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Gemstone mining as a development cluster: A study of Brazil's emerald mines

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ABSTRACT

For many centuries, emeralds have bejeweled the rich and famous all over the world. Emeralds have also made many millionaires overnight, sometimes by chance, as in some of the cases reported in this study. On the other hand, even though emerald mining has brought some economic benefits, many of these have remained at the top of the production chain. In many cases mining activities have caused a number of negative social and environmental impacts locally. Working conditions in small mines are very poor in general: with bad ventilation, high temperatures, long working hours, lack of safety, informal working contracts and no health or life insurance. Environmental impacts can be significant, such as widespread deforestation, erosion of abandoned mines, and soil and water pollution in streams. The economic and social public benefits can be minimal. Even when taxes on gem mining are relatively low, much of the mining local activity is informal and the high value-added formal activities take place outside the mining regions. This study aims to understand the dynamics of emerald mining and its impact on local development using the concept of clusters. The research analyzes three case studies in Brazil: Campos Verdes/Santa Terezinha (Goias state), Nova Era/Itabira (Minas Gerais state) and Carnaiba/Campo Formoso (Bahia state). Emerald mining regions attract many migrants, increasing the demand for public services (infrastructure, health, education, etc.), but local governments are unable to provide for them because the activity produces little tax revenue. In the end, there is a growing mismatch between demand and supply of public services, leading to a series of social and environmental problems. However, working with the concept of cluster can help to shed light on policies to improve the local benefits of gem mining, by organizing the miners and their supporting organizations to allow investments that bring long term benefits locally.

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Introduction

Gem production generally contributes little to miners and local development² (Cartier, 2009), but it does generate jobs and income (Hilson, 2009). Given the growth of the jewelry market worldwide, the economic impact and economic and social potential related to emerald mining are immense. However, little is understood about social, economic and environmental impacts on the localities where emeralds are produced in Brazil and other developing countries. There is some knowledge on the technical part of emerald production (e.g. gemology, see Giuliani et al., 1998; Giuliani, 1997), but very

few studies exist about the social, economic and environmental aspects of gem production. Our aim is to empirically understand the dynamics of emerald production in Brazil through case studies in the three most significant emerald producing regions in the country by using the concept of “clusters”.³

This article considers how small-scale gemstone mining may potentially create conducive conditions for longer-term development by acting as a catalyst sector. We aim to understand how good local governance in the cluster could bring together small mining related producers to join forces with the help of the public sector to overcome many of those institutional obstacles.

This paper considers how gem miners, businesses, Non-Governmental Organizations (NGOs) and governments can play an important role in improving the predicament of many emerald producing

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E-mail addresses: japo3@yahoo.com (J.A. Puppim de Oliveira), saleem@alum.mit.edu (S.H. Ali).URL: <http://www.ias.unu.edu> (J.A. Puppim de Oliveira).¹ Tel.: +1 802 656 0173; fax: +1 802 656 8015.² Some specialists estimate that less than 5% of the retail price of a good cut emerald stays at local level, and much less again is available to be invested in public goods (we estimate less than 0.1% in the case of local government). The 5% includes the private remuneration of miners, even though they may spend very little locally.³ In this paper, we will utilize the expression “cluster” to refer to an agglomeration of mineral related activities, though other expressions are found in the literature. There are a few other concepts similar to clusters, such as the Local Productive Arrangement (Arranjos Produtivos Locais—APLs in Portuguese), industrial districts and local innovation systems.

regions by promoting initiatives that lead to more effective local development. Based on this analysis, we propose some recommendations for improvement in the sector. The promotion of gem related small scale activities as a clusters can build institutional capacity to overcome obstacles by formalizing mining related activities, attracting investment and bringing a balance between social demands and provision of social services.

Mining and clusters

We use the concept of clusters and social upgrading to analyze the case of emerald mining. Although there are many definitions of clusters, we define them as small agglomerations of economic agents working in one specific sector in one region. There may be some interaction or potential for interaction among the economic agents, and between them and supporting organizations, such as governments, Non-Governmental Organizations (NGOs) and universities. Even though the focus of clusters is the dynamics of small economic agents, we also consider as clusters agglomerations with a presence of medium and large economic agents. We could borrow the concept of clusters for mining areas, as mining firms, independent miners and others in the mineral production chain (cutting, commerce, etc.) both in the formal and informal sector could be considered economic agents in the same (mining) sector. Academia and the business community have used the idea of clusters widely in recent decades. The literature on the subject has grown rapidly, along with public policies that try to create and develop clusters.⁴ A cluster as a unit of analysis can also serve as an interesting concept in thinking about local development, as do other units of analysis of economic organizations, such as firms, sectors or production chains, lack the territorial boundaries that delimit local development, and includes non-economic actors (governments, training organizations and units).

Using clusters as a conceptual framework to work with mining activities is especially useful when dealing with small-scale mining. Generally, a mining region develops as a resource cluster over time because it naturally becomes an agglomeration of economic actors in the mining sector. Minerals attract miners and mining companies, as well as organizations that work closely with them, such as specialized training organizations, trade unions, dealers and jewelers. Those actors interact with each other to a certain extent to explore, exploit, commercialize or add value to minerals. Miners can work alone or in small groups, and could be considered small or micro-enterprises. The relationships among different organizations and individuals are affected by the amount of trust existing among the social actors, which in turn is shaped by cultural local values. These relationships influence the way the actors cooperate as well as the cluster's innovative capacity, which in the end determines the spill over effects on local development.

The dynamics of the interactions among the different actors in the cluster can bring positive effects for the economic agents (firms or individuals). These effects could be divided into two kinds. First there are the external economies documented by Alfred Marshall in the 19th century (Marshall, 1890). They are the positive or negative unpaid, extra-market side-effects (externalities) of the activity of one economic agent on other agents. There is also a second effect, collective efficiency, which is the advantage to be gained by local external economies and joint action (Schmitz, 1995). This is a deliberate conscious act resulting from the collective action of different actors in the cluster (both economic agents and supporting organizations). Those effects are important in explaining cluster

upgrading as collective action is necessary to help firms to overcome certain obstacles to upgrading.

The concept of the cluster was particularly important in providing conceptual support to policies in small scale gem mining in Brazil, as gem mining is developed mostly through formal and informal mining organizations, generally at a small scale. In clusters, small economic actors are able to overcome some of the hindrances they usually face when working in isolation, such as lack of scale, lack of specialized skills, difficulty in obtaining modern technologies and inputs and services, problems in reaching markets and good distribution channels, and access to information, credit and services.

Clusters can also help small scale mining firms and individual miners to socially upgrade. Social upgrading is the improvement of social, environmental, labor and economic (formalization) standards and local and/or regional development.

The good governance of clusters can help small producers to overcome the obstacles to social upgrading, bringing the advantages of scale and collective efficiency:

- Scale in finding individual solutions for many. For example, one low-cost individual sediment tank for reducing water pollution.
- Collective joint solutions, such as common schist washing tanks.
- Development of specialized skills helping to improve the productivity and income of miners.
- Potential for innovation in technology and the spread of information and learning, as there are more people and organizations developing their ideas.
- Potential for development of external services (consultancy, maintenance).
- Scale in the organization of social movements (environmental, labor) and law enforcement.

However, being in a cluster may also have some limiting effects on social upgrading, as clusters may lead to difficulties in scaling-up because of the number of actors and high total costs involved and due to political resistance from social actors that benefit from the disorganization of the cluster.

The literature in Brazil has exposed several examples of clusters in different sectors and regions⁵ (Amorim, 1998; Lasters et al., 2003; Cassiolato and Lastres, 2003), including the analysis of social and environmental improvement (Puppim de Oliveira, 2009). In the mining sector, some practical interventions in the clusters in the mining sector have taken place to improve environmental quality, as for example, in the cluster relating to ornamental stones in Santo Antonio da Padua in the state of Rio de Janeiro (Langsch et al., 2009; Peiter et al., 2000).

Emerald production in Brazil

Mining of different minerals has going on in Brazil for centuries (Machado and Figueiroa, 2001), but emeralds were not found until recently. The Brazilian explorers (called Bandeirantes) of the seventeenth century trailed the interior of the country several times to try to find emeralds without success (Sauer, 1982, 1992).⁶ Only in the 1960s, were emeralds found in the state of Bahia by chance. Since then, emeralds have been found in several places in Brazil in the states of Minas Gerais, Goias, Tocantins, Bahia and Ceara. The history of appearance of Emeralds in Brazil is shown in Fig. 1.

⁵ See the extensive work of REDESIST (www.redesist.ie.ufrj.br).

⁶ In the attempts to find a legendary "emerald mountain" in the middle of Brazil, the "bandeirante" Fernao Dias Paes Leme found gold in the region of Vila Rica (today's Ouro Preto). This led to the gold rush and boom of the gold cycle in Brazil, which was fundamental to the development of the country in the seventeenth and eighteenth centuries.

⁴ See the work of Schmitz (1995), Schmitz and Navi (1999) and Altemburg and Eckhardt (2006).

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