

Traditional Small-scale Gold-mining of Northern Philippines Mountain Tribes: A Case of Sustainable Mining?

I. Introduction

This research proposal focuses on one of the least studied areas in development field -- traditional mining of indigenous tribes and its relevance to sustainable development. This combination of the subjects of mining, indigenous systems, and sustainable development is still almost an unexplored terrain. Not a few studies have already been done about the ecological and socio-economic sustainability of non-mining activities of tribal communities such as traditional farming, logging and hunting (cf. Gadgil, 1985; Klem, 1985). The few studies done on mining and development have largely been about corporate large scale mining (cf. Beaumont, 1989; Rees, 1985). Still fewer are the studies specifically on the consequence of these corporate mining industries on the local indigenous populations (cf. Emberson-Bain, 1993). On the other hand, there are only perhaps a handful of studies discussing contemporary small-scale mining of indigenous tribal communities and certain aspects of sustainability (cf. Trudinger et. al., 1991).

The dearth of studies on the subject of traditional mining by indigenous communities and sustainable development does not match the actual importance of the mining sector in the economies of many developing countries and regions. The scantiness of materials does not fit too the magnitude of problems and issues on resource and environment management, social equity, and ecological and socio-economic sustainability that corporate large-scale mining, primarily, and non-traditional small-scale mining (the rush miners), secondarily, have engendered. Neither does the lack of research in this field reflect the major significance of indigenous peoples as resource users and managers who in the Philippines number 3.5 million, and in Asia, 150 million.

Contrary to popular perceptions, nonfuel mining still occupies a major role in the world economy. In about a dozen low-income and lower-middle-income countries, it has accounted for more than 10 percent of the GDP and more than 50 percent of their total merchandizing exports, or both (Gillis et. al., 1992: 526). In many other developing countries, nonfuel mining comprises a substantial share and a leading position in their commodity exports. It continues to occupy a dominant position in the economies of such large developing countries as South Africa, China, and Chile and also in the narrow, primary-commodity-based economies of many small island states in the Pacific.

While the conventional wisdom of the the 1950s and 1960s which held that countries with relatively rich natural resource endowments would attain higher rates of economic growth than less well-endowed countries has already been rejected (Ibid: 527), today in many developing countries with mineable reserves, mining continues to be regarded as a major component of their over-all export-led growth strategy toward industrialization. In most Pacific island states, for example, the mining sector serves as linchpin of their export-led growth strategy. In South East Asia, although a significant shift to export of manufactures has occurred in a number of

countries, to date, production and processing of primary products based on both renewable and non-renewable natural resources such as fuel and nonfuel minerals, continue to be in value terms the dominant industrial sectors in all countries of the region, except Singapore (Dicken, 1990: 200). In the Philippines, in particular, mining is held by the government as one of the would-be propellant sector in an export-led strategy designed to catapult the country to NIC status by year 2000.

The wisdom of high dependence on nonfuel mining for sustainable economic growth has been seriously questioned on socio-economic grounds. Postwar history shows that countries which are leading exporters of nonfuel minerals tended to grow substantially more slowly than low-income nations in general. Such is also true for exporters of nonfuel minerals which are middle-income nations (Gillis et. al., 1992: 526). Not only slow growth, but serious social inequalities have marked these mineral exporting countries, limiting the spread effects of mining revenues (Rees, 1985: 153-154).

Aside from socio-economic growth arguments, the mining sector as a sustainable development pole has also been seriously challenged on ecological grounds in recent decades. Great concerns have been raised against the rapid and massive degradations of ecosystems wherever the big mining companies operate.

Environmental effects of mineral exploitation may greatly differ depending on the type of activity involved, but in general the original environment in the mining site itself is almost totally destroyed (Beaumont, 1989: 154). The flora and fauna in the area become impoverished. Pollution of the water systems, soil erosion, sediments deposits in riverine systems, large mining spoil mounds, loss of timber resources and other forest covers, and toxification due to chemical wastes or weathering of mining spoils are among the major environmental impact of strip- and deep-mining operations of big commercial firms. These degradations of the ecosystem are not only on-site but downstream or off-site as well.

Mining in its dominant corporate business mode today has, for legitimate reasons, been stigmatized as highly unsustainable and ecologically disastrous. The popular notion is that mining is an activity only useful in the short-run. As such resource exploitation should be optimized. This, in order to be able to diversify in the future the country's existing resource base to that which is more by nature sustainable. Yet, the premise that mining activity can be conducted and operated only under the current dominant mode has never been challenged. To date, the popular assumption among state planners and growth strategist is that the large commercial businesses -- the transnational and big domestic mining enterprises -- would continue to be the only significant and viable players in the field. At this point certain important questions are in order.

Has nonfuel mining, specially precious metal mining, always been large-scale, capital-, technology- and infrastructure- intensive, which could be viably operated only by big business corporate set-up? Should mining always be conducted and governed by the micro-economic cost-benefit function of private firms, regarding environment costs as mere externality? Should nonfuel mining ought to be, as it is common now, 'intrinsically' highly unsustainable both in the socio-economic and ecological sense? Should governments ignore certain, albeit uncommon but real, situations that can prove mining to be otherwise and study the possibility that the activity can be developed along certain lines rather than the operations of private capitalist firms?

And if mining could be removed from its current big corporate business mode of operations, would it still be so unsustainable? If it were operated by more or less egalitarian communities, with strong social cohesion and common welfare values and whose members employ local indigenous small-scale technologies and effective traditional regimes of environment management, would non-renewable nonfuel resources deplete as fast? And would the consequence to surrounding natural resources be as serious? Would all these happen, if small-scale mining is effectively supplemented by small-scale farming as it is in some cases in Northern Philippines? In short, is there such a sustainable alternative to big corporate mining?

II. Objectives of the Study

This research proposal would inquire into another mode of mining, which, based on my preliminary observations, is an apparently sustainable alternative (in the socio-economic and ecological sense as well as in a comparative sense) to the big corporate mining. It would be a case study of traditional gold mining practiced by the indigenous mountain tribes inhabiting the municipality of Itogon in Northern Philippines, my area of field research last summer in connection with my recent masteral thesis in the Institute of Social Studies (cf. Sajor: 1993). It will be a deepening study of the sustainability claims of the indigenous miners cum farmers, whom I stayed with for more than a month in my research data gathering last year.

The traditional small-scale miners have been so termed because of their cultural history which dates back to at least the 15th century. A mining technology similar to that described in the historical records is still being used by these miners, except for certain innovations such as the use of iron where wood and bamboo were ones used. The current customs and social organization to date are still basically those that have been passed on from one generation to another (Trudinger et al., 1991: 21).

This research project would problematize sustainability in resource use and management of communities primarily engaged in the extraction of a non-renewable resource. It would investigate a real model of interaction between the mineral and land resource users organized as an indigenous tribal community and the local environment. It would look into the former's patterns of behaviour, performance and institutions in resource use and management and their persistence and change over time. This research would also investigate local socio-cultural mechanisms that influence resource use and allocation, distribution and redistribution of outputs, which are pertinent to explaining the indigenous miners' performance as resource users and managers, as well as the changes that have been occurring in this sphere over time. Further, this research would study external and macro entities such as the actions of nearby big mining firm, the market, the state, and global conditions and how they interact and influence the dynamics of local mining, subsistence agriculture and resource management. Lastly, this research would inquire into the degree of possible replicability in other mineral-rich communities of the local indigenous technology, social mechanisms, and cultural traits and practices related to sustainable practices of gold mining and supplementary agriculture.

III. Relevant Issues

a. *Sustainability in the context of extraction of non-renewable resources as nonfuel mining and*

policy options

Socio-economic as well as ecological arguments against rapid and massive exploitation of nonfuel mineral resources that are non-renewable have buttressed the popular view that mining should be looked upon only as a useful *short-term* activity which can be capable of providing significant wealth locally and nationally. It would however be unwise to regard it as a *long-term* component of the national economy (Beaumont, 1989: 162).

Under the circumstance that historically transnational corporations and private big business have captured the natural-resource rents in mining and considering that the resources at stake are non-renewable and, in some cases, nearing exhaustion, governments of LDCs in recent decades have increasingly used direct tax and other fiscal instruments for the capture of natural-resource rents (Gillis et. al., 1992: 536). Thus rent capture has become the focus of public policy in mining.

An objective of this measure is for the government to increase its share in rent capture so that it can implement necessary strategies for sustainable development and be able to fend for itself in the future, in anticipation of the depletion of mineral resources and the post-mining massive environmental destruction. While public instruments for greater rent capture in mineral resources exploitation may have increased state revenues for development projects, the basic wisdom of encouraging large scale corporate mining with its attendant socio-economic and ecological unsustainability has remained unquestioned. Alternative type of mining has not been seriously posited. Public policies are more geared towards either temporarily disallowing the operations of big companies in cases of very serious and immediate environmental disasters or in cornering more share in the corporate profit windfalls for future, post-mining economic activities.

Should current public policy focus on greater rent capture by the government in the corporate mining sector, or should it instead reorganize the mining industry, wherever possible, into community-oriented, small-scale mining which emphasizes environment-friendly indigenous technology and harnessing local traditional social institutions for equitable distributions and more sustainable operations and effective resource management? Should not mining be problematized as a possible sustainable people's livelihood project in mineral-rich communities?

b. Indigenous peoples and development

Mineral-rich areas traditionally inhabited and more often worked on by indigenous minority groups have become increasingly threatened by global and national processes of resource exploitation. Conflicts between indigenous peoples and multinationals and governments, the chief actors of many developmentalist projects, have become a worldwide phenomenon. For the developers, investors, financial institutions and national policy elites, the presence of and the material and cultural stakes of indigenous peoples in these "frontiers of development" are merely incidental (Wilmer, 1993: 128). On the other hand, for the local indigenous peoples, their material and cultural life form the very basis of their survival and overall well-being.

In this growing conflicts important issues have arisen. Should indigenous communities' -- their existence and distinct development in their natural environment -- be traded-off for the profits and revenues of transnational corporations and governments from the extractive industries, which are being alleged as necessary to propel wider-scale growth and

industrialization? Should not global and national development be based on a pluralist attitude, recognizing that local communities, especially indigenous communities, have established their distinct way of life and development path that are no less legitimate than the hegemonic global and national development as defined by interstate, state and transnational bodies today?

c. *Traditional environmental knowledge and sustainability*

Another relevant issue is the knowledge base of local and indigenous peoples acquired through their intimate contact with their environment. Referred to as traditional environmental knowledge, this has gained international recognition through such documents as *World Conservation Strategy* (1980), the Brundtland Commission's *Our Common Future* and the UNCED Agenda 21 (1992), which underscored the importance of the expertise of local people in natural resource management. These knowledge bodies, however, have always been handled with an attitude of skepticism by western scientists who argue that traditional environmental knowledge may have been impressive in earlier forms but is now irreparably eroded with the assimilation of aboriginal peoples into the western culture and who deny the continued vitality of traditional cultures (Morin-Labatut and Akhtar, 1992: 24).

In mineral resource conflict situations, more often than not, transnational corporations and state planners have resorted to the hegemonic status of western science to enforce their ecologically controversial development projects, ignoring the legitimacy and validity of relevant local traditional environment knowledge. Moreover, top-down environment management programs have failed to harness pertinent indigenous knowledge systems in the localities.

Much research studies on indigenous knowledges and their dissimulation have to be done by both social and natural scientists in order to legitimate the former as epistemologies running parallel to western science. The ongoing debate is necessary, and hopefully should contribute to remedy current asymmetrical relationship in status between indigenous and western knowledge systems so that complementation between the two fields in environment expertise can progress.

d. *Indigenous management regimes and sustainability*

A closely related issue is the growing debate within the environment camp "on how indigenous management regimes for communally held resources could be supported, which could form the basis for future community-based natural resource management programmes (Davies S. and Leach and David R., 1991: 22)". Effective local institutions of resource management of common property resource have undergone erosion processes due to a host of external forces such as the operations of nation-state jurisprudence, market impingement and commercialization, cultural integration and in-migration of outsiders in the communities. On the other hand, many have persisted even as certain alteration processes go on.

Traditional small-scale mining and effective management of the environment, for example, occur under distinctive local institutions of social authority, communal concepts of property, and custom laws and cultural practices concerning land use and distribution and redistribution of land produce. Identifying what institutions and practices should be preserved and how to ensure this under the circumstance of changing macro situations can help in search for remedies to the problems of resource degradations and effective management of resources.

I will locate my research study in these raging debates, investigating and explaining a sustainable model of traditional small-scale mining – its component processes, institutions, and dynamics – and argue the case not only for local development but also in terms of a sustainable growth and development on a broader scale and contribute as well to elaborating theories on the issue on sustainable development.

IV. Central Problem of Research

The central research question of this proposal is – Does the traditional small-scale gold mining of the Igorot tribes in Northern Philippines provide a model of sustainable mining? If it does, what chain of causes explains this sustainability? If it does not, what are the interacting variables and how have they related and have generated a process of unsustainability over time?

V. Specific Research Questions

a. Has traditional small-scale mining in the communities under study caused significant environment degradations in about four generations? If there were/are, how have these affected other resource uses in the community?

b. Has traditional small-scale mining – singularly or in combination with other land uses in the community/household such as swidden farming, vegetable gardening and livestock raising – provided livelihood (*i.e. adequate stocks and flows of food and cash to meet basic needs* - [Davies, Leach and David, 1991: 10]) to the people in the mining communities over time?

c. Has population pressure on resources manifested over time in these communities? How?

d. Have macro and external factors such as commercialization, state of the market and commodity prices, state policies, and operations of adjacent big mining firms, caused serious depletion of minerals and overall degradation of the resource base of the communities through time, resulting in the narrowing of 'ecoscope' (*i.e. the boundaries of what is and what is not sustainable in the economic functions of the environment* [DC, 1993: 17]) of the locality, straining its basic livelihood capability?

e. What is the state of traditional environment knowledge of these indigenous communities, and how significant has this been in the preserving sustainable practices in resource use?

f. What have been the role of certain local socio-cultural institutions of allocation, use and management of resources, property regimes, distributive and redistributive mechanisms in sustainable use and effective management of local resources and in spreading evenly livelihood opportunities and economic surplus? Have these institutions persisted strongly or are they dying out over time? How?

g. How have the traditional small-scale miners as the central actors in land management in the community exercised decision-making, what have been their constraining and enabling elements which determine or influence their patterns of behavior in land management over time?

h. What are the conditions by which local traditional small-scale mining could remain sustainable in the present communities? What are the conditions necessary for replicability of their sustainable aspects in other communities elsewhere?

VI. Theoretical Framework: approach and assumptions

This is a study of the interactive process over time between communities of indigenous resource users/managers engaged primarily in mining and secondarily, in farming and livestock raising, and their given natural environment. It aims to unravel the process and the chain of causes of ecological and socio-economic sustainability or unsustainability of traditional small-mining of these communities over an inter-generational time span. It will use the following preliminary theoretical framework which will be further elaborated and sharpened in the preparatory phase of the PhD program.

a. *On Sustainability*

In the reproduction of societies and communities, nature provides the material conditions and opportunities for life. However, it does not contain an inexhaustible reservoir available to be transmuted to human needs (Giddens, 1981: 245). Natural environment provides both enablements and constraints which can only be defined in connection with social praxis (I. Cohen, 1989:217). There is an inherent contradiction in the relation between human social life and the material/organic aspects of the human condition. Human social life is predicated upon nature, yet it has a non-conformity to the natural order and, therefore, it is set off against it (Ibid, 260).

In the relationship of society and natural environment, the latter should not be regarded as a mere passive background. Rather, the physical processes and the social processes should be regarded as in a conjuncture and interacting in situations. Equilibrium or disequilibrium between exploitation and availability of natural resources is at the heart of the relationship and tension between society and nature. It is the key problem defining sustainable or unsustainable use of resources.

Sustainability should be viewed in two ways -- in terms of ecological sustainability and in terms of socio-economic sustainability. Ecological sustainability implies "that land is used in such a way that production levels (output) can be maintained for actual and future populations, without causing environmental degradation and consequent loss of ecosystem production potential (Chandy et. al., 1991: 12)". Socio-economic sustainability of an activity (e.g. use of land) "means that such an activity can continue to be carried out and supported by a specific target group by their own means and within the limitations set by their socio-economic environment . . . (so without an everlasting subsidized external input) (Ibid)".

This study will define sustainable use of natural resources "as meeting the needs of the present population without causing environment degradation and consequent loss of ecosystem production potential in such a way that these land use systems can be maintained with the means of these populations determined by the limitations of their socio-economic environment (Ibid)". Sustainability implies not only ecologically responsible but as well as socially just--equitable and gender fair--and economically beneficial use of resources (DC, 1993: 12).

Sustainable resource use is closely related to the concept of the carrying capacity of a given ecosystem, the limit of exploitation of an area beyond which the ecosystem is in danger or suffers degradation (Ibid: 13).

Over time, resource use in a given environment may lead to one of the four following situations of the ecosystem: under-use (there is unused productive potential available); optimal use (output can only be increased if the carrying capacity is also increased by applying inputs

or ensuring the stability of the system in some other way); exploitation causing depletion (degradation is not yet occurring, but measures are needed to prevent over-use); over-use and depletion (further degradation of the system can only be prevented if measures are taken to stabilise and regenerate the ecosystem and the level of exploitation is reduced)(DC, 1993: 38).

The distinction between non-renewable and renewable resources has important implications on the question of sustainability. Resources such as fuel and nonfuel minerals are intrinsically exhaustible and their use therefore cannot be *indefinitely* sustained. In analysing the problem of sustainability in non-renewable resources, two important questions have to be settled: a) What is the "best" balance between present and future consumption? b) How can the benefits from current exploitation on non-renewable resources be sustained (Conway and Barbier, 1990: 28)? The first generally would refer to the volume and rate of exploitation over a period of time which would result in the rate of depletion of the non-renewable resources. The second would generally refer to how the current earnings from non-renewable resources are used to create a new resource base and production which are renewable such as farming or industries.

b. *On Land Degradation*

Unsustainability and resource degradation are both part of a disequilibrium process between exploitation and availability of resources. Land degradation should not be viewed as purely a physical process. It should be by definition a social problem. The process implies a social criteria which is related to land's actual or possible uses (Blaikie and Brookfield, 1987: 1). Degradation is a loss in the intrinsic value or the capability of the land brought about by both natural degrading process and human interference less the benefits derived from natural reproduction and from restorative management in the land (Ibid: 7) over a period of time.

The relationship between society and land degradation has three main characteristics: 1) the interactive effects of degradation and society through time; 2) the crucial consideration of geographical scale and the scale of social and economic organization; 3) the contradictions between social and environmental changes through time (Ibid: 13). These issues would underpin the analyses of the problem of land degradation in this research.

Spatial and temporal scales are significant in the analysis of land degradation. Geographical scale is tied closely to the issues of decision-making process over land use, conservation and degradation and accounting of costs and benefits. The scale of analysis too will affect the type of explanation made in land degradation (Ibid: 64-65). On the other hand, physical and social causation of degradation unfolds through time. The causes may lie not in the present generation of land use and management but in earlier generations or even centuries ago (Ibid: 66). A historical analysis, therefore, is necessary in any study of sustainability and resource degradation.

This research will follow not a uni-causal explanation of degradation but a conjunctural approach, having a chain of explanations which start with the link of land managers and their direct relations with the land. The next link concerns relations with each other, other land users, and groups in the wider society who affect them in any way, which in turn determines land management. In this chain, the state and the world economy constitute the last links (Ibid: 27).

Multiple, interacting conditions or processes may cause resource degradation. These can be ignorance of the consequences of action on the land, the reckless quest for profit, poverty and deprivation, pressure of population on resources, and population decline (Ibid: 240). The actual

factors involved and their interactions would be both temporal- and locality-specific.

Pressure of population on resources (PPR), *in association with other causes* (such as with poverty, for example), may serve as a critical factor. This research for the moment adopts an open approach to the relation of population pressure to land degradation. Degradation can occur under rising PPR, under declining PPR, and without PPR. PPR can operate to degrade resources or to aid management and repair that may lessen degradation (Ibid: 34). Moreover, population growth has usually a reciprocal causal link, and "that there are other intervening variables between rapid population growth and its causal role in land degradation (Belshaw, Blaikie and Stocking, 1991:72)".

3. On Indigenous Resource Management

The object of human interference in land may be directly related to the production of current crop or any raw material, in which case the consequences may just be incidental. Or its purposive design may be to secure future production in the land. The latter case pertains to land management, which "consists of applying known or discovered skills to land use in such a way as to minimize or repair degradation, and ensures that the capability of the land is continued beyond the present crop or other activity, so as to be available for the next (Blakie and Brookfield, 1987: 8)". The land manager's fundamental job is to manage natural processes by limiting their degrading consequences, both 'on-site' and 'downstream' or those effects which are away from the site (Ibid).

In the indigenous peoples' land management practices, traditional environmental knowledge, which refers to the knowledge base acquired by indigenous and local peoples over the generations through direct contact with their environment (Morin-Labatut and Aktar, 1992: 24), plays a major role. Local indigenous knowledge bodies on environment and technology are intimately bound in the local productive practices of the communities. Their perceptions of their environment and their technology skills are two sides of the same coin of their production practice (Croll and Parkin, 1992: 53).

Most traditional systems of indigenous peoples have been characterized by ecological sustainability such as sound anti-degradation forms of land use practices and the existence of regulatory cultural mechanisms (e.g. taboos and rituals) that limit harvests and production to encourage long-term exploitation or promote of genetic diversity. Although these measures are not necessarily intended always to be conservation instruments, they are generally effective in maintaining the population in equilibrium with the environment (Klem, 1985: 246). Traditional husbandry and use of natural resources in many cases are attuned to local circumstances, integrated in the lifestyle, values, norms and activities of the local population (DC, 1993: 10).

Traditional environmental knowledge is embedded in local social and political structures, and they cannot be properly understood independent of these structures (Johnson, 1992 cited in Morin-Labatut and Akhtar, 1992: 25). Local property custom laws, usufructory rights, rituals, cultural practices, and strong community values related to access to resources and distribution of wealth, are important structures and components related to the practice of traditional environmental knowledge and local sustainability. Moreover, common property management regimes and their institutions headed by locally legitimate leaders have at the community level, village level or extended family level successfully managed resources on behalf of their members in a sustainable (though not always equitable) way (Davies, Leach and David, 1991:

22).

Traditional ecological knowledge, ethno-scientific and common property management regimes evolved in pre-capitalist and/or non-market situations that have ensured long-term sustainable utilization of natural resources have been subjected to and eroded by commercialization, social fragmentation, adverse national policies, populations increase, surplus extractions and patterns of development and their combined effects (Gadgil, 1985: 136; Blaikie and Brookfield, 1987: 244; Davies, Leach and David, 1991: 22; DC, 1993: 10). On the other hand, even as undoubtedly some erosion of the traditional ecological knowledge and management regimes have occurred, they have exhibited vitality and a capacity to evolve and not to pass out (Johnson, 1992 cited in Morin-Labrut and Akhtar, 1992: 24).

4. *Macro Situation and Exogenous Factors*

Macro situation and exogenous factors are relevant to analysing sustainability or degradation in a given scale over a period of time. These aspects have to do with the nature of the agrarian society (especially its land distribution and tenure as well as the ownership of other natural resources), the nature, capability and policies of the state, and the conditions of the national and international economy. Exogenous factors can also be in the form of operations of upstream or extractive industrial firms which could positively or negatively affect the immediate environment of a local community. The macro situation and exogenous factors constitute the social and political economy setting that influence the behavior and options of resource users and managers in the locality.

Although in non-market situations sustainable production for subsistence needs and for petty commodity production and trade have remained as a major objective, the market has virtually penetrated directly or indirectly all land use in the world — directly, as when crops, livestock or timber are produced for intended sale; indirectly, as when resources allocated to subsistence production are affected in type, quantity and timing of allocation by the market sector of the farm and the labour of the family. Market opportunities do serve as a strong force which can put pressure on resources (Blaikie and Brookfield, 1993: 244).

The state plays various roles which are relevant to the process of degradation. It can intervene for better land management. It can regulate resource use or give more freedom to resource users. Its actions can impact on the range of choice of the land managers. One of its most important role is defining the distribution of land and access to resources itself. The state is also the one responsible for formulating and implementing macroeconomic policies which, depending on its substance, focus and scale, more often have unintended negative or positive incidence on the environment (cf. Hansen, 1991).

International economic factors such as low prices of primary commodities and debt servicing problems for developing countries have reduced the economic security of these countries and have limited their capability to invest in necessary medium- and long-term environment rehabilitation programs (DC, 1993: 10).

5. *The Resource User and Manager Approach*

Sustainability and degradation are perceptual and socially defined. More often, there are competing perceptions in which different classes and groups perceive and use land and its resources in different ways. This research will put at center stage the perceptions, actions and

patterns of behavior of the resource users and the managers. In this approach, land and resources become a 'resource-in-use', inextricably related to the people and society that uses them. This also means avoiding a single hypothesis explanations of degradation (Blaikie and Brookfield, 1987: 16,27). After the physical and economic indicators of sustainable resource use and degradation would have been identified, the question that should be asked is: why does the land and resource user treat the land and resources in this way? This question deals with the circumstances of the users and managers themselves, particularly their resources, skills, technology and the time horizon over which they make their decisions (Belshaw, Blaikie and Stocking, 1991: 70).

Ultimately, effective land management rests directly with those who work the land, and who continuously have to make the decisions concerning resource use practices and repair (Blaikie and Brookfield, 1987: 245).

VII. Research Setting

a. *Brief Background on Gold Mining in the Philippines*

Gold mining has historically been the most important mineral industry in the Philippines. Gold was an important barter and trade commodity before and during the period of Spanish colonization of the island. During the American colonial period in the 1900s, gold mining in the Philippines experienced booms. In the 1930s, for example, the country produced more gold than Alaska and its output was second only to California. It also was the third most important commodity in the Philippine export market at that time (Lopez, 1992: 114). To date, though gold has been surpassed by several other non-traditional exports like manufactures, it has consistently belonged to the country's top ten exports. The country's current mining sector, which is dominated by the gold and copper industries, has been eyed by the present government as one of the lead sectors in its thrust for the country to reach NIC status by year 2000.

There are three types of gold mining operations in the country: 1) the corporate large-scale commercial mining operations conducted by twelve major companies, which has recently been shifting to more ecologically disastrous bulk-mining and open-pit mining; 2) the non-traditional (or gold rush miners) small-scale miners, who number about 300,000 and are noted for their ecologically destructive systems of uncontrolled tunnel digging, mine waste disposal and mercury-intensive refining processes; 3) the traditional small-scale miners who number about 40,000 and are noted for their non-use of chemicals and non-destructive mine waste disposal systems (Trudinger et. al., 1991: 16-33).

The third type will be the subject of this research, while it will draw comparisons with the first two types that comprise the bulk of metallic mining in the country and in the world.

b. *The Research Location*

This research will be located in three villages of Itogon municipality, a town located at the southern fringe of the Cordillera Region, a major mountain range in Northern Philippines which is inhabited by 11 indigenous ethno-linguistic groups generically termed as the *Igorots*. The municipality of Itogon is known to be one of the most gold-rich areas in the Philippines. At the height of the gold boom in the 1930s, six corporate commercial mining firms operated in the area (Lopez, 1992: 118). It has been mined by the big commercial mines for eighty years

now. Today, Benguet Corporation, which started operations in the municipality way back in 1905 and the only remaining mining company in the place, conducts open-pit mining in the area and has two milling plants. Benguet Corporation is a transnational corporation, the largest gold producer in Asia and the seventh in the world.

Side by side with the operations of the big commercial mining firms in Itogon, the *Ibaloi* and *Kankanai* inhabitants (two of the largest ethno-linguistic *Igorot* groups) of the place have conducted traditional small-scale mining in the villages. The traditional small-scale miners in the town number about 40, 000. Although there are communities and households engaged only in mining as their sole livelihood occupation, a big number supplement their mining with swidden farming and vegetable gardening.

Based on the findings of my own research in my masteral thesis on the locality, these indigenous miners' gold mining technology has the following important features: a) non-mechanized lode mining operations characterized by small subsurface tunneling at relatively shallow depths; b) high-grade ore mining characterized by extremely low muck waste; c) non-use of chemicals in ore processing and gold refining through the use of water-and-gravity separation techniques; d) labor intensiveness and optimal community and household participation all phases of production. (See Appendix I.)

Based on my interviews in the previous research, the traditional small-scale miners unanimously claim their mining to be ecologically sound, in sharp contrast with that of large-scale open-pit mining of the private company which they regard as environmentally destructive. According to the local indigenous miners, their methods are ecologically superior to the methods of the corporate commercial firms in such terms as soil management, ore-dump rate, waste dumping method, protection of timber and water resources, swidden farms and housing settlements, avoidance of toxification through non-use of chemicals in processing, disposal of mill tailings and in the over-all sustainability of working the gold deposits in the area. (See Appendix II.)

Based on my field and secondary data gathering last year, I found out that the indigenous small-scale miners of the Itogon operate within a traditional socio-cultural context and traditional mechanisms that are related to their use and management of gold deposits, water, forest and farm and grazing lands in their locality. The gold ore deposits are regarded as belonging to the *tomingaw* (a spirit, who according to folk belief, to reside in the bowels of the earth and the mountains who owns and dispenses gold to the local villagers), and the elders of the community are their guardians. Ownership and access to gold tunnels are clan-based. The local council of elders, still held in high esteem by the community, are the authority and advisors in environment management and in resource and property conflicts.

In addition, a plethora of community rituals and traditional practices are practiced such as the *canao*¹, *sagaok*², and *makilinang*³. These cultural practices act as redistributive

¹The *canao* system is a tradition of village feasts common among all the ethno-linguistic tribes in the Cordillera. It is also practiced in connection with occurrences related to mining activity. In cases of abundant gold strike, the owner/miner has to butcher pigs or carabaos and invite the whole village for the occasion. Each relative also gets a generous share of meat, depending on the closeness of consanguinity to the one tendering the *canao*. In the local belief system, this practice is done to show gratitude to the spirit guarding the gold in the mountains who has showered the individual miner with good fortune. Failure to offer the required fowl would likely displease the *tomingaw*, and become a cause for the rich gold vein to disappear. Through the *canao* system, the social status of a fortunate and industrious miner is also

mechanisms in the community for spreading wealth in gold mining and mitigating high social stratification in the village. In addition, these mechanisms enhance and preserve the dominant values of community cooperation and mutual help among members and of social equity, another highly valued local normative.

Aside from local claims of ecologically sustainable practices and presence of effective indigenous resource management regimes, my preliminary research in a couple of villages of predominantly traditional small-scale miners in Itogon during my data gathering last year and also in my visit last month to several villages to prepare this dissertation proposal have yielded two important possible indications of the sustainability of traditional small-scale mining in the place. One is the fact that indigenous mining has occurred in the place for at least four generations already, based on the elders' recall. Another is that the population size of these places has more or less remained stable, even attracting a modest level of in-migration resulting from inter-tribe marriages of their members.

On the other hand, sustainability may also be in a process of decline or waning. In my field visits last year and this year, I noticed that in many villages where swidden farming and vegetable gardens have been an important supplement to gold mining, the former have been suffering from declining water source, soil erosion and nutrient depletion. How long can indigenous traditional mining remain as a sustainable livelihood in these communities whose food supply also depends a lot on subsistence farming and livestock is a big question. Based on my interviews, there are also complaints from miners of growing difficulties in having to dig deeper tunnels due to the depletion of shallower ores and crowding of miners in the likely locations of rich veins.

Depletion of gold deposits, erosion, and decline of water sources and soil nutrients which threaten the whole sustainability of mining in the area come from various causes -- from physical processes, from strained local resource use by the villages experiencing population growth, and also from the nearby big mining plants of Benguet Corporation which has been operating in the municipality continuously for a period of about ninety years now.

validated. After amassing a certain wealth through fortuitous and hard work, the individual is expected by the community to share his bounty by tendering a feast. The number of pigs and carabaos sacrificed symbolizes a level of social status and prestige attributed by the community to the individual. Social hierarchy in the village is patterned in the kind or level of *canao* an individual has tendered. Through this cultural practice related to mining, social order and cohesion is preserved. Further, such festivities also serve as a redistributive mechanism of wealth accumulated through the fortuitous mining of an individual.

² The *sagaok* system is a traditional practice of tunnel owners to open their mines for access by all members of the community when a rich vein has been discovered. No owner can escape this social obligation since the women and elders who are processing his high-grade ore would spread the news around about the abundant find. More importantly, the elders, the interpreters and guardians of the tribe's norms and values, would castigate such owner refusing access to others to mine in his tunnel after such discovery. The owner, however, organizes the work schedules of all wanting to work in his tunnel in order to give a chance to everyone to have a share of high-grade ore, while also ensuring his own major claim in the find.

³ The *makililang* system is another traditional mechanism for redistribution and mutual help in the community. Under the system, any woman, elder, or child -- the economically dependent population of the community -- can participate in the processing work of gold ore (particularly in selecting ores, crushing, milling and sluicing) and becomes entitled to a share of *linang* (the left-over slurry after the first panning before cooking the gold particles). This is panned for the second time after the owners have panned it. The gold recovered in the second panning would be divided among those who assisted in the processing. The local norm forbids ore owners to refuse anyone from the village wanting to work in the processing stage.

Local resource management regimes and traditional socio-economic mechanisms contributing to controlled and responsible exploitation of resources by the community as well as to the equitable distribution of outputs have still persisted strongly. But these aspects are also being challenged and may likely be eroded by the forces of commercialization, fragmentation of the community, and village in-migration. Moreover, state policies and new laws concerning small-scale miners do not recognize the positive contributions of these traditional mechanisms to resource use and management. Under the new legislations, these systems would be supplanted by other externally imposed formal structures not attuned to the local culture and practices.

In sum, my preliminary data-gathering shows persistent aspects that indicate sustainability of traditional small-scale mining in the villages of Itogon municipality. On the other hand, other important factors of agricultural land degradation, population growth and mobility, commercialization, state policies, and certain exogenous pressures have to be examined, because apparently they have been undermining many features of sustainability over time.

VII. The Research Process and Methodology

This research will approach the problem of sustainability from various levels: district, village, household and individual resource user and manager. It will investigate the problem by starting with the current situation related to sustainability and tracing the origin of the present practices and problems by going backwards to situations four generation ago. Moreover, it will use a comparative analysis of three indigenous villages to isolate certain variables such as culture, agriculture and temporal span and their implication to sustainability.

The study of sustainability of resource use and management of the village, the household and the individual would be analyzed against a host of socio-economic environment data and wider-scale environmental situation which are directly and indirectly pertinent.

This research will employ both structured and unstructured interviews, participant observation and ocular surveys and field measurements in primary research data gathering. It will also gather historical data, micro and macro socio-economic, environment and political data from secondary sources books, articles, local and national government reports, published interviews and newspaper clippings. It will also look into existing relevant archaeological records.

The tentative sites of field data gathering are three villages of Itogon municipality: Sitio Dalicno, Sitio Garrison and Sitio Muyot. These three villages or sitios are different in terms of ethno-linguistic composition, significance of supplementary agriculture, known length of time of mining activity of the village, common perceptions regarding richness of mineable gold deposits and number of households.

	Dalicno	Garrison	Muyot
<i>ethnic composition</i>	Kankanaey (pure)	Kankanaey (dominant)	Ibaloi (pure)
<i>supplementary agriculture</i>	none	swidden farming	swidden farming, vegetable gardening

<i>beginning of mining (based on recall)</i>	since early 1900s	since 30s	since 70s
<i>perceptions about richness of gold deposits</i>	rich	very rich	not so rich
<i>no. of households</i>	100+	40	44

The following data would be gathered based on interviews of village informants of three generations:

- a. history of mining in the village
- b. history of population and household growth
- c. history of resource degradations in the locality
- d. changes in the output and technology in mining
- e. changes in the output and technology in supplementary agriculture (swidden farming, wet-rice cultivation, commercial vegetable gardening, livestock raising, etc.)
- f. changes in the relative combination and contribution to basic needs of mining and agriculture and other possible economic activity or linkages over time
- g. changes in the socio-cultural practices and mechanisms related to management of mining and agriculture as well as to the distribution of surplus

These data will be cross-checked with existing secondary sources from the local government records, local newspapers and archive materials.

At the level of the household the following data would be gathered through interviews and inter-household data cross-checking. Random sampling would be used in the three villages.

- a. Past and current profile of the household as single or multiple resource users (as miners, swidden farmers, etc.) and the gender division of labor based on this.
- b. Basic needs consumption pattern of the household and its income from all economic activities and how these have changed over generations.
- c. The household's decision-making process in allocating labor and capital to mining, agriculture and possible off-farm economic activity.
- d. The dynamics of the household's decision-making process related to resource management.

Furthermore, in-depth interviews would be carried out to form a good picture of how individual miners as singular/multiple resource users and managers respond and decide under typical conditions, and how his/her response and decisions affect the over-all direction of sustainability or unsustainability of the household, village and district.

Important field measurements of output, productivity, and resource depletion and degradations in local mining and agriculture would be taken.

Data on macro situations and exogenous forces would be gathered largely from secondary sources. However, selected interviews from key informants (especially from mining company's current or former staff) would be conducted for the purpose.

The whole research data-gathering process is estimated to last for twelve months. Tentatively, ten months are allotted for field work in the three villages. The remaining two

months would be for selected interviews of key informants in the commercial mining corporation, and in the government sector, and from among senior municipal and provincial citizens, local historians, anthropologists and social researchers who have done work in the area. These two months would also include secondary research on books, articles, periodicals and archive and archaeological materials in academic and government institutions.

APPENDIX I

Pocket mining (*i.e. traditional small-scale mining — Author*) is the main source of cash income in the village. It is the primary source of cash for buying rice staple, viand, household articles, clothing, housing, and for providing for medical and education needs of the family.

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The Kankanai pocket miners of Sitio Garrison are excellent indigenous mineralogists. They have their own elaborate ways of identifying and classifying minerals, based on the stone's place of origin and physical properties such as color, streak, texture, hardness, cleavage, fracture, malleability, specific gravity, magnetism and also the presence of other minerals in the ore. Pocket or lode mining involves digging of tunnels following the lode, or the mineralized veins, usually in hard rock. Tunnels are dug and a permanent adit is made after the pocket miners have assayed the sample ore found in the location. This is done by crushing the ore found until it becomes fineslime. The latter is pan in water in order to separate the gold particles from lighter materials. After conducting this kind of assaying, the experienced Kankanai pocket miner already has a good estimate of how many grams of gold will likely be collected from one cavan of such ore.

The pocket miners of Garrison never use blasting to open a tunnel. They use hammers, pickaxes, spades and crowbars and pin heads. They light their way with carbide lamps, digging tunnels vertically or horizontally in following the gold vein. When necessary, they shore up soft portions of the tunnel with wood beams. Since the tunnels are small, timber support are not generally required. The maximum limit of horizontal advance in a tunnel is usually 300 ft. from the portal, while the 'sinking' or downward vertical digging is 100 ft. below the portal level. Beyond these limits, the pocket miners experience difficulties in breathing and coping with the high temperature. Big electric blowers and especially constructed air pipes (which the pocket miners don't have) seemed to be necessary to be able to work in these depths.

Mined ores are transported to the nearest point near the portal using an improvised small wheelbarrow. These ores are put inside plastic straw-sacks, locally called a *cavan* (about one-half the size of a regular 50 kg. rice sack) and hauled manually from the portal of the tunnel to the backyard ball mill plant where they will be processed.

At the plant site, ores to be milled are further selected and then crushed by manual hammering to the size of corn kernels. These are then put inside a motor-powered ball mill and mixed with water to achieve a consistency of 70 percent solids in the charge. After about half a day of milling, the ground ore or slurry (*linang*) is emptied to a holding tank beneath the ball mill. This slurry consists of magnetite sand with some pyrite, non-metallic rock grains, metal shavings, and a quantity of gold particles (Caballero: 1991: 13). By continuous and controlled flow of water, the slurry is released to a launder (*anayan*) then through an inclined metal trough lined with jute or cordoroy fabrics. Most of the heavier gold-bearing grains are trapped in the fabric, while the other mineral-bearing particles and the lighter soil materials are carried off by the water. The latter are still collected by a container placed at the end of the trough so that its remaining gold particles may later be retrieved.

After the sluicing process, jute or cordoroy fabric lining of the trough are rinsed in vats to collect the trapped gold particles. This rinsed-off material is then panned (skillfully jiggled in a circular metal dish, as in rice-winning process). In this process, gold is collected by gravity separation. Because gold particles are heavier, it settles at the bottom of the metal dish with the lighter materials staying up. Oftentimes, a magnet is used to remove iron particles. The gold is then ready for refining.

The pocket miners refine these gold particles themselves. They are treated with soda, wrapped in cellophane, and placed in a clay crucible, then cooked over a steady charcoal fire, which is ensured by the use of a manually operated blower. The melted gold is allowed to harden in the shape and size of a pellet. These pellets are taken by the miners of Sitio Garrison to the illegal buyers in Baguio City, who are mostly Chinese traders or connected to them. Usually they are assayed with a value of 16 to 18 carats, which means 67%-75% gold and containing 25%-33% base metal impurities (Briones and Lagunilla: 1992: 26).

Appendix II

The following is a summary of the most important meanings of the local ecology discourse developed among the Garrison people (From separate interviews with twenty-one pocket miners, ball mill owners and village elders):

<i>Subject</i>	<i>Open-pit Mining</i>	<i>Pocket Mining</i>
1. Soil Management	Stripping of entire top soil in levelling operations.	Only a small amount of soil altered in tunnel digging.
2. Ore-dump waste ratio	Little amount of ore for massive muck waste.	1:4 (common estimate)
3. Waste dumping method	Moving massive muck waste to river valleys and creeks, clogging natural waterways.	Filling in back muck waste to abandoned tunnels.
4. Timbering requirement	No timber post needed, but levelling operations itself will uproot trees.	Only a few timber posts needed in extremely soft spots since the tunnels are small (usually 4 ft in height and 3 1/2 ft in width) and, therefore, not prone to cave-ins.
5. Water source preservation	Complete destruction of water sources in massive soil stripping operations.	Conscious detouring of tunnels to prevent damaging underground water sources.
6. Swidden farm preservation	Complete destruction of swidden farms due to the levelling of entire mountain slopes.	Protection of swidden farms by consciously locating portals and tunnels at safe distance away.
7. Housing settlement protection	Wholesale dislocation of housing settlements and massive relocation.	No dislocation. Tunnel mining banned by community when located closely underneath houses.
8. Pollutions related to ore extraction	Heavy clouds, loud noises, and constant ground shocks due to massive earth moving.	None.
9. Processing technique	Uses toxic chemicals such as cyanide, mercury and lead in gold separation.	Uses only water and gravitation for gold separation.

10. Tailings disposal	Chemically treated tailings are trapped in a pond constructed by damming the river. This highly toxic water and wastes is only partially filtered when released in the river system, causing heavy poisoning and pollution to water and irrigation systems in the lowland rice farming areas. This method has damaged severely marine life and rice crops. In addition, the tailings pond emit fumes causing respiratory diseases to people living nearby.	Water-based tailings are trapped in small backyard containment pond. Water is pumped up back to the system, to be reused in grinding and sluicing. Tailings are sold to BC or simply scattered around the house to add to the topsoil.
11. Sustainability of mining activity	Eight to thirteen years.	Entire lifetime and an undetermined number of future generations.

+ Bibliography / references