

Community Biodiversity Use Assessment Akyem Project



Newmont Ghana Gold Limited



Conservation International – Ghana

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Foreword

Today, community participation and involvement go beyond simply having good public relations and stakeholder meetings. Participation means engaging people in their daily activities and working with them to establish sound practices that are consistent with their local environmental values. It means understanding the community's vision, way of life and how biological and cultural resources are valued and utilized. In the past, many commercial, industrial and extractive projects have tended to ignore the biodiversity use values, attitudes, behaviours, beliefs and assumptions communities share about themselves and about the natural world in which they live and from which they derive their livelihoods. In addition, external environmental values, presumed to be universal, have often been imposed

To the contrary, it has been realized that, community socio-cultural and biological values provide insight into the complexity of community life, whilst at the local level, consumptive use value is often the most relevant. At the regional level, local and regional governments tend to be most interested in the productive use value of biodiversity, often in terms of the foreign exchange earned, and often to the detriment of the local community use values.

In order to develop carefully crafted and well-designed biodiversity conservation strategies to mitigate the impacts of mining, a community biodiversity use assessment is therefore a fundamental first step to determine the interaction between communities and their local biodiversity.

The assessment in this study will provide guidance for prioritization of investments, projects and mitigation measures in the conservation of the biological resources at the community level.

Newmont Ghana Gold Limited

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Abbreviations and Acronyms

NGGL	-	Newmont Ghana Gold Limited
CI-Ghana	-	Conservation International – Ghana
CBVR-Technique	-	Community Biodiversity Values Ranking – Technique

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1.0 INTRODUCTION

Biodiversity provides the basis for life on earth and is the key to safeguarding the wealth of the biological world for future generations. Diversity of life differs from place to place, particularly in varied ecological regions. In the same way, specific uses, values and order of importance placed on biodiversity vary at the local, national and global levels.

At the international level, emphasis is placed on the global value of biodiversity (ecological, scientific, educational existence and intrinsic value). However, for those living in developing country, rural settings, particularly in rural Africa, biodiversity is valued for providing food, medicines, fuel, building materials, sources of livelihoods and in some cases religious and cultural identity.

In the rural communities in Ghana, a large variety of both vertebrate and invertebrate species constitute the bulk of the community's food supply. These include large and small mammals, particularly ungulates, primates, rodents and fruit bats. Meat and eggs are sometimes provided by guinea fowls and francolins.

Various fish species and both marine and freshwater mollusks are eaten in large quantities especially the giant African land snail. In other rural communities, insects are an important supplementary food - especially those that are easily gathered such as termites, locusts, grasshoppers, crickets and large beetles.

A large number of plant species are also collected or cultivated for human consumption. These include bananas, beans, cassava, maize, millet, potatoes, rice, sorghum, sugarcane, and others. In addition, a great range of plants is used for housing construction, traditional and cultural artifacts, festivals and for a host of other purposes.

An estimated 60–80% of the rural communities in Ghana also depend primarily on traditional medicine for the treatment of different ailments. Dependence on medicines derived from indigenous plants is especially predominant in rural areas where modern western medicine is often unavailable or is simply too expensive.

Currently, many rural communities are rapidly losing their access to or sources of herbal medicinal plants due to vegetation clearing for agricultural expansion, logging, surface mining, bushfires, and hunting. This has resulted in a drastic decline in the supply of traditional medicines. At the same time, demand for these medicines has increased as the population increases couple with rising poverty levels. These factors – growing demand and dwindling resources – together mean that many useful plants and animals or biological resources are at risk of becoming extinct.

There is therefore an urgent need both to protect the remaining forests and to preserve the local cultural knowledge of their use. Newmont Ghana Gold Limited and Conservation International through their partnership seek to work in the following biodiversity areas:

- Investigate and document the importance of biological resources to communities in the Akyem Gold mining concession area;
- Examine ways to conserve the biological resources, particularly medicinal plants;
- Identify indigenous plant species which can be used in the restoration of the degraded mine sites during mining and after closure; and
- Ensure that development-impacted communities are not totally cut off from critical aspects of their socio-cultural life.

2.0 ASSESSMENT APPROACH

In order to identify and assess how biodiversity is used by local communities in the project area, the study adopted a process of learning about rural biodiversity use in an intensive, interactive, and expeditious manner, using a range of methods, tools, and techniques including the following:

- Field surveys;
- Focus groups;
- Direct observation;
- Group interviews;
- Questionnaires;
- Participatory mapping;
- Seasonal calendars; and
- Activity profiles;

Field surveys focused on identifying plants, mammals, birds, invertebrates, reptiles, amphibians, wetlands, aquatic habitats, ecological services, etc as they are used by the communities to meet their basic needs of food, shelter and clothing. The focus groups and areas which were covered by the assessment included the following:

2.1 *Chiefs and Elders*

Surveys were conducted to determine key biodiversity uses by the community chiefs and elders as related to administering and sustaining the chieftaincy institution. The surveys focused on artifacts, cultural practices, appellations, herbal medicines, festivals, ceremonies, and other rituals performed by the chief and elders. Surveys included direct observations, local histories, folklores, songs, poetry, activity profiles, and key probes to identify necessary information.

2.2 *Herbal Medicine Practitioners*

Herbal medicine practitioners were surveyed by direct observation of herbal medicine preparation and dispensing. Inventories of plants and animals used were identified along with locations, relative abundance, and availability of biodiversity resources. These characteristics were established through a combination of field visits and engagements with herbal medicine practitioners.

2.3 *Income Generation*

The economic base of communities was assessed in relation to biodiversity of the area. Various income-generating activities were identified and ranked in order of priority. The assessment was done through direct observation, group interviews, and questionnaires. Primary and secondary sources of income were identified and related to the available biodiversity use and degree to which communities depend on biodiversity in the Project area.

2.4 *Women's Groups (Gender Implications)*

The role of women in the use of biodiversity in communities was assessed. Various herbal medicines, cooking utensils, artifacts for domestic use, and biodiversity resources used in cooking and nourishment were identified through group discussions, direct observations, structured questionnaires, key probes, activity profiles, and daily routine interviews.

2.5 Festivals

Biodiversity used in various celebrations and festivals was also assessed by direct observation and review of participatory mapping, seasonal calendars, opinion leaders' interviews, local histories, songs, folklore and poetry

2.6 Building Industry and Construction

Key uses of biodiversity in the building and construction industry were identified through direct observations and semi-structured interviews. Various biodiversity resources used in the construction of bridges, roads, culverts, and other structures were identified and described.

2.7 Energy

Communities' sources of energy (e.g., charcoal, wood, and vegetable oils) were assessed by direct observations and interviews with housewives and heads of households.

2.8 Protein

Communities' sources of protein, particularly bushmeat were assessed. This was done through semi-structured interviews, and group interviews. The degree to which communities rely on bushmeat was specifically assessed.

2.9 Cultural Practices

The role of biodiversity in the socio-cultural life of communities in the Project Area was assessed through local histories, folklore and seasonal calendars. Through interviews with chiefs, elders and the communities, various festivals and cultural practices which use plants and animals were assessed. Transect walks with key informants through villages helped to identify cultural artifacts, sacred areas, sacred groves, cemeteries, sacred rivers and streams, shrines, and totems in the communities.

2.10 Cultural Artifacts

The use of biodiversity as materials for festivals, songs, crafts, drumming, cooking utensils, and other uses were assessed through direct observations and interviews.

2.11 Biodiversity Values Typology

In order to structure and summarise how individuals and groups in the Akyem project area interact with local biological resources, a set of eight basic values which the Akyem community considers as their priority (Table 1) was used. The values were incorporated into the various assessment methods so as to gather data on biodiversity values from the community members. It also guided the design of the questionnaires as well as focus group discussions. The definitions of the values were used to form questions which respondents were asked during the interviews.

Finally, Community Biodiversity Values Ranking Technique (CBVR-Technique) was used to analyse the data collected from other methods to understand how community members express their relationship with biodiversity. Each identifiable group was engaged to rank the values on a scale of 1-10 or was given 10 stones for each of the eight values. In effect, each group received 80 stones and distributed on the values. Each value is not to be given more

than 10 stones and the final score established to indicate how the communities value their biological resources.

Table 1: Akyem Communities Biodiversity Values

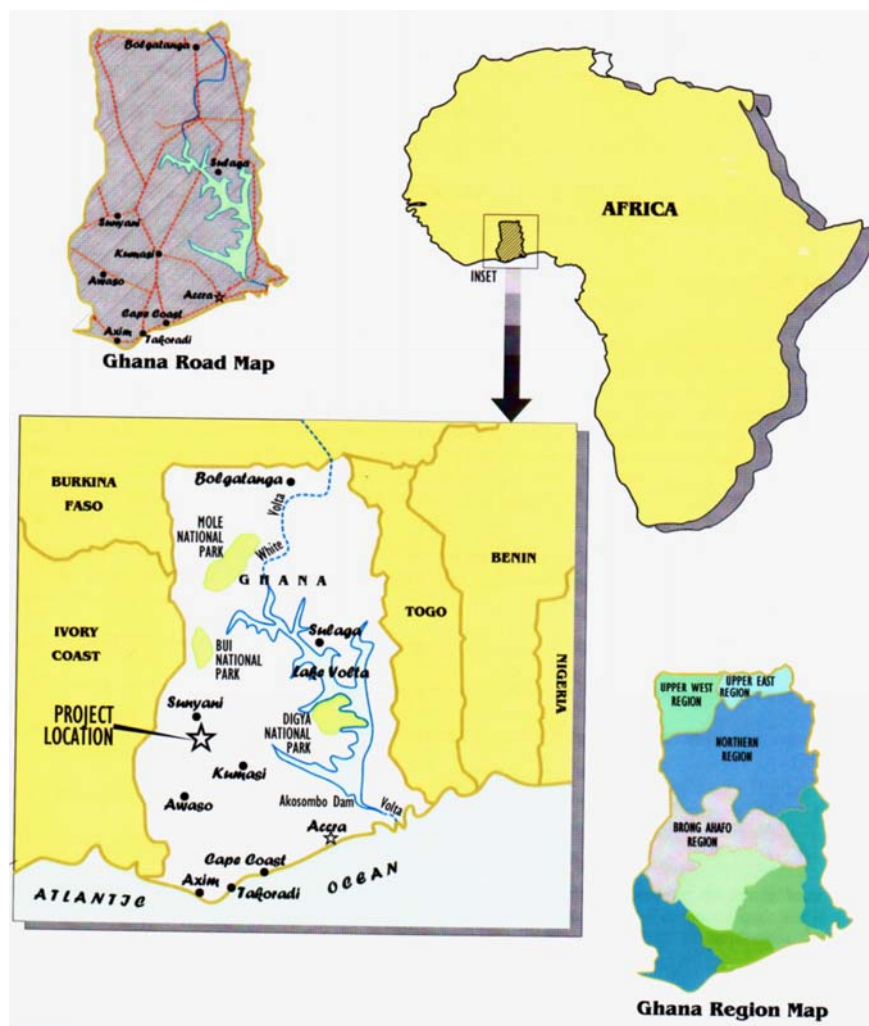
Value	Definition	Function*
Consumptive Use	The value placed on nature's products that are consumed directly without passing through a market	Physical sustenance
Productive Use	Value assigned to products that are commercially harvested for exchange in formal markets	Pecuniary interest
Symbolic use	Use of nature for language and thought	Communication
Naturalistic Use	Direct experience and exploration of nature	Recreation and tourism
Moralistic Use	Spiritual reverence for nature	Righteousness
Aesthetic Use	Physical appeal and beauty of nature	Inspiration, harmony and joy
Education and Training	Value placed on nature in providing the environment for socio-cultural ethnic training	Cultural indoctrination
Ecosystem services	Value placed on nature in sustaining the ecological systems	Ecological stability

* Possible attitudes, behaviours or actions that might result from having this value.

3.0 ECOLOGICAL AND CONSERVATION OVERVIEW

3.1 Project Location

The proposed Akyem Gold Mining project is located in the Ajenjua Bepo Forest Reserve in the Birim North District of the Eastern Region of Ghana. It lies between latitudes $6^{\circ} .00'N$ and $6^{\circ} .30' S$ and longitudes $1^{\circ} .00' E$ and $0^{\circ} .00' W$. The site is approximately 130 kilometers (km) northwest of Accra (Map 1) and 3km west of the district capital, New Abirem. The site is characterized by subsistence farming, land degradation, logging, settler farmers, poor infrastructure, unemployment and poverty. The area is occupied by a number of ethnic groups, particularly, the Akans, whose settlements and farms are scattered around the Ajenjua Bepo forest reserve.



Map 1: Map of Ghana showing the project locations

3.2 Ajenjua Bepo Forest Reserve

The Ajenjua Bepo Forest Reserve was established in 1930. The Reserve is classified as moist semi-deciduous forest with a total area of 569 hectares (ha). It is located entirely within the Pra river and the Mamang river drainage basin. The area is characterized by steep hills and undulating landscape with elevations ranging from 155 meters (m) to over 295 m above mean sea level.

The settlements in and around the project area include New Abirem, Afosu, Ntronang, Mamanso, Old Abirem, Yaayaaso, Ayesu Zigah, Yaw Tano, Hihivi, Akrofonso, Adawsena (Fig.2), Hweakwae, and other hamlets (E.K. Marfo Hamlet in Fig.1).

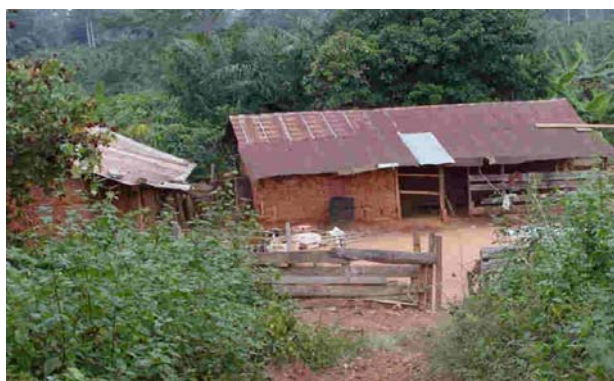


Fig.1 E. K Marfo hamlet



Fig.2 Adawsena village

In 2001, the Forestry Commission in consultation with the Minerals Commission established a technical committee to assess potential environmental impacts of proposed mining operations within Forest Reserves. The committee reported the following:

- Except for the southeast corner where there is a small patch of original forest with a rating of 4, the remainder of the mineral concession area is considered a secondary forest with a rating of 6 (ratings range from 1 to 6, with 1 being excellent and 6 having no significant forest remaining);
- The number of species and species density in the concession area is poor and the vegetation is also heavily degraded;
- The portion of forest currently undergoing exploration is under convalescence and consists of *Cedrella odorata* and *Gmelina arboreai* plantation with patches of natural forest;
- The rich gold deposit, underlying a portion of the forest, necessitates the exploitation to the benefit of the economy.

The report did not identify specific environmental impacts of the proposed mining activities in the forest reserve probably because the vegetation at the proposed project site was predominantly *Cedrella odorata* (SGS 2004a). The remnant of original forest exists at higher elevations in the areas to the north-west of the proposed site for the mining operations.

Between 1975 and 1983, the Forest Reserve was placed under the Conversion Working Circle system and 71 ha were re-planted with *Cedrella odorata*. Subsequently, a review of the national forest protection strategy placed the Ajenjua Bepo Forest Reserve under the Hill Sanctuary protection category. In 1998, 250 ha of degraded forest located in the southern part of the forest reserve were permitted for mineral exploration activities due to the fact that the site is considered a convalescence area.

3.3 *Climate and Vegetation*

The project is located within the wet semi-equatorial climatic zone of Ghana. It is characterized by an annual double maxima rainfall pattern occurring from March to July and September to mid-November. The rainfall in the area has an annual peak regime between 1,600mm-1,700mm. The peak of the major rains occurs around June and the second peak occurs in October during the minor season from late September to mid-November.



Fig.3 Semi-deciduous vegetation



Fig.4 Degraded semi-deciduous vegetation

The vegetation of the area (Fig.3 & 4) is semi-deciduous and the plant communities closely represent the natural forest types of the region. The few patches of forest are between 35 to 40 meters high, dominated by *Cyclodiscus gabonensis*, *Celtis mildbraedii*, *Milicia excelsa*, *Ceiba pentandra*, and *Antiaris toxicaria* (SGS 2004b). Common undergrowth species are *Leptaspis cochleata*, *Olyra latifolia*, and several species of fern. On the other hand, the vegetation outside the Ajenjua Bepo Forest Reserve is composed of a mixture of plant communities in the early stages of ecological succession.

3.4 Population Profile

The population of Birim North District, where the project is sited, is about 123,579 (Pop. 2000). The district has an annual growth rate of 3.4% and constitutes about 4% of the total population of the Eastern Region. The district has a lower population density (99 persons per km²) than the average for the region of 109 persons per km², reflecting the prevalence of relatively small size settlements in the district.

The population of the major settlements in the project area ranges from a low of 570 residents in Yaayaaso to over 3,500 residents in Afosu. The area is occupied by Akims, Ashantis, Kwahus, Ewes, Northerners, Ga-Adangbes, Akuapems and Fantes.

3.5 Traditional Administrative Structure and Culture

The Akim Kotoku Traditional Area is administered by a paramount chief (Fig.5) in association with five divisional chiefs: Ajenjua, Adawsena, Afosu, New Abirem and Ntronang. The main paramountcy of the area is the Akim Kotoku Traditional Authority which:

- Serves as the custodian of stool lands;
- Provides leadership for subjects;
- Maintains traditional heritage;
- Mobilizes the subjects for development; and
- Adjudicates disputes.



Fig.5 The Paramount Chief of Akim Kotoku attending EIA Public hearing at Yaayaaso.



Fig.6 Ayesu Zigah Shrine

The main sacred site identified within the project area is the Ayesu Zigah shrine outside Afosu (Fig.6). There are two main cemeteries and a royal mausoleum, all located at Yaayaaso.

3.6 Economic Activity

The primary economic activity in the area is agriculture. It employs about 75% of the population. Cocoa has been the most important crop in the past, as shown by the number of cocoa farms bordering the fringes of the forest reserves and the presence of the Afosu Cocoa Research Institute (Fig.7). Other important cash crops are oil palm, cola and citrus. Food crops such as plantain, cocoyam, cassava and maize are also cultivated (Fig.8) mainly for subsistence purposes.



Fig.7 Cocoa Farmer at Ntronang



Fig.8 Oil Palm Processing at Yaayaaso

The farmers practice mixed crop farming on a land rotation system. The system employs slash and burn and zero-tillage techniques for land preparation. The farmers rotate farmland to allow some fields to lie fallow (abandoned or unused) for a number of cropping seasons.

3.7 Project Description

The Akyem Gold Mining project will involve mining approximately 8.8 million tons of ore processed annually to produce the currently estimated resource of 7.7M oz of gold. The projected mine life is 15-17 years.

The project will include one open pit mine, two waste rock disposal facilities, a tailings storage facility, an ore processing plant, a water storage dam, a water transmission pipeline,

sediment control ditches and ponds, haul and access roads, staff housing and support facilities.

The development of the mine and its infrastructure will require about 1,579 hectares. However the buffer zone and the resettlement sites will increase the land take to about 1,989 hectares. The proposed open pit will be approximately 900 meters wide, 2,560m long and 456m deep.

The development of the open pit will cover about 74 ha (13%) of the Ajenjua Bepo Forest reserve. The pit will lie along the southern edge of the forest reserve where the forest is seriously degraded through years of anthropogenic interventions. The Ajenjua Bepo Forest reserve is about 569 ha and has *Cedrella* and Teak plantations at its southern edge.

4.0 ASSESSMENT RESULTS AND DISCUSSION

The community biodiversity use survey was conducted over a three month period in the 10 communities located within a 10 km radius of the project area. The 10 communities, whose total population is about 15,400, include those listed below.

- New Abirem
- Afosu
- Ntronang
- Mamanso
- Old Abirem
- Adawsena
- Hweakwae
- Yaw Tano/E.K. Marfo/Ayesu Zigah/Hihivi
- Akrofonso
- Yaayaaso

The chiefs and elders (including queen mothers) in all these communities were interviewed. Also all the herbal medicine practitioners, women's groups, farmers, religious groups, men's groups, youth as well as the executive committees members of all the identifiable groups were interviewed. In addition, about 10 percent of the entire population of the 10 communities were interviewed. Other key officials who participated in the various discussions included the District Forestry Officer, the Town and Country Planning Officer, the District Health Officer, Pharmacist, a chemical seller and the District Medical Superintendent. The interviews or meeting sessions were very relaxed, participatory and informal.

4.1 Biodiversity for Community Livelihood

The survey results show that the community obtains 30% of its food requirements from its immediate biological resources. This includes cereals, seeds, nuts, vegetables, roots, bulbs and tubers, fruits and berries, or drinks such as herb tea, and palm wine prepared from the oil palm tree (Fig.9). Due to the ever-increasing land degradation, the area is gradually becoming a net importer of staple food - i.e. cassava, cocoyam, maize and plantain - for consumption. Most of the food crops grown are for subsistence purposes. A few cocoa farms and oil palm plantations provide limited cash to the communities. Due to the poor returns from farming activities, the area has one of the lowest population densities (99 persons per km²) as compared with the regional average of 109 persons per km² for the Eastern Region.

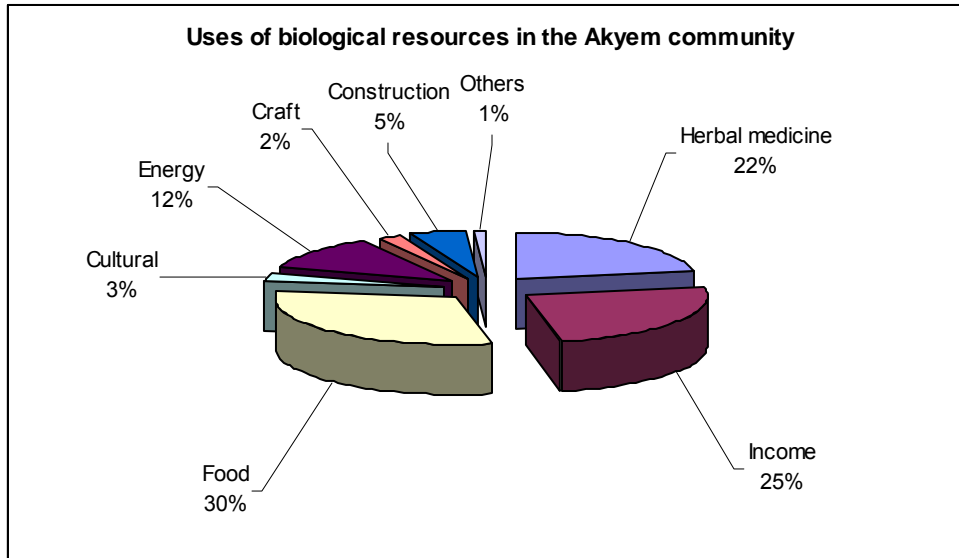


Fig.9 Use of biological resources at the Akyem community

4.2 Biodiversity for Community Health Care (Herbal Medicine)

The interview results show that traditional medicine is very popular in the area in spite of the establishment of a District Health centre. As indicated in Fig. 9, about 22% of its herbal medicine is also obtained from its environment. This is expected as the area has a number of professional herbalists, fetish priests, herbal medicine peddlers and chemical sellers.

Furthermore, about 91% of the respondents indicated that they have used herbal medicine at one time or another. When asked to consider both herbal medicine and the current westernised health care system in the district, 70% of the respondents considered herbal medicine as “very important”, 25% rated it as “important” and 5% indicated that herbal medicine was “not important” (Fig.10).

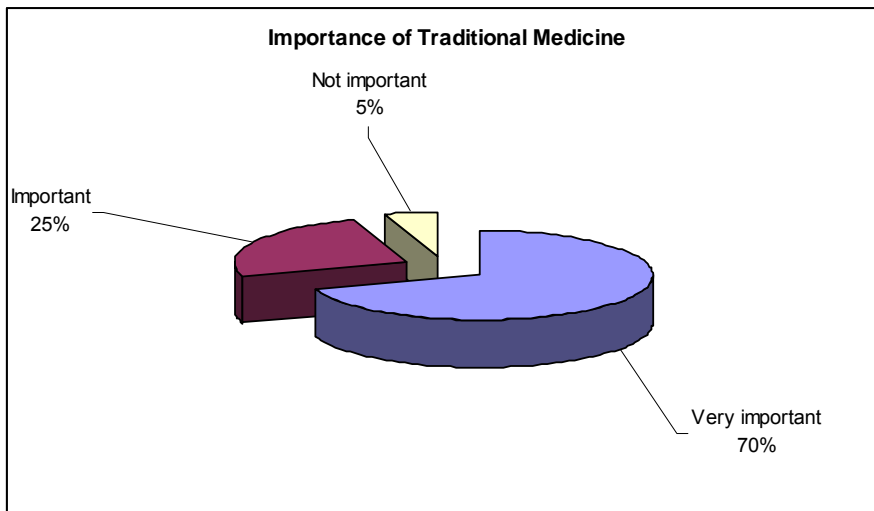


Fig.10 Importance of traditional medicine to respondent

In the preparation of traditional medicine, indigenous plants always constitute a significant portion. On the question of what types of plants are used for the preparation of the traditional medicines, out of the 120 plant species which are known, only about 60 species are frequently used (See Appendix 1).

Herbal medicines exist for all illnesses in the community. Some of the major illnesses which are frequently treated include, coughing, high blood pressure, rheumatism, joint pains,

diarrhea, dysentery, stomach problems, diabetes, migraine headache, piles, malaria, snake bite, bleeding, convulsions, worms, painful menstruation, gonorrhoea, infertility, ovulation and even cancer. Sometimes, as many as 10 different plant species are combined to treat a particular ailment, such as stomach ache.

All the traditional medicine practitioners confirmed that the major problem they are facing is the rapid loss of herbal plants sources. Therefore, areas which are degraded or which will be disturbed by mining activities have a potential to reduce availability of locally important plant species. However, people were all excited about the possibility of ex-situ propagation of useful species in nurseries, home gardens and farms. They emphasized the need for medicinal plant farms to provide the following:

- Easy access to inexpensive herbal plants;
- Sources of income as plants are sold in all big markets; and
- Employment opportunities.



Fig:11 A herbalist standing by a protected Tree at Afosu Township



Fig:12 Fetish Priest standing by his shrine at E. K. Marfo village

In addition to medicines, members of the communities use plants in the area for many other purposes. Various plants are valued for beauty products such as perfumes, soaps, cosmetics and repellents that can be made from them.

4.3 Biodiversity for Energy, Crafts and Construction

The survey revealed that floral resources are used for making tools for hunting and fishing, dyes and tans. Others are used for making crafts such as basketry, weaving and ropes, thatching, mats and brooms.

In all, the community obtains about 12% of its energy requirements (charcoal, firewood) for cooking and as a tool for weeding from its environment. Even though about 60 percent of the communities have access to electricity, and LPG, they still depend on fuelwood and charcoal for cooking.

4.4 Biodiversity for Protein

The main traditional sources of protein in the Akyem communities are bushmeat, freshwater fish and vegetables. Even though the communities are located in an ecological zone which should have large stocks of small and large mammals as well as various large birds, bushmeat is very scarce in the area due to over-hunting. Most of the people indicated that they travel over 20 kilometers to larger regional markets, particularly Nkawkaw to buy their

most preferred bushmeat – grasscutter. Therefore, most of the community members particularly those in the New Abirem and Ajenjua depend on marine fishes, poultry and beef from butchers' shops. The bushmeat trade, which used to be one of the most lucrative economic activities in the area, has totally collapsed due to the rapid destruction of the forests and years of over-hunting.

4.5 Biodiversity for Cultural Activities

Resource management is most likely to be sustainable when a culture – a shared system of values, beliefs and attitudes, grounded and governed by traditional norms – encourages environmentally sound management practices. In the Akyem project area communities, the lands and resources protected for socio-cultural purposes derive their value from religious fulfillment, social prestige and other intangible benefits.

In Malshegu, Ghana, for example, the community has, for more than three centuries, restricted land and resource use in a sacred forest grove – as well as a surrounding buffer zone – that they believe is the home of an important traditional god. Protecting the sacred grove fulfils a religious and an ecological need. The story in the Akyem area is no different. However, the chieftaincy institution is anchored in the biodiversity of the area. Each of the traditional rulers in all the communities has a totem. In the same way, members of families and clans in the communities have their own totems which are mainly wildlife species due to their historical or socio-cultural significance and the symbolic quality of each of them.

There is a belief that a certain intimate relationship exists between members of particular families and certain classes of natural objects such as animals, birds, fish and plants. Members of these families therefore, do not eat, kill or trap animals, birds or fish revered as totems. When a totem dies or is sold, members of the tribe or family it represents will show respect by mourning and burying it as in the case of a human being.

On the other hand, if the animal or totem is captured alive by a non-clan member, a ransom of money must be offered to secure its release into the wild. In some of the communities, totems are conspicuously displayed at the entrance of or inside the chief's palace. When the chief sits in state, the linguist (spokesperson) holds the chief's staff with the totem atop it (Fig.13).



Fig.13: Chief's staff with the totem atop



Fig. 14: The totem of the Chief of Afosu

The totem of the chief of Afosu, and indeed the entire community at Akyem, is the African Gray Parrot (*Psittacus Erithacus*) (Fig.14). This parrot is regarded as the soul and spirit of the Akyem people in that locality. The staff of the chief of Afosu is carved in the shape of the parrot (Fig.13). Hunters are not permitted to kill them, neither are they allowed to disturb their habitats. There is a big tree at the outskirts of Afosu which has for decades been the safe haven for the parrots. The link between the community and the parrot is so strong and sensitive that development endeavours must always recognise this traditional sacred fact.

All the communities use the available biodiversity resources in carrying out cultural practices, festivals and other traditional rituals. Various species are used for funeral celebration, birth ceremonies, burial ceremonies, initiation rituals, inheritance systems, carving of musical instruments and the chief's stool (Fig.15). The staple food of the entire Akyem community, 'fufu' is best prepared with the use of specific plant species (*Wonton*) for pounding.



Fig. 15: The stool of a paramount chief

5.0 YAAYAASO COMMUNITY BIODIVERSITY USE

Yaayaaso, which is a small community located in the project area and earmarked for resettlement, presents a similar biodiversity use scenario. The people of Yaayaaso are mainly subsistence farmers, engaged in cultivation of cocoa, oil palm, citrus, maize, cassava, plantain and cocoyam. The community derives 35% of their primary food requirements from the local biological resources. Similarly, 23% and 20% of their herbal medicinal needs and income respectively are also obtained from the biodiversity of the locality. (Fig.16).

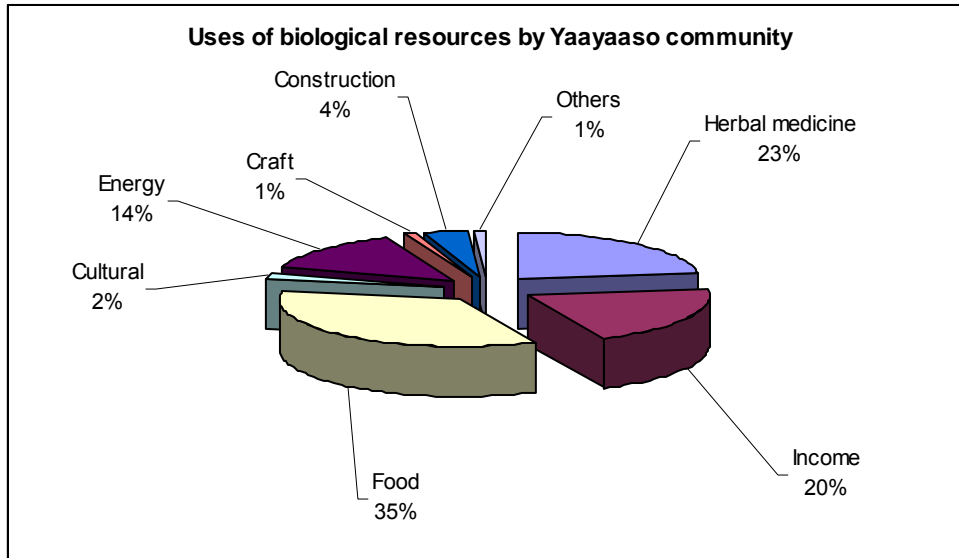


Fig. 16 Uses of Biological Resources by Yaayaaso community

The dependence of the community on herbal medicine is corroborated by the existence of four traditional herbal medicine practitioners and fetish priests in that small community of less than 600 people. In addition to this, most households are known to practice herbal medicine in their individual homes.

The four herbal medicine practitioners provide health services by using herbs from the immediate forest. These herbalists are also supported by a number of community elders who have vast knowledge in the use of herbs and tree barks to cure various ailments (Fig. 17).

There are a number of herbal medicine peddlers in the area who are also involved in the sale of herbal medicine in various formulations to the public. On weekly market days, an average of four herbal medicine sale vans parades the main streets of the communities advertising and selling to prospective herbal medicine users. The FM Radio station, located in Nkawkaw, advertises herbal medicine daily on the radio. There is therefore a strong bond between the community members and herbal medicine such that orthodox medicine is turned to only as a last resort.



Fig.17 Bark of a tree removed for herbal medicine at Yaayaaso

From the survey, Yaayaaso community apportions about 20% of its biological resources to provide income. This involves farming, hunting, wild collection, cottage industry and leasing of lands (*Abunu/Abusa*). Similarly, it assigns 14% of her biological resources for the provision of energy (firewood and charcoal).



Fig.18 Completed Wattle & Daub House at Yaayaaso



Fig.19 Wattle & Daub house under construction at Yaayaaso

Another striking feature of Yaayaaso is the use of biological resources for the construction of their houses. These housing types are generally of wattle and daub construction with ramped earth floors, and sometimes with thatched roof (Fig.18 & 19).

Therefore, if Yaayaaso community is relocated outside the mining area without access to the basic biological resources that are customarily used, the community may be impacted and disadvantaged. The situation will be worse if the community is transformed from its current subsistence level into a cash economy without any other sustainable livelihood projects. This may compel the community to carry out encroachments in the concession area.

Finally, the biodiversity use analysis indicates that the community sustainability is precariously linked to the biodiversity resources of the area. They depend on the biodiversity resources for their income, health, food, housing and cultural practices. With the diminishing biodiversity resources through anthropogenic and natural factors, most community members are now outsourcing biodiversity resources for their sustenance. Any further change in the land use of the area, which results in drastic change in their traditional biodiversity use could generate social conflicts unless alternatives are provided.

6.0 ASSESSMENT OF COMMUNITY BIODIVERSITY VALUES

Community Biodiversity Value Ranking Technique (CBVR-Technique) was used to assess how the communities value their biodiversity (Table 1) based upon the survey results in Appendix 2a and 2b. The tool provided insight into how these values are likely to motivate certain community behaviours as well as facilitate the design of appropriate biodiversity conservation projects. Eight core values which the communities place on their biodiversity were identified during the survey. These core values – consumptive, productive, naturalistic, aesthetic, symbolic, moralistic, education and training and ecosystem services were used to prioritise the use to which communities put their biodiversity.

Each identifiable group was given the opportunity to rate each value on a scale of 1 to 10 at several informal meetings. In order to make the technique quicker to execute and easier to understand, each of the groups were given 80 stones to be distributed to the values, each one not to be given more than 10. In all, 1,540 people from the 15 communities (10%) were asked to rate the values, i.e. about 220 people from each of the seven categories namely, chiefs and elders, religious groups, farmers, men's group, women's group, herbal medicine practitioners, and the youth.

The consumptive value obtained a total score of 57 which means that about 21% of the respondents consider their biological resources to be for consumptive use (Table 2). This confirms the fact that the people are only involved in subsistence agriculture (i.e. to feed

their families) since the land can no longer support cocoa and other cash crop cultivation due to years of land degradation.

Table 2: Community Biodiversity Values Ranking Technique (CBVR-Technique)

Akyem Communities Biodiversity Values	Identifiable Groups in the Community								
	Chiefs & Elders	Religious Groups	Farmers	Men's Group	Women's Group	Herbal Medicine Practitioners	Youth	Total	%
Consumptive	9	9	6	6	9	8	10	57	21
Production	1	1	4	4	1	1	0	12	5
Naturalistic	2	4	2	3	3	6	8	28	11
Aesthetic	1	2	1	1	4	1	4	14	5
Symbolic	9	2	5	5	4	8	1	34	13
Moralistic	4	5	3	4	5	7	3	32	11
Education & Training	8	4	10	8	6	10	4	50	19
Ecosystem Services	6	5	8	5	6	6	3	39	15
Total	42	33	39	36	38	47	31	266	100

It is also interesting to note that the community members traditionally use their forests and agricultural lands as training grounds for their children. Farmers traditionally train their children in the farms. By working with their parents in the farm, children acquire hands-on training and professional maturation. It is for this reason that the table shows the second highest score 50(19%) for education and training value of the biodiversity of the area.

The community rated ecosystem services as the third most important value 39 (15%) after considering the key ecological services, i.e. provisioning, regulating, cultural and supporting. (Table 2, Figs.21)

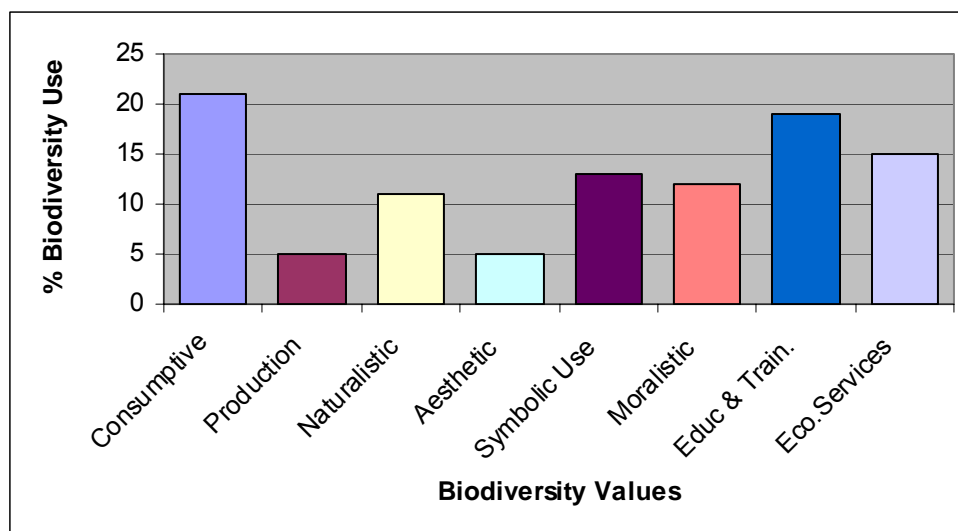


Fig.20 Akyem Communities Biodiversity Values (Basic components)

It is also not surprising that the symbolic value received the fourth place (34) since Akyem is an indigenous community. In such a rustic society, daily language is full of proverbs and euphemistic expressions with a connection to nature, which is not often the case in the urban areas with their cosmopolitan focus.

Considering the total value of biodiversity to the groups in the Akyem community, the herbal medicine practitioners considered the Akyem environment as very important and lucrative. This probably stems from the fact that they are able to make money out of the various herbal plants in the area despite the current level of degradation. It also indicates that there is demand for herbal medicine and any activity which leads to accelerated deforestation, could drastically affect public health and the livelihoods of the practitioners.

The chiefs and elders, religious groups, women’s groups and the youth, generally consider the biological resources of the area as mainly for consumptive purposes (Appendix 3). It is only the farmers and men’s group which pointed out that the biological resources of the area are of limited production value. Similarly, it is only the women’s group and the youth who indicated that the biological resources of the area have some aesthetic value (Appendix 3). There are marked differences in terms of how the various groups value the biological resources of the area. Overall, the response of the Akyem community is that their biological resources are valuable for consumptive purposes and an excellent training ground for their children into manhood (Appendix 3)

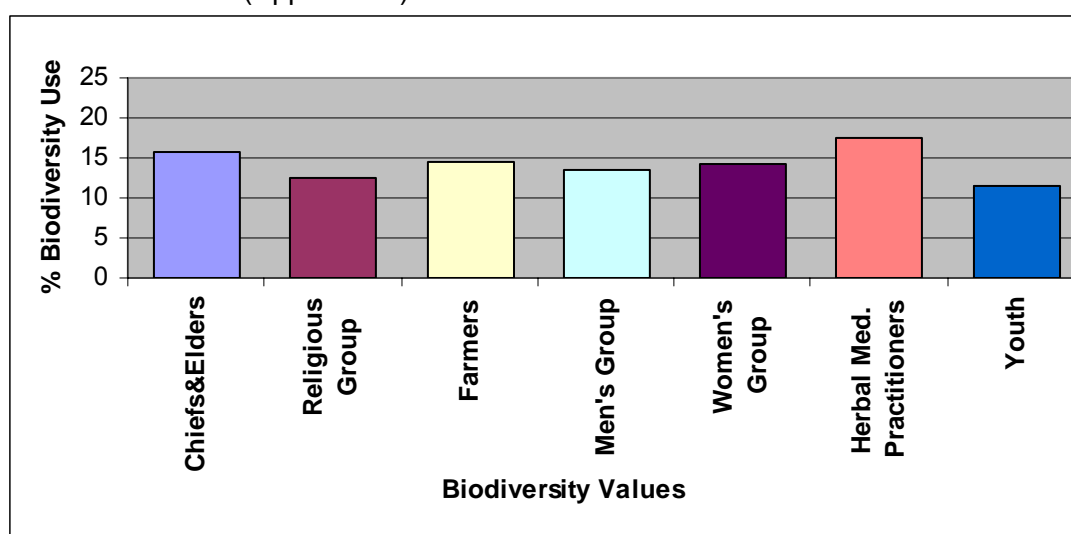


Fig. 21 Total value of Biodiversity to Identifiable Groups

Even though the land is degraded and cannot support adequate food production for the communities, the chiefs and elders also consider it as a great value to their survival. Since they are, by tradition, the custodians of all the lands, they periodically obtain royalties from developers to support their survival and the chieftaincy institution. They are also enjoined by their traditional oath of office to hold the land in trust for the next generation.

7.0 KEY ISSUES AND RECOMMENDATIONS

This assessment of the community biodiversity use shows that the mine development could result in a negative impact on the community’s biodiversity use, i.e. for consumption, production, naturalistic, aesthetic, symbolic, moralistic, education and training and the services obtained from the ecosystem.

Regardless of whether the communities will be resettled away from their current ancestral home or not, the relationship is one of dependency on plants for fuel, food, fodder, herbal medicine, building materials and protein from the wild.

Therefore, the main potential community biodiversity use issues which need to be managed include the following:

- Loss of flora (for energy, building materials and utility use);
- Loss of fauna (for protein from the wild);
- Loss of medicinal plants (for community health);
- Loss of livelihoods (for employment and income);
- Loss of indigenous knowledge (for indigenous conservation practices); and
- Loss of social cohesiveness (for interdependent and subsistence economy).

8.0 RECOMMENDATIONS

Considering the fact that the Akyem community is inextricably interwoven with their local biodiversity resources, the following recommendations are put forward to ensure long-term impacts can be properly mitigated:

1. Organise communities into seed hunting groups to collect seeds for the establishment of medicinal plants farms.
2. Organise training for communities on nursery practices for the propagation of medicinal and local plants.
3. Establish medicinal plant demonstration farms for two communities to provide hands-on training for community members.
4. Assist prospective herbal medicine practitioners and interested individuals in the establishment and management of herbal medicine backyard gardens.
5. Landscape all the resettled communities with local species and herbal plants to provide shade, fodder and serve as wind breaks for the communities.
6. Train communities to undertake improved vegetable production for the local market, NGGL workers and restaurant/canteens.
7. Carry out environmental education programme for the Akyem project staff and the communities.
8. Relocate the two herbal medicine practitioners, Ayensu Zigah and E. K. Marfo into locally designed house types to enable them to provide spiritual and psychological healing for the communities.
9. Train Newmont Nursery staff at Akyem in the propagation of local and medicinal plant for the restoration of degraded mine sites.

9.0 CONCLUSION

The assessment has shown that there is a significant bio-cultural relationship between the Akyem community and its natural environment. In view of this, subsistence farming and the collection of wood and non-wood forest produce form a key link to livelihoods.

Therefore, the need to mainstream biodiversity into the environmental and social management aspects of the Akyem project development is critical to community sustainability. Mainstreaming biodiversity into mining operations management as a means of seeking solutions to biodiversity loss is a challenging activity, especially if the cultural values are to be seriously considered.

The various “bottom up” interventions identified in section 8.0 may help to ensure a harmonious and complementary relationship between the Akyem Project and the Akyem Community throughout the life of the project.

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Appendix 1

List of Medicinal Plants Frequently Used by The Akyem Community

Ceiba petandra
Griffonia simplicifolia
Morinda lucida
Xylophia aethiopica
Tetrapleura tetraptera
Trichilia monodelpha
Alchonea coldifolia
Okuoubaka aubrevilleii
Zanthoxylum gillettii
Cola nitida
Chromolaena odorata
Funtumia elastica
kaya ivorensis
Paullinia pinnata
Rauvolfia vomitoria
Spathodea campanulata
Milletia zechiana
Cola gigantea
Solanum erientum
Lantana camara
Alstonia boonei
'Anya'
Bombax buonopozense
'Atoa
Newbouldis laevis
'Metwa
Pycanthus angoiense
Trema orientalis
Dalbergia lacteal
Barleria opaca
Phaulopsis barteri .
Kigelia africana
Thumbergia chrysops
Musanga cecrspioides
Celosia argentia
Combretum smeathmanii
Carica papaya
Ageratum conyzoides
Celosia laxa .
Cnestis ferruginea
Cythula prostrata
Costus afer
Pupalia lappacea

Mangifera indica
Crinum jagus.
Dracaena surculosa
Spondias mombim
Garcinia kola
Cleistopholis patens
Hoslundia opposita
Monodora tennifolia
Leea guineesis
Monodora tennifolia
Azadirachta indica
Pachypodanthium staudtii
Uvaria afzelii
Xylophia quintasii
Baissea multiflora
Jatropha gossypifolia
Picralima nitida
Strophanthus hispidus
Voacanga africana

Annex 2a: Biodiversity Products Being Enjoyed by the 10 Communities

Name of Product	Biological Name	Type of Benefit	Details of Benefit	% of community enjoying the benefit	Current status of product	Possible impact of mining on product	Ranking: community rating importance (1-least – 5 very important)
Mahogany	<i>Kaya ivoriensis</i>	Health	For curing anaemic conditions and dizziness.	100	Vulnerable	Possible extinction	5
Kakapenpen	<i>Rauvolfia vomitoria</i>	Health	For curing stomach aches.	98	Common	Possible extinction	4
'Frafraha'	<i>Milletia zechiana</i>	Health	For curing waist pains	62	Common	Possible extinction	5
'Pepediawuo'	<i>Solanum erientum</i>	Health	For treatment of piles.	76	Common	Possible extinction	3
'Prekese'	<i>Tetrapleura tetraptera</i>	1.Food 2.Health	1. As spice in foods 2. For treatment of poultry diseases	100	Common	Possible extinction	5
'Esa'	<i>Celtis malbraedii</i>	Household usage	1For household use 2 for making handles of farm tools	100	Locally Vulnerable	Possible extinction	4
Danta'	<i>Mesogordonia papaverifera</i>	Household usage	For construction of buildings	100	Globally vulnerable	Possible extinction	5
Esuro wesa	<i>Piper guinsense</i>	health	Curing various ailment			Possible extinction	
'Wonton'	<i>Morus mesozygia</i>	Household usage	For making pestles and mortar for pounding fufu. 2. As chewing sticks	60	Common	Possible extinction	4
'Odum'	<i>Milicia regia</i>		For making handles of farm tools	100	Globally Endangered	Possible extinction	5
'Nyamedua'.	<i>Alstonia boonei</i>	Cultural artifacts/ health	For making stools Treatment of measles	65	Locally endangered	Possible extinction	5
'Sese'	<i>Holarena fugal</i>	Cultural artifacts	For making drums and stools	62	Locally endangered	Possible extinction	5
'Ofuntum'	<i>Funtumia spp</i>	Heritage inheritance values	For making the staff of linguist	45	Common	Possible extinction	3

Name of Product	Biological Name	Type of Benefit	Details of Benefit	% of community enjoying the benefit	Current status of product	Possible impact of mining on product	Ranking: community rating importance (1-least – 5 very important)
'Akonkodee'	<i>Bombax buonopozense</i>	Health	For treatment of different ailments	55	Common	Possible extinction	4
'Anya'		Health	Enhanced quick recuperation	80	Common	Possible extinction	4
'Susumansa'	<i>Newbouldis laevis</i>	Health	Enhanced birth and expulsion of retained placenta	100	Locally Endangered	Possible extinction	5
'Otee'	<i>Pycnanthus angoiense</i>	Health	For curing anaemic conditions	65	Common	Possible extinction	3
'Ahomakyem'	<i>Dalbergia lacteal</i>	Health	For curing fits and boils	60	Common	Possible extinction	3
'Atoa'		Health	For the expulsion of retained placenta	80	Common	Possible extinction	3
'Metwa'		Health	For curing elephantiasis and severe headaches.	65	Common	Possible extinction	3
'Keja seed'	<i>Griffornia simplicifolia</i>	Health	For the treatment of many ailments	95	Common	Possible extinction	4
'Odwene'.	<i>Baphia nitida</i>	Physical protection	For dispersing soldier ants and red ants	82	Common	Possible extinction	3
'Whintea'	<i>Xylophia aethiopica</i>	Health	Treatment of various ailments	100	Common	Possible extinction	5
'Otanduro'	<i>Trichilia monodelpha</i>	Health	Treatment of waist pains and constipation	75	Common	Possible extinction	3
'Odii'	<i>Okouobaka aubrevilleiu</i>	Health	Convulsion in children And boils	65	Common	Possible extinction	3

Name of Product	Biological Name	Type of Benefit	Details of Benefit	% of community enjoying the benefit	Current status of product	Possible impact of mining on product	Ranking: community rating importance (1-least – 5 very important)
'Kankabi'	<i>Centipede</i>	Health	For the treatment of whiteloe.	65	Common		3
'Onin'	Royal python (<i>Python regae</i>)	Health	The fat is used in curing many ailments	85	Common		4
'Efoo'	<i>Black and white Colobus</i> (<i>Colobus velerosus</i>)	Cultural usage	For cultural usage	55	Globally vulnerable		4
'Otwe'	Maxwell Duiker (<i>Cephalophus maxwelli</i>)	1. Food 2. Cultural artifacts	1. Protein 2. Skin used for making drums	100	Common		5
'Abosomaketre'	Chameleon	Protection	Used in traditional medicines	100	Locally vulnerable		4
'Kankani'	Civet Cat (<i>Viverra civetta</i>)	1. Protection 2. Food	1. Used in traditional medicines. 2. For protein	52	Locally endangered		3
'Nwa'	Snails <i>Achatina achatina</i>	1 Food 2. Health	1. For protein 2. Used in traditional medicines.	100	Common		5
Okwekuo	Mona monkey	1. Food 2. Health	1. For protein 2. Strengthening of bone	75	Common		4

Appendix 2b: Environmental Services being enjoyed by the 10 Communities

Name of Product	Type of Benefit	Details of Benefit	% of community enjoying the benefit	Current status of product	Possible impact of mining on product	Ranking: community rating importance (1-least – 5 very important)
Sacred Grove	Spiritual	For ancestral burial grounds, traditional rituals.	100	Intact	Loss of heritage	5
Livelihood support	Income	1. NTFPs 2 Farm products	100	Intact	Loss of sustenance	5
Watersheds	Water	Domestic and other uses.	100	Intact	Partially contaminated	5
Windbreaks	Protective coverage	Protection of settlements against wind destruction.	100	Intact	intact	5
Training	Training grounds for the youth	Initiation into socio-cultural life of the communities.	100	Intact	Likely to be affected	5
Seed Bank	Sources of seeds	Provision of seeds for farming and other medicinal plants	100	Intact	Loss of indigenous seeds	5
Cultural Heritage	Social security	Inheritance assets/collateral	100	Intact	Loss of cultural heritage	5

Appendix 3

RESPONSES OF THE IDENTIFIABLE GROUPS ON THE EIGHT BIODIVERSITY VALUES

