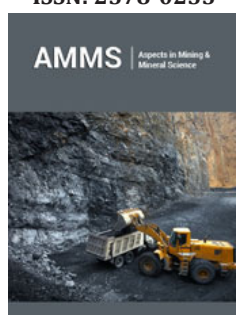


The Collective Fabric of Sustainable Management of Mining Sites to Reconcile Sensitive Land Uses and Human Health

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Opinion

Mineral resources help meet the needs of daily life [1]. According to Kitula [2], mining offers significant opportunities for socio-economic development through local employment and public revenue. But, the processes associated with mining and further processing of the ore, although they generally occupy a small land area, have the potential to lead to large-scale negative impacts on the environment and health: air pollution and noise, soil pollution, landscape problems... The media coverage of the “environment-health” risks associated with former mining sites has indeed led, for example, in France to publicizing the problems with repercussions in terms of public concerns and mistrust, creating controversies at various scales. In addition, (peri)urban agriculture is developing strongly around the world, and food production is an activity classified as sensitive by the managers of polluted soils. Thanks to the dynamics driven by urban agricultural projects, the question of soil quality is therefore put in visibility: How to avoid soil degradation? How to improve their fertility? How to produce unpolluted vegetables even if the soil is polluted? All these questions are asked by citizens to managers of cities impacted by mining sites.

However, public action in terms of the preservation of natural resources is struggling to achieve its objectives, as a consequence of the logics of economic development of the territories. In France, the operation of a mine is moreover specifically framed by the Mining Code for economic reasons and technological strategies, and not by the regulations for Installations Classified for the Protection of the Environment (ICPE). In addition, scientific information to the public on the complex subject of transfers of persistent pollutants into the environment is insufficient [3]. Today, according to several socio-technical studies, the issue of management of mining sites leads to increased consideration of the question of the relationship between social contexts and land uses. However, for these complex terrestrial ecosystems, the transfer of pollutants and therefore ultimately the exposure scenarios of populations are influenced by multiple factors [4-6], partly explaining the controversies surrounding the environmental pollution frequently observed in long-standing anthropized territories. This is why, faced with the risk of the dissemination of persistent (eco) toxic substances around mining sites and the uncertainties that generate questions and fears on the part of citizens; when they deem insufficient the responses provided by the legitimate bodies of debate, the local associations, mobilize “media strategies”. This was also observed recently for the site of the former gold mine of Salsigne at the origin of the pollution of the Orbiel Valley (Occitanie), with the “visibility” of what is presented as a “public problem” by associations and the media. A link between the relationship with the ground maintained by these actors and the relationship with the risks relating to the mining site is thus created and gives rise to a form of negotiation with the consideration of different kinds of expertise. The lack of accessible information, in an anxiety-provoking context of environmental degradation, creates citizen mistrust. The social fabric of pollution problems and also of the associated environmental- health risk arises from experiences, values and beliefs, knowledge resulting from a confrontation of scientific and lay expertise [7]. To promote nature as a common good and a vector of health, the emergence of mobilizations of actors hitherto excluded from the circle of stakeholders is currently observed and accentuated by the development of urban agriculture [8]. Universal values of justice and ecological awareness of the constraints imposed by environmental problems

in the context of the anthropocene are all vectors of these citizen mobilizations concerning the interactions of mining activities with their environment.

How can we now approach the management of mining sites in a way that is both more collective and more ecological on the basis of accumulated knowledge? Building trust between the various actors involved in their territories in the sustainable management of post-mining operations requires a prior rethinking of knowledge production systems by promoting their co-production [9]. Consultation and heritage enhancement of mining sites produce dynamics of development and resilience of territories; however, the conflict is not systematically eliminated by consultation and above all it can constitute a vector of democratic added value, a mode of participation. Beyond the social and environmental issue, for indigenous communities, there are now growing expectations of real sharing of the added value of mining projects. The more integrated territorial approach makes it possible to consider the pluri-functoriality, interactions and various specificities of the field, which intervene in the complex construction of a desired environment. For example, in the context of space mining company in Gafsa (Tunisia), in order to overcome conflicts of interest and reduce environmental inequalities induced by socio-spatial segregation, Salhi [10] proposes a multicriteria and interdisciplinary approach, particularly suited to dealing with the complex subject of quality of soils according to their uses, ecosystem services provided and land aspects. In France, the 2018 law for a "State at the service of a trusted society" has already initiated organizational transitions for the mining sector; and ecology industrial and territorial offers ways to reduce the ecological footprint of human activities by drawing inspiration from the functioning of natural ecosystems. Considering the model of landscapes agroecology, the objective is to design additional developments integrating different plants to reduce transfers by erosion and runoff and enhance the landscapes. For the mining sector, it is now imperative to improve the consideration of environmental [11] and health risks [12]. In addition, failure to meet expectations or legislative standards leads to a loss of value for the company. Fenton Villar [13] study examines the role of a long-standing international transparency program, the "Extractive Industries Transparency Initiative" (EITI), in building trust in politicians. There is a positive relationship between countries' membership in the EITI and trust in politicians. Numerous recent research projects are thus devoted to the sustainable development process of mining territories to reconcile healthy dwellings and mining sites, to manage mining residues [14]. These interdisciplinary research projects (human and social sciences, economics, biogeochemistry, urban planning...) highlight contextualized practices, decision support tools [15,16] methodologies to promote co-construction [17]. Faced with significant sustainability challenges in this emerging era of the circular economy [18-20] and citizen dynamics of urban agriculture, industry mining must therefore provide responses to environmental, social and economic issues by promoting the full involvement of local populations in the choice of site uses also appears crucial for the management of post-mining sites [21,22].

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