

RICARDO OYARZÚN
Universidad de La Serena, Chile

JORGE QUINTANILLA
Universidad Mayor de San Andrés, La Paz, Bolivia

Strictly speaking, sustainable development requires that human activities are undertaken in such a manner that they do not eliminate options for future generations. Clearly, once a given mineral deposit has been mined to exhaustion, future generations do not have the option of mining it again; hence mining fails to qualify as sustainable development sensu stricto (1). Consequently, mining can only ever, at best, aspire to compatibility with sustainable development sensu lato, which can be defined as exploitation of a nonrenewable resource (such as a mineral deposit) such that it gives rise to long-term benefits (environmental and/or social and/or economic) that equal or exceed the values obtained prior to exploitation (2). At the crudest level, the “economic sustainability” of a given mining operation can be estimated by comparing extraction rates to estimates of total reserves. However, this coarse approach implicitly assumes that the only important episode in the life of a mine site is that period during which active mining takes place. This is fallacious even on economic grounds, because the wealth generated by mining can circulate in markets for decades or centuries afterward. The postextractive phase of the mine life cycle is, if anything, even more important when it comes to evaluating environmental sustainability, for which we need to examine the balance of benefits and dis-benefits over the (finite) extractive phase and the (essentially infinite) postclosure phase.

Environmental benefits and dis-benefits of active mining are potentially very broad, affecting any or all of air, soil, water, and biota (1). In the mine’s postclosure phase, by far the most important environmental issues relate to water. Air and soil pollution are often readily dissolved by revegetation and landscaping (2). Even mine sites which have otherwise been restored to high standards can subsequently develop pervasive and persistent problems in relation to water quality and quantity. Such problems tend to be most stark in arid catchments, such as the depicted site in Bolivia.

In this article we trace the evolution of thinking on sustainability in the mining sector from 1970 to 2010, drawing particularly upon our shared experiences of action research and developments in policy and practice in the U.S., Europe, and South America. Our findings demonstrate that the development of mining within the framework of sustainable development has arisen from the interplay of state regulation and industry-led innovation, paying particular attention to postclosure environmental issues, tempered by open dialogue with other communities of interest (e.g., agriculture, rural and urban development).

Emergence of the Sustainability Agenda in Mining

Mining has long been a bête noir for environmental and social activists (1). In the early years, the industry did little to merit a more favorable appraisal. Gradual change began only in the 1980s with the emergence of stricter environmental regulations within a handful of national jurisdictions. Initially, the mining sector resisted these regulations as external impositions. At the global level, the Rio de Janeiro Earth Summit in 1992 provoked a decade of reflection in the mining sector, as major companies gradually recognized that genuine engagement with environmental and social issues was a prerequisite for gaining and retaining the “social license to operate” which is necessary for the long-term pursuit of profit in democratic states. This thinking first entered the public domain in 1998 with the Global Mining Initiative (GMI), which was launched in preparation for the 2002 Johannesburg World Summit. The period 2001–2002 were heady days for the