

**CRITICAL ECOSYSTEM PARTNERSHIP FUND (CEPF) PROJECT**  
*“Protecting Atewa Critical Ecosystem through Biodiversity Assessments and  
Participatory Monitoring”*

**IDENTIFICATION AND ASSESSMENT OF DEPENDENCIES AND IMPACTS OF  
PRIVATE SECTOR ACTIVITIES ON NATURAL RESOURCES AND ECOSYSTEM  
SERVICES OF ATEWA FOREST RESERVE AND LANDSCAPE**

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## LIST OF ACRONYMS

AE	Atewa Extension
ARFR	Atewa Range Forest Reserve
BAC	Business Advisory Centres
CEPF	Critical Ecosystem Partnership Fund
GEA	Ghana Enterprises Agency
GoG	Government of Ghana
GSBA	Globally Significant Biodiversity Area
MDGs	Millennium Development Goals
NBSSI	National Board for Small-Scale Industries
NTFPs	Non-Timber Forest Products
SDGs	Sustainable Development Goals
UN	United Nations

## EXECUTIVE SUMMARY

A Rocha Ghana, with funding from the Critical Ecosystem Partnership Fund (CEPF), commissioned a study to identify and value the impacts and dependencies of private sector activities on natural resources and ecosystem services in the Atewa Range Forest Reserve and landscape, as well as identify how the threat of government-planned bauxite mining would affect their business activities. In the Atewa Forest Reserve, enterprises interact with the Atewa Forest landscape, not the protected area. The Atewa Forest and its landscape provide provisioning, regulating, cultural, and supporting ecosystem services. Compared to other ecosystem services provided by the Atewa Forest and its landscape, cultural ecosystem services are not highly valued in terms of money, ecotourism, spiritual cognition, wood availability, or soil formation.

Hospitality businesses such as ecotourism and nature parks have the highest dependency on ecosystem services overall and their survival would be threatened if Atewa Forest were to be damaged by bauxite mining. Ecotourism and nature-based tourism are highly dependent on intact natural areas and the biodiversity and habitats that these support. If the forest is upgraded to a National Park, ecotourism and nature-based tourism would flourish.

The ecosystem service of raw materials is highly depended on by many businesses as it provides inputs for their activities, while clean water is also critical to many including farming, hospitality, tourism, and mineral extraction. Herbal medicinal plants, fertile lands, and biomass are also all important ecosystem services for local businesses. The businesses, particularly the woodworks and agro-services sector are mostly out doors and therefore depended on good climatic conditions (oxygen and cool climate), especially cool climate as this means the businesses that operate in doors do not require air-conditioning to ensure safe temperatures for office staff, and also outdoor workers have a healthy climate to work in.

The extent of business impact varies by company operations. In the Atewa Forest and its surrounding landscape, major commercial impacts include depletion of freshwater resources and loss of soil fertility. Of the 47 business respondents, 11 had low impacts, 26 had medium, and 10 had high impacts. The businesses are aware of their impacts on the Atewa Forest and its landscape.

Most businesses do not have a plan to maintain and conserve the Atewa Forest and its landscape. The analysis showed that only 18 (38%) businesses undertake tree planting and do not buy from illegal loggers and hunters, 19 (40%) undertake environmental conservation education, 11 (23%) reuse waste, 4 (9%) do not discharge waste directly into the environment, and 3 (6%) use solar panels. Some firms such as Yayra Glover, Pinora Limited, and HPW Fresh and Dry Limited have gone a step further by incorporating environmental conservation techniques into their core operations. Bunso Eco-park, Beauty of Nature Hotel, and Vicomeg Farms/Rephiden Resource Centre actively contribute to environmental conservation by planting trees, protecting biodiversity, and restoring lands degraded by mining.

All surveyed firms are aware of the intentions to mine bauxite in the Atewa Forest, but none support the proposal, believing that forest destruction by illegal mining activities would worsen with bauxite mining. The loss of ecosystem services, difficulties procuring raw materials, and loss of both medicinal plants and ecotourism potential are all cited as negative impacts of bauxite mining in the Atewa Forest.

Businesses in the Atewa Forest and its landscape benefit from direct access to ecosystem services, local technologies, and reliable raw material sources. The firms also have issues with market presence, financial flow, professional and experienced workforce, technology adoption, marketing, and rising health issues. The Atewa forest landscape offers several prospects for enterprises, including nature-based/tourism development, low cost, availability of and easy access to raw resources, favourable environmental conditions, and government support through rigorous environmental legislations. Proposed bauxite mining in the Atewa forest landscape threatens the enterprises' activities.

The study recommends that the state should fully fund and support the Forestry Commission's efforts to protect and maintain the Atewa Forest and its landscape. Periodic contact with the businesses is required to ensure they realize the importance of the Atewa Forest to their survival and the need to conserve it. The business entities should be helped technically to design an action plan to conserve and maintain the Atewa Forest ecosystem. There is also a requirement for

frequent business-level environmental audits with public reporting. Companies in the vicinity should be educated on sustainable practices that safeguard and conserve the Atewa Forest landscape. This is critical to forming alliances with environmentally conscious enterprises that have activities or presence in the landscape.

## **SECTION 1: OVERVIEW AND BACKGROUND OF THE ASSIGNMENT**

### **1.1 Introduction**

#### **1.1.1 General overview of environmental issues**

Human-induced environmental change remains one of the greatest challenges of the 21<sup>st</sup>-century world. Fuelled by an ever-increasing population, economic growth, and the unsustainable quest for natural resources to feed the demands of urbanisation and industrial expansion, the situation presents a considerable challenge for environmental sustainability in the future. The key issues are ecosystem degradation, habitat and biodiversity loss, waste management and pollution. Additionally, climate change and its associated impacts of extreme weather, increased flooding, droughts, and wildfires are intensifying the existing vulnerabilities resulting in dire consequences for environmentally-dependent livelihoods and the limited adaptive capacity of developing countries.

Habitat loss through deforestation and degradation, unregulated mining activities, environmentally-unfriendly farming and fishing practices, and pollution are increasingly impacting many ecosystems' productive capacities and habitat suitability (Hasnat, Kabir & Hossain, 2018; Otto, Roth, Carlson & Smart, 2016; Ncube-Phiri, Mucherera & Ncube, 2015). A significant concern arising from habitat degradation and loss are the health-related concerns, including the spread of many zoonotic diseases among human populations caused by habitat destruction.

The destructive impacts of human activities on the environment, its sustainability and the ability to support future generations have dominated recent discussions in academia and research. Initiatives to avoid these consequences include the introduction of concepts that seek to improve the human-environment relationship. At the apex of these efforts are the Sustainable Development Goals (SDGs), which build on the successes of the Millennium Development Goals (MDGs). The SDGs seek, among others, to end poverty and hunger by 2030 by drawing the minds of all to the need to carry out activities on the planet (land, water) in ways that do not

harm the integrity and the capacity of the environment to support the needs of current and future generations.

### **1.1.2 Overview of the Atewa Forest Reserve**

The Atewa Forest Reserve located in the Akyem Abuakwa Traditional Area of the Eastern Region remains one of only two remaining reserves with upland evergreen forests in Ghana. It is made up of a core zone designated as Atewa Range Forest Reserve (ARFR) and the extension Atewa Extension (AE) (Purwins, 2020; Salaün, 2021). Covering an estimated area of about 236 km<sup>2</sup>, the Atewa Range (evergreen forest) is of significant international and national ecological importance. It was declared a National Forest Reserve in 1926, later classified as a Special Biological Protection Area in 1994, a Hill Sanctuary in 1995 and, finally as a Globally Significant Biodiversity Area (GSBA) in 1999 (Schep et al., 2016). It is also has he international designation of Key Biodiversity Area (KBA). Among the primary reasons for designation at the national level is its role as an important "Water Tower", the source of three major rivers (Densu, Ayensu and Birim), providing drinking water for an estimated 5 million Ghanaians across the Eastern, Central, and Greater Accra Regions (Ayivor & Gordon, 2012). The associated ecosystem of the ARFR is home to unique and endemic species of global biological importance. There are known to be 1,134 species of plants, 69 mammals, 40 amphibians, 239 birds, 14 reptiles, and 711 butterflies, with new species continually being discovered (A Rocha Ghana, 2020). The range also provides significant socio-economic benefits to the environmentally-dependent livelihoods of forest fringe communities through farming and the extraction of high-value Non-Timber Forest Products (NTFPs), including fibre, fruits, bush meat and medicinal plants (Purwins, 2020; A Rocha Ghana & Forestry Commission, 2016).

The landscape has recently attracted increasing human activities and business interests, including mining and agriculture, the primary livelihood. This pressure has notably resulted in increased impacts on the landscape, potentially on its ecosystem services integrity. It is also worthwhile indicating that the intended bauxite mining by the Government of Ghana (GoG) would drastically impact the landscape and its sustainability if implemented.

### **1.1.3 Overview of A Rocha Ghana**

A Rocha Ghana is a not-for-profit national environmental conservation organisation aimed at contributing to the sustainable management of critical ecological habitats and initiating

programmes that support target communities to use natural resources sustainably and adapt to current trends in climate and environmental change. A Rocha Ghana has been at the forefront of advocacy for conserving the Atewa Forest Range and its landscape through sustainable means and is a crucial advocate against the intended bauxite mining. In line with its objective to promote the conservation of the landscape, A Rocha Ghana is undertaking a project dubbed "*Protecting Atewa Critical Ecosystem through Biodiversity Assessments and Participatory Monitoring*" to address threats facing the Atewa forest, particularly the threat of bauxite mining by the government and the challenges of illegal gold mining, logging, poaching, and unsustainable resource extraction and utilisation within the Atewa landscape. The broad objectives of the project are three-fold:

1. Develop innovative participatory monitoring system for sustainable management of critical ecosystems
2. Strengthen the knowledge base for international designation for Atewa
3. Engage the private sector to support the protection and sustainable management of Atewa Forest

It is essential to identify, assess and value the dependencies and impacts of private sector activities on natural resources and ecosystem services of Atewa Forest Reserve and landscape to inform strategies for engaging the private sector in support of the protection and sustainable management of the Atewa Forest.

## **1.2 Scope of the consultancy, objectives and deliverables**

The assignment is intended to identify, assess and provide an overview of the direct and indirect impacts and dependencies on the Atewa Forest resources and ecosystem services (water, food security, climate, biodiversity and habitats) by private sector entities operating in the landscape and how their impacts (positive and negative) can affect the sustainability of their operations. It will also gauge the awareness level of businesses of the proposed bauxite mining in the Atewa Forest and its potential impacts on the environment and businesses.

Specifically, the assessment aims to:

1. Identify and describe all private businesses within the landscape whose activities directly or indirectly depend on and impact the natural resources and ecosystem services of Atewa Forest Reserve (including water bodies).

2. Assess each business's extent of dependency/impact on the natural resources and their level of awareness of their dependence on the ecosystem services for survival.
3. Provide a ranking of the dependence on the ecosystem by the businesses, understand their contribution to environmental conservation.
4. Divide the companies into mining, processing, produce buying and manufacturing
5. Assess the number of employees and turnover.
6. Level of business's community engagements and Corporate Social Responsibility (CSR).
7. Perception and relationship with regulators and information regarding regulatory issues confronting companies.
8. Ownership, whether Ghanaian or Foreign or if both, what percentage shareholdings.
9. Connect the impacts of the organisations' operations to the ecosystem services to understand their sustainability performance.

### **1.3 Outline of report**

This report is laid out in five main sections. The first section is the introduction to the report which is presented above. Section two elaborates the methodological approach adopted for conducting the business dependency assessment in the seven Districts within the landscape. Section three (findings) presents the results of the assessment by detailing the characteristics of business activities, including sector, scale, operations, dependencies and impacts, regulatory issues and opportunities for sustainable environment and livelihoods. Section four presents a SWOT analysis of business operations and their potential for promoting the conservation and sustainability of the landscape. Section five deals with the recommendations and conclusions for engagements towards promoting effective business-environmental relations within the landscape.



## **SECTION 2: ASSESSMENT APPROACH**

### **2.1 Assessment approach**

The consultants used quantitative and qualitative research methods to identify, assess, and value the dependencies and impacts of private sector activities on natural resources and ecosystem services of Atewa Forest Reserve and landscape. The application of quantitative and qualitative methods allowed the researchers to examine the businesses and engage with the business leaders and contact persons by adequately analysing the strengths and challenges of the companies surveyed concerning the forest environment. Including both quantitative and qualitative data improves the assessment's interactive component. The consultants interacted with the district's Business Advisory Centres to understand the business operations in the areas under study as well as the respective business owners or contact persons and cooperative members using a questionnaire (Appendix 1), interview guide (Appendix 2), and observation. The consultants also convened telephone conversations with some business operators in the study area.

### **2.2 Study population and sampling procedure**

Businesses that depend on the environment or source their raw materials from natural resources within the Atewa Forest and landscape were the principal target population of the assessment. The consultants, however, limited their accessible population for practical evaluation to private businesses whose activities depend directly or indirectly on the Atewa Forest and its landscape ecosystem.

Specifically, the consultants contacted 50 businesses (including 5 cooperatives under National Board for Small Scale Industries (NBSSI)). All the 50 businesses were visited and basic information on the businesses such as the name of business, location of the business (district and town), GPS coordinates, sector of business, business operation, the registration status of the business, category of business (limited liability company, sole proprietorship, or partnership) target market, and the number of years in business existence. However, three (3) of the companies could not respond to the specific issues related to the Atewa forest reserves.

The businesses were selected using a snowballing sampling technique. The consultants established contacts with Business Advisory Centres and the Planning Units in the district

assemblies to have a fair understanding of the various business operations in the districts. The consultants then took contacts of the businesses and visited the businesses to information. The initially contacted businesses then directed the contacts to other businesses in the districts for assessment. In some instances, the consultants upon arriving at the district capitals make enquiries about some potential businesses that can be contacted. The identified businesses were then visited for information.

### **2.3 Study area**

The consultants carried out the assignment in fringe communities within seven Districts of the Eastern Region of Ghana. The TOR required the consultants to collect data from Abuakwa South, Fanteakwa South, Atewa West, Kwaebibirim, Denkyembuor, West Akim and Ayensuano Districts. However, the consultants extended the data collection to Suhum Municipality and Upper West Akim District in addition to the seven required districts in the TOR. These districts are also within the catchment areas of the Atewa forest reserve and enjoy some of the ecosystem systems services in the Area. Companies like Chocho Industries Limited and HPW Fresh and Dry Limited in Suhum Municipality and Upper West Akim Districts respectively benefits significantly from the Atewa forest reserves in terms of sourcing raw material for their operations. The figure below is the map of the study area. Basic information on the Districts visited (appendix 5) and the movement plan during the assignment are presented in appendices 5 and 6 respectively.

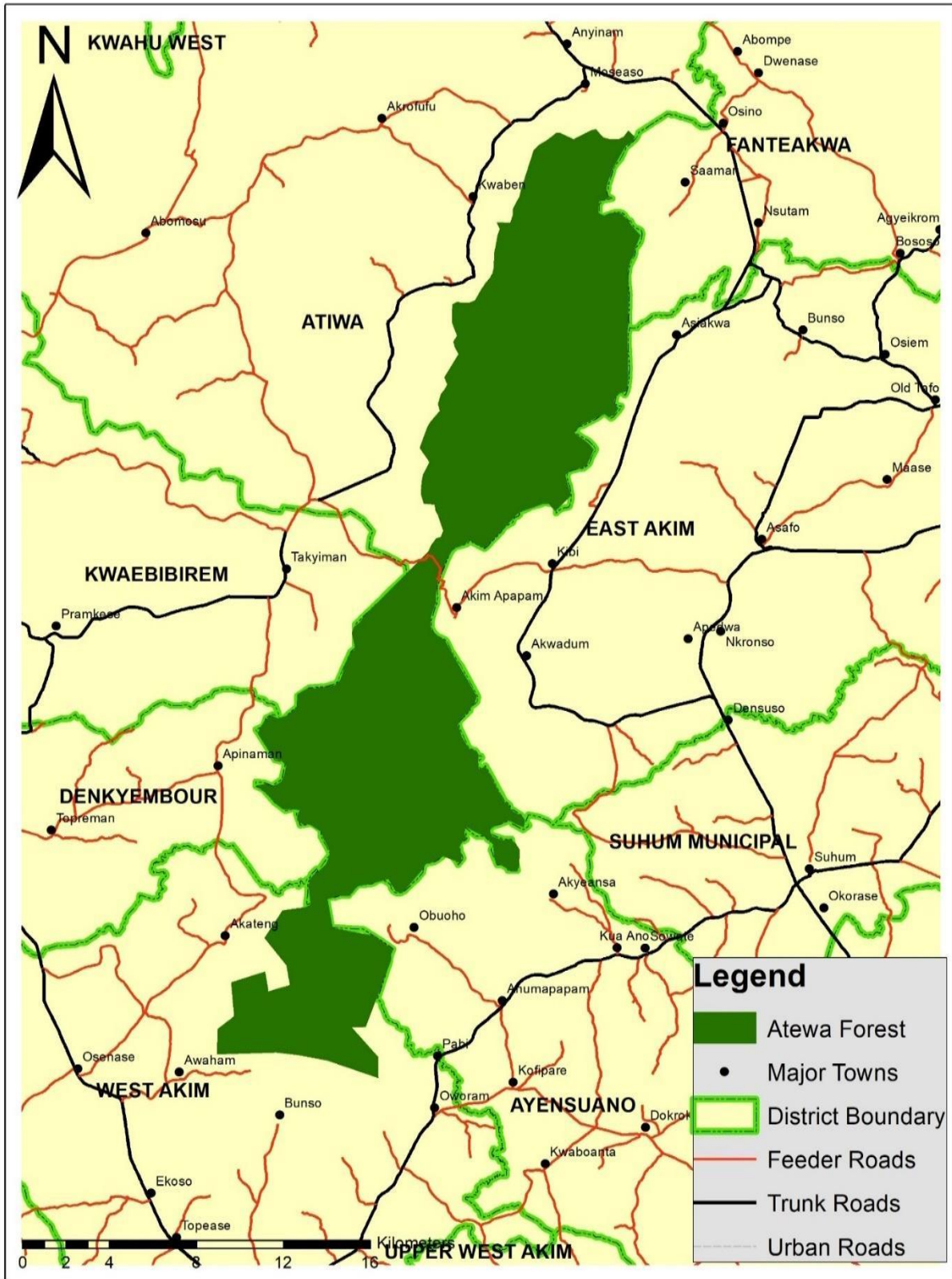


Figure 1: Map of the study area

## **2.4 Data collection and analysis**

### **2.4.1 Data Collection Procedures**

The primary respondents of the study were private businesses, including ‘informal companies and formal that draw their raw materials from natural resources, i.e. forests, water bodies and associated ecosystem services within the landscape. There was also a focus on businesses impacting or being impacted by the three major rivers and businesses dependent on the landscape but not physically located within it.

To identify businesses relevance for the study, the Consultants made initial contacts with units of the Ghana Enterprises Agency (GEA), formerly the National Board for Small-Scale Industries (NBSSI), or the Business Advisory Centres (BAC) in the respective district assemblies. With an introductory letter provided by A Rocha Ghana, the Consultants visited the respective GEA or BAC units to request the list of relevant businesses for visits and interviews. The Consultants then called each enterprise to schedule visits and interactions. It was difficult acquiring the list due to bureaucratic reasons. The Consultants also relied on their knowledge of the locations, contacts on the ground, the locals, physical scouting and the Snowball technique to reach the desired respondents. Interviews were primarily conducted at business premises. The consultants then took the GPS coordinates of the businesses.

During the assignment, fifty-four (54) businesses were contacted. However, the consultants had access to fifty (50) businesses and took basic business information from them. The security at the business sites stopped the consultants from accessing fundamental business information on four businesses. Moreover, out of fifty (50) businesses, the consultants received only forty-seven (47) responses on dependencies and effects on the Atewa Forest Reserve and its landscape, while the remaining three (3) businesses did not respond. The consultants also contacted three community waterfalls in Kobriso, Kwaku Sae, and Akanteng, but did not include them in the research since the West Akim District Assembly is now developing them into tourism sites.

### **2.4.2 Data collection instruments**

The consultants created quantitative and qualitative data collection instruments, comprising questionnaires, interview guides, and observation criteria, to make data collection more manageable. Essential information collected includes business information (name, operations, employees, ownership, contacts etc.); ecosystem services of the Atewa Forest Reserve and Landscape particularly relevant to the business operations; Business dependency/impact and contribution to conservation; relationship with regulators; and perceived impacts of the proposed bauxite mining on business operations.

A questionnaire was used in interviewing the businesses and their responses recorded in a spreadsheet format and analysed qualitatively and quantitatively and results displayed as graphs, figures and tables. Additionally, an interview guide was used to conduct 'group' interviews for members of businesses belonging to associations or in instances where two or more persons were present at the time of the consultant's visit. The interviews included details on the dependencies and impacts of their businesses on Atewa Forest and its landscapes' ecosystem services, the commitment of the business entities to protect the Atewa Forest and its landscape, anticipated obstacles in preserving the ecosystem, and the potential effects of the proposed bauxite mining on their business activities. The businesses interviewed are listed in appendix 7. The consultants also undertook observation exercises on the operations of the businesses and their potential impacts on the environment within the Atewa Forest landscape.

### **2.4.3 Data analysis**

The data was carefully and thoroughly cleaned before analysis was conducted. The consultants made use of content and thematic analysis for the data collected through the interviews by arranging the written responses according to themes. The responses were assessed based on their content and how relevant they are to the main tasks and deliverables of the assignment. The consultants coded the data from the questionnaire using Statistical Package for Social Science (SPSS) version 20 and conducted analyses using both SPSS and Excel. The responses to the main tasks and deliverables in the assignment were analyzed using descriptive statistics including tables, figures and graphs.

## **SECTION 3: PRESENTATION OF RESULTS AND DISCUSSIONS**

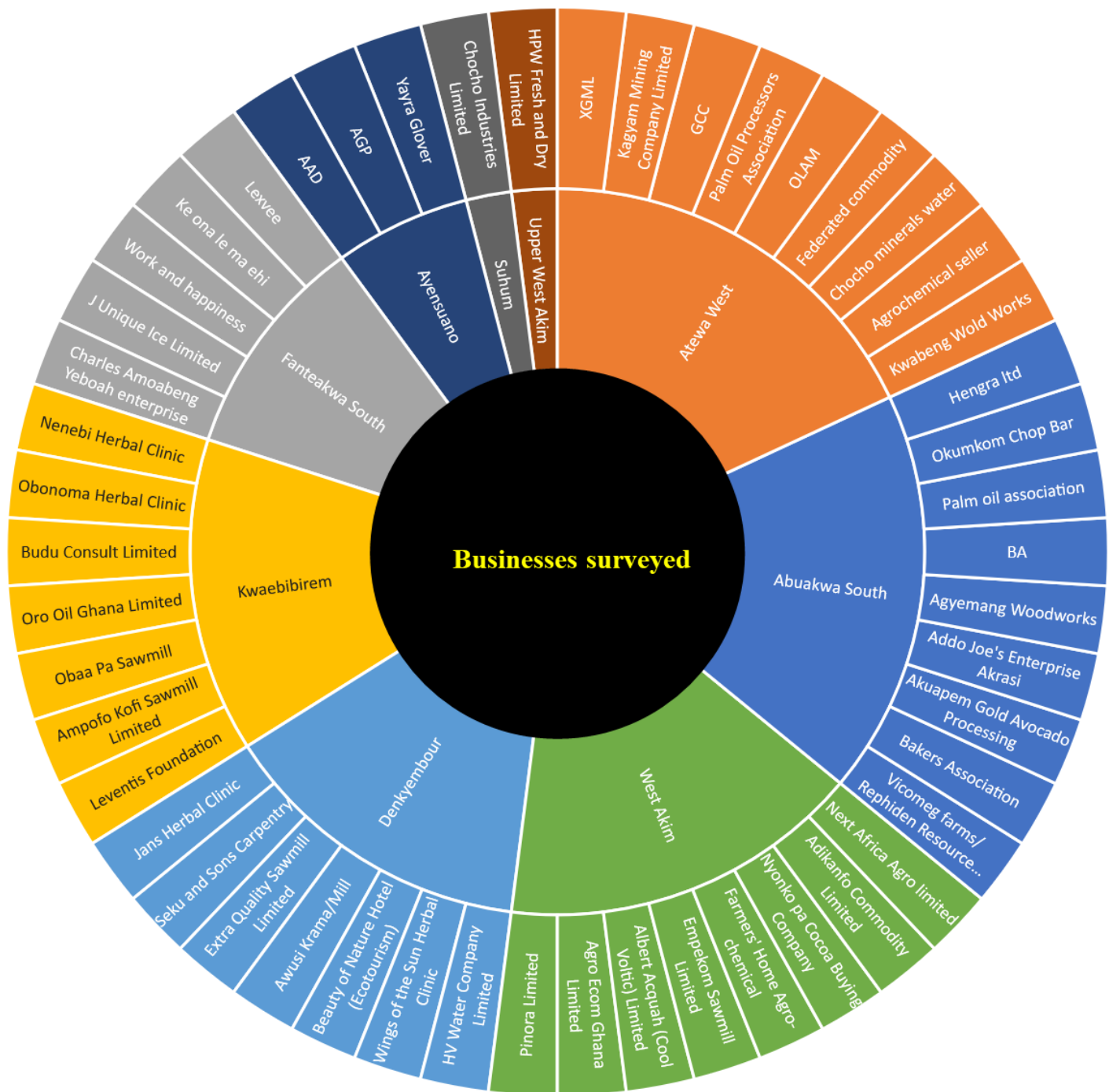
### **3.1 Introduction**

This section of the report presents the results of the assignment and provides discussions on the findings. The section is divided into two main parts. Part one deals with the information on the businesses contacted while part two provided the results and discussions on the businesses dependencies and impacts on the Atewa Forest Reserve and its landscape.

### **3.2 Description of private businesses within the landscape**

The findings are based on the analysis of responses from forty seven (47) out of the fifty (50) private businesses contacted across nine (9) Districts (figure 1) within the landscape whose activities directly or indirectly depend on and impact the natural resources and ecosystem services of the Atewa Forest Reserve (including water bodies). The consultants found that no legal and regularised business operates within the designated Atewa Forest, their activities are carried out within on the fringes of the forest reserve.

The analysis revealed that the districts (as indicated in the TOR) with the most represented businesses were Abuakwa South and Atewa West Districts respectively having 9 (18%) businesses each followed by the West Akim 8(16%), and Kwaebibirem and Denkyemba Districts at 7(14%) respectively. Appendix 8 is a pictorial presentation of the locations of the businesses visited with appendix 9 containing information on the businesses spread across the Districts.



**Figure 2: Businesses surveyed**

**AAD:** Amanase Akpeteshie distillery; **AGP:** Amanase Gari Processors;  
**BA:** Bunso Arboretum/Bunso eco-park; **GCC:** Gold Collective Company  
**XGML:** Xtra Gold Mining Limited

The businesses identified are made up of micro (less than 10 employees) representing 16 (32%) businesses, small (10 to 49 employees) representing 19 (38%), medium (50 to 249 employees) representing 13 (26%), and large scale (above 249 employees) representing 2 (4%) businesses based on the Organisation for Economic Co-operation and Development (2022) business classification. These businesses included business operations such as sawmills, oil palm/kernel processors, tourism and hospitality, produce (cocoa) buyers, agrochemical dealers and miners. These businesses can be broadly classified under the following sectors based on the national classification of companies under Agriculture, Industry, and Service. Overall, Industry topped with 16 (32%) businesses followed by Services 13 (26%) and finally the Agricultural Sector 7(14%). Companies that fell within Service & Agriculture, Industry & Agriculture, and Industry & Service were 1(2%), 9(18%), and 4(8%) respectively. Appendix 10 and appendix 11 present the sectoral representation of the businesses contacted.

It is useful to understand the activities undertaken by the businesses in the various sectors. The Agriculture sector is described as any commercial activity that helps with crop production. The Service sector is defined as businesses that provide activities that improve and support people's lives. Business operations that assist the manufacture and processing of raw materials into finished and semi-finished commodities are classified as the Industry sector. In the agriculture sector, the critical activities of high economic potential are cocoa, palm, orange, and cassava plantations that provide raw materials for the industry sector. The industry sector comprises processing palm fruit into palm oil and palm kernel oil, producing fruit drinks, and processing cocoa beans for export. The service sector comprises sawmill operations, carpentry, carving, tourism and hospitality, and the production of herbal medicine and herbal treatment of diseases. Appendix 12 summarises the businesses activities.

Based on the TOR, the consultants divided the businesses into mining, processing, produce-buying, and manufacturing and provided detailed information on the businesses in appendix 13. The analyses of the listed companies show that the majority of them can be classified under processing and manufacturing, most of which are also into agriculture as a means of sourcing raw materials. Agricultural activities such as purchasing cocoa beans, fruits and dealing in



agricultural inputs are produce buying businesses. The key produce-buying activities identified among the businesses include the sale of agrochemicals and purchasing of cocoa beans.

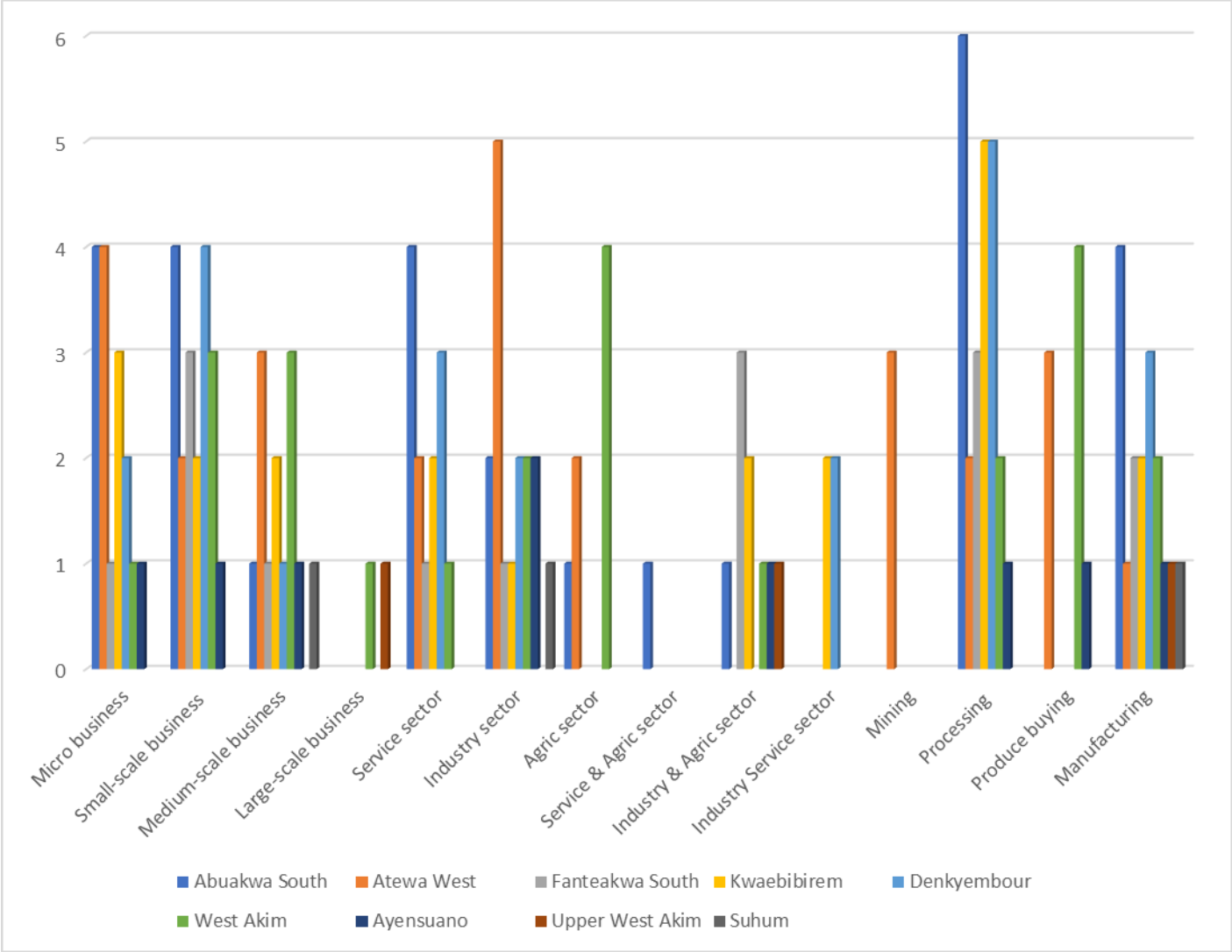
The mining activities are predominantly small-scale operations. Large-scale mining companies include Extra Gold Company Limited, Kibi Goldfields Company Limited, Med Mining Company, and Great Consolidated Diamond Limited. Interviews with community members and miners revealed that some large scale mining companies had allocated some portions of their lands to the small-scale mining companies to mine on their behalf. Mining activities are very rampant in the Atewa Forest landscape. Illegal mining activities have caused a huge decline in the production of cash crops such as cocoa to the extent that some licensed cocoa buying companies have even stopped going to communities such as Akanteng and Krobiso to purchase cocoa beans.

Processing activities among the businesses contacted include gari production, palm oil production, carpentry, saw millers and carvers. The processing activities involved changing the form and shape of natural resources from the Atewa landscape. The major manufacturing business activities include sachet water production, avocado paste production, catering services and herbal medicine production. The manufacturing activities within the Atewa Forest landscape are largely small-scale and informal businesses. There are however some large scale and formalised ones that include for example the One District One Factory's Akuapem Gold Avocado Processing Company Limited, a fruit processing factory in Apedwa, and Oro Oil limited, near Kade among others.

The report also describes the scale of operations, ownership structure, registration status, target market, and annual turnover range of the surveyed businesses. The consultants noted that individuals manage most businesses though some are cooperatives and micro, small, medium, and large-scale business entities. The activities of many of the companies are not formalised. However, the district assemblies have detailed information on these businesses and periodically move to the business premises to collect levies and fees managed by the local authorities. Most of the companies contacted have registered their business entities with the Registrar General Department and or the District Assemblies.

A significant proportion of the businesses contacted are owned by Ghanaians, while few have some foreign interests in ownership. The consultants also found that most contacted companies have operated between 6 and 15 years. It shows that most businesses understand the impacts of and their dependencies on the Atewa forest and its landscape. The end products of the companies are sold at local, national and international markets. However, most end products are consumed at local and national markets. These turnover for most of these businesses is between GHC 50,000.00 and GHC 132,000,000 annually.

The businesses have between 2 and more than 100 employees directly and indirectly in the companies' operations. Additionally, majority of employees of the businesses contacted are males. Most business activities are carried out in the district capitals or communities close to them. The typical villages within the Atewa Forest landscape do not have processing and manufacturing activities with high economic potentials. The villages are flooded with illegal mining activities with negative impacts on agriculture activities. Appendix 14 presents a summary of the business characteristics, and Appendix 15 shows the ranking of the companies based on the number of years of operations, revenue level, number of employees, and corporate organisational effectiveness. A summary of the business characteristics is presented in Figure 3.



**Figure 3: Summary of business characteristics**

**3.3 Businesses’ dependency and impact on the Atewa forest and their sustainability performance**

This section of the report presents information on the business dependence and impacts on the Atewa Forest. It contains findings on the ecosystem services depended upon by the businesses, the impacts of the companies on the ecosystem services, companies’ awareness of their effects on the Atewa forest, and the ranking of the business dependence on the Atewa Forest. The information in this section was collected from 47 businesses.

### **3.3.1 Understanding the values/relevance of the Atewa Forest landscape among the businesses**

This section of the report is devoted to assessing the understanding of the businesses on the relevance of the Atewa Forest landscape. This is to set the foundation for assessing businesses' level of dependence on the Atewa forest and its landscape and the kind of values or services from the Atewa Forest that the businesses depend on for their operations. Key variables assessed under the relevance of the Atewa Forest include provision services, regulating services, cultural services, and supporting services. It is revealing to note that the business operators have a high understanding of the value or relevance of the Atewa Forest to the community and the people including their employees. The results show that cultural services provided by the Atewa Forest and its landscape are not highly valued as compared to the provision services, regulating services, and supporting services except serving as a sense of identity for the people within the landscape where all the 47(100%) businesses indicated that is this true.

When probed further as to why they value the Atewa Forest and its landscape as a sense of identity, it was revealed that the Atewa forest gives people within the Akyem Abuakwa area a unique sense of identity. A response indicated that: *“Anytime one mentions that he is from the Akyem area, the comment that normally follows is Akyem Kwa a onum Birem”*. It indicates the uniqueness of the ecosystem services, particularly of the Birem River in the provision of good quality drinking water to the people of Akyem. It is evident however that the drinking water provisioning of the River has been heavily impacted by the effects of small scale illegal mining. Indicatively, this has led to many of the inhabitants in the area devaluing the importance of the forest and its ecosystem services; for example, only 21, 25, and 28 businesses operators representing 45%, 53%, and 60% indicated that the Atewa Forest and its landscape is a source of income and employment for the local people, serve as spiritual cognitive and ecotourism respectively. This is may also be linked to the situation in which people are restricted from entering the protected forest to directly access natural resources or ecosystem services. A cocoa buying clerk indicated: *“I was allocated a portion on the edge of the main forest to do farming. I cultivated plantain and later cocoa. when the cocoa started fruiting the forestry officials came and prevented us from farming on the land. So, all my efforts were wasted”*.

On the regulation services, it was revealed that all the 47 (100%) businesses noted that the Atewa Forest Reserve and its landscape play critical roles in mitigating flood disasters that might affect their businesses in the respective communities. Moreover, all the businesses noted that Atewa Forest supports Carbon Sequestration, water purification, improve soil fertility, enhance air quality, and facilitates the pollination of seeds. Further probe revealed that the Atewa Forest landscape records a high volume of rainfall yet the incidence of flooding in the communities is very minimal as compared to cities like Accra and Kumasi with limited forest cover. This was indicated by a participant as: *“The weather here is cool because we have rain falling almost every day. Luckily for us, all the rainwater goes directly into the forest and they are absorbed because we are surrounded by the forest. I don’t remember any incidence of flooding related deaths”*. The forest also provides oxygen and also sequester a high volume of carbon from the communities. The air from the Atewa Forest is very clean and of high quality. A participant reported: *“As for air we breathe the best oxygen in Ghana. You can see that as you approach the community from Accra, the quality of air changes.”*

The Atewa Forest landscape is a major source of water for the community members. Many streams and rivers take their sources from the Atewa Forest landscape. However, the quality of water in the rivers can only be seen in the deepest part of the forest these days due to rampant illegal mining activities. This was confirmed by a participant: *“We have many rivers in the Akyem area. We used to fetch water from the rivers until the galamsey people came around. The water was very clean. Even now if you can get inside the forest, you can see that the water is very clean and healthy.”*

The Atewa Forest and its landscape also have some provisioning services such as fuelwood, food, herbal medicine, and water as indicated by all the 47 businesses surveyed. The businesses did not consider timber as a major provisioning service (only 19 (40.4%)) from the Atewa Forest since there are restrictions on the felling of timber in the ARFR. The Atewa Forest and its landscape have very rich soil for agricultural cultivation. Farmers in the Atewa Forest area grow several types of food and cash crops such as cocoyam, plantain, cereal (like maize, rice, etc.), legume, (groundnut, beans, etc.), cocoa, coffee, rubber trees, grains of paradise (“efom wisa”), African black pepper (“esoro wisa”), ginger, vegetables (pepper, tomatoes, garden eggs, etc.) and

many other crops, it is therefore not surprising that many of the inhabitants in the selected districts are into farming.

The consultants also assessed the supporting services provided by the Atewa Forest and its landscape. Except for soil formation and retention services which recorded 30 (64%) businesses, all the other supporting services such as enhancement of photosynthesis activities, nutrient cycling, oxygen, water cycling, and habitat for plants and animals were agreed by the 47 businesses assessed. The participants indicated that Atewa Forest is home to many plants and animals that are unique to the area. The Atewa Forest has many unique butterflies and other insects that boost tourism in the area. At the Bunso Arboretum for example, the respondent noted that *there is one giant python that normally comes around. There are also antelopes, birds, and other animals that live in the forest but normally come around in search of food.* These animals are flourishing in the Bunso arboretum due to the quality ecosystem services provided by the Atewa Forest landscape.

Figure 4 below summarizes the key ecosystem services that are provided by Atewa Forest and its landscape. Based on the ecosystem services assessed, the consultants then assessed the businesses' dependencies on the Atewa Forest and its landscape in the next section.



**Figure 4: Ecosystem services provided by the Atewa Forest and its landscape**

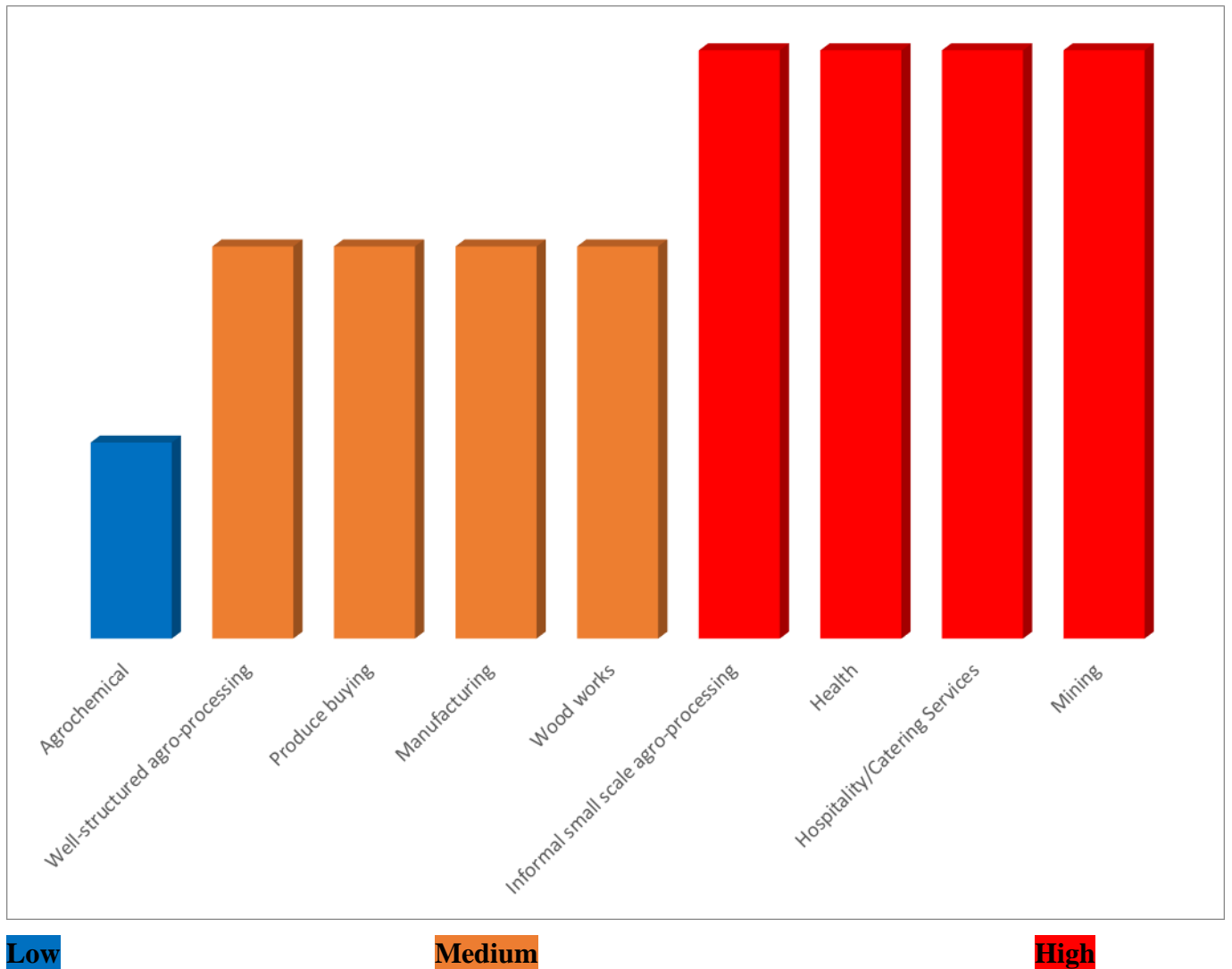
### **3.3.2 Businesses' dependency on the Atewa Forest**

Businesses within the Atewa Forest and its landscape depend heavily on the ecosystem services provided by the forest for their growth and survival. All the businesses surveyed source their resources from the ecosystem services provided by the Atewa Forest Reserve and its landscape. Appendix 16 provides the names of the businesses and the respective dependence on the Atewa Forest's ecosystem. The level of business dependencies on the Atewa Forest and its landscape was rated on a scale of low, medium, and high. The scales were defined as follows:

- **Low:** No direct resource utilization of resources from the Atewa Forest. The business will survive if the Atewa Forest is completely damaged.
- **Medium:** Direct resource utilization of resources from the Atewa Forest. The business will have to source resources (currently source from the Atewa Forest landscape) from other places which will increase production costs. Business production will be greatly affected if the Atewa Forest is completely damaged.
- **High:** Direct resource utilization of resources from the Atewa Forest. The businesses cannot source resources from other forest areas. Business production in the Atewa Forest area will be greatly affected and will eventually collapse if the Atewa Forest is completely damaged.

The analysis revealed that some of the businesses depend on the Atewa Forest more than others. It was revealed that the destruction of the Atewa Forest and its landscape will lead to the collapse of some businesses while other businesses will operate below capacity and will have to relocate to be closer to raw materials. Figure 5 shows that business category dependencies on the ecosystem services provided by the Atewa Forest and its landscape.





**Figure 5: Level of businesses' dependencies on the ecosystem services from the Atewa Forest ecosystem**

The ecosystem services assessed include tourism and research purposes (animals, trees, waterfalls), fertile land for food and cash crop production, firewood for fuel, land and water for mining, foodstuff, meat, snail, etc. for consumption, medicinal plants for medical purposes, oxygen and cool climate, sense of identity and spiritual cognition, timber, rattan for export, building, furniture, etc., and water for farming, processing and manufacturing.

Further assessment through the interview revealed that some specific ecosystem services provided by the Atewa Forest landscape and relied upon by the businesses surveyed include

biodiversity, excellent climatic conditions, fertile land, firewood, quality air, water, good rainfall pattern, timber, palm trees, insects for pollination, cocoa, fertile soil for farmers, cassava, herbal plants, orange, pineapple, banana, mango, avocado, and good water aquifers, etc. Most of the raw materials that the surveyed businesses depend on were sourced either directly or indirectly from the forest ecosystem within the Atewa Forest landscape. Some companies depend so heavily on them that a depletion of the Atewa Forest landscape will ultimately collapse their operations. These businesses include Bunso Arboretum/ Bunso Eco-park and Beauty of Nature Hotel (popularly called Ecotourism).

### **Excellent climatic conditions**

All 47 (100%) businesses indicated that the Atewa Forest provides clean oxygen and a cool climatic environment. The businesses indicated that they experience cool weather conditions throughout the year. This is very good for most of the informal and small businesses that do not have the financial capacity to fix air conditioners in their premises. More than 90% of the businesses visited have no air-conditioning system or fans in their offices or operational areas. A participant noted: *“My friend, you can feel the weather, it is very cool so I don’t think it is prudent to spend the small revenue we generate to buy air conditions”*. Another participant revealed: *“The workers are already feeling cold. They will die if we fix air conditions here. they are not used to it”*.

Only 3 (6%) businesses namely Yayra Glover, HPW Fresh and Dry Limited, and Pinora Limited used air-conditioning systems. This can be explained from the point of view that these companies’ products require an extremely cool environment for preservation.

### **Clean water**

The analysis also points out that water is a key ecosystem service that the companies within the Atewa Forest depend on for their operations. In all 32 (68%) businesses indicated that they use water from the Atewa Forest and its landscape for their operations. This ecosystem service from the Atewa Forest is used for the cultivation of raw materials, processing of raw material, and manufacturing of final products. Water is sourced from rivers and streams that take their source from the Atewa Forest Reserves and its landscape. Rainfall is regular in the area due to the presence of the Atewa Forest and this improves water aquifers and water tables.

The water table in the communities is quite high due to the high precipitation (rainfall) level in the Atewa Forest and its landscape, and more water seeps through the soil into the groundwater table when there is a lot of rain. Because of the high-water table, more groundwater flows into wells, dugouts, streams, and rivers in the area. Because the underground flow of water into water bodies is quite high in the Atewa Forest and its terrain, finding water for commercial activities is very easy and does not require any complicated technology. The participants indicated that they have an adequate supply of water for the cultivation of palm nuts, cassava, plantain, fruits, cocoa, etc. None of the businesses indicated that they import or source water from other places outside the Atewa Forest Reserve and its landscape for their operations.

Even though most of the rivers with the Atewa Forest landscape are polluted due to the illegal mining operations, most of the businesses that used to source water directly from the rivers and streams within the landscape have drilled boreholes and wells (both mechanized and non-mechanized) to access water. However, the sachet water manufacturers have to incur additional operational costs in sourcing and treating water for production. A participant indicated: *“There are many wells in this vicinity which makes the source of water available throughout the years to process our palm nuts into palm oil and palm kernel oil. This kind of business operation requires a high volume of water so we use water a lot. It is very easy to find water in this area. You can easily use cutlass to dig for water”*. Another participant revealed: *“I used to buy the palm nut and process them in Accra, but I realize the cost of operation is high especially water expenditure. Because we were using pipe water for operations and even the borehole we dug in Accra could not supply enough water for operations. We decided to buy land around this area and set up our operations here. We have only one well and it is able to supply water for operations”*.

### **Fertile land**

Moreover, the consultants also assessed how the businesses within the Atewa Forest Reserve and its landscape depend on the fertile land as an ecosystem service. More than half of the businesses indicated their dependence on the fertile land in the Atewa Forest and its landscape. This is represented by 31 (66%) businesses that depend on the fertile land to support their operations.

Most of the processing and manufacturing companies in the target area have their plantations or rely on farmers within the Atewa Landscape for raw materials.

### **Raw materials**

Except for fruit drink manufacturing companies such as Pinora Limited and HPW Fresh and Dry Limited that source some of their raw materials (fruits like pineapple, coconut, mango, etc.) from other districts outside the Atewa Forest landscape, all the businesses surveyed rely on communities for their raw materials. The businesses in tourism and hospitality rely on foodstuff like plantain, cassava, cocoyam, etc. for their operations. This is because the Atewa Forest landscape is noted for fertile soil that supports the cultivation of such food crops. The ability of the businesses to source their raw materials within the communities in the Atewa Forest and its landscape minimizes the cost of carriage inwards associated with the sourcing of raw materials. One participant indicated: *“We could have set up our factory in Tema or Accra since we export our palm oil but we will have to transport our raw materials from the farms to Accra or Tema. We decided to come to this area due to the abundance of palm trees in this area. We have large acres of palm plantation that we depend on for our operations. This area is very good for palm plantation because the soil is good for palm trees and the yield is also high”*. Another participant noted: *“As you can see, we are all farmers. We plant our cassava and process them into gari. Yes, we have a lot of cassava plantations around so we also buy from other farmers to supplement our raw material base”*.

### **Energy**

Most of the small businesses with their Atewa Forest landscape especially the processing companies have a weak financial capacity to use electricity and gas to power the processing equipment since the cost of electricity and gas is very high and increases their operational costs significantly. They also use simple and traditional methods to process raw materials into finished and semi-finished products. Biomass is a major source of energy for 17 (36%) businesses in the Atewa Forest landscape (64% of the businesses do not use fuel in their operations). The climate condition in the Atewa Forest landscape supports the growth of biomass. The use of biomass (firewood and other wood waste from sawmills, carpentry shops, etc.) to cook palm nuts is very common among the palm oil, baking, and gari processing businesses as well as herbal medicine

practitioners. They use biomass to process the concentrate from pounded palm nuts and crushed palm kernels into palm oil and palm kernel oil. The herbal medicine practitioners also use biomass to boil their herbal plants to herbal medicine. Even the businesses that have installed electricity in some components of their operations still utilize biomass in other parts. Moreover, fruit manufacturing companies have also retrofitted their plants so that they can also use biomass and process waste to generate electricity to power their production machines. Biomass within the Atewa Forest landscape plays a significant role in the business operations in the area. None of the palm oil, baking, and gari processors indicated that they source biomass from places outside the Atewa Forest landscape to serve as a source of energy in their operations. Even the fruit manufacturing companies all indicated that they source biomass from the districts within the Atewa Forest landscape. Again, biomass is the most common form of energy in communities within the Atewa Forest landscape.

A participant noted: *“Every powerful herbal medicine depends on nature. Though you can use electricity or gas to prepare the medicine, I prefer to boil them using natural available fuel such as firewood. It makes the medicine potent and also reduces production costs. You the profit we make is very small and sometimes it takes a longer period to sell the products, therefore, if we use expensive production methods, it will collapse our business”*. Another participant indicated: *“We don’t have money to buy big machine to process the palm oil for us. So, we use firewood and the waste from the palm fruits to process the palm oil”*. Another participant also pointed out: *“We have a biomass combustion plant that we also use to power our production plants. This ensures that we reuse our waste and also minimize the use of crude oil products that emits greenhouse gases into the atmosphere in our operations. We also buy wood waste from Oda, Asamankese, Kade, etc to feed the biomass combustion plant”*.

## **Timber**

Notwithstanding, the frantic efforts by the Forestry Commission to combat illegal logging activities with the communities (both within the protected forest and on private lands), there are also many mini sawmill companies and carpentry shops with the Atewa Forest landscape. All 11 timber-related businesses noted that the Forestry Commission does not permit them to source timber from the forest. However, it was revealed that they also source timber from private lands

with a “permit from the Forestry Commission”. However, all the mini sawmill operators complained of Forestry Commission staff confiscating their woods for the reason of not having permits. All the mini sawmill operators were actively working with adequate raw materials (wood). Chainsaw operations are very common in the area and during the period of the assessment, the consultants could hear the sound of a chainsaw in three instances. The timber logging firm indicated that they have a timber concession that has been allotted by the Forestry Commission. This shows that the Atewa Forest landscape is a key source of raw material for the timber-related companies operating within the Atewa landscape. In a further probe, a participant indicated: *“I have been in the timber business since the 1990s. We used to get a lot of wood from this area but due to the galamsey operations now getting wood is becoming difficult. I have a cocoa farm that has timber in it, so, if the timber becomes too big to deny the cocoa trees of good sunlight I cut it down as timber for my operations”*. Another participant noted: *“I have over 500 acres of timber/tree plantation and as you can see even on my site here, I have planted many tree species including teak. I also have a tree plantation at the cemetery. This area is good for the timber business”*.

### **Sense of identity**

The Atewa Forest and its landscape provide a sense of identity to businesses whose brands are based on nature. Many businesses identify themselves with the Atewa Forest landscape in their marketing strategies. Eight (8) businesses representing 17.02% that are into tourism and herbal medicine practices depend massively on the Atewa Forest and its landscape for survival. Tourism-related businesses rely on the Atewa Forest's ecosystem services to attract visitors. The Atewa Forest is rich in natural beauty and wildlife. Because of its mountainous terrain, frequent rainfall, beautiful and thick forest, and unusual species of fauna and flora, the Atewa Forest is an ideal ecotourist attraction in Ghana. The Atewa Forest and its natural beauties are primarily responsible for the area's tremendous rise in tourism businesses. The possibility of generating revenue for the companies is primarily reliant on visitor spending. The maintenance and preservation of Atewa Forest ecosystem services are therefore critical to the financial viability and sustainability of these tourism-related enterprises.

### **Medicinal plants**

Moreover, the Atewa Forest and its landscape is a source of medical plants. Because of the year-round availability of raw materials in the Atewa Forest landscape, many herbal medicine practitioners are settling in the Akyem communities. Due to the existence of the Atewa Forest and its accompanying vital ecosystem services, medicinal plants thrive in the Akyem area. None of the herbal medicine practitioners surveyed said they got their raw material (medical plants) from outside the Akyem area. Furthermore, the Atewa Forest's ecosystem services make it easier to process and manufacture herbal medication, such as boiling, crushing, and soaking. This means that as the Atewa Forest and its ecosystem deteriorate, the availability of medicinal plant species will inevitably decline. Through further discussions with the businesses, a participant noted: *“We are doing our best to protect the Atewa Forest because our operations are tied to its existence. Many visitors, especially foreigners come to this place just to look at the beauty of the forest. We sometimes get both local and international researchers who come around to explore the plant and animal species in the landscape. Surprisingly, anytime they come around they document new plant or animal species”*. Another participant indicated: *“I used to prepare my herbal medicine in Kumasi because there are also forests over there but I moved to this place when a treated a prominent man from this area and he offered me his house to operate in. I accepted it because when I searched around I could find almost all the medical plants I use”*.

### **Mineral resources**

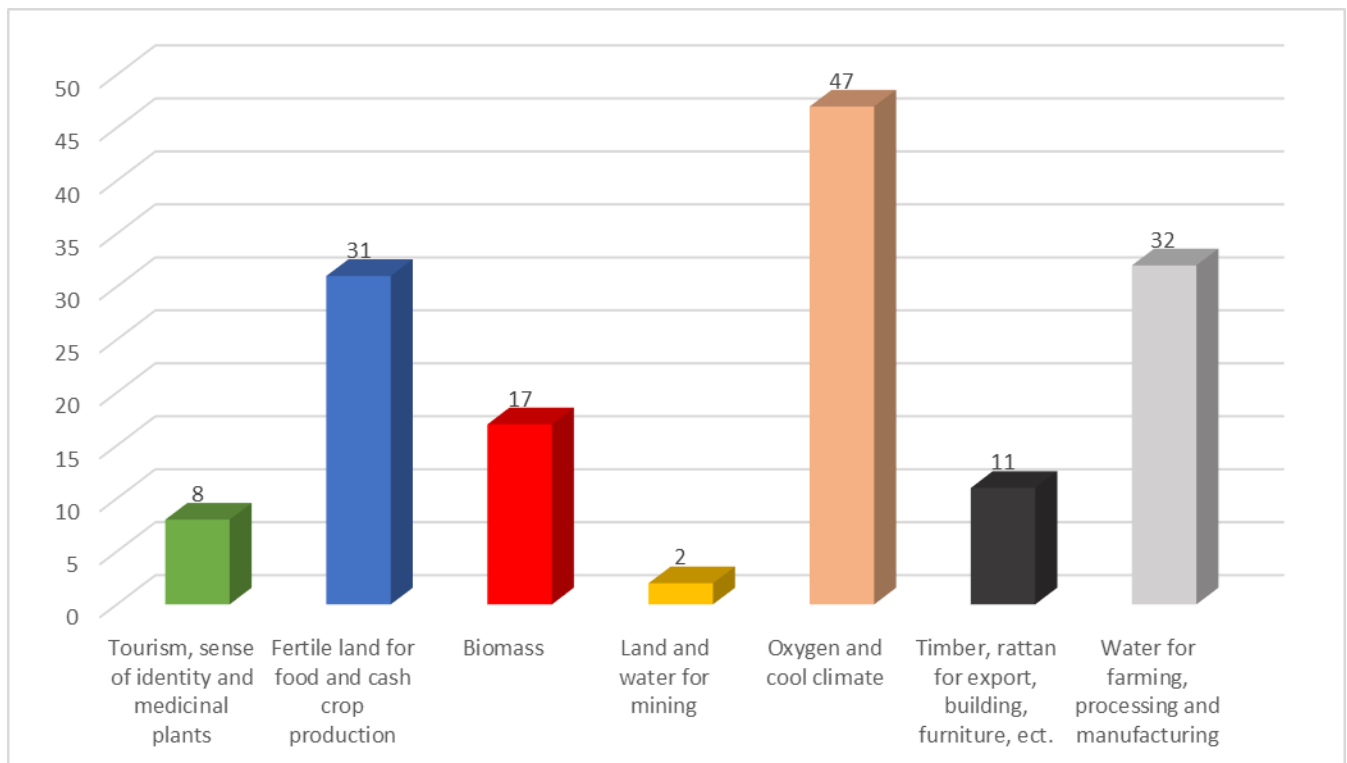
The Atewa Forest landscape is also endowed with an abundance of gold and diamond. Mining companies representing 2 (4.26%) companies surveyed depend on the mineral-rich land and water resources within the Atewa Forest landscape for their business activities. There is a vast stretch of land designated as gold and diamond concessions. There are many small-scale mining companies in the area. Therefore, mining is a key economic activity proving a source of employment for many youths in all the districts within the Atewa Forest landscape. Every district within the designated Atewa Forest landscape has mining activities. This has resulted in the degradation of a large portion of the Atewa Forest Reserve and its landscape.

The mining activities are also facilitated by easy access to water in the Atewa Forest landscape. Due to the high water table in the area, miners do not have to invest huge amounts of money to extract waste for gold and diamond production. Most of the miners process their gold-bearing

rocks in the many rivers and streams that take their source from the Atewa Forest. The miners also use simple technology to extract water from the rivers and streams to process their gold and diamond. However, activities have massively polluted virtually all the streams and rivers in the Akyem area. Some mining companies have dug their wells to process gold and diamond.

A participant during the interview posited: *“Mining is very lucrative in the Akyem area. Most of the youth are into mining and we employ many of them. I can say that the Atewa Forest and its landscape is well endowed with mineral deposits. Mining in this area requires simply technology and equipment for extraction and processing. It is easy to find water to process the gold and diamond-bearing rocks and sand”*.

Key Atewa Forest ecosystem services depended upon by the businesses within the landscape are provided in Figure 6 below.



**Figure 6: Ecosystem services from the Atewa Forest and its landscape depended upon by the businesses**



### 3.3.3 Ranking of the first ten businesses who heavily depend on the ecosystem services

Though every business assessed by the consultants depends on the Atewa Forest landscape's ecosystem services in one way or another, some businesses rely on them more heavily than others. It is vital to assess these businesses to promote the Atewa Forest landscape's conservation and sustainability engagement with the heavily dependent business entities. The businesses with the highest dependencies on the Atewa Forest ecosystem are provided in descending order. The ranking was done based on the following.

1. Business survival: Can the business survive without the Atewa Forest and its landscape? If yes dependence is low. If no dependence is high.
2. Raw material quantity: Does the business get all its primary raw materials from the Atewa Forest and its landscape? If yes dependence is high. If no dependence is low.
3. The main raw material for operation: Can the business source resources from other places? If yes dependence is low. If no dependence is high.
4. Ability to pay for raw materials: Can the business pay for raw materials sourced outside the Atewa Forest landscape? If yes dependence is low. If no dependence is high.
5. Diversification of business operations. Can the business diversify its operations by adjusting its machines and equipment? If yes dependence is low. If no dependence is high.
6. Relocation: Can the business move to other places and survive? If yes dependence is low. If no dependence is high.

Table 1 provides information on the individual business' reliance on the Atewa Forest landscape's ecosystem.

#### Keys

- ↓ means low
- ↑ means high

**Table 1: Ranking for top ten businesses depending on Atewa Forest landscape’s ecosystem in Descending order (1= highest and 10= lowest)**

Rank	Name of Business	Indicators					
		1	2	2	4	5	6
1 <sup>st</sup>	Bunso arboretum/ Bunso eco-park	↑	↑	↑	↑	↑	↑
2 <sup>nd</sup>	Beauty of Nature Hotel (Ecotourism)	↑	↑	↑	↑	↓	↑
2 <sup>nd</sup>	Vicomeg farms/ Rephiden Resource centre	↑	↑	↑	↑	↓	↑
4 <sup>th</sup>	Palm oil associations & Awusi Krama/Mill	↓	↑	↓	↑	↑	↑
4 <sup>th</sup>	Amanase gari processors & Work and happiness gari processors	↓	↑	↓	↑	↑	↑
6 <sup>th</sup>	Budu Consult Limited	↓	↑	↓	↓	↑	↑
7 <sup>th</sup>	Nenebi Herbal Clinic & Obonoma Herbal Clinic & Jans Herbal & Wings of the Sun Herbal Clinic	↓	↑	↓	↑	↑	↓
8 <sup>th</sup>	Oro Oil Ghana Limited & Next Africa Agro limited & Lexvee	↓	↑	↓	↓	↑	↓
9 <sup>th</sup>	Gold Collective Company & Kagyam Mining Company Limited	↓	↑	↑	↑	↑	↓
10 <sup>th</sup>	Empekum Sawmill Limited	↓	↑	↓	↑	↑	↓

### 3.3.4 Businesses’ impact on the Atewa Forest Landscape

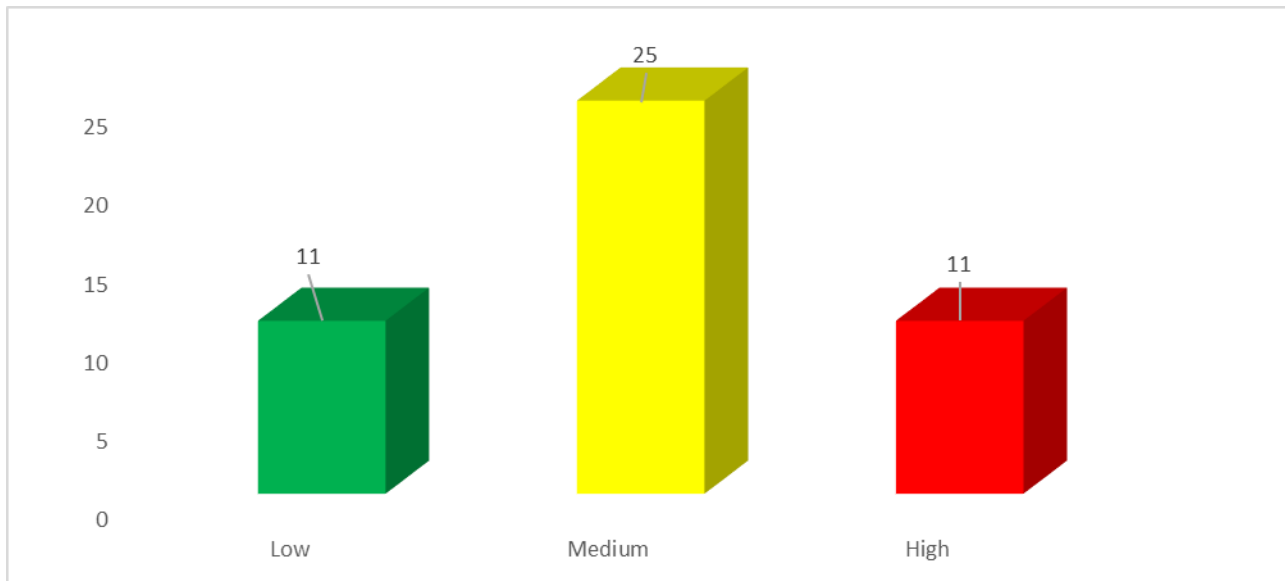
After determining business dependencies on the Atewa Forest Reserve, it is also necessary to assess business impacts on the Atewa Forest and its landscape. The activities of some companies have severe consequences on the conservation of the ecosystem services provided by the forest. Some businesses have contributed to the deterioration of forest ecosystems directly or indirectly. Business activities can cause deforestation, pollution of water bodies, poor air quality, biodiversity loss, etc. Illegal business activities cause the most severe consequences on the Atewa Forest’s ecosystem.

Business impacts on the Atewa Forest and its landscape were rated on a scale of low, medium, and high impacts. The main criteria for the classification include:

- Low: No direct effects on Atewa Forest.
- Medium: Business activities can have direct effects on the Atewa Forest landscape. Uncontrolled activities can have significant effects on the Atewa Forest landscape.

- High: Business activities can have direct effects on the Atewa Forest landscape. Uncontrolled activities can destroy the Atewa Forest and its landscape.

From the analysis it is observed that 11 businesses' impacts on the Atewa Forest and its landscape were low, 26 were medium, and 11 were high. One company is into purchasing and processing cocoa beans. Figure 7 presents the number of businesses and their impacts on the Atewa Forest and its landscape.



**Figure 7: Number of businesses and their level of impacts on Atewa Forest ecosystem**

### **Agrochemical Producers**

The agrochemical businesses supply pesticides, herbicides, and fertilizers to farmers within the Atewa Forest landscape. The impact of the agrochemical business on the Atewa Forest and its landscape is not direct but through the activities of the various farmers who purchase and use the chemicals. Agrochemical businesses can contaminate the Atewa Forest environment, which includes water bodies, tree species, birds, fish, insects, and more through the sales of chemicals and fertilizers. However, the impacts of the agrochemical sellers are rated low in terms of their damaging impacts on the Atewa Forest and its landscape. The application of agrochemicals in the area is not widespread since there are few commercial plantations operated by businesses. Even the businesses indicated that they practice organic farming and encourage their out-grower farmers to practice organic farming. A participant noted: *“I don’t think we have any effects on*

*the Atewa Forest. Our farmers do not farm in the forest. We also advise the farmers on the proper means of mixing the chemical and its application*". However, the use of chemicals in farming has devastating effects on the environment.

### **Herbal medicines**

Herbal medicine businesses have virtually no adverse impact on the Atewa Forest and its landscape. The activities of herbal medicine practitioners such as harvesting herbal plants (barks, leaves, roots, fruits, etc.) cannot degrade the Atewa Forest and its landscape since their harvesting level is very low and can allow the Atewa Forest and its landscape to regenerate by themselves. The herbal medicine practitioners are naturally sensitive and value the resources provided by the Atewa Forest. Most herbal medicine practitioners regard medicinal plants as sacred and contain a spiritual value. They understand their business survival is linked to the survival of the Atewa Forest and therefore are willing to protect the forest. During the interaction, a participant noted: *"Due to the difficulty of locating herbal plants we ensure that when we identify a plant we protect the plant. God has given us the forest to give us healing. Once the forest is destroyed, our business will collapse and the health of our clients will deteriorate"*.

### **Tourism, hospitality, and catering businesses**

Tourism, hospitality, and catering businesses can also impact the Atewa Forest and its landscape but their impact has no significant potential to destroy the forest. These businesses may have a detrimental influence on the Atewa Forest's ecosystem services if the number of visitors they receive exceeds the forest ecosystem's ability to deal with the effects of visitors in terms of their movements, feeding habits, water use, waste disposal and other impacts. Tourism may put the Atewa Forest and its landscape under a lot of stress, including soil erosion, pollution, natural habitat loss, and strain on threatened species. The businesses may also put pressure on water supplies which can lead to water conflict with residents. Notwithstanding all the tourism, hospitality, and catering businesses' potential adverse impacts, the tourism, hospitality, and catering businesses in the Atewa Forest are geared toward environmental conservation and they currently have no impact on the destruction of the Atewa Forest and its landscape. Based on this,

a participant noted: *“The Atewa Forest is our business, and our business is the Atewa Forest. We, therefore, make sure the forest and its landscape is highly conserved”*.

### **Agro-processing, Fruit Processing and Produce Buying Companies**

The agro-processing and manufacturing (fruit) businesses as well as produce buying businesses have the potential to exert some pressure on the Atewa Forest and its landscape. Most of the agro-processing, manufacturing (fruit), and produce buying (cocoa) businesses have established plantation farms and have many out-grower farmers supplying them with raw materials such as palm nuts, cassava, fruits, cocoa beans, etc. These plantations need vast swathes of fertile land and in this area, the land is very fertile due to the presence of the Atewa Forest and its landscape. To create the space for the production of their raw materials, these plantation farmers typically cleared and burned enormous areas of forest and its landscape. The Atewa Forest can be deforested and deteriorated as a result of the agro-processing, manufacturing (fruit), and produce buying (cocoa) companies’ activities. In the Akyem region, most farmers use slash and burn to clear the environment to create space for palm nut, cassava, cocoa, orange, pineapple, and other crops. In the course of farming, many animal species like bush rats, grasscutters, antelope, pangolins, etc. are killed for meat which can lead to their extinction. Clearing the land in this way also destroys their habitats and confines them to ever decreasing areas of forest.

Moreover, the production activities of the agro-processing and manufacturing (fruit) businesses also pollute the Atewa Forest and its landscape. Biomass is used as fuel to boil the palm nut for crushing and boiling the concentrate into palm oil and palm kernel oil in the Atewa Forest landscapes. This causes a large amount of smoke to be released, which is hazardous to human health and the environment. Deforestation can also increase as a result of biomass sourcing. The majority of enterprises discharge their waste directly into the environment, polluting land and water which endangers the ecosystem in the river bodies. These activities if not well managed will cause a massive negative impact on the Atewa Forest and its landscape. Providing further insight, a participant indicated: *“We have a large palm oil plantation. We source most of our raw material from our farm. However, we also buy some of our palm nuts from the farmers within the community. As you can see, this place is very good for palm plantations. Almost every farmer*

*has palm trees on his farm*". However, over-conversion of land in the Atewa Forest and its landscape into palm plantations will cause massive deforestation.

### **Woodworks Businesses**

Woodworks businesses such as sawmills and carpentry operators depend on timber from the forest and its landscape. The woodworks businesses have a severe impact on the Atewa Forest and its landscape. The majority of the wood-related activities in the Akyem area result in uncontrolled logging in the Atewa Forest and its surrounding landscape. This is because almost all sawmill and carpentry operators complained that the Forestry Commission had confiscated their timber because they cannot produce logging permits. Illegal tree felling for timber and fuel has been documented in the Atewa Forest and its surrounding area. When causing damage to the forests, woodworks activities have the potential to cause species extinction, ecological imbalance, soil erosion, hydrological cycle disturbance, and water pollution. Inability to control the activities of these businesses will cause massive degradation of the Atewa Forest and its ecosystem.

### **Mining**

Mining businesses also have a severe negative impact on the Atewa Forest and its landscape. Open-pit mining is used by mining companies in the Atewa Forest area. Large areas of land, including forest land and its ecosystem, were removed, resulting in considerable land degradation and deforestation. To transport equipment and workers to mining sites and mineral resources, mining companies are destroying biodiversity by moving their machines through the Atewa Forest landscape. These miners also hunt for wildlife and kill endangered species as well as cut down trees for construction at the mining sites. Furthermore, mining operations pollute the Atewa Forest's and its landscape's land, air, and water ecosystem services. The mining companies use heavy earth moving machines and vehicles that generate a huge amount of dust into the atmosphere. To remove gold and diamond from mud and rock, miners utilize hazardous chemicals like cyanide. Mining waste is dumped into the environment, polluting both land and water ecosystem services. This hazardous mining causes aquatic and terrestrial plants and animals to perish, harming agricultural land and contaminating the major source of drinking

water in the Atewa Forest and its landscape. Most of the river bodies in the Atewa Forest and its landscape have been destroyed by mining activities.

The impacts of the business activities on the Atewa Forest and its landscape are provided in Table 2 below.

**Table 2: Summary of business impacts on the Atewa forest landscape ecosystem services**

<b>Business category</b>	<b>Potential impacts</b>	<b>Level of Potential Impacts</b>
Agrochemical	Air pollution, water pollution	Low
Agro-processing	Deforestation, land pollution, water pollution, air pollution	Medium
Produce buying	Deforestation	Medium
Manufacturing	Deforestation, land pollution, water pollution, air pollution	Medium
Health	No visible adverse impact	Low
Tourism/Hospitality/Catering Services	Threat to biodiversity	Low
Mining	Deforestation, degradation of lands, pollution of water bodies, destruction of air quality	High
Woodworks	Deforestation	High

### **3.3.5 Level of awareness of their dependency/impacts on the natural resources and ecosystem services**

The business entities located within the Atewa Forest landscape are direct beneficiaries of forest ecosystems and natural resources. Therefore, it is necessary to ascertain whether the companies are aware of the existence and importance of the Atewa Forest landscape ecosystem services. The consultants assessed the level of awareness of the businesses dependencies and impacts on the ecosystem services provided by the Atewa forest landscape. Key areas of awareness assessed include knowledge of the status of Atewa Forest, the relevance of the Atewa Forest and its landscape to the businesses' sustainability, and factors destroying the forest and its landscape. The analysis of the data revealed that all 47 (100%) of the businesses who responded to the survey know the status and demarcation of the Atewa Forest. The participants can give a vivid description of the Atewa Forest and its landscape. This is very significant as they can appreciate where their level of activities can influence or be influenced by the Atewa Forest and its landscape. Moreover, 45 (95.7%) of the business entities surveyed indicated that the Atewa Forest and its landscape provide vital production materials for their operations. Except for the

agrochemical companies, none of the businesses revealed that it does not source inputs from the Atewa Forest and its landscape. However, all 47 (100%) businesses indicated that Atewa Forest is very important to their operations. This indicates the businesses' level of understanding of the relevance of the Atewa Forest to their business survival. This can be interpreted to mean that the businesses will thrive once the Atewa Forest and its landscape flourish.

Furthermore, the consultant sought to find out if the businesses are aware of the negative impacts of businesses and individuals on the Atewa Forest and its landscape. The results showed that all the 47 (100%) businesses surveyed know the business impacts on the forest. The analysis showed that the destruction of the forest ecosystem is caused by human and business activities. The analysis showed that only 8 (17.02%) of the businesses were aware that their business activities influence the plant species within the landscape. Moreover, out of the 47 businesses surveyed, only 7 (14.89%), 4 (8.51%), and 4 (8.51%) were aware that their business activities have influenced the animal species, soil quality, and habitat of animals within the landscape respectively. This means that, although the businesses appreciate their impact on the Atewa Forest, their knowledge of the actual influence of their activities on the Atewa Forest and its landscape is very low.

Notwithstanding this, all the 47 (100%) noted that the forest cover has reduced over the years. Probing further, a participant indicated: *“The Atewa Forest is very large and stretched across many communities within the Akyem Abuakwa Traditional Area. The Forestry Commission officers have indicated to us the demarcation of the forest and where we can also farm. The Atewa Forest is very visible because it is on a mountain”*. Another participant noted: *“When we're kids, the forest used to be very thick and very close to us. But the activities of the chainsaw and galamsey operators have reduced the forest cover. I must also admit that we also have to blame farmers who clear the forest to have access to land for cash crop and food crop cultivation. However, the Forestry Commission officers normally come around to destroy all farms located in the forest”*. Another participant who is into sawmill operations posited: *“I know the forest cover has reduced but how can my business activity affect this large forest. I believe it is the galamsey and loggers who impact the plants and animal species in the forest and its*



*landscape. Just look around and you will see how the galamsey operators have destroyed the landscape. We cannot even get water to drink again unless borehole or sachet water”.*

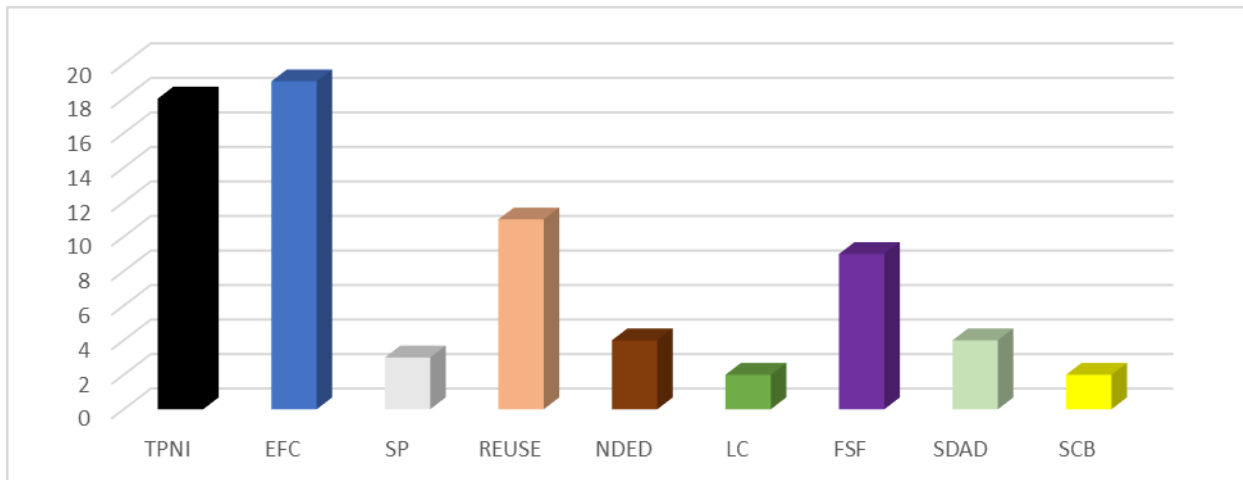
From the analysis, it is obvious that businesses’ awareness of the importance of the Atewa Forest ecosystem to their sustenance is very high. However, there were differences in the importance and need to protect the Atewa Forest ecosystem from mining activities. The businesses did not fully understand the cultural services provided by the Atewa Forest landscape. Their desire for spiritual benefits offered by the forest landscape is low. However, the businesses have a sufficient understanding of the provisioning, regulating, and supporting services provided by the Atewa Forest ecosystem.

The businesses were aware that the critical ecosystem services provided by the Atewa Forest and its landscape include provisioning services (such as rainfall, water bodies, foodstuff, meat, snail, firewood, timber, rattan, bamboo, herbal medicine), regulating services (such as control erosion and flooding, carbon sequestration and maintenance of air quality, improvement in soil fertility, etc.), and supporting services (such as enhancement of photosynthesis, enhancement of nutrients; provision of habitat for plants and animals). The businesses contacted completely recognised the critical role of the Atewa Forest ecosystem services in guaranteeing human wellbeing, business growth, and sustainable development.

They noted the personal experience of the relevance of the Atewa Forest businesses concerning illegal mining which has a significant impact on businesses' awareness of the forest's ecosystems. The companies were aware that the Atewa Forest landscape influences the supply of food, palm nut, cocoa, clean air and water. The awareness levels include the knowledge of Atewa Forest’s status as a forest reserve, as a source of raw materials, and the fact that the destruction of the forest ecosystem is caused by human and business activities, and that forest cover has reduced over the years. The assessment also points out that the Atewa Forest ecosystem services have changed over the years, with water bodies, land, and soil fertility showing significant deterioration. These changes also have been caused by illegal mining in and out of the Atewa forest reserve.

### 3.3.6 Level of business's environmental conservation measures and corporate social responsibilities

In terms of contribution to the environment, most of the companies do not undertake any particular activities specifically and directly aimed at environmental conservation. They have no conscious plan to protect and conserve the Atewa Forest and its landscape. However, these businesses indirectly undertake some environmental conservation activities. The analysis revealed that some of the conservation measures undertaken by businesses surveyed include tree planting and not buying from illegal loggers and hunters, educating people on environmental conservation measures, using renewable energy sources such as solar panels, processing waste for sale and using wastes to power biopower plants, and not discharging waste directly into the environment. Figure 8 presents the environmental conservation measures and corporate social responsibilities performed by businesses in the Atewa Forest landscape.



**Figure 8: Environmental conservation measures and corporate social responsibilities performed by businesses in the Atewa Forest landscape.**

**NB:**

**TPNI:** Tree planting and not buying illegal loggers and hunters

**EFC:** Educating people on forest and landscape conservation and tree planting

**SP:** Solar panels

**REUSE:** Processing of waste for sale and using production wastes for biopower plants

**NDED:** Not discharging into the environment directly

**LC:** Land reclamation

**FSF:** Providing financial assistance to farmers  
**SDAD:** Supporting district assemblies with donations  
**SCB:** Supporting community members with boreholes

The analysis showed that only 18 (38.3%), 19 (40.4%), 11 (23.4%), 4 (8.5%), and 3 (6.4%) undertake tree planting and do not buy from illegal loggers and hunters, environmental conservation education, reuse of waste, do not discharge waste directly into the environment, and use solar panels respectively. None of these environmental conservation measures was undertaken by more than 20 businesses. This shows that the level of environmental conservation among the businesses is low.

Moreover, a few businesses among the produce buying and manufacturing companies such as Yayra Glover, Pinora Limited, and HPW Fresh and Dry Limited can be described as a little ecologically conscious and have incorporated environmental conservation practices into the core operations. They have policy guidelines that drive environmental conservation activities in their operations. These businesses are into organic farming and have trained their out-grower farmers on sound environmental practices such as conservation agriculture, tree planting and protection, use of organic fertilizers, and non-application of pesticides and weedicides on farms. Companies like Yayra Glover go to the extent of certifying their farmers as organic farmers. These measures are key to the protection of the ecosystem in the Atewa Forest and its landscape.

Additionally, it is worthwhile noting that businesses like Bunso Eco-park, Beauty of Nature Hotel, Vicomeg Farms/Rephiden Resource Centre consciously contribute to conserving the environment through tree planting, biodiversity protection, and reclamation of degraded lands (due to mining activities). Moreover, a particular sawmill company like Empecom, located in Asamankese, has raised many hectares of forest consisting of economic tree species. The mining companies that were surveyed undertake land reclamation and reforestation to protect and conserve the forest. They build social amenities, provide livelihood support to the aged and less privileged, and boreholes to communities. Manufacturing companies such as Pinora Limited and HPW Fresh and Dry Limited process their waste before discharging it into the environment, and they also use solar panels for their offices. Again, businesses like Oro Oil Ghana Limited, Pinora

Limited, and HPW Fresh and Dry Limited use their production waste as fuel to power their biomass plants.

Furthermore, some of the businesses undertake corporate social responsibility (CSR) within the communities they operate. Some of the key initiatives include providing financial assistance to community members, supporting District Assemblies with in-kind and cash donations, supporting community members with boreholes, and training community members on environmentally friendly practices. Specifically, the mining businesses surveyed have provided some boreholes to some communities within the Atewa Forest landscape after the main sources of water were polluted. Again Yayra Glover has instituted a farmer support scheme where farmers are supported financially to encourage environmentally-friendly activities. Other businesses like Yayra Glover, Oro Oil Ghana Limited, Pinora Limited, HPW Fresh and Dry Limited, Chocho Minerals Water, and J Unique Ice Limited support the local government authorities with financial and material assistance when the Assemblies call on them. Yayra Glover, Pinora Limited, and HPW Fresh and Dry Limited have taken the initiative of building the capacity of community members through training on organic farming.

### **3.3.7 Environmental sustainability performance of the businesses**

Business activities must be carried out with no or minimal adverse impact on the environment. The businesses in the Atewa Forest landscape must move towards sustainable business practices that pay attention to their impacts on the environment to produce zero emissions, zero waste and rely on innovative ways of using resources. The sustainability of the businesses is measured in terms of the contribution of products made by enterprises to improved health, wellbeing and quality of life people within the Atewa forest landscape; corporate social responsibility, in particular the extent of social and environmental responsibility within the Atewa forest landscape; utilisation of resources bearing in mind intra-generational and inter-generational share of the benefits provided by the Atewa forest landscape.

The companies' environmental sustainability performance was assessed using the following indicators: land use, water use, ambient air, flora, fauna, solid wastes management, and liquid wastes management through discussions with the businesses and observation. These indicators

were measured based on the level of utilization of the businesses and efforts taken to minimize their impact on the Atewa Forest and its landscape. The businesses were grouped into agrochemical, processing (e.g. agro-processors), produce-buying, manufacturing, health (e.g. herbal medicine), hospitality/catering services, mining, and tourism.

The assessment revealed that all the operations of businesses except for the mining and wood related companies, in general, are environmentally sustainable. This is based on the level of business influence on the ecosystem. The business operations cannot degrade the landscape. However, the mining operations cannot be classified as sustainable and adversely impact the Atewa Forest landscape. The tourism and health businesses were deemed very environmentally sustainable. This is because they undertake business activities that ensure the protection of the Atewa Forest and its landscape such as tree planting, biodiversity conservation, reporting of illegal and suspicious activities with the Atewa Forest reserve to relevant authorities for actions to be taken. Table 3 presents the summary of the environmental sustainability performance of businesses.

**Table 3 Environmental sustainability performance of businesses**

Businesses	SUSTAINABILITY MEASURES						
	Land Use	Water Use	Ambient Air	Flora	Fauna	Solid Waste Management	Liquid Waste Management
Agrochemical	√	√	√	Δ	Δ	√	√
Processing (e.g. agro-processors)	√	√	√	√	√	Δ	Δ
Produce buying	√	√	√	√	√	√	√
Manufacturing	√	√	√	√	√	√	√
Health (e.g. herbal medicine)	√	√	√	√	√	√	√
Hospitality/Catering Services	√	√	√	√	√	√	√
Mining	χ	χ	Δ	χ	χ	Δ	χ
Tourism	√	√	√	√	√	√	√

**NB:** √ = good; χ = not good; Δ = fairly good.

### 3.3.8 Regulatory issues

Regulatory issues remain one of the cardinal issues that confront companies. Many regulatory institutions directly or indirectly regulate the operations of the businesses surveyed during the

assessment. The institutions can be grouped into three broad categories: business formalisation and finance, land and forest, and environmental regulators. The finance regulators include the Ghana Revenue Authority, Ministry of Trade and Industries, Business Advisory Center, National Board for Small Scale Industries, Ghana Cocoa Board (COCOBOD), and the revenue units of the District Assemblies. The land and forest regulators include the Ministry of Land and Natural Resources and Forestry Commission. The environmental regulators include the Environmental Protection Agency, Water Resources Commission, Environmental Health Units of the District Assemblies, and Minerals Commission.

The District Assemblies are the most visible regulatory organisations that frequently visit the businesses but they are limited to the mobilisation of revenue by collecting levies and fines from them. The District Assemblies make no conscious effort to educate the companies on protecting and conserving the forest and its associated ecosystems.

The Ghana Revenue Authority is also present in the study districts. However, its regulatory focus is on mobilising taxes from the businesses to the detriment of forest protection and conservation. No clear policies are put in place by the Ghana Revenue Authority to guide the policies that depend on the forest ecosystems for the raw materials and survival.

The Ministry of Trade and Industries, Business Advisory Center, and National Board for Small Scale Industries are also present in all the districts visited, providing businesses with financial and technical support. However, not every business contacted receives this support. They do not have any conservation practices to support the companies to enhance their forest and environmental protection.

Ghana COCOBOD is also present in all the districts and ensures the quality production of cocoa beans and the protection of the forest ecosystem through education of farmers, testing of agrochemicals and fertilisers, and provision of quality seedlings to farmers. It also licenses and regulates the activities of licensed buying companies in the purchase of cocoa beans, and its regulatory activities only pertain to produce buying companies within the districts.

The Ministry of Land and Natural Resources and Minerals Commission regulates mining companies' activities within the district, and they issue licenses to mining companies. Part of their remit is also to ensure that the mining companies operate in an environmentally sustainable manner, do not destroy the Atewa Forest landscape, and undertake land reclamation and reforestation.

The Forestry Commission is directly related to protecting and conserving the Atewa Forest landscape by enforcing Ghana's forest laws. Part of its remit is also to ensure that no company trespasses into the protected area of the Atewa Forest landscape. The Forestry Commission also regulates the felling of trees in and outside of the Atewa Forest landscape. The regulatory activities of the Forestry Commission revolve around farmers who produce for processing and produce buying companies, timber loggers, chainsaw operators, herbal medicine practitioners, and mining companies, but tend to be more reactive. For example, it arrests persons who enter the forest reserve or fell timber within the districts without a permit. The Forest Commission does not provide any education to the businesses contacted concerning protecting the Atewa forest landscape.

The Environmental Protection Agency is visible among manufacturing, processing, mining and agrochemical sellers. It regulates the activities of businesses (especially mining companies) from polluting the environment (water and land pollution) within the Atewa Forest landscape. Part of its remit is to ensure that companies, especially manufacturing companies, do not release effluents into the environment without treating the waste. The Environmental Protection Agency also regulates the indiscriminate burning of waste to minimise the release of greenhouse gases into the atmosphere.

The Water Resources Commission regulates the water quality and protection of water bodies within the Atewa Forest landscape. Part of its remit is to ensure the mining and manufacturing companies do not pollute the water bodies and test water quality within the Atewa Forest landscape.

### **3.3.9 Impacts of proposed bauxite mining in the Atewa Forest**

The consultants further assessed awareness of the government's proposed bauxite mining in the Atewa Forest, which showed that all surveyed businesses are fully aware of these plans. It was

instructive to note that none of the companies supports the idea of mining bauxite in the Atewa Forest. They believed that forest destruction by illegal mining activities would worsen with bauxite mining. Discussions with the business revealed that many of the individuals working within the surveyed businesses were not aware of the processes involved in bauxite mining. The participants view bauxite mining as the usual galamsey mining activity in the area. It was only the participant from the Bunsu arboretum who was able to narrate how bauxite is mined. This may be due to the business' advocacy against mining in the forest. He indicated: "*Bauxite mining is done using open cast mining techniques, which means that everything on top of the soil is cleared. The topsoil is then totally removed so that the ground may be blasted, drilled, and ripped to get the bauxite. Heavy earth-moving equipment, such as big bulldozers and caterpillars, were also used in the operation. All the plants and animals in the forest will be lost entirely if the bauxite mining progress in the Atewa Forest*". This means that the proposed bauxite mining activities will cause complete deforestation at the locations targeted for bauxite mining.

The analysis further indicated that the bauxite mining process would involve a total removal of the topsoil of the Atewa Forest surface and all the biodiversity, including fauna and flora. The consultants found out that bauxite mining will undermine the provisioning services, regulatory services, cultural services, and support services provided by the Atewa Forest landscape's ecosystem. The Atewa Forest will not be able to provide its ecosystem services such as good rainfall pattern, available water bodies, timber, rattan, bamboo, medicinal plants, absorbing excess water, carbon sequestration, maintenance of air quality, habitats for plants and animals, etc.

The Atewa Forest stands to lose if the bauxite mining is allowed to progress there, and the businesses that depend on the landscape for raw materials and survival will be threatened. The assessment showed that the companies within the Atewa Forest would be adversely impacted in the following ways: the high cost of sourcing raw material from other places for operations; increase in the cost of treating water due to destruction of water bodies and water quality; loss of timber, rattan for export building, furniture and fittings purposes; loss of medicinal plants for medical purposes; loss of tourism potential; loss of fertile agricultural land for food and tree crop



production; loss of land and water for gold mining; and inability to source firewood from the forest environment.

### **3.4 SWOT analysis of businesses contacted**

The businesses operating within the Atewa Forest landscape were assessed based on their strengths, weaknesses, opportunities, and threats concerning the ecosystem provided by the Atewa Forest that supports their operations (table 4).

#### **3.4.1 Strengths**

All the surveyed businesses have the capacity (whether small or large) to extract the critical raw materials for production from the Atewa Forest landscape. It was revealed that all 47 surveyed businesses rely on the natural environment. This has the propensity to minimise their production costs. Even the big manufacturing firms like Pinora Limited and HPW Fresh and Dry Limited that source some of their raw materials from other places still source some of their raw materials like pineapple, orange, and banana from the Atewa Forest landscape. The palm oil manufacturers, timber loggers, sawmills, carvers and carpenters, herbal medicine practitioners, sachet water manufacturers, cocoa buyers, gari processing, fish farmers, mining companies, etc., fully extract all their raw materials from the Atewa Forest landscape.

The businesses have direct access to raw materials. The competition on the raw materials within the Atewa Forest landscape is minimal. The access to raw materials does not pass through intermediaries. Some of the businesses contacted, such as palm oil, gari processes, fruit juice manufacturers, and herbal medicine practitioners have out-grower schemes with farmers who give them direct access to raw materials such as palm nut, cassava, oranges, pineapple, herbal plants, etc. Again, businesses have also established farms to access raw materials directly. Moreover, the firms such as mining companies have abundant gold and diamond reserves. There are many water bodies within the Atewa Forest landscape, making water supply easy and cheap. The businesses also can process the sources of the raw materials from the Atewa Forest landscape into finished and semi-finished products using indigenous technologies. They can convert the raw material into products. This gives them the upper hand over the other competitors in different areas.

The businesses also have dependable suppliers of raw materials. The suppliers are within the landscape. Many persons are involved in sourcing raw materials (natural resources from the landscape) such as cocoa, palm oil, cassava, avocado, etc. The discussion with the business entities and consultants' observations, revealed that the majority of the businesses (45 representing 95.74%), except for some illegal mining companies, practice some level ecologically friendly business operations though not formalized in most businesses' operation except for Pinora Limited, HPW Fresh, Dry Limited, and Yayra Glover. For instance, companies such as palm oil producers and other manufacturers (like palm oil associations, Budu Consult Limited, Oro Oil Ghana Limited, Next Africa Agro limited, Pinora Limited, HPW Fresh, Dry Limited, Yayra Glover, etc.) practice reuse of raw materials and use their waste as fuel. They also buy waste such as palm shells, sawdust, wood chippings etc., from other businesses to fuel their plants. Companies such as Yayra Glover, Pinora Limited, HPW Fresh, Dry Limited, Akuapem gold avocado processing, etc., practice conservation agriculture and organic farming.

#### **3.4.2 Weaknesses**

The companies have operational challenges that need to be strategically managed to boost profitability, growth, and survival. Some of the weaknesses include the following.

Most businesses (except for Yayra Glover, Pinora Limited, HPW Fresh, Dry Limited, Oro Oil Ghana Limited, Akuapem gold avocado processing, etc.) only sell within the local market. They have a weak capacity to penetrate the national and international markets effectively. This limits their ability to manipulate and gain favourable prices for their products. The market forces in big cities and markets decide the prices of products. This has the propensity to affect the profitability of the businesses.

Many businesses within the Atewa Forest landscape are sole proprietorships or partnerships whose financial positions are weak. The weak economic situation affects their ability to deploy environmentally friendly technologies effectively to extract resources from the Atewa Forest. The businesses have limited capacity to expand operations and compete on the national and international markets.

Most businesses have no qualified financial, administrative, operations, and accounting staff to manage the activities of the companies. This affects the business aspects of their operations and their capacity to be vibrant in local, national, and international markets.

Most businesses have challenges in marketing their products. Most companies have weak bargaining power in the markets.

Most of the technologies used to extract raw materials from the Atewa Forest landscape are outmoded and inefficient. This results in much operational waste.

### **3.4.3 Opportunities**

Some of the significant opportunities available to businesses include the following.

The Atewa Forest has many potentials for nature-based/tourism development and untapped resources that give a favourable business position to the businesses.

The cost of raw materials in the Atewa Forest landscape is very low. This supports businesses to operate at a low operational cost compared to other companies operating in other areas in Ghana that utilise the same resources.

The Atewa forest landscape provides easy access to the many resources and raw materials for businesses operating in the landscape. The Atewa Forest provides good environmental conditions that support the growth of raw materials for production. It serves as a good source of oxygen, water, excellent climatic condition, etc., to the businesses operating in the Atewa Forest landscape.

Many government interventions support businesses operating in rural communities like areas in the Atewa Forest landscape. The government is implementing measures that provide financial support to the operations of small businesses. Through the National Board for Small Scale Industries and the Business Advisory Centers, the government gives soft loans and grants to companies in areas like the Atewa Forest landscape. The government is also streamlining the operations of businesses in the natural resource sector and has also established new and robust environmental policies to create a level playing for businesses such as mining companies within the Atewa Forest landscape.

### **3.4.4 Threats**

Due to the actions and inactions of illegal miners and chainsaw operators, the government has enacted policies and legislation that impose high restrictions on environmentally friendly businesses to access resources from the Atewa Forest landscape easily. Companies have to go through such as timber loggers and miners have to go through bureaucratic processes to secure permits to operate in the off-forest reserves and their farms. Unfortunately, most of the business

operators are uneducated and do not understand the process. These policies and legislation tend to increase the cost of raw materials for most businesses.

Illegal chainsaw and mining activities have exposed many businesses to unwarranted harassment from Forestry Commission staff. In some instances, the forestry commission enters into the premises of sawmill shops, carpentry shops, and households to seize woods if the owners cannot produce permits, whether the woods are from the forest reserve or not. The illegal mining operations have also caused many businesses like palm oil, cocoa buyers and herbal medicine practitioners to lose vast tracts of land, increase costs of treating water waste due to water pollution and lose essential herbal plants in the Atewa forest landscape.

Another threat to the operations of the businesses is the proposed bauxite mining in the Atewa Forest. This will push many companies who depend on the ecosystem services provided by the forest out of businesses.

**Table 4: SWOT analysis of the businesses in the Atewa forest landscape.**

<b>STRENGTH, WEAKNESSES, OPPORTUNITIES &amp; THREATS (SWOT) ANALYSIS</b>	
<b>STRENGTHS</b>	<ul style="list-style-type: none"> <li>Ability to extract resources from the forest environment</li> <li>Direct access to ecosystem services from the forest landscape</li> <li>The use of indigenous technology in production to produce products using the available raw material</li> <li>Reliable suppliers of raw materials</li> <li>The practice of waste to fuel in production</li> </ul>
<b>WEAKNESSES</b>	<ul style="list-style-type: none"> <li>Little market presence at national</li> <li>Unreliable cash flow to expand operations</li> <li>Inadequate professional and experienced staff</li> <li>Poor technological uptake</li> <li>Poor marketing of products developed with resources from Atewa forest</li> <li>Increasing health problems for workers due to poor business practices</li> </ul>
<b>OPPORTUNITIES</b>	<ul style="list-style-type: none"> <li>Potentials for nature-based/tourism development</li> <li>Low cost of raw materials in the Atewa forest landscape</li> <li>Availability and easy access to raw materials in the Atewa forest landscape</li> <li>Good environmental conditions that support the growth of raw materials for production</li> <li>Government's commitment to supporting businesses through NBSSI, Business Advisory Centres,</li> <li>New and robust environmental policies to create a level playing for firms within the Atewa Forest landscape</li> </ul>

<b>THREATS</b>	<p>High restrict on the use of raw materials directly from the Atewa Forest</p> <p>Illegal mining operations causing substantial environmental concerns in the Atewa forest landscape</p> <p>Proposed bauxite mining in the Atewa forest landscape</p>
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## **SECTION 4: CONCLUSIONS AND RECOMMENDATIONS**

### **4.1: Introduction**

This section concludes the assessment and highlights some limitations faced during the execution of the assignment. Based on the conclusions, the consultants propose some recommendations.

### **4.2 Conclusions**

The Atewa Forest Reserve has an estimated land size of 17,400 hectares. The forestry commission is very visible and active in preserving the Atewa forest. The Atewa forest landscape spans many towns in the Akyem Abuakwa traditional area and the Abuakwa South, Atewa West, Atewa East, Fanteakwa South, Kwaebibirem, Denkyembour, West Akim, Ayensuano, Upper West Akim, and Suhum district assemblies. The Atewa forest landscape provides many ecosystem services to individuals and businesses. Notwithstanding the massive ecosystem services provided by the Atewa forest landscape, it has experienced enormous degradation and pollution over the years due to the activities of illegal gold and diamond miners.

Most Atewa forest landscape companies are primarily informal and small-scale businesses. However, the district assemblies can track every business within the landscape for levy collections. The businesses depend heavily on the forest ecosystem services provided by the

landscape. The essential raw materials used in the operations of the businesses are sourced from the landscape. The firms' activities, except the mining companies and sawmill operators, do not have direct adverse impacts on the Atewa Forest landscape because the operations of the businesses are on a micro and small scale.

Many regulatory agencies are operating within the Atewa Forest landscape. Agencies whose regulatory functions directly impact the Atewa forest management include the Forestry Commission, Environmental Protection Agency, Minerals Commission, and Water Resources Commission. The Forestry Commission is not interested in educating businesses on the potential effects of their operations on the Atewa forest but only focuses on reactive measures such as the seizing of resources extracted from the forest without a permit.

All the 47(100%) Atewa Forest businesses oppose the proposed bauxite mining operations in the Atewa forest landscape after explaining to them the ramification of the bauxite mining during the discussion with the participants. Bauxite mining will have severe consequences on the Atewa forest and the companies operating in the Atewa forest landscape. The health implication of bauxite mining is negative.

#### **4.3 Limitations of the assessment**

The critical limitation of the assessment revolves around data collection. Specific rules include the following:

Most of the companies were very restrictive in the provision of data. The businesses were of the view that the business information provided will be used against them in terms of tax mobilisation. This caused the consultants to spend more time explaining the business rationale of the study during the data collection exercise.

Mining companies were very reluctant to provide information. Some mining companies established contacts, but they refuse to give the consultants audience. The consultants connected with the mining committee chairman in the Fantekwa South district assembly (through the Planning officer of the assembly) and officers in mining companies in the area. The introductory letter and the data collection instrument were sent to them for six weeks, but they could not provide information. This caused the consultants to issue the first draft data set. However, the consultants' attention was drawn to the fact that the mining companies must be included in the

data at all costs. The consultants have to spend additional three weeks chasing some mining companies for data. This caused a delay in the preparation of the final report.

There are many communities within the Atewa Forest landscape. It was expected that the consultant would visit all the communities and identify businesses operating in these communities. However, most of the communities do not have any viable companies. This resulted in colossal transportation expenditure. Most of the routes to these communities are not in good shape. These cause some delays in the data collection processes.

#### **4.4 Recommendations**

The consultants propose the following recommendations for consideration.

There is a need to support the Forestry Commission to protect the Atewa Forest landscape. The Forestry Commission can be supported financially and technically to organise community engagement for businesses within the Atewa Forest landscape. Periodically, the Forestry Commission, Environmental Protection Agency, and Business Advisory Centers should visit the companies and educate them on the impacts of protecting and conserving the forest on profitability and growth since they are within the Atewa Forest landscape.

The business entities should be supported technically to develop an action plan to be implemented at the business level to facilitate the achievement of the Atewa Forest ecosystem conservation objectives. The plan can be made up of actions and procedures involved in routine operations to address environmental issues in the operations of the businesses.

The business entities should be supported to conduct periodic environmental audits at the business level by training persons to collect data on parameters such as waste discharge, emissions, resource extraction and utilisation, water and air pollution, etc., at the business level.

There should be preparation and publication of quarterly, half-year, and annual reports.

There should be intensive education and awareness creation on sustainability practices that protect and conserve the Atewa Forest landscape among companies in the area. Businesses should also be sensitised on the benefits of sustainability practices for their revenue generation, the health of employees, and the environment. This will enhance and promote sustainability practices among the businesses in the Atewa Forest landscape.

There should be the institutionalisation of motivation packages to encourage businesses in the Atewa Forest landscape to effectively promote and implement sustainability practices that conserve the forest landscape in their business activities. Such decisions must be made with high inputs from all the stakeholders to ensure full compliance and promote ownership of the decision among the businesses. There can also be award packages to reward companies who will implement sustainability and conservation practices independently.

The district assemblies must be supported financially and technically to formulate and implement fiscal and monetary policy measures that will encourage companies in the Atewa Forest landscape to implement sustainable business practices in their operations. Such policy measures can be in the form of tax incentives and financial support to companies who are willing to integrate sustainability and conservation practices into their operations. The assemblies should be encouraged to enact and enforce by-laws that will stringently punish companies whose activities are detrimental to the Atewa Forest ecosystem.

It is crucial to forming alliances with environmentally-sensitive businesses with presence and operations in the landscape as a point of contact. In turn, these companies should help organise and enrol their partners at the local levels (communities) into networks and activities that focus on advocacy for the conservation of the AFR and its landscape.

The district assemblies' revenue collection units have direct contact with the businesses. These units should be contacted to work through them to support the companies to protect the forest. There can be partnerships established with the assemblies and educate the businesses anytime they visit them.



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10. If both what is the shareholding percentage?.....
11. Number of years in business existence **A.** Below 1 year [ ] **B.** 1-5 years [ ] **C.** 6-10 years [ ] **D.** 11-15 years [ ] **E.** 16-20 years [ ] **F.** 20 years and above
12. Is the business registered? **A.** Yes [ ] **B.** No [ ]
13. The number of workers: Male .....Female .....
14. Gender of the owner(s) or contact person **A.** Male [ ] **B.** Female [ ]
15. Age of the owner(s) or contact person **A.** Below 20 years [ ] **B.** 21-30 years [ ] **C.** 31-40 years [ ] **D.** 41-50 years [ ] **E.** 51-60 years [ ] **F.** 61 years and above
16. Highest level of formal education of owner(s) or contact person **A.** None [ ] **B.** Primary [ ] **C.** Secondary [ ] **D.** Tertiary [ ]
17. Telephone of the owner(s) or contact person: .....
18. Name of the owner(s) or contact person.....
19. **Position of the contact person**

**Section 2: Ecosystem services of the Atewa Forest Reserve and Landscape**

**A: Which of the following ecosystem services are provided by the Atewa Forest Reserve and Landscape?**

**Provisioning services**

The landscape provides fuel through firewood	The landscape supports agriculture through food and cash crop production
The landscape provides food through fruits, foodstuff, meat snail, etc.	The landscape provides water through the rivers and streams
The landscape provides timber, rattan, and bamboo	The landscape provides herbal medicine
Others (specify)	

**1. Regulating services**

The forest and its landscape control erosion and flooding by absorbing excess water	The forest and its landscape regulate the climate through carbon sequestration
The forest and its landscape purify water for consumption	The forest and its landscape improve soil fertility
The forest and its landscape maintain air quality	The forest and its landscape improve plant pollination and plants growth
Others (specify)	

**2. Cultural services**

The forest and its landscape provide employment and income to local people	The forest and its landscape serve as a sense of identity
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The forest and its landscape provide spiritual cognitive and enrichment	The forest and its landscape provide aesthetic and recreational value through ecotourism
Others (specify)	

### 3. Supporting services

The forest and its landscape enhance photosynthesis for plant growth	The forest and its landscape enhance nutrient cycling and evolution
The forest and its landscape increase atmospheric oxygen	The forest and its landscape improve soil formation and retention
The forest and its landscape enhance water cycling	The forest and its landscape provide a habitat plants and animals
Others (specify)	

**B: Which of the Ecosystems Services provided by the landscape and forest are important to you as a business entity?**

.....  
 .....

### Section 3: Business dependency/impact on the Atewa Forest Reserve and Landscape

**My business activities depend on the forest landscape for:**

1. Water for production/manufacturing purpose [ ]
2. Water for catering services [ ]
3. Timber, rattan for building, furniture and fittings purposes [ ]
4. Water for irrigation in plantation farms [ ]
5. Medicinal plants for medical purposes [ ]
6. Foodstuff, meat, snail, etc. for consumption purposes [ ]
7. Research purpose [ ]
8. Tourism purposes [ ]
9. Forest land for food and meat production purposes [ ]
10. Forest land for cocoa production [ ]
11. Forest land and water for mining [ ]
12. Firewood for fuel [ ]
13. Others (specify).....

**My business activities can impact the forest landscape in the following ways**

1. Discharge of business waste directly or indirectly into the water (rivers and streams) can lead to pollution
2. High usage of freshwater resources and no system of recycling can affect water quantity.
3. Illegal sourcing or illegal logging of timber leading to deforestation
4. Illegal sourcing of wildlife leading to the extinction of animal species
5. Emissions of greenhouse gases

6. Release of waste and effluents into the forest ecosystem
7. Over clearing of forest landscape for food and cocoa production
8. Unstainable sourcing of medicinal plants leading to loss of plant species
9. My business also has impacts on other businesses that depend on the forest landscape
10. Destruction of biodiversity within the forest landscape
11. Others (specify).....

**Section 4: Level of awareness of business dependency/impact on the Atewa Forest Reserve and Landscape**

1. I know where the Atewa forest reserve is located
2. I know the forest is a national reserve
3. I know that I get all or most of my inputs from the forest
4. I know that the forest and its landscape is very important to my business survival
5. I know the destruction of the forest ecosystem is caused by human and business activities
6. I know that my activities affect the water resources in the forest landscape
7. I know that my activities influence the plant species within the landscape
8. I know that my activities influence the animal species within the landscape
9. I know that my activities influence soil quality within the landscape
10. I know that my activities influence the habitat of animals within the landscape
11. I know that the forest cover has reduced over the years
12. Others (specify).....

**Section 5: Contributions of businesses to the conservation of the environment within the Atewa Landscape**

**Kindly list any activity your business has carried out to protect water, biodiversity and forest in the landscape in Atewa forest.....**

**Section 6: Perception and relationship with regulators and information regarding regulatory issues that companies have to contend with**

1. I know that some of the institutions that regulate my business activities include
  - A. Ministry of Land and Natural Resources
  - B. Forestry Commission
  - C. Environmental Protection Agency
  - D. Water Resources Commission
  - E. Ghana COCOBOD
  - F. Food and Drugs Board
  - G. Ghana Standard Authority
  - H. District Assembly
  - I. Other (please specify).....
2. Do know the functions of the regulatory institutions you selected above  
.....

.....  
 .....  
 3. How do the institutions affect your business operations.....

4. What is the communication channel between your business and the regulatory institutions?.....

**Section 7: Impact of the proposed bauxite mining on the within the ecosystem services Atewa forest and d its landscape**

**A: Bauxite mining will impact the forest and its landscape in the following ways:**

**1. Provisioning services**

The landscape will not be able to provide adequate firewood	The landscape will not be able to support adequate food and cash crop production
The landscape will not be able to provide adequate fruits, foodstuff, meat snail, etc.	The forest and its landscape will not be able to provide adequate water through the rivers and streams
The landscape will not be able to provide adequate timber, rattan, and bamboo	The landscape will not be able to provide adequate herbal medicine
Others (specify)	

**2. Regulating services**

The forest and its landscape will not be able to control erosion and flooding by absorbing excess water	The forest and its landscape will not be able to sequestrate carbon dioxide
The forest and its landscape will not be able to purify water for consumption	The forest and its landscape will not be able to improve soil fertility
The forest and its landscape will not be able to maintain air quality	The forest and its landscape will not be able to improve plant pollination and plants growth
Others (specify)	

**3. Cultural services**

The forest and its landscape will not be able to provide employment and income to local people	The forest and its landscape will not be able to serve as a sense of identity
The forest and its landscape will not be able to provide spiritual cognitive and enrichment	The forest and its landscape will not be able to provide aesthetic and recreational value through ecotourism
Others (specify)	

**4. Supporting services**

The forest and its landscape will not be able to enhance photosynthesis for plant growth	The forest and its landscape will not be able to enhance nutrient cycling and evolution
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The forest and its landscape will not be able to increase atmospheric oxygen	The forest and its landscape will not be able to improve soil formation and retention
The forest and its landscape will not be able to enhance water cycling	The forest and its landscape will not be able to provide a habitat for plants and animals
Others (specify)	

**Section 8: Impact of the proposed bauxite mining in the Atewa Forest Reserve and Landscape on business operations**

**A: Bauxite mining will impact business operations in the following:**

1. High cost of sourcing raw material from other places [ ]
2. Increase the cost of treating water due to destruction of water bodies and water quality [ ]
3. Loss of timber, rattan for building, furniture and fittings purposes [ ]
4. Loss Medicinal plants for medical purposes [ ]
5. Reduction in the quantity of bushmeat, snail, etc. from the forest [ ]
6. Loss of tourism potential [ ]
7. Loss of agricultural land food production [ ]
8. Loss of land for cocoa production [ ]
9. Loss of land and water for gold mining [ ]
10. Inability to source firewood from the forest
11. Others (specify).....

**B: Are there any related health issues anticipated for workers in the business?**

- A. Yes                      B. No**

**C: If Yes kindly describe the health issues.....**

## **Appendix 2: Interview guide**

### **INTERVIEW GUIDE**

Biodata of the respondent

Business information

Knowledge of the Atewa forest landscape

Understanding on ecosystem services from the Atewa forest landscape

Understanding of business impacts on Atewa forest landscape

How the business depends on the Atewa forest landscape

Business contribution to the conservation of the Atewa forest landscape

Understanding of functions of regulatory agencies in the protection of the Atewa forest landscape

Knowledge of the proposed bauxite mining in the Atewa forest landscape

Understanding the bauxite mining on the Atewa forest landscape

Potential health implication of the proposed bauxite mining





**Appendix 3: Pictures of some selected businesses contacted**



HPW Fresh & Dry Company



Lexvee gari Processing, Guaso near Osino





Empekom Wood Processing, Asamankese



Polluted River Birim (Obodom near Kade) due to mining activities





Active mining in Riverbed (Obodom near Kade)



Next Africa Agro Limited, Asamankese





Kwabeng Woodworks, Bunso



Oro Oil Processing Company, Subi, near Kade





Local gari processing in Ehiamenkyene near Osiem



Oro Oil Palm plantation at Subi near Kade

## Appendix 4: Summary of the demographic and socio-economic situation of the survey

### Districts

District	Demographic Characteristics
Abuakwa South	<p><b>Population:</b> 104,189 (2019 est.); female (51.3%), rural (40%)</p> <p><b>Private Informal Sector:</b> (84.8%)</p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
Fanteakwa South	<p><b>Population:</b> 108,614 - females (50.3%), rural (72.5%)</p> <p><b>Private Informal/formal Sector:</b> (90.0/3.8%)</p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
Atewa West	<p><b>Population:</b> 110,622; females (50.58%); rural (%)</p> <p><b>Private Informal Sector: (More than 80%) Large percentage of the population is in the informal sector.</b></p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
Kwaebiberim	<p><b>Population:</b> 113,721 - females (51%), rural (57.3%)</p> <p><b>Private Informal/formal Sector (85.5/7.4%)</b></p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
Denkyembuor	<p><b>Population:</b> 78,841; females (50.8%), rural (42.3%)</p> <p><b>Private Informal/formal Sector: (86.2/5.5%)</b></p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
West Akim	<p><b>Population:</b> 108,298; females (51%)</p> <p><b>Private Informal/formal Sector: (95.1/1.9%)</b></p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>
Ayensuano	<p><b>Population:</b> 77,193; females (50.2%), rural (93%)</p> <p><b>Private Informal/formal Sector: (95.6/2.2%)</b></p> <p><b>Livelihoods:</b> Large percentage of the population are into Agriculture, small scale mining, trading, artisans and beauticians, small and medium scale industries, tourism</p>

## Appendix 5: Movement Plan

The Consultants started the assessment from Abukwa South Municipal and continued to Fanteakwa South, Atewa West, Kwaebiberim, Denkyembuor, West Akim, Upper West Akim, and Suhum, and ended the trip at the Ayensuano District. The Consultants visited all the districts within three weeks. However, there was a challenge in obtaining data from the mining companies, which were very hesitant in providing information. The consultants had to spend an additional two weeks in Abukwa South Municipal, Fanteakwa South, Atewa West, Kwaebiberim, Denkyembuor, and West Akim to collect data from some mining companies. Table 2 presents the movement plan for the assessment.

Day	Date	Districts	Communities
Monday	08/11/2021	Abuakwa South	Domea Bra, Apapam, Nkronso, Bunso junction, Bunso junction, Bunso, Amanfrom, Apedwa
Thursday	11/11/2021	Atewa West	Kwabeng, Akim Pameng
Monday	15/11/2021	Fanteakwa South	Juaso-Saamang, Sango-Ehiamakyini, Ehiamankyene, Osino
Wednesday	17/11/2021	Kwaebibirem	Abodom, Subi, Kade, Okumaning Camp,
Friday	19/11/2021	Denkyembour	Boadua, Number 8, New Adankrono, ST Dominic Hospital Road
Tuesday	23/11/2021	West AKim	Abesim-Asamakese, Empekon Area, Sabaki lane, Wawase
Wednesday	24/11/2021	Upper West Akim	Adeiso
Thursday	25/11/2021	Suhum	Suhum
Friday	26/11/2021	Ayensuano	Appietu, Amanase



## Appendix 6: Businesses available for interviews

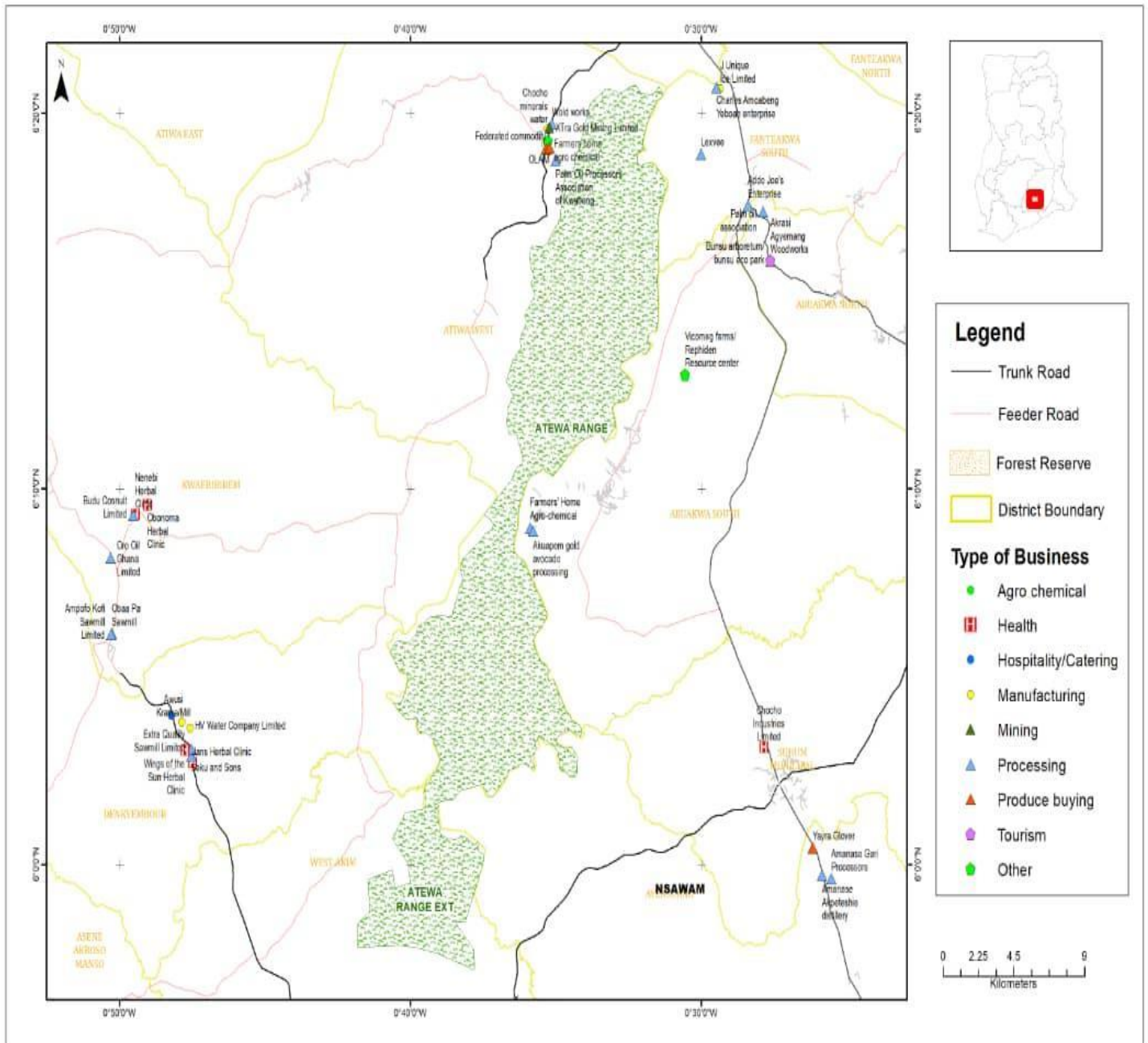
Interviewed Businesses	Interviewed Businesses
1. Bakers Association	24. Vicomeg farms/ Rephiden Resource centre
2. Akraasi Agyemang Woodworks	25. Akuapem gold avocado processing
3. Palm oil association at Bunsu	26. Addo Joe's Enterprise
4. Chocho minerals water	27. Bunsu arboretum/ Bunsu eco-park
5. Federated commodity	28. Kwabeng Wood Works
6. Ke ole ma ehi	29. Agrochemical Seller
7. Work and happiness	30. Lexvee
8. Okumkom Chop Bar formerly Barima Nkwan	31. J Unique Ice Limited
9. OLAM	32. Charles Amoabeng Yeboah enterprise
10. Palm Oil Processors Association of Kwabeng	33. Nenebi Herbal Clinic
11. Obaa Pa Sawmill	34. Obonoma Herbal Clinic
12. Ampofo Kofi Sawmill Limited	35. Jans Herbal Clinic
13. Leventis Foundation	36. Seku and Sons
14. Extra Quality Sawmill Limited	37. Budu Consult Limited
15. Awusi Krama/Mill	38. Oro Oil Ghana Limited
16. Wings of the Sun Herbal Clinic	39. Beauty of Nature Hotel (Ecotourism)
17. Agro Ecom Ghana Limited	40. Pinora Limited
18. Nyonko pa Cocoa Buying Company	41. Albert Acquah (Cool Voltic) Limited
19.. Adikanfo Commodity Limited	42. Empekom Sawmill Limited
20. Amanase Gari Processors	43. Farmers' Home Agro-chemical
21. Amanase Akpeteshie distillery	44. HPW Fresh and Dry Limited
22. Kagyam Mining Company Limited	45. Next Africa Agro limited
23. Hengra ltd	46. Yayra Glover
	47. Gold Collective Company

**Appendix 7: Business distribution across the districts**

<b>Districts</b>	<b>Name of business contacted</b>	<b>Number of businesses</b>
Abuakwa South	Vicomeg farms/ Rephiden Resource Centre	9
	Bakers Association	
	Akuapem Gold Avocado Processing	
	Addo Joe's Enterprise	
	Akrasi Agyemang Woodworks	
	Bunso Arboretum/ Bunso eco-park	
	Palm oil association	
	Okumkom Chop Bar	
	Hengra ltd	
	Kwabeng Wold Works	
Atewa West	Agrochemical seller	9
	Chocho minerals water	
	Federated commodity	
	OLAM	
	Palm Oil Processors Association	
	Gold Collective Company	
	Kagyam Mining Company Limited	
Xtra Gold Mining Limited		
Fanteakwa South	Lexvee	5
	Ke ona le ma ehi	
	Work and happiness	
	J Unique Ice Limited	
	Charles Amoabeng Yeboah enterprise	
	Nenebi Herbal Clinic	
Kwaebibirem	Obonoma Herbal Clinic	7
	Budu Consult Limited	
	Oro Oil Ghana Limited	
	Obaa Pa Sawmill	
	Ampofo Kofi Sawmill Limited	
	Leventis Foundation	
	Jans Herbal Clinic	
Denkyembour	Seku and Sons Carpentry	7
	Extra Quality Sawmill Limited	
	Awusi Krama/Mill	
	Beauty of Nature Hotel (Ecotourism)	
	Wings of the Sun Herbal Clinic	
	HV Water Company Limited	
West Akim	Pinora Limited	8
	Agro Ecom Ghana Limited	
	Albert Acquah (Cool Voltic) Limited	
	Empekom Sawmill Limited	
	Farmers' Home Agro-chemical	
Nyonko pa Cocoa Buying Company		

	Adikanfo Commodity Limited	
	Next Africa Agro limited	
	Yayra Glover	
Ayensuano	Amanase Gari Processors	3
	Amanase Akpeteshie distillery	
Upper West Akim	HPW Fresh and Dry Limited	1
Suhum	Chocho Industries Limited	1
<b>TOTAL</b>		<b>50</b>

## Appendix 8: Spatial distribution of businesses across the districts



### Appendix 9: Sectoral distribution of business visited

<b>Sectors</b>	<b>Number of businesses contacted</b>
Service	13
Industry	16
Agriculture	7
Service & Agriculture	1
Industry & Agriculture	9
Industry & Service	4
<b>Total</b>	<b>50</b>

**Appendix 10: Sectoral distribution of business visited across the districts**

Districts	Sector of Business					
	Service	Industry	Agriculture	Service & Agriculture	Industry & Agriculture	Industry & Service
Abuakwa South	4	2	1	1	1	-
Atewa West	2	5	2	-	-	-
Fanteakwa South	1	1	-	-	3	-
Kwaebibirem	2	1	-	-	2	2
Denkyembour	3	2	-	-	-	2
West Akim	1	2	4	-	1	-
Ayensuano	-	2	-	-	1	-
Upper West Akim	-	-	-	-	1	-
Suhum	-	1	-	-	-	-
Totals	13	16	7	1	9	4

## Appendix 11: Description of business activities by sectors

Sector	Description of activities
<b>Agriculture</b>	<p><b>Production, Produce buying</b>            Farming, e.g. Cocoa farming (individual farmers); fish farming,            Buying of cocoa beans (e.g. Olam, Federated Commodities, Agro Ecom)            Nursery of avocado seedlings, grafting, planting of trees (e.g. Akwapem Gold Processing Limited)            Organic potato, cassava, cocoa, maize, plantain, banana; processing and export of cocoa beans;</p>
<b>Industry</b>	<p>Production of palm oil; sachet water;            Sawmill, furniture and fittings; Carpentry and furniture, planning of woods            Production of herbal medicine, education of herbal medicine, medical consultation on herbal medicine            Processing fruits into fresh fruits and fruit (orange, pineapple, lime Etc.) drinks (e.g. Pinora). Export of dry fruits and fruit snacks such as fruit balls, bars and mills (e.g. HPW Fresh &amp; Dry)            Export of timber, logging of timber, sawmilling, manufacturing of doors and pallets, doors and windows frames (e.g. EmpeKom)            Processing of palm nut into palm kernel oil, Selling of palm shell to processing and manufacturing companies in Tema as fuel, processing of palm kernel cake for poultry feed (e.g. Oro Oil)            Production of food and beverages such as baby foods fortified by orange flesh potatoes,            Production of animal feed;            Processing of gari (includes individual and groups of gari processors)            Distillation of Akpeteshi</p>
<b>Service</b>	<p>Carving, Carpentry works            Recreational/eco-park, butterfly sanctuary, afforestation &amp; reclamation of mined-out pits, greenhouse farming (e.g. Rephidim, Bunso eco-park, Beauty of Nature hotel, Boadua)            Catering services, e.g. local restaurants.            Sales of spraying machines, watering cans, agrochemicals            Provision of herbal-based treatment to various ailments, including diabetes, prostate cancer, infertility, stroke, typhoid fever, Etc.</p>

### Appendix 13: Grouping of businesses contacted in their respective district

Districts	Mining	Processing	Produce buying	Manufacturing
Abuakwa South		Vicomeg farms/ Rephiden Resource centre Bunso arboretum Addo Joe's Enterprise Akraasi Agyemang Woodworks Palm oil association Bunso arboretum		Bakers Association Akuapem gold avocado processing Okumkom Chop Bar Hengra ltd
Atewa West	Gold Collective Company Kagyam Mining Company Limited Xtra Gold Mining Limited	Kwabeng Wold Works Palm Oil Processors Association	Agrochemical seller Federated commodity OLAM	Chocho minerals water
Fanteakwa South		Ke ole ma ehi Work and happiness Charles Amoabeng Yeboah enterprise Budu Consult Limited Oro Oil Ghana Limited		Lexvee J Unique Ice Limited
Kwaebibirem		Obaa Pa Sawmill Ampofo Kofi Sawmill Limited Leventis Foundation		Nenebi Herbal Clinic Obonoma Herbal Clinic
Denkyembour		Seku and Sons Extra Quality Sawmill Limite Awusi Krama Beauty of Nature		Jans Herbal Clinic Wings of the Sun Herbal Clinic HV Water Company Limited
West Akim		Empekrom	Agro Ecom	Pinora Limited



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	Sawmill Limited Limited	Ghana Limited Farmers' Home	Albert Acquah (Cool Voltic) Limited
	Next Africa Agro limited	Agro-chemical Nyonko pa Cocoa Buying Company Adikanfo Commodity	
Ayensuano	Amanase Gari Processors	Yayra Glover	Amanase Akpateshie distillery
Upper West Akim			HPW Fresh and Dry Limited
Suhum			Chocho Industries Limited

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## Appendix 14: Summary of the Business Characteristics

<i>Indicators assessed</i>	<b>Number of businesses</b>
	<b><i>Years in business</i></b>
<i>Less than 1</i>	1
<i>1-5 years</i>	5
<i>6-10 years</i>	13
<i>11-15 years</i>	15
<i>16-20 years</i>	4
<i>20 years and above</i>	12
	<b><i>Ownership structure</i></b>
<i>Ghanaian</i>	45
<i>Both Ghanaian and Foreign</i>	5
<i>So Foreign</i>	0
	<b><i>Registration at Registrar General Department</i></b>
<i>Yes</i>	40
<i>No</i>	10
	<b><i>Type of registration</i></b>
<i>Sole Proprietorship</i>	17
<i>Partnership</i>	6
<i>Limited Liability</i>	27
	<b><i>Cooperative society organisation</i></b>
<i>Society</i>	7
<i>Not society</i>	43
	<b><i>Target market</i></b>
<i>Local</i>	19
<i>National</i>	17
<i>International</i>	14

**Appendix 15: Presentation of the businesses based on the number of years of operations, revenue level, number of employees, and corporate organisational effectiveness**

<b>Name of business</b>	<b>Years in business</b>	<b>Employees</b>	<b>Annual Turnover (GHC)</b>	<b>Organisational Structure</b>
Akuapem gold avocado processing	1-5 years	30	Above 4,000,000	Excellent Structure
Oro Oil Ghana Limited	11-15 years	65	100000-600000	Excellent Structure
Leventis Foundation	1-5 years	61	150000-300000	Excellent Structure
Beauty of Nature Hotel (Ecotourism)	6-10 years	10	100000-200000	Good Structure
Pinora Limited	11-15 years		100000000-500000000	Excellent Structure
Empekom Sawmill Limited	20 years and above	15	150000-500000	Good Structure
HPW Fresh and Dry Limited	6-10 years	300	100000000-500000000	Excellent Structure
Yayra Glover	11-15 years	70	100000000-500000000	Excellent Structure
Gold Collective Company	8 years	100	1,000,000-2,000,000	Excellent Structure
Kagyam Mining Company Limited	35 years	100	200,000,000.00	Excellent Structure
Chocho Industries Limited			100000000-500000000	Excellent Structure
Xtra Gold Mining Limited			100000000-500000000	Excellent Structure
Bunso arboretum/ Bunso eco-park	20 years and above	35	500000-2000000	Good Structure
Palm oil association	20 years and above	20	100000-500000	Weak Structure
Chocho minerals water	11-15 years	15	100000-500000	Good Structure
Lexvee	1-5 years	16	500000-1000000	Good Structure
J Unique Ice Limited	6-10 years	25	100000-700000	Good Structure
Budu Consult Limited	11-15 years	21	100000-600000	Good Structure
Albert Acquah (Cool Voltic) Limited	1-5 years	58	300000-600000	Excellent Structure
Next Africa Agro Limited	Below 1 year	19	100000-500000	Good Structure
Hengra ltd	6-10 years	35	960000-1500000	Good Structure
Vicomeg farms/ Rephiden Resource	11-15 years	8	118000-350000	Weak Structure

<b>Name of business</b>	<b>Years in business</b>	<b>Employees</b>	<b>Annual Turnover (GHC)</b>	<b>Organisational Structure</b>
centre				
Federated commodity	16-20 years	5	100000-500000	Good Structure
Charles Amoabeng Yeboah enterprise	20 years and above	7	100000-400000	Weak Structure
Nenebi Herbal Clinic	20 years and above	3	60000-200000	Weak Structure
Okumkom Chop Bar formerly Barima Nkwan	20 years and above	6	50000-100000	Poor Structure
Obonoma Herbal Clinic	6-10 years	4	50,000 - 100,000	Weak Structure
Jans Herbal Clinic	6-10 years	2	50000-100000	Weak Structure
OLAM	11-15 years	5	100000-500000	Good Structure
Palm Oil Processors Association of Kwabeng	20 years and above	10	40000-80000	Poor Structure
Obaa Pa Sawmill	11-15 years	6	50000-100000	Weak Structure
Ampofo Kofi Sawmill Limited	11-15 years	10	45000-95000	Weak Structure
Extra Quality Sawmill Limited	6-10 years	10	50000-100000	Weak Structure
Wings of the Sun Herbal Clinic	6-10 years	30	50000-100000	Weak Structure
Agro Ecom Ghana Limited	6-10 years	100	132,000,000.00	Good Structure
Farmers' Home Agro-chemical	6-10 years	6	100000-400000	Weak Structure
Nyonko pa Cocoa Buying Company	6-10 years	70	132,000,000.00	Good Structure
Adikanfo Commodity Limited	1-5 years	20	2,970,000.00	Good Structure
Amanase Gari Processors	11-15 years	15	50000-100000	Weak Structure
HV Water Company Limited	6-10 years		300000-600000	Good Structure
Addo Joe's Enterprise	20 years and above	2	40000-70000	Poor Structure
Akrasi Agyemang Woodworks	6-10 years	3	40000-70000	Poor Structure
Kwabeng Wood Works	20 years and above	2	50000-100000	Excellent Structure
Seku and Sons	11-15 years	3	50000-100000	Poor Structure

<b>Name of business</b>	<b>Years in business</b>	<b>Employees</b>	<b>Annual Turnover (GHC)</b>	<b>Organisational Structure</b>
Awusi Krama/Mill	11-15 years	62	100000-200000	Weak Structure
Amanase Akpeteshie distillery	11-15 years	5	20000-500000	Weak Structure
Ke ole ma ehi	11-15 years	10	30000-70000	Poor Structure
Bakers Association	16-20 years	6	30000-70000	Poor Structure
Agrochemical Seller	11-15 years	2	40000-50000	Weak Structure
Work and happiness	16-20 years	35	30000-70000	Poor Structure

## Appendix 16: Businesses and their dependencies on the Atewa forest ecosystem

Business categorization	Description of activities	Ecosystem dependency	Level of dependence	Types of businesses
Agrochemical	Selling of agrochemical to farmers	Oxygen, cool climate	Low	Kwabeng Agrochemical Seller, Farmers' Home Agro-chemical
Well-structured small and medium scale agro-processing	Palm oil, gari, avocado, cocoa beans processing	Oxygen, cool climate, fertile soil, water (from rivers and rain), biomass(fuel)	Medium	Lexvee, Budu Consult Limited, Oro Oil Ghana Limited, Leventis Foundation, Next Africa Agro limited, Akuapem gold avocado processing, Yayra Glover
Informal small scale agro-processing	Palm oil, gari, akpeteshi, avocado, cocoa beans processing	Oxygen, cool climate, fertile soil, water (from rivers and rain), biomass(fuel)	High	Palm oil association at Bunsu, Palm Oil Processors Association of Kwabeng, Amanase Gari Processors, Ke ole ma ehi, Work and happiness, Awusi Krama/Mill, Amanase Akpeteshie distillery
Produce buying	Purchasing of cocoa beans	Oxygen, cool climate, fertile soil, water (from rivers and rain)	Medium	Federated commodity, OLAM, Agro Ecom Ghana Limited, Nyonkopa Cocoa Buying Company, Adikanfo Commodity Limited, Yayra Glover
Manufacturing	Sacket water, fruit drink manufacturing	Oxygen, cool climate, water (from rivers and rain), fertile soil, biomass(fuel)	Medium	Chocho Minerals Water, J Unique Ice Limited, Albert Acquah (Cool Voltic) Limited, Hengra Ltd, Pinora Limited, HPW Fresh and Dry Limited
Health	Herbal medicine production and healing of diseases using herbal medicine	Oxygen, cool climate, water (from rivers and rain), sense of identity, spiritual cognition, biomass(fuel),	High	Nenebi Herbal Clinic, Obonoma Herbal Clinic, Jans Herbal Clinic, Wings of the Sun Herbal Clinic

<b>Business categorization</b>	<b>Description of activities</b>	<b>Ecosystem dependency</b>	<b>Level of dependence</b>	<b>Types of businesses</b>
		sense of identity, spiritual cognition		
Hospitality/Catering Services	Tourism, catering, baking, rearing and selling of fish	Oxygen, cool climate, habitat for animals and plants, ecotourism, wood(fuel), sense of identity, spiritual cognition	High	Bunsu Arboretum, Beauty of Nature Hotel (Ecotourism), Okumkom Chop Bar formerly Barima Nkwana, Bakers Association, Vicomeg farms
Mining	Exploration and extraction of gold	Oxygen, cool climate, water (from rivers and rainfall), land	High	Gold Collective Company, Kagyam Mining Company Limited
Woodworks	Carving, Sawmill, carpentry	Oxygen, cool climate, timber, rattan, bamboo	Medium	Addo Joe's Enterprise, Kwabeng Wood Works, Akraasi Agyemang Woodworks, Charles Amoabeng Yeboah enterprise, Obaa Pa Sawmill, Ampofo Kofi Sawmill Limited, Seku and Sons, Extra Quality Sawmill Limited, Empekom Sawmill Limited