

Small-scale mining and alluvial gold panning within the Zambezi Basin : an ecological time bomb and tinderbox for future conflicts among riparian states

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Abstract

Small scale mining, and particularly alluvial panning of minerals, is a relatively new informal economic activity, which has been sweeping across the globe in the past two decades. The haphazard nature of the activity and its intense dependence on water for the panning process and firewood for fuel has resulted in uncontrolled siltation of rivers and other water reservoirs as well as rampant deforestation. The Zambezi Basin, with some of its fragile ecosystems and endangered species, has and is being negatively impacted upon by small scale and alluvial panning activities. Transboundary natural resources, including water and biological resources are at the receiving end of these activities. Flooding events (two in as many years in Mozambique and parts of South Africa - 2000 and 2001) have been largely blamed on siltation as well as climate change. The fact that the activities are more prominent in some countries than others is likely to cause tension and/or conflict between and among riparian states of the Zambezi Basin. The conduct of these operations as common property enterprises is suggested with appropriate modifications of the legal and institutional framework incorporating traditional and customary governance structures.

Key words: *Small-scale mining, alluvial mining, riparian states, transboundary, environmental impacts, legal and institutional frameworks*

INTRODUCTION

The Zambezi Basin and its water resources are shared by eight of the fourteen Southern African Development Community (SADC) states. The long-term environmental well being of the Zambezi river, its tributaries and associated dams and lakes, depends on the types and volumes of economic activities which take place within the basin. These activities include urbanisation, logging, agriculture, manufacturing, tourism and mining. More recently, small-scale mining and alluvial gold panning activities have taken centre stage as a result of both the economic structural adjustment programmes (ESAPs) and recurrent droughts within the SADC region. It is estimated that up to 2 million people directly or indirectly benefit from small-scale and alluvial panning of minerals within the Zambezi Basin. Most of this mining activity takes place on riverbeds and banks and releases enormous amounts of silt and heavy metals into river systems, dams and lakes. Siltation of rivers reduces river conveyance and the storage capacity of reservoirs, which in turn makes several areas prone to flooding. Other effects of siltation include the shortening of reservoir life spans, depleting fisheries and diminishing hydropower generation potential. Small-scale miners are also responsible for clearing extensive areas of natural forests for firewood and infrastructural constructions. Deforestation directly contributes to rapid loss of soil moisture and topsoil resulting in disruption of climatic balances and the spread of desertification.

This can lead to water scarcity/stress within the region, a sure precursor for conflict between neighbouring states.

This paper analyses the effect of small scale mining and alluvial panning on transboundary

common property resource management (TBCPRM) and use within the Zambezi Basin. Regional and local legislative and institutional regimes are assessed. A grassroots governance structure is suggested for the management and use of transboundary commons. The paper reviews the major challenges, prospects and obstacles to transboundary natural resource management (TBNRM) within the Zambezi Basin. It is also argued that policy formulation should be informed by the overall distribution of economic, social and environmental costs and benefits among the principal stakeholders (governments, miners and local communities) and could be based on customary and traditional governance structures.

An analysis of common property resource management and use has to be appropriately based on a clear definition and identification of what constitutes common property and the community. Unfortunately, consultants' reports and project documents are often helplessly vague on these issues (Bruce, 1989). In most cases, and particularly in transboundary common property resource management, the definition and identification of unit communities is a complex and intricate issue. Community control of resources is primarily associated with geographically bounded communities where ties of kinship buttress territorial ties. Community membership is commonly defined by present or previous residence, by property ownership, by kinship ties, or by some combination of these factors. Communities are also broadly defined by unitary traditional and customary institutional structure. The definition of community membership determines who may or may not lay any claims against community resources. The limits placed by definition of membership, if they can be enforced, regulate pressure on the resources. Property refers to an enforceable right of a person or persons to some use or benefit from an asset or resource. Property can also be defined as a benefit (income) stream, while a property right is a claim to such a benefit stream (Ciriacy-Wantrup and Bishop, 1975). Four property regimes can be differentiated on the basis of the above definitions (state, private, common and open access property regimes). Property regimes characterised by rights of exclusion are often referred to as private while those characterised by rights of exclusion are termed public or common property. Common property is a shared resource. The sharing is however restricted to a well defined group of individuals who can exclude access by others. The group shares the resource's beneficial use. Common property rights are a special class of property rights which assure individuals access to resources over which they hold collective claims.

Common property is created when members of an interdependent group agree to limit their individual claim on a resource in the expectation that the other members of the group will do likewise. For a resource to be managed as a common property, each individual confidently relies on every other member's contribution to management.

Common property should be restricted to communally owned resources - that is, those resources for which there exists communal arrangements for the exclusion of non-owners and for the allocation among owners.

Common property resources have also been described as a class of resources for which exclusion is difficult and joint use involves subtractability (Berkes and Farvar, 1989). The non-property or open-access regime is a situation where no claim can be laid by anybody on a

particular resource. Each potential user has complete autonomy with respect to use of the resource and nobody has any legal right or ability to keep others out. A natural resource is therefore subject to the rule of capture and basically belongs to nobody until it is someone's physical possession. There are therefore no property rights but just possession (Bromley and Cernea, 1988).

Small-scale mining and particularly alluvial gold panning, as currently structured, is an open access, non-property regime. This is largely due to the fact that over the years central governments within the SADC region have tended to downplay the existence and/or legitimacy of the sector. Declining regional economic fortunes due to a number of factors has resulted in the small scale mining sector employing large numbers of people in recent years. State governments are feeling the pressure to recognise the sector, which they appear to be doing reluctantly. In countries where the existence of the sector is now recognised, the state has sought direct control or allowed partial devolution of responsibility to local authorities. The state governments apply command and control regulations, which are usually enacted for large scale mining operations, on small scale mines. These are commonly far too complicated for full compliance by small scale miners. Paradoxically, central governments have neither the financial nor the human resources to enforce these regulations on small scale miners. Local communities see no justification for involvement in the management and control of the activities as there are no direct benefit streams. The result is largely a chaotic, unregulated and poorly organised small-scale and artisanal mining sector causing untold environmental degradation with a direct effect on local communities.

OVERVIEW OF SMALL SCALE MINING

There is as yet no widely accepted definition of artisanal and small scale mining. The term has been used to cover a broad spectrum of activities - from the army-run Hpakant jade mines in Myanmar, for example, where up to a million miners can be working on one site, to individual *garimpeiros* panning for gold in the remote regions of the Brazilian Amazon, as well as former state mining company workers or laid-off private company employees who have organised themselves into cooperatives (MMSD Global Report, 2002). At the other end of the spectrum, particularly in industrialised countries, are many quite sophisticated and mechanised small scale mining activities. In developing countries, most of the small scale miners (men women and children) are rural and poor. In such countries as Bolivia, Colombia, Indonesia, Mali, the Philippines and Zimbabwe, they participate in the activity seasonally when they are not involved in agriculture or during drought periods.

The activity may be poverty driven during periods of economic recession as has happened in countries including Bolivia, Peru, Venezuela and Zimbabwe.

It has been estimated that in China alone, up to 15 million people may be involved in small scale mining activities and that worldwide between 80 and 100 million people may have their livelihoods directly affected by small scale mining activities.

The problems associated with small scale mining are numerous and fairly common to all developing countries of the world. They range from the disruption of local community life,

conflict over land (which in the case of Brazil's Yanomani Indians resulted in the death of about 1500 people during a gold rush in 1987), numerous environmental impacts which affect the delivery of common property services to local communities.

It is the thesis of this chapter that given the right legal and institutional framework, as well as technical and financial support, small scale mining can contribute to poverty alleviation through the encouragement of alternative economic activities for sustainable rural development. The realisation that small scale mining is largely a poverty driven economic activity demands a coordinated and collaborative approach which is geared towards poverty alleviation, improving knowledge and skills as well as improving the mining system from production to marketing. This requires cooperation by national governments, mining industry, NGOs and donor organisations, local communities as well as the small scale miners themselves.

Small-scale mining is commonly associated with informal, unregulated, under-capitalised and under-equipped mining operations, where technical and management skills are lacking. They are also believed to erratically produce limited amounts of minerals from uncertain reserves. While small-scale mining can lead to wastage of non-renewable resources and can be hazardous to human and environmental health, it can also contribute to national economies and economically empower disadvantaged groups by virtue of its low investment costs and short lead time from discovery to production. This sector produces minerals from deposits which are not economic at large-scale mining level.

Small-scale mining is labour intensive and thus provides employment and incomes to large numbers of people who are generally uneducated, poor and live in remote areas where no opportunities exist for formal employment. It is estimated that in the southern African region alone, up to 10 million people are employed or benefit directly from small-scale and artisanal mining activities involving more than a dozen different types of minerals dominated by gold and a variety of gemstones. In most of the SADC countries, mining is the only known alternative economic activity to agriculture and the employment figures within the sector increases many fold during the recurrent droughts in the region. More than 50% of those actively involved in the sector are women and unfortunately children. Globally, small-scale miners produce hundreds of thousands of tonnes of gold annually. In countries such as Zimbabwe and Tanzania, small-scale miners contribute up to 25% of the total gold production. As a poverty-driven economic activity, small-scale mining cannot be wished away.

The small-scale mining sector plays an important complementary role in relation to their large-scale mining counterparts. The former, due to lower overheads and uncosted labour, are able to work smaller and lower grade mineral deposits considered subeconomic by the latter. In addition to the creation of employment and wealth within rural communities in remote areas, a viable small-scale mining sector will also stem the common rural-urban drift. In face of all these factors, it would appear that a concerted global effort is required to remove most of the stumbling blocks to the growth of the sector for sustainable development in both the developing and developed countries.

The major stumbling blocks to socio-environmental sustainability within the small-scale mining sector are poverty, population pressure on natural resources, as well as a lack of knowledge.

Indeed a number of bold measures have to be taken to ensure that small-scale mining is done in a way that is economically viable, socially acceptable and environmentally/ecologically sustainable. The International Labour Organisation (ILO) noted in a recent resolution that the lack of resources, skills and knowledge meant that many small-scale mining operations suffered from low productivity, inadequate incomes and poor safety and working conditions. The resolution called on member states of the ILO and on employers' and workers' organisations to take a range of measures that would enable small-scale miners to work more productively, more safely and with less of a negative environmental impact.

Environmental impacts of small-scale mining on transboundary natural resources

Small-scale mining operations are always located close to, and are supported by water bodies. Mining is a geographically concentrated activity which results in a number of negative impacts on the immediate and oftentimes, distant areas. These effects include water and air pollution, river and dam siltation as well as loss of biodiversity (deforestation, overfishing and poaching). There are today a number of extinct and threatened species within the Zambezi Basin. Some of the negative impacts have been causing considerable anxiety and tension among neighbouring countries.

Recent flooding (2000 and 2001) that affected Mozambique, South Africa and Zimbabwe is believed to have been exacerbated by siltation and deforestation within certain riparian states. The absence of common water standards means that there will always be disagreement as to what water quality ought to be or how and where it should be tested. Governance issues within the small scale mining sector will have to be harmonised to create a basin wide climate of openness and cooperation over water resources and water quality.

Although the environmental impacts of individual operations are not necessarily significant, the accumulated impacts of numerous small-scale mining operations can create serious problems for ecosystems and local communities.

These problems are recorded in the form of deterioration and reduction in the quality and amounts of environmental and common property services within and beyond state borders. The most noticeable negative environmental impacts from mining include land disturbance, deforestation, depletion of water resources, pollution of water and air.

Land disturbance and siltation

All operations of small-scale miners lead to considerable land disturbance. For artisanal alluvial gold panning operations, this involves the digging up of river channels and banks, paleochannels and their floodplains as well as surface trenching, using picks and shovels. In some cases, the mining requires the stripping of overburden to expose the mineral bearing horizons. The most noticeable effect of these operations is the siltation of rivers and dams, deterioration of water quality, reduction of grazing areas for domestic and wild animals and the overall reduction in biodiversity.

Some of the overburden stripping may be accomplished using bull-dozers. Rarely explosives are used in small-scale gold and chrome mining of reefs and seams respectively. In chrome mining, underground operations require the opening up of adits, vertical shafts, winzes and raises as well

as underground tunnels. Underground openings eventually result in land subsidence.

All methods employed by mining co-operatives result in land disturbance and serious problems of waste disposal. The digging up of river banks and floodplains in alluvial gold panning and the stripping of overburden in the tantalite and chrome operations result in enormous amounts of waste sand, gravel and rock dumps which contribute to siltation of river channels and dams. Siltation is reported to have been increasing at the rate of more than 5% per annum in Zimbabwe, Tanzania and Mozambique (Chiwawa, 1993).

Siltation results in the reduction of conveyance and storage capacities of rivers and dams and is believed to play a major role in the frequency and magnitude of flooding affecting Mozambique, Zimbabwe and South Africa. Siltation is also responsible for the destruction of habitats for fish and other aquatic organisms.

Deforestation

The rapid sprouting of overnight settlements in newly discovered gold and gemstone areas lead to rapid “urbanisation” in the form of haphazard settlements which do not only result in rampant deforestation, but also social ills associated with urbanization which include alcohol and drug abuse, prostitution, land use conflicts with local communities, as well as water pollution, infant/child labour and disease. Deforestation is driven by the need for the construction of shelters, underground support props, panning dishes and use of fuel wood. The excessive reliance on wood as a source of energy results in the reduction of biodiversity and increasing rates of desertification.

It is estimated that about 4 million tonnes of wood is used every year in Zimbabwe as fuel, which translates to felling trees covering approximately 100 000 hectares (Chiwawa, 1993). Biodiversity is further threatened by habitat destruction, uncontrolled hunting and fishing. The loss of biodiversity (particularly woodlands and grasslands) commonly leads to tension between miners and local communities.

The introduction of an exogenous mining community always upsets the local traditional and cultural common property management and use systems.

Water pollution and depletion

In alluvial tin, tantalite and gold mining operations, mineral concentration is done by the use of gravity separation through the medium of water. The concentration is done using panning dishes and sluice boxes.

Absolute dependence on the use of large amounts of water in mining operations dictates that mining operations are located as close to water sources as possible and in some cases at the water source. Alluvial ore is a result of river deposition and is therefore part of a river system. The reliance on water for mineral concentration results in accelerated evaporation of surface water, drainage of wetlands and the siltation of rivers and dams. As previously mentioned, the siltation of rivers, dams and lakes has been blamed for frequent flooding of low-lying areas especially in Mozambique, South Africa and Zimbabwe.

Some small-scale miners use cyanide and mercury in their gold concentration and amalgamation

respectively. A lot of these chemicals end up polluting water and ecosystems. The coming into existence of unplanned mining compounds sited close to water courses, with attendant poor sanitary facilities, results in considerable pollution from human waste.

In Tanzania, for example, 78% of water samples analysed in the lake Victoria Goldfields contained mercury in concentrations significantly above the drinking water standard of 1g/l (Mpendazoe, 1996). The situation is believed to be similar in countries like Zambia, Zimbabwe and Mozambique where the use of mercury by small-scale miners is equally extensive. Mercury is poisonous to humans and aquatic based food chains through bioaccumulation. The use of cyanide in gold concentration has been responsible for cyanide poisoning of domestic and wild animals.

Ore and waste stockpiles established on surface commonly contain significant amounts of sulphides and, with the passage of time, heavy metals, sulphates and other pollutants are dissolved and leached out by precipitation into local streams and community water sources. The impact of mineral pollution on an ecosystem may be severe and may result in the total elimination of animal life from the receiving waters. The depletion and pollution of fresh water within the Zambezi Basin by mining activities is bound to have tragic consequences for a sub-region which does not only receive relatively little rainfall, but whose extremely high air temperatures and higher rates of evaporation reduce surface water flows in rivers and streams, and provide little recharge to groundwater.

The region is already classified as being under a water scarcity/stress regime. The Zambezi Basin riparian states are already competing directly or indirectly to derive maximum possible benefits from the available water resources (for domestic, industrial and hydropower generation). It is not inconceivable that a water related conflict or war will be recorded in the region in a matter of a few years, if regional water management strategies are not immediately put in place.

Environmental, economic and social costs and benefits

It would appear that the quality of, and degree of commitment to prudent management and use of common property resources is predicated on the overall distribution of costs and benefits (economic, social and environmental) among the stakeholders.

The socio-economic benefits of small scale mining which include employment and income generation are seriously weighed down by devastating environmental costs/impacts. These negative impacts (costs) are imposed on communities downstream of the mining activities. The affected communities are neither involved in the mining activity nor are they included in the mining benefit streams, and hence the impacts are externalities. The small scale mining sector does not compensate the local communities for the loss of common property services.

Based on the analysis of economic and environmental costs and benefits, a study done in Zimbabwe (Mashonaland West Province) showed that alluvial gold panning as presently

practiced is not economic when a full range of economic, social and environmental costs are compared with the limited number of benefits (Milne and Marongwe, 1995). The distribution of costs and benefits is an important aspect for policy makers.

Policy considerations are in most cases given towards having the beneficiaries compensating the losers for externalities.

It is clear that while the miners receive a lion's share of the benefits of their activities, they do not pay for the social and environmental externalities borne by communities downstream. For the most part these are incident on other groups in society. The governments appear alternatively responsible for most of the costs and yet they they recover nothing from the miners by way of taxes. This unjustifiably increases government expenditure. Increased government expenditures are not costless to society.

Costs to society include either increased internal borrowing and upward pressure on domestic interests rates, increasing external borrowing and pressure on balance of payments, or difficult trade-offs by reducing spending in other programmes such as health or education. Where funds are borrowed the question of debt servicing and the impact this has on current expenditures must be raised.

The gold panning situation represents a classic case of externalities caused by inappropriate natural resource extraction. Any policy formulation option for alluvial gold panning activities must take into account the fact that miners should take more and increasing responsibility for their downstream negative environmental and social impacts within a more appropriate institutional and property regime.

THE ZAMBEZI BASIN: An Overview

The SADC region, and indeed most regions of the world, share a range of transboundary natural resources, most of which include shared river courses and nature reserves and/or protected areas. More often than not, there is no shared vision or standard legislation, policies and regulations for the sustainable management and use of these shared resources at national, regional and even international level. Further, there are no established and/or coordinated regional/international institutions for the supervision and enforcement of transboundary resources management and use as well as for the resolution of conflicts.

Transboundary natural resources management is about the sustainable use of resources that are shared by various communities domiciled in different countries. The Zambezi Basin and its water resources are shared by eight riparian states in central and southern Africa (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe shown in Fig. 1). Riparian states are countries that share a transboundary natural resource.

The total geographic area is approximately 5.08 million square kilometres, of which the Zambezi Basin constitutes approximately 26%. The Zambezi Basin refers to the total area drained by the Zambezi and all its tributaries.

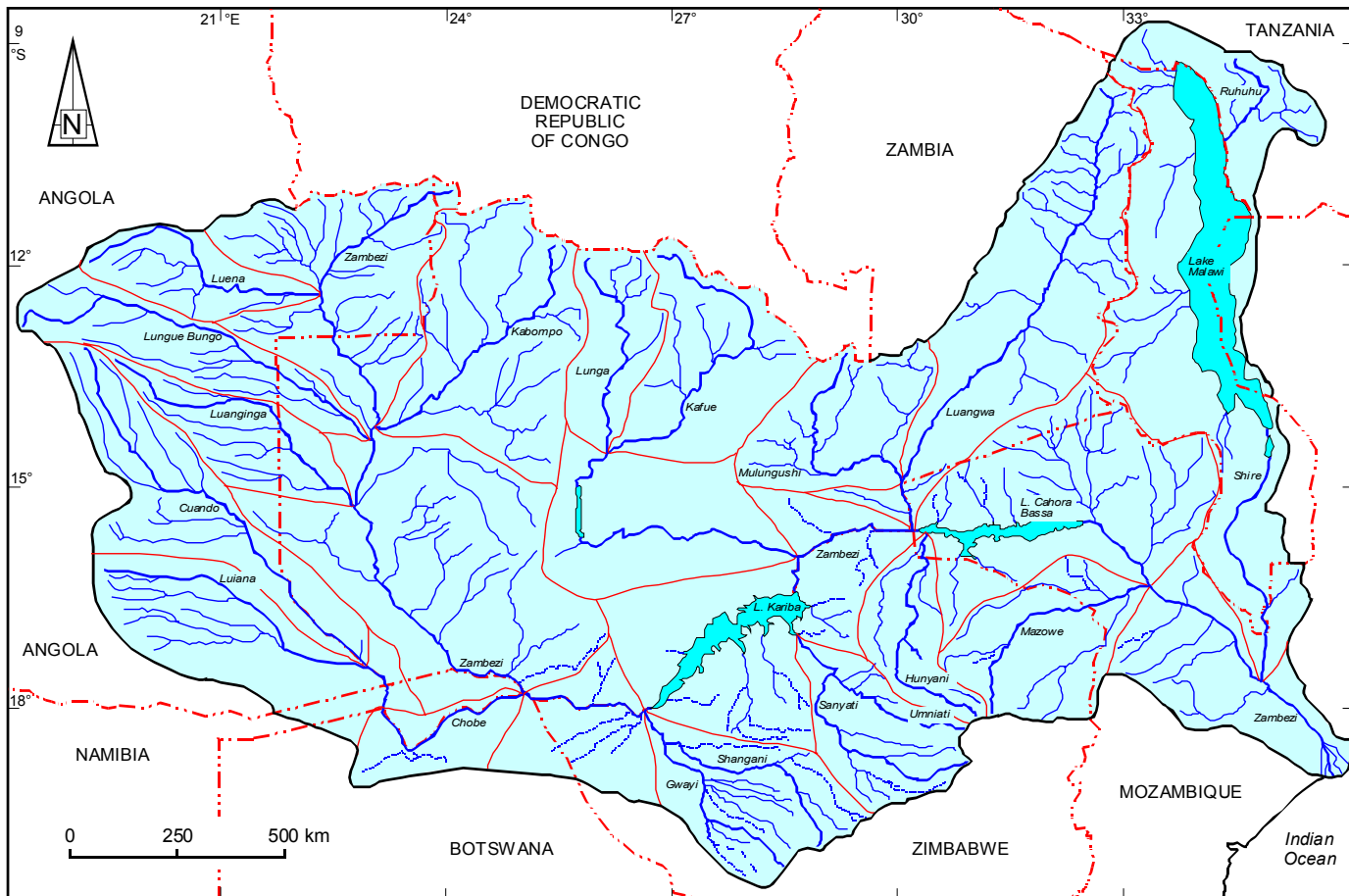


Figure 1: Sketch map showing the main rivers, lakes and sub-catchments of the Zambezi basin.

Water is one of the resources that is most prone to transboundary environmental problems and conflicts. Not only is water a vital commodity, more than 300 river basins worldwide, accounting for nearly 50% of the Earth's land surface, are shared by two or more countries. Underscoring the tensions that divided basins engender, nearly 300 international treaties or protocols have been adopted for the purpose of avoiding conflicts over water (<http://www.sadc-usa.net/reference/protocol/h2oprot.html>).

The total population of the Zambezi Basin riparian states is estimated at 105 million. About 30 million (30%) live within the Zambezi Basin. All economic activities within the basin depend critically on the basin's water, mineral and biological resources. These activities contribute adversely to water quality and availability as well as impacting negatively on most other natural resources within the basin.

Shared river courses, their water and biological resources, are perhaps the most well known forms of transboundary common property.

Shared river courses present profound and multifaceted problems and challenges to state governments and various stakeholder communities in terms of their management and use. The resolution of these problems requires complicated definitions of “communities” at various levels as well as what constitutes “common property”.

All transboundary commons including potable water for humans, drinking water for domestic and wild animals as well as fisheries, forests and wetlands are negatively impacted upon by various economic activities which include agriculture, manufacturing, mining, tourism and logging.

The negative impacts which include water and air pollution, as well as siltation, are externalities where they affect communities other than those involved in a particular economic activity. The above economic activities are subject to varying legislative and institutional regimes within individual nation states as well as regionally. These regimes differ in format, content and degree of enforcement within riparian states. Most stakeholder communities living within the Zambezi Basin have very little or no influence on which economic activities can or cannot take place in their backyards.

While state laws and regulations, where they exist, can be reasonably enforced on all formal economic activities, some of which are mentioned above. Informal economic activities such as small scale mining and alluvial panning, usually happen outside the state’s legislature and regulatory authority. This results in a disproportionate contribution of externalities on common property services by this informal sector.

CHALLENGES FOR TRANSBOUNDARY NATURAL RESOURCES MANAGEMENT WITHIN THE ZAMBEZI BASIN

In most SADC countries, small-scale mining and particularly artisanal mining is not legally recognised and the sector’s production and marketing figures are not always captured by national statistics. All the eight Zambezi Basin riparian states have a long tradition of small scale mining yet only a few have moved towards recognising it, let alone putting a legislative and institutional framework for the sector. This lack of recognition largely stems from a lack of a clear or the existence of a skewed cost-benefit structure among the main stakeholders (government, small scale miners and local communities). Experience shows that the small scale mining sector consists of people involved in subsistence mining and will continue their activities whether or not they exist legally. The financial requirements for environmental management are well beyond the reach of most if not all small scale miners and they would need less stringent laws and regulations to operate profitably. The migratory and scattered nature of the operations would require a very well resourced legal and institutional framework to enforce any stringent regulations, which most SADC economies cannot afford.

A further complicating factor is that the “equitable sharing approach” has no built-in mechanism to safeguard the rights of communities and other local users (Mahomed-Katerere, 1995). There

is no recognition that local stakeholders should be incorporated into the decision making process when their rights and interests are at stake.

Often times the founding principles of the SADC Treaty and associated protocols are found to be in sharp contradiction with the overriding need to address socio-economic issues of rampant unemployment and rural poverty. One set of competing and even conflicting values is *environmental protection versus economic empowerment/ poverty alleviation*. Environmental stress has always been seen as the result of growing demand on scarce resources/consumption of raw materials and the pollution generated by the rising living standards of the relatively affluent. But poverty pollutes the environment to a comparable extent. “Those who are poor and hungry will often destroy their immediate environment in order to survive: They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers, they will crowd into congested cities’. It was also noted that ‘Many parts of world are caught in a vicious downward spiral: Poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of the their environment further impoverishes them, making their survival even more difficult and uncertain’ (World Commission on Environment and Development 1987). While small-scale mining is credited with advantages of operating mineral deposits too small for large scale mining, using ‘appropriate’ technology, employment creation in remote areas, small initial capital and infrastructural requirements as well as short lead time from discovery to production, the trade off has been low incomes due to inefficient mining, processing and marketing of minerals. This has generally led to widespread poverty among small scale miners. This in turn has resulted in over dependency on nature for fuel, food and infrastructural constructions. This has also meant poor housing and sanitary facilities for the miners. The overall result is increased rates of deforestation, siltation, pollution of water bodies as well as poaching of fish and wildlife. Poverty has been singled out as a major cause of environmental degradation by the World Bank.

While the small scale miners, and particularly alluvial panners, are nomadic, the effects of their negative environmental impacts are felt by local and distant users of environmental services while national governments and/or non-governmental organisations have to pick up the cost. The ‘tragedy’ of the management and use of transboundary commns is usually rooted in the non-consultation and non-involvement of local communities in decision making processes by central and even local governance structures. “Indigenous people are the base of the environmental security system. They are the gate-keepers of success or failure to husband their resources. They are the first to know about changes in the environment and yet they are the last to be asked or consulted. The most they have learned to expect is to be compensated, always too late and too little. They are seldom asked to help avoid the need for compensation by lending their expertise and consent to development” lamented the president of the Native Council of Canada to the World Commission on Environment and Development (WCED, 1987).

RECOMMENDATIONS

Small scale mining and particularly alluvial panning as currently practised within the Zambezi Basin is an open access property regime, which results in uncontrolled degradation and uneven appropriation of common property services such as water and biological resources. The sector is still largely illegal and informal in most of the Zambezi Basin riparian states and will have to be fully recognised and formalised. There is an obvious lack of interest in the sector by central governments, which in part stems from the lack of collectible taxes due to the scattered and mobile nature of the miners.

It is clear that the sector as well as central governments will benefit from a well organised, formal sector which can operate within the confines of a well crafted legislative and institutional framework. The architectural design of this framework will have to be informed by an analysis of the distribution of costs and benefits among the main stakeholders.

Small scale mining should be managed as common property enterprises at local community level. This may have to be predicated on traditional and customary leadership structures in addition to appropriate revisions of the existing land tenure in communal areas. It is essential, in the search for policy solutions to the problems of resource degradation in communal areas, to consider and define the tenure system operating in these areas as it is ultimately this system that in turn defines the nature of relationships in the utilisation of common poverty services. In this vein, the following is instructive, "I think this Commission should give attention on how to look into the question of more participation for those people who are the object of development. Their basic needs include the right to preserve their cultural identity and their right not to be alienated from their own society and their own community. We cannot discuss environment or development without discussing political development. And you cannot eradicate poverty, at least not only by redistributing wealth or income, but there must be more redistribution of power' WCED, 1987.

The lack of internal organisation of small scale mining activities, their scattered and commonly remote nature as well as their illegal status are factors which make central governments uninterested. Local communities are commonly in conflict with small scale miners due to their negative impacts on common property services such as water, forests, grazing land as well as interference with traditional and customary lifestyle but lack the authority to control them. Local government departments lack the requisite resources to supervise these scattered activities. The cheapest regulatory route appears to be through local communities who are not only close to the activity, but have an obvious interest in controlling it. A system of penalties and levies for degradation and pollution could be introduced and policed by village committees.

An added incentive to local communities would be that the money collected is used by the local communities themselves. Conflicts between local communities and small scale miners would be arbitrated by a committee from local government.

The regulatory framework for small scale mining should be simple, clear, understandable and stable. Complex regulations dissuade small scale miners from attempting to adhere to them. More often, the widespread lack of institutional capacity to implement small scale mining regulations means that the chances of being caught and sanctioned are slim. It has been observed that where the traditional command and control regulations exist for small scale miners, they serve to stifle the activity, trapping it in sub-optimal operations rather than promoting it as a sustainable, profitable entrepreneurial activity that can provide significant employment in rural areas. The SADC protocols on transboundary natural resources (Mining, Shared Watercourses and Wildlife Conservation) suffer from serious drawbacks such as: The accords are top-down in nature and reflect policy decisions that are made in national capitals and which ignore the needs, desires and aspirations of those affected by them. This is particularly problematical when a river basin forms an international boundary and the people on the opposite banks have stronger ties to each other than to their respective heartlands as is the case for most of the Zambezi Basin riparian states.

Other clear weaknesses of the regional protocols are that goals have been poorly chosen in some cases and the organizations or government departments tasked with implementation are not adequately resourced, and lack the capacity and motivation to be effective. There is generally a lack of or weak public participation in the decision making process. Unfortunately, the exclusion of public interest groups and the local communities makes implementation of the accords difficult and expensive.

The major constraints to TBNRM within SADC are the reluctance of central governments to devolve tenure and user rights to local communities. The reluctance by cooperating states to allow free movement of people, goods, services and money. Differences in capacity, commitment and national policy can be obstacles to the finalisation and formalisation of transboundary agreements. Issues of national sovereignty, security and high transaction costs may slow down the formulation of multinational policies and agreements. The lack of resources and capacity can also be a serious hindrance to regional integration and effective TBNRM. National and regional governance structures will have to deal with issues of competing values such as openness versus secrecy, established cabals versus public values, use versus environmental protection, over allocation versus conservation and sustainability versus immediate economic gain. Competing values can be major constraints/obstacles to regional integration and to programmes such as TBNRM.

Zimbabwe's CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) concept has received worldwide acclaim as a clear demonstration of benefits that accrue from sustainable management and use of natural resources for local communities. The big question is: Can this concept be applied successfully on the management and use of all other natural resources including minerals?

This also begs the question as to whether suitable policy and appropriate legal frameworks exist for local participation in the management of mineral resources?

From a study conducted to assess the rationale for local management of mineral resources (Manzungu and Sithole, 1999), some of the important findings were:

- It was morally wrong and undemocratic to deny people a chance to participate in issues that affected their lives. There was demonstrable decentralisation in some sectors that promoted participation of local communities eg in the water and land sectors.
- A centralised system compromised efficiency and effectiveness of managing mineral resources as the state could not effectively monitor all the mining activities due to a shortage of financial and human resources.
- Local participation reduced management transaction costs as it obviated huge transport, subsistence and salary costs required for central government employees
- Local management engenders local stewardship of natural resources, which, in the end results in a sustainable natural resource management.
- The negligible benefits, less than 0.01%, that accrues to local authorities was neither enough to compensate for the losses suffered by local people or to generate interest in natural resource conservation. The enhanced revenue base would result in local authorities being able to better perform their functions.
- Prominent NGOs in CAMPFIRE were of the opinion that local management of mineral resources was the best option since this compensated local communities in order to enable them to negotiate directly with mining companies and any other miners.

In Zimbabwe, the government has shown some willingness to move towards local participation through the enactment of the Mining (Alluvial Gold) (Public Streams) Regulations (1991) . These regulations, *inter alia*, give the local authority the power to issue mining licences, to collect revenue for these licences, enforce the general provisions of the regulations which include the need to prove residence as a condition for being issued with such a licence. The overall policing of the mining activities is done by the Rural District Council (RDC) in conjunction with local traditional, village and ward institutional structures. An explicit definition of benefit streams to the local communities buttresses the whole management structure and engenders a sense of belonging, responsibility and ownership to the local population.

The adoption of similar regulations by other Zambezi Basin riparian states would clearly go a long way in addressing the serious environmental degradation taking place within the basin, and most importantly, would slow down the alarming rates of siltation and the deterioration of water quality and its availability to basin states. The institutional capacity building process that such regulations require would serve as a much cheaper avenue for the administration and enforcement of the various provisions of SADC transboundary natural resources related protocols.

CONCLUSIONS

Boundaries between and among states are often tinderboxes, places where conflicts incubate and hostilities erupt. The competition for resources, more often as a result of uncontrolled economic activities, population growth and migration across national boundaries, has resulted in a number of boundary clashes and wars in recent years, a good example of which is the war between the Democratic Republic of Congo and its eastern neighbours (Uganda, Rwanda and Burundi). Most of the problems to do with transboundary natural resources management and use are commonly due to the arbitrary political boundaries which apportion natural systems and resources to two or more nation states.

Small scale mining is a widespread activity in all the eight Zambezi Basin riparian states. The economic activity is haphazard, poverty-driven and ever increasing numbers of people within the basin are turning to it due to recurrent droughts and economic hardships accompanying economic reforms within the region. Alluvial panning activities are illegal and therefore unmonitored. These activities have largely been blamed for the siltation of rivers, dams and lakes, deforestation and poaching of wildlife. The greatest losers in this unfolding drama are the local communities whose common property services are being negatively impacted upon. Some of these common property services, including water and wildlife are of a transboundary nature. Siltation due to mining and panning activities in one part of the basin (one or more countries) results in the deterioration of water quality or flooding in another part of the basin (other countries). With worsening water scarcity within the SADC and the increased incidence of flooding affecting particular countries, tension has been rising and could easily lead to future conflicts. The SADC region is duty bound to take firm and binding cooperative action to arrest the slow drift towards regional conflicts arising from economic activities such as small scale mining and alluvial gold panning.

The SADC protocols on the management of shared resources are a bold attempt to co-ordinate and harmonize the use of shared resources. Their effectiveness is however considerably watered down by a plethora of problems and challenges which are specific to regional circumstances. Some of these problems are a lack of institutional capacity as well as financial and human resources to monitor and implement protocol provisions, competing values and priorities among riparian states and the overarching issue of rampant poverty within the region. Perhaps, more importantly is the issue of translating the spirit embodied within these protocols into practical legislation within individual countries. The legislation should be complete with effective institutional arrangements for their implementation.

Most of the control mechanisms (legislation) derived from the regional protocols are in the form of command and control legislation and regulations (Shoko et al., 2001).

Command and control regulatory approaches involve the state's prescription of desired changes which are then promoted and enforced through laws. The major weaknesses of this regulatory regime are that it requires intensive monitoring and therefore a strong and well resourced enforcement mechanism.

Successful prosecution of offenders will also require reliable and efficient analytical laboratories. Indeed as regulation becomes more sophisticated, monitoring requires human resource skills that are far beyond the technological and managerial capabilities of many developing countries and frequently beyond their budget capabilities. Taping into local

communities and traditional leadership structures offers the best solution and is the most cost effective. The basic requirement is that demonstrable benefits should accrue to the local communities in order that they are sufficiently motivated to be involved.

Innovative policy formulation strategies will be required for the adoption and adaptation of customary laws and traditional institutional structures. Custom, when understood as shared norms and values which have evolved over time and provide a basis for decision making on matters of common interest and concern to communities or segments thereof, will always remain an organic system which responds to both internal and external stimuli despite initial capture in contextual form (Murombedzi, 1990).

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