Threats to the sustainability of the Venezuelan Guiana watersheds

Accepted 4th June, 2017

ABSTRACT

The purpose of this study is to determine the threats to sustainability associated with the illegal artisanal gold mining that is being developed in the Venezuelan Guiana watersheds. The Delphi Method is used to know the motivations behind illegal mining in the Venezuelan Guiana watersheds and to obtain a sustainability prospection on the region. Institutional weakness, corruption, impunity, lack of decent jobs and the displacement of miners from the Venezuelan Guiana neighboring countries were pointed as some of the main threats to the Guiana watersheds sustainability.

Key words: Sustainability, Venezuelan Guiana, Delphi method, illegal mining.

INTRODUCTION

One of the causes of the Venezuelan Guiana watersheds unsustainability is due to the artisanal or small scale mining that destroys and pollutes broad spaces when searching and extracting mineral (Paolini, 2008; Paolini et al., 2011). We refer to the gold illegal mining that contaminates riverbeds with mercury, used as metals amalgamate. Neurotoxic effects have been observed in people belonging to three different populations on the Venezuelan Guiana because of the consumption of fish contaminated with mercury (Paolini et al., 2012). This work is dedicated to the development of a consult of an experts group from different disciplines with the aim of obtaining diverse opinions on the Venezuelan Guiana gold mining. For this consult, we chose the Delphi Method. The consult purpose is to determine the causes and motivations of mining in order to understand this phenomenon and to acquire a vision facing the future sustainability of the socio-ecological systems located in the Venezuelan Guiana.

The problem of mining in the Venezuelan Guiana watersheds

In the environmental situation balance of Venezuela (VITALIS 2009, 2010) the persistence of illegal mining in the south of the country is pointed out as a problem, particularly in the states Amazonas, Bolívar and largely on the Caura watershed, all with regrettable consequences on water quality owed to the discharge of mercury in water bodies. On the Presidential Decree of the Republic Nº 4633 (TSJ, 2006) it is stated that:

The irrational exercise of the mining activity in the Bolívar state has severely altered the environment violating so the norms envisaging concerns of its conservation, defense and improvement, thus nearby towns, indigenous populations and the rest of the collective have been affected.

This governmental recognition of the damage of mining upon the Guiana region is not new nevertheless for this work the importance remains on the fact that the knowledge of the problem has become explicit from the instance with greater level at the national government. To palliate the illegal mining situation, euphemistically called artisanal mining, a public policy was designed to denominate mining reconversion. The Mining Reconversion is a governmental strategy with the objective of incorporating gold and diamond miners working illegally in the

The Delphi method

The Delphi Method has been used as an information
request technique directed to a group of experts about future events, estimation of quantities on a phenomenon and obtaining technology previsions (Strauss and Zeigler, 1975). This technique has also been used to explore the importance of historical event, evaluate budget options, gather the structures of a model, and determine the advantages and disadvantages of policies appliance (Linston and Turoff, 2002). Okoli and Pawlowski (2004) used Delphi to identify and prioritize problems in administrative decision making when designing information systems. Green et al. (1990) used Delphi to identify environmental impacts on rural environments and to obtain information about tourism impacts on urban areas.

The technique is based on problem definition and the design of questions formulated to a panel of selected experts aiming to obtain information and where possible, to reach consensus towards the raised problem. The number of consulted people can vary from two to thirty; some authors prefer to consult few persons to get concrete answers. The anonymous nature of the consultation pretends to avoid dominance and possible biases between those consulted (Dalkey, 1969; Wuodenberg, 1991; Linston and Turoff, 2002). The validity of the technique was assessed by Ono and Wedemeyer (1994) and they concluded that the forecast results were significantly correlated with the evaluation of the studied cases tendencies.

In this investigation the Delphi method was used to explore the illegal mining motivations in the Venezuelan Guiana watersheds and to obtain a forecast on the sustainability of the Venezuelan Guiana. The group of experts comprised eighteen persons from different areas and occupations that are aware of the problem from their different viewpoints: environmentalists, journalists, anthropologists, lawyers, engineers and university professors. From the eighteen consulted persons, twelve have Ph.D. degree from European and North American Universities. Whenever possible two professionals per specialty where included in the group of experts. To be part of the opinion group it was required that all consulted persons were in knowledge of the mining issue in Guiana. The designed questionnaire was sent by e-mail to each one of the chosen experts.

The questions of the Delphi consult

The number of questions and the way the Delphi consult was presented can vary from problem to problem. To evaluate the technique Ono and Wedemeyer (1994) consulted the experts using twenty four tendencies and seventeen events. Okoli and Pawlowsky (2004) used three questions to identify key factors in the development of strategies of electronic trade. In the evaluation of the tourism impact on the environment Green and Moore (1990) used seven questions. Choi and Siraka (2006) designed a structured questionnaire with twenty six indicators, while García-Melón et al. (2012) used thirteen questions for similar purposes.

In this investigation, the following questions were formulated (Q):

**Q1:** Under your criterion, which is the main motivation for the existence of illegal gold mining in the Guayanese watersheds?

The objective of this first question is to explore the motivations behind mining exercise in the Venezuelan Guiana.

**Q2:** Do you think that the Caura Plan and mining reconversion (4633 Decree) will make miners desist from Guayanese watersheds that have been object of illegal mining?

In this question, it is wished to know the experts perception of the public policies developed to incorporate miners in other activities that do not impact the watersheds in the way the artisanal mining does.

**Q3:** Referring to this kind of mining, can this situation change in the future?

This third and final question is meant to inquire about the future of mining, in order to obtain a future vision on mining activities in the Guayanese watersheds. This last question is related to the sustainability of the watersheds of Guiana. The answers to this question will enable to obtain in an indirect way a prospection on the sustainability of the Venezuelan Guiana watersheds thorough the visions of consulted people.

In the Venezuelan Guiana, besides gold mining, diamond, iron and some incipient coltan mining can also be found. It is important to note that in this case we refer to illegal mining due to the existence in the region some institutionalized large scale mining developments: an iron and steel industrial park because of the existence of mineral iron and the export industry of aluminum (between the top ten of world production) that resides in Guiana thanks to the presence of enormous bauxite reservoirs and water resources to generate the hydroelectricity needed to the production of this metal. Nevertheless for the consultation purposes we referred to gold mining, the most significant and with greater impacts for the Guiana region because of mercury pollution with neurotoxic effects and the landscape deterioration that this activities produce.

Delphi consultation results

The answers to the question (Q1) about the motivations for mining existence covered a broad spectrum that was related with the historical character of mining in the
Guiana region. Over time, families have been raised with mining as only livelihood and therefore making it a more than centuries-old tradition. This activity has generated a whole way of life and a deeply rooted mining culture. Other mentioned motivations are the existence of great reservoirs of the mineral, the need for a job that provides quick monetary income to overcome the material poverty caused by the lack of economic opportunities and alternatives. The existence of a system for the mineral production, distribution and merchandising allows economic profiting in this activity. The low inversion required to maintain alluvium mining activities altogether with the few or scarce controls on the made environmental damages and the relative ease of extraction, make out of this kind of mining an attractive economic activity. In this sense, there are experts that point the existence of a system formed by officials, politicians, military and traders that live, allow and maintain this activities.

On the other hand, facing the world economic crisis, gold has become a safe refuge for investors raising its role in the economy. An additional motivation exists in the fact that the Venezuelan Guiana is a bordering region with little shelter. This situation makes these sites permeable to the presence of any fortune seeker that ventures over these places. Therefore the pressure exerted on the environment by this activity it is not limited to the national inhabitants due to the presence of foreign miners in this Venezuelan region.

One of the consulted experts refers to ancient legal motivations that would historically endorse mining activities:

In old mine laws two regulations exist watersheds disorder and depredation: one is the denounced, which gave exploitation and exploration rights through concessions to whom discovered and ‘denounced’ the reservoir, free of profiting call that gave and right two to the anyone to exploit alluvium gold in an artisan way. The free profiting because of local authorities corruption and complicity, became to an indiscriminate use of ‘hydraulic monitors’—diesel gasoline (motorized machinery that remove and extract large amounts of soil with water pressure causing severe and irreversible damages [environmentally].

Therefore, it is considered that both denounced and free profiting would largely motivate in a legal way the developed activities by small scale miners. The negative environmental effects of this kind of mining go from environmental mercury pollution to the destruction of forest and riverside ecosystems. Despite the damages on river beds and banks produced by alluvium mining, this activity is a way of livelihood for a part of the occupied population and has a low level of social conflict in the region as it is assured by one of the consulted experts. In summary with its social, cultural, historical, legal and economic motivations, gold mining is nowadays an undeniable activity with undesirable consequences for the socio-ecological systems of the Venezuelan Guiana.

In the answers given to the question (Q2) about the public policies that would allow miners to desist from their purposes and engage into other activities different from mining (be reconverted), there was a general consensus manifested on the little confidence provided by this public policies for the reconversion and conservation of the watersheds where mining is exerted. In the respondents opinion there are different factors that make a policy like the Mining Reconversion ineffective. First of all, mining traditional culture and its historic evolution in the Guiana region is unknown. Away from seeking for consensus and approximations between the position miners behold and the government’s vision, a model that doe between the parts is imposed, denying an existent social reality in the Venezuelan Guiana.

Mining reconversion has been a failed strategy; gold market prices leave no place for economic profits offered by the strategy for miners to abandon these activities. Consequently, artisanal mining is maintained as an attractive activity for those who don’t have the appropriate educative level income for their subsistence.

The Caura Plan is a policy that was designed to protect the watersheds of Guiana against the environmental threats illegal mining represents and to restore areas devastated by this practice. The Plan aims whole territory located at the right. The bank Minister of the Environment comments that integrated environmental policy at the south of the Orinoco is oriented to protect the region’s ecosystem” (CO, 2010a), and to prevent aggressions to the territorial sovereignty and to protect nature, which in some points, could take more than a century to recover from the damages [caused by illegal mining]” (CO, 2010b).

Consulted experts pointed out that the Caura Plan failed as a policy for the conservation and protection of the south watersheds of control mechanisms in such a wide scope:

There is no territorial planning activity of certain law areas of the Guayanese region, yes, there are forest reserve zones, national parks, woodlots, river beds, gallery forests, whereby deduction mining is banned, but that implicit prohibition it is not complied.

Besides the aforementioned citation, experts state that the Caura studies or plans has a clear fascist decree miners into farmers or artisans”, and will no longer be farmers but vehicle and cell phone consulted makes this reflection:

Human kind history has been written with the attempts, in many times vane, of modifying the life systems that nature itself has imposed to human beings, it is part of the lections of history that the authoritarian and repressive destruction of traditions and idiosyncrasies of the people have brought death and very negative consequences, social and economic wounds with long and difficult recovery, that in most cases have not been useful to get the desired
Illegal mining as a threat to the sustainability of the Venezuelan Guiana watersheds

Threats to this socio-ecological systems sustainability are related to both the external and the internal field, with a greater strength in the socioeconomic domain. Nevertheless the biggest consequences are evidenced on the environment and revert to the population that gets contaminated with the mercury used to amalgamate mining extraction metals. Table 1 shows some of the studied threats to the sustainability of socio-ecological systems synthesized.

Illegal mining subsists because of the economic attractive, the individual situation of people who work in this activity, for the State weakness in fighting this environmental illicit and the corruption that strolls over this places.

In a study by Pellegrini and Invernón (2007) on National Parks System, around 500 persons are working as univestry staff, technicians and park rangers. This small Natural Reservoirs and Parks system shows partly the weakness of the State presence on this vast region of the Venezuelan Guiana. The Caroní and Caura rivers watersheds occupy more than 120.000 km² (Table 1).

Miners relapse, as claimed by consulted watersheds] and return over and over again”. That is fought in one place, but the knowledge miners have on where the mineral is located makes them abandon that point, as a result from pressure, but they move to another uncontrolled or with less pressure within the same weakness of the state, the impunity and the corruption that have been established in these lands. The pressure on the Brazilian garampeiros push them to cross the border and establish favorable spaces for mineral. The people who exercise mining are Venezuelan and the rest 60% come from boarding countries, Brazil and Colombia (Davies, 2010), these data are not accurate. For the environmental sector, the Minister comments that "more foreigners... emanate from Brazil and Colombia (CO, 2010c). Apart from the estimations inaccuracy, it is inferred from cited declarations that there is a high presence of foreigners dedicated to illegal mining.

This social scenario has been aggravated with the presence of national and international mafias on the region of Guiana. One of the consulted experts manifests it by this saying:

"Illegal gold mining is a huge illegal business of Guiana corruption in which local and foreign mobs participate as well as an international trading network makes it very

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<tr>
<th>Scope / Domain</th>
<th>Socio-ecological and legal</th>
<th>Biophysical</th>
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<tbody>
<tr>
<td>Internal</td>
<td>Illegal subsistence mining</td>
<td>Ecosystems destruction</td>
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**Table 1: Threats to the sustainability of socio-ecological systems in the Venezuelan Guiana watersheds.**
hard to disappear on a short term”. Another said:

"Organizations and all kind of delinquent mobs with arms act as search organizations in these distant places and in most cases, are favored by the government with its concessions, contracts or business to ruthlessly evict those standing in their territories. Also, the military authorities, instead of fulfilling their patriot and citizen protection duty, serve as a shaming help for this subordinated interests, that have monopolized mining activity from extraction to gold smithery”.

Also, one of the respondents mentioned that "in La Paragua (Caroní River watershed) where thieves are lords and master, eight people were killed due to a ‘disp the control of the zone, making mining eve facts bind to the allegations made by Defense Minister, who sustains that indigenous leaders on the Bolívar state are linked with gold mobs in the region (Rangel, 2012). This information reply did not take long from armed force as-participant’ illegal mining the ‘co [Bolívar] of the consulted experts refers to this situation in this way: “the Armed also be depurated, since they contribute to laws violation even themselves being owners of machinery in illegal deposits”.

Reflecting on the reality pictured about the region and the investigations made in Guayanese watersheds, questions can be raised regarding the sustainability of these socio-ecological spaces in a rational time horizon.

Artisanal mining as a sustainable development opportunity

Gold mining in Guiana has gone from artisanal issue to overcoming material poverty illusion. The amount of metal reservoirs is indubitable, with an estimate of over 8000 tons of probable reservoirs, though it has been recently stated that there are about 6300 tons of inferred reservoirs (Franceschi, 2006). Thus, gold and metal keeps have been extracted and diverted to international markets. In recent years, the constantly increasing price has passed from 595 to 1580 US$/oz. The continuous increase in price and metal existence configure a true opportunity for the development of an organized and sustained mining activity. With this, great quantity of people with experience in auriferous mining should be technically trained to shape the human resource needed to rationally exploit this metal resources. On the amount of miners precariously exercising this activity, there is no liable information. From various sources, between fifty thousand and near half a million people are dedicated to mining, a third of which is believed to be foreign. It has been stated that there is a limited access to public information, from crime data to information regarding environmental issues (VITALIS, 2010). This is not a limitation, except that a census on this huge human resource would generate honest numbers on the growing phenomenon of uncontrolled mining. Therefore, the planning of activity on profitability, conservation and restoration using the principles of spaces is a challenge that must not be undertaken. A change of vision is needed, by considering the solution to this problem, that is, the simple adoption of a public policy, and to conceive it as a real sustainable development opportunity at a regional scale. Owing to the opportunities and comparative advantages, it has been estimated that adequately organized gold mining would generate enough resources to make out profitable activity. A profitable enterprise does not only generate material richness but would become an effective source for dignifying great number of people illegally working under undesirable conditions.

Conclusions

Mining will exist for as long as gold market exists and the aforementioned system that has normalized those illegal practices. The situation is complex and multifactorial. Rigorously taken decisions are needed to control spaces used by this type of mining, an adequate socioeconomic attention to humanize the conglomerate of people now depending from this kind of life, educational attention that teaches mining communities about the damages caused by these practices based on techniques that impoverish and pollute the environment and an effective monitoring of those spaces feasible to be exploited by illegal mining. Changing the present state of the situation is not easy. Few wills exist on stopping those means of ecosystems destruction. Ever since miner incursions started in the Caura watershed, the phenomenon has not been stopped, the Caura Plan more than a successful policy has become a failed strategy that could not yield fruitful results.

As a result of illegal mining, the sustainability of Guiana’s has experienced a decline. Reverting this situation is a challenge to citizens across the globe to do their bit in the recovery of these vast spaces deteriorated by the practice of uncontrolled illegal gold mining.

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