



# Sustainable Management of the Lake Bosomtwe in the Ashanti Region of Ghana

António D. Abreu | Alberto Hernandez Salinas | Miguel Clusener-Godt

Project Implemented by:



With financial support from:



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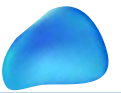
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LAKE  
BOSOMTWE



## Acknowledgments

### A word from crema and the chiefs

The Executive and the entire members of the Bosomtwe CREMA acknowledge the presence and the contribution of UNESCO/ MAB under the framework of sustainable management of Lake Bosomtwe project in the Ashanti region of Ghana.

We duly pledge our support and devotion in ensuring the sustainability of this Biosphere Reserve.

Thank you.

*Hon. Noble Afrifa Yamoah*

*Chairman CREMA*

We the chiefs the and people who custodians of the lake acknowledge and show gratitude's to UNESCO/ donor and all the key stakeholders for this noble and historic project under the framework of sustainable management of lake.

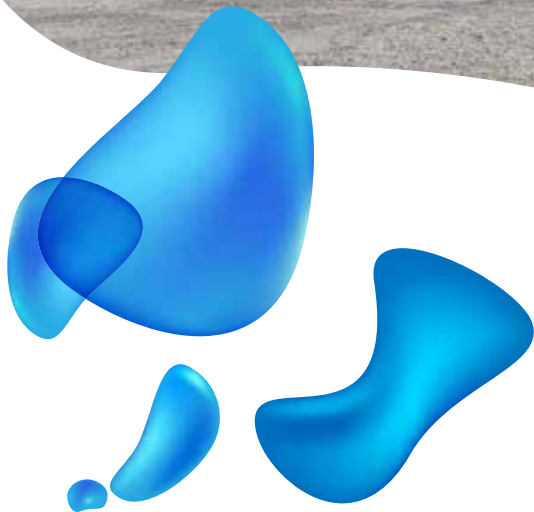
We are happy to be integral part of this project and we will make sure that the cultural practices needed to make the project a success and strictly adhere to.

Thank you.

*Nana Antwi Boasiako*

*Chief of Abono*





# Preface

## MAB Secretariat

Launched in 1971, UNESCO's Man and the Biosphere Programme (MAB) is an Intergovernmental Scientific Programme that aims to establish a scientific basis for the improvement of relationships between people and their environments.

MAB's work engages fully with the international development agenda –specially with the Sustainable Development Goals and the Post 2015 Development Agenda– and addresses challenges linked to scientific, environmental, societal and development issues in diverse ecosystems; MAB combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable.

The MAB programme provides a unique platform for cooperation on research and development, capacity-building and networking to share information, knowledge and experience. It contributes not only to better understanding of the environment, but also promotes greater involvement of science and scientists in policy development concerning the wise use of biological diversity.

This project has a main objective to create a New Biosphere Reserve in the Bosomtwe Lake area focused on the people and including research. During the 3 years of its implementation, the project promoted several issues involving research and monitoring programme on fresh water, soil and water conservation to promote alternative sources of livelihood, such as fish farming and agroforestry practices. It achieves also the creation byelaw of a Community Resource Management Area (CREMA) in charge of the management of the area. We hope the achievement of this project will be a good opportunity to inspire other communities in the world to be part of the World Network of Biosphere Reserve that are 631 biosphere reserves in 119 countries, including 14 transboundary sites. The results will be also presented during the 4th World Congress of Biosphere Reserves: A New Vision for the Decade 2016-2025. UNESCO Biosphere Reserves for Sustainable Development.

# Preface

## Ministry of Food, Agriculture and Environment of Spain

The basic objective of the MaB Programme is to establish a new system of relationships between people and nature based on the understanding that humans are not alien to the Biosphere but part of it. Today's world is the result of a millenary relationship between people and their surroundings. However, socioeconomic development needed by human society must not imply the degradation of the natural environment and loss of biodiversity that puts in jeopardy the very viability of the development model. In this respect the MaB programme advocates the integration of social, economic and environmental components in what has been called "sustainable development".

The World Network of Biosphere Reserves is the largest network of protected areas in the world, with a surface area of over five million square kilometers, approximately the equivalent of half Europe. By 2015, 120 countries have declared a total of 651 biosphere reserves on their territories. This network is very heterogeneous; some reserves are larger than countries such as the United Kingdom or Italy. They range from tropical ecosystems to deserts, from high mountains ecosystems to wetlands, savannahs, etc. Practically all ecosystems and all biogeographical regions are represented in this network. However, as stated before, it is not only natural systems that have a prominent role in the reserves, but also the human factor, society and its relationships with nature that are considered as an essential part of biosphere reserves and it is precisely this integrating approach that makes the concept different from other protection classification.

In today's world, where global climate change and other problems are questioning our development model, special emphasis must be placed on underscoring that biosphere reserves are ideal territories on which to launch pilot experiments implementing the MaB Programme's sustainability model.





In this context, Spain, with forty-seven designated biosphere reserves on its territory, is the country together with the United States with the highest number of biosphere reserves. Right from the start of the MaB Programme, Spain has been one of the most active countries within UNESCO, dedicating great efforts to the development of the MaB Programme.

The Ministry of Agriculture, Food and Environment of Spain has set, as one of its objectives, international cooperation on the protection, management and dissemination of protected natural areas. On this regard Spain has contributed to the development of the MaB Programme in other countries. The cooperation project “Sustainable Management of Lake Bosomtwe in the Ashanti Region of Ghana” is an example of these activities.

The “Sustainable Management of Lake Bosomtwe in the Ashanti Region of Ghana” project has an ultimate goal the conservation of the environment of this geographic area, its sustainable development to preserve the Bosomtwe Lake of the impacts endangering the ecosystem, as well as to preserve the Lake’s biodiversity.

# Project Description

The present publication aims to resume the results of the project “Sustainable Management of Lake Bosomtwe in the Ashanti Region, Ghana. This report was developed following two main activities: a) desk review of relevant documentation from the project and, b) field mission with visits to sites and communities, consultations and discussion with local and national authorities, donor’s representatives, UNESCO officials and other relevant stakeholders, which were used to highlight the main outcomes of the project.





## Objectives

The project aimed at enhancing the sustainable management and conservation of Lake Bosomtwe, the largest natural lake in West Africa and the only natural lake in Ghana. Lake Bosomtwe is very rich in aquatic biodiversity of national and global significance, but has become particularly vulnerable due to intense human pressures. Existing traditional laws and uses have helped to prevent the overexploitation of resources in the lake and its catchments area; which subsequently has ensured sustainable fish productivity of the lake. However, localized pollution of the lake and the degradation of the forests in the catchment area are undermining the integrity of the lake. Increasing demand for resources due to rising population as the situation currently is could also have adverse impacts on the available resources.

The project promoted an integrated approach to conserve the aquatic and terrestrial biodiversity in the basin and catchment by supporting traditional conservation practices and a community based conservation programme. Information on indigenous water conservation and management practices were elicited using socio-economic surveys. This information will be mainstreamed into current scientific and practical approaches to water management, to develop best practices for sustainable conservation and management. Consultations were promoted with fishers, farmers and other stakeholders contributing to establish community ownership and consensus. Apart from raising stakeholder awareness to the importance of water in the human development agenda, capacity building of stakeholders was also an integral part of the project in order to ensure an active role in monitoring and protecting the lake and its catchment areas. A final objective of this project is to promote the establishment a biosphere reserve in the area as a tool for the long term and sustainable management of natural resources and development of communities around the lake.



**As specific objectives, the project established the following:**

1. To document cultures at risk and what replaces them, if any, for the conservation of Lake Bosomtwe.
2. To identify and document sources of water to Lake Bosomtwe and their seasonality.
3. To promote soil and water conservation and good agricultural practices in the catchments.
4. Promoting alternative sources of livelihood, such as fish farming and agro forestry practices.
5. Develop a comprehensive and long-term lake water quality monitoring programme as a tool for water quality management.
6. Build capacity, especially at the community level for monitoring and protection of the lake and its basin resources.
7. To create community based water conservation approaches as integral part of water development projects and programs.
8. Bring into enforcement all environmental related laws, including undertaking of EIAs in all projects around the lake and its catchments.
9. Set up a management system made up of the relevant stakeholders with an appropriate organizational set up to help ensure sustainable management of the lake.
10. To enhance public awareness of the importance of water in all human development agenda.
11. Promote and support the creation of a biosphere reserve in the area.

## Organization

The project started through the installation of a management unit, who was responsible for the organization and implementation of project's activities. The daily management of the project was delivered to a project implementation unit, which was responsible for the establishment of a work plan and all other required functions and activities. The implementation unit was based in UNESCO's office in Accra .

A Steering Committee was also established including representatives of all relevant stakeholders involved in the project, such as the Ministry of Water Resources Works and Housing, the Mahnyia Palace, local communities, university and other research institutions, the MAB National Committee and UNESCO. The Steering Committee's activities included regular meetings and the global monitoring of all project's activities.

The implementation of the project main specific activities was endorsed through outsourcing, when required, to external organizations after a public selection process published on national newspapers.







Table 1

Organization/Team	Implemented activities
A Rocha Ghana	<ul style="list-style-type: none"> <li>• Promoting environmentally sustainable alternative forms of livelihood.</li> </ul>
Friends of the Earth, Ghana	<ul style="list-style-type: none"> <li>• Human Capacity Building for lake monitoring and protection.</li> <li>• Enhancing public awareness.</li> </ul>
CSIR – Forest Research Institute of Ghana	<ul style="list-style-type: none"> <li>• Promotion of good agricultural practices, soil and water conservation.</li> </ul>
Intelligence Nature International	<ul style="list-style-type: none"> <li>• Documentation of cultures at risk and what replaces them.</li> <li>• Promoting conservation of the lake and its fisheries resources through appropriate agro forestry and fisheries practices</li> </ul>
CSIR - Water Research Institute, Accra	<ul style="list-style-type: none"> <li>• Documentation of water sources and seasonality.</li> <li>• Long-term water quality and management.</li> </ul>
MAB National Committee	<ul style="list-style-type: none"> <li>• Enhancing public awareness on the MAB concept</li> <li>• Ensuring nomination of an area as a Biosphere reserve</li> <li>• Formulation of management system made up of relevant stakeholders to ensure sustainable lake management.</li> </ul>

## Actions

### Alternative livelihoods for sustainable conservation and development

Through and in depth characterization and dialogue with all communities living in the catchment of Lake Bosomtwe it was possible to identify alternative livelihood options such as the introduction of grass-cutter rearing, mushroom farming, snail farming and bee keeping. Training was provided and addressed to all community members with special focus on gender equality (Table 2), including the management and handling with each specific activity or alternative livelihood as well as on small business organization and management. Demonstration centres were installed aiming to ensure training, marketing, and support to scaling-up ongoing successful entrepreneurs and back up eventual failures. These demonstration centres also serve to support and incentivise other communities.

The benefit of these trainings on alternative livelihoods was distributed equally between men and women.



Table 2 – Participation in training activities

Intervention in alternative livelihood	No. (males)	No. (females)	Total
Grass-cutter rearing	188	43	231
Mushroom farming	140	93	233
Snail farming	96	105	205
Beekeeping	100	135	235



## **Awareness and capacity building on water quality and monitoring**

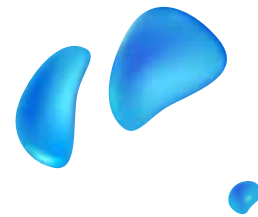
During the project a water quality monitoring programme was build up on the use of biological and ecological indicators such as the macro-benthic invertebrates. Around 1000 students, boys and girls, from basic schools were trained and integrated in environmental clubs from 18 communities. Systematic collection of ecological data (biotic and abiotic) was introduced and supported with sampling equipment and other scientific instruments. Field data sheets were used to record and report data collected in order to build up a database.

## Water and soil management

Ecosystem sustainability through water and soil management by introducing conservation agriculture was promoted through training and the selection of key interventions covering the main agro-ecological units: on-farm, on-shore and community living areas. For each of these types of areas selected interventions were made after awareness, training and dialogue with the communities. Specific interventions were selected according with the priorities identified. For the on-farm sites the main activities included trees with cash and food crops, selection of lots for timber and firewood production and conservation agriculture – legume intercropping improving soil fertility and alternative income. On the on-shore sites the priority activities chosen were the planting of economic and multipurpose trees – soil conservation and fruit production – and the use of Vetiver grass to prevent erosion and sediment transport from land to the lake. On the community living sites the main activity selected was the use of Vetiver grass to prevent soil erosion.

Community nurseries provided seedlings and agriculture cash crops, which were introduced on training and demonstration activities





## Water quality

The lake water basin was deeply studied in order to identify and map water sources and to establish a water quality assessment including the human related factors influencing water quality. A physical, chemical and bacteriological assessment was developed providing a base line reference for future monitoring. Water quality parameters measurements were combined with meteorological, environmental chemistry and sediments. The continuation of this complete monitoring programme will provide essential and solid information for the lake management as well as will serve as scientific project to be supported by the future biosphere reserve.

Communication, educational and awareness activities can be potentiated by combining this scientific activity with the macro-benthic invertebrate monitoring programme ensuring the knowledge transfer to the school community and contributing to increase the scientific base of the education on Lake Bosomtwe communities.

## Culture and conservation

Traditional knowledge and practices and some of the cultural relation between the communities and the lake were identified as a potential contribution to the conservation of the lake. This includes fisheries as well as agro forestry activities. Some cultures at risk were identified even if not being replaced by other practices. Planting and agro forestry activities were promoted in upland waters complemented by awareness and training as well as fish catch monitoring was established at two sites aiming to demonstrate the vulnerability and variation of the catch and its relation with fish stock management introducing the need of preserving sites for breeding and the limits for aquaculture.





## The future Lake Bosomtwe Biosphere Reserve

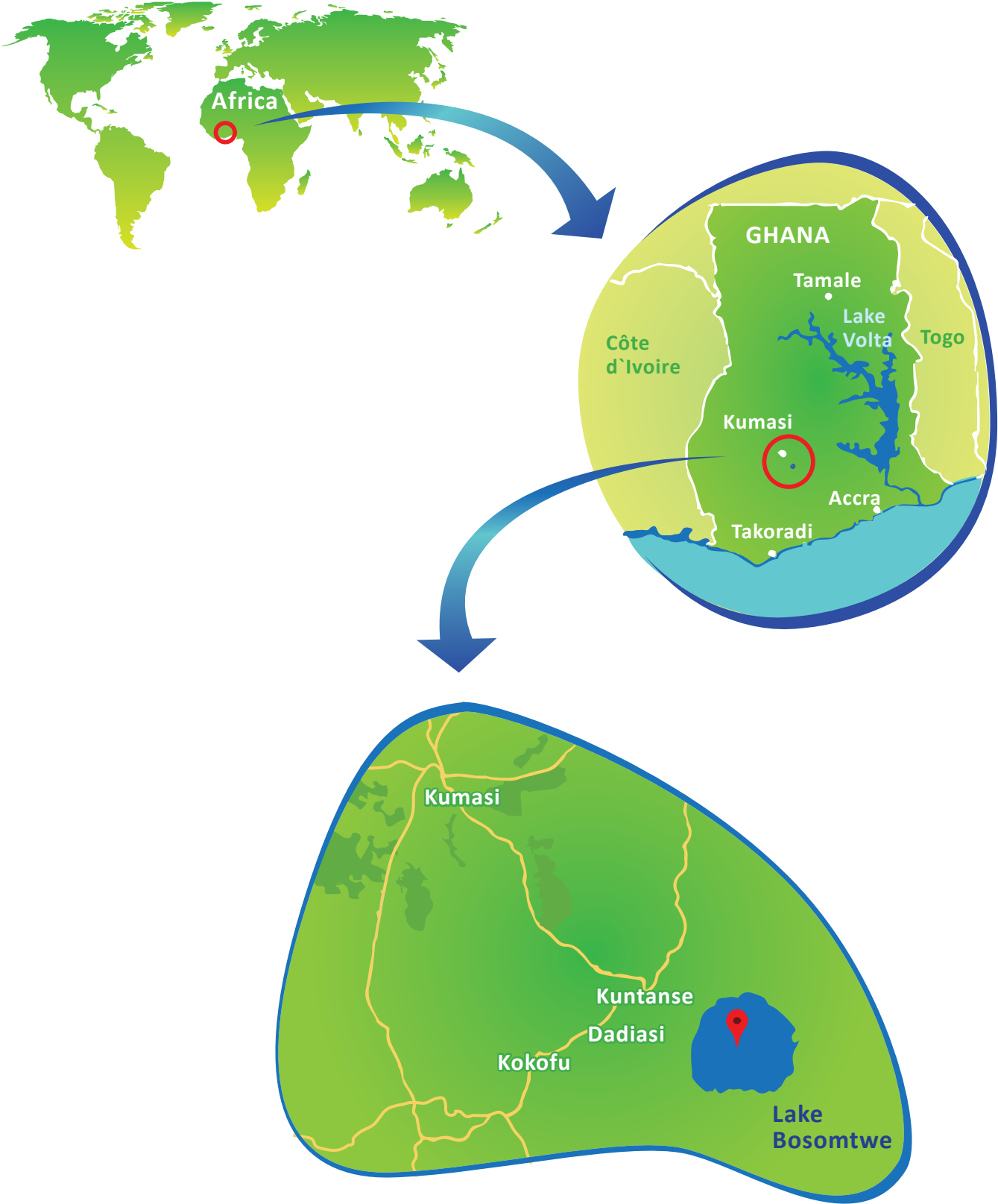
As an overall goal of the project, the application of Lake Bosomtwe as a future UNESCO Biosphere Reserve aims to secure a tool for an integrated sustainable management of the Lake and its communities. The project provided demonstration activities, knowledge and ideas that can be combined and promoted in order to ensure the ecological and social sustainability of the Lake Bosomtwe.

The concept of Biosphere Reserve was introduced and well perceived by the communities and it is highly recognized by communities and leaders.

Ecological and social base line studies were conducted enabling a solid characterization of the Lake Bosomtwe and identification of relevant natural, social and cultural values. These studies, including land use, geology, hydrology, sociology, soil, habitats and species, together with the water monitoring and ecological monitoring programmes will support the nomination dossier for the future Biosphere Reserve.

The future Lake Bosomtwe Biosphere Reserve will bring together the lake communities on conservation, sustainable use and management of the natural resources, providing opportunities to explore new and innovative socio-economic development strategies under a green economy vision and looking for job opportunities, especially for the youth. It will be also promoting gender equality and women's empowerment. The development of the project led to the creation of a CREMA (Community Resource Management Area).

Geographic location





## General description

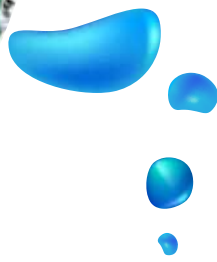
### Climate

The Lake Bosomtwe area falls within the equatorial zone with a rainfall regime typical of the moist semi-deciduous forest zone of the country. There are two well-defined rainfall seasons. The main season occurs from March to July with a peak in June. The minor season starts from September to November with a peak in October. The mean annual rainfall is between 1600m-1800m. The main dry season occurs in December to March during which the desiccating harmattan winds blow over the area.

The temperature of the area is said to be uniformly high and throughout the year ranging between 32°C in March and 20°C in August.

Relative humidity is generally high throughout the year. The morning relative humidity (RH) is highest during the minor dry season and start of the minor wet season (95%) whilst the lowest is towards the end of the main dry season





## **Biophysical Geology, geomorphology and soils**

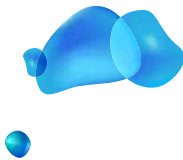
Two types of soils are described for the Lake Bosomtwe catchment area: Gleyic Alisols, corresponding to around 55% of the area and covering from the North to North-western parts of the area proposed to be included in the Biosphere Reserve and, Ferric Acrisols, covering from the south to south-eastern part of the future Biosphere Reserve.

In relation with mineral resources, the area shows a significant potential as it includes gold, sand, clay and stone deposits as well as forest resources. For the moment only two recently installed and operating sites were identified.

## Land cover and water

The main land cover types corresponds to open and closed tropical forest, grasses, bare surfaces, built up/residential areas, agricultural lands and water bodies. Agricultural practices are carried out in all the communities. When comparing the available satellite imagery of 1990 and 2010 it is evident an increasing trend of bare surfaces and built up areas at the expense of forest and other vegetated area.

In terms of land uses, the immediate Lake's environs are characterized by uncontrolled development of structures, which calls for planning in order to prevent potential impacts of unsustainable landscape management.





**Mixed Arable Crops:** The local inhabitants carry out subsistence farming, mixed arable cropping to feed their families, the total area covered by these activities is 5058.36 hectares, which forms 17.58% of the total area of the future Biosphere Reserve.

**Mixed Arable and Tree Crops:** Most of the farmers are also involved in other food and cash crops farming like large scale food cropping and other tree cropping like cocoa, oil palm and citrus plantations.

The total area covered by these types of farming is 13853.82 hectares, which forms about 48.16% of the total area of the future Biosphere Reserve.

**Fallow Land:** The lake environment is surrounded by steep hills, rocky areas and inaccessible places due to the topography nature of the slopes. Most of these areas are left as fallow lands which has a total area of 2851.15 hectares, this also forms 9.9% of the total area of the future Biosphere Reserve.

**Forest Reserve:** The Southern Part of the project area is covered by a Gazetted Government Forest Reserve with a total area of 1434.73 hectares, this also forms 4.9% of the total area.

**Mining:** Small-scale illegal mining activities have started in the Southern and Eastern parts of the project area. The total area of these activities is 41.93 hectares which forms 0.15%.

**Riverine Vegetation:** These are dense vegetation along some of the rivers especially their catchment areas, total area of these riverine vegetation is 25.85 hectares, this forms 0.09% of the total project area.

**Shrine/Sacred Grove:** This covers a 0.029 hectares of the project area and its forms only 0.0001% of the total area.

**Water body:** The lake forms the main water body of the project area with a total area of about 4927.60 hectares corresponding to 17.13% of the total area of the future Biosphere Reserve.

## Ecosystems

The future Biosphere reserve is located in the deciduous forest zone of Ghana consisting of a mixture of three basic types of ecosystems: forests, wetlands and mountains.



**Forest ecosystem:** The area includes part of the Bosomtwe range forest with tree species. About 35 tree species including 3 Scarlet species (threatened by overexploitation), 3 Red species (significant pressure from exploitation), 9 Pink and 20 Green species (species of no conservation concern) were identified during the species survey conducted under the Sustainable Management Of Lake Bosomtwe Project. They include timber species such as the endemisms *Khaya ivorensis* and *Triplochiton scleroxylon*. Also endemic to the forest ecosystem are 8 species of ants, termites, 19 species of butterflies, 5 species of amphibians, 2 species of reptiles, 29 species of birds including 2 of conservation interest and 29 species of mammals.

**Wetland ecosystem:** As the only natural lake in Ghana and one of six meteoritic lakes in the world the Lake Bosomtwe presents a unique diversity of species particularly *Tilapia busumana* which is considered vulnerable and found nowhere else in the world, and *Hemichromis frempongii*. Being an inland crater, the lake has no known outflows and has the tendency to increase concentration of dissolved and particulate matter. Conservation is critical in managing the inflows of dissolved and particulate matter to ensure that the lake can continue to support both human and aquatic life forms as well as managing siltation levels. Conservation of flora within the crater slopes will ensure the sustainable exploitation of the lake and slow the accumulation of sediments and solutes.

**Mountain ecosystem:** The Bosomtwe Range constitutes a vital system, which influences the hydrology, climate and geology of the area. The mountains have the forest reserve hosting a significant number of endemic species.

## Biodiversity

At the species level the terrestrial biodiversity of the Lake Bosomtwe future Biosphere Reserve includes 35 tree species, 8 species of ants, 19 species of butterflies, 5 amphibians and 2 reptiles, 29 bird species and also 29 mammal species. Some of these species are endemic and several have conservation status, at national and international level.



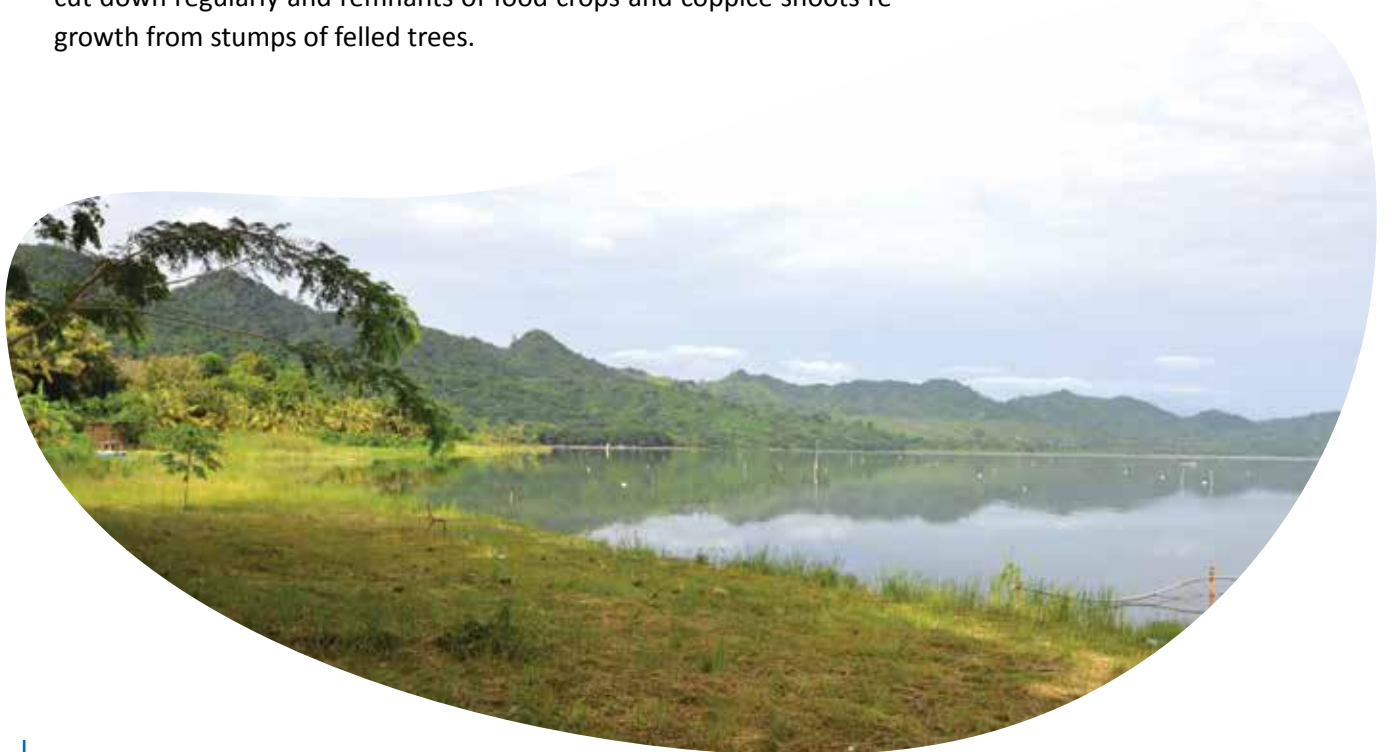
## Vegetation

The natural vegetation of the area falls within the semi-deciduous forest zone of Ghana, which is characterized by plant species of the Celtis-Triplochetal Association. However, due to extensive and repeated farming activities in the past, the original vegetation has been degraded to mosaic of secondary forest, thicket and for re-growth and various abandoned farms with relics of food crops and vegetables.

The Secondary Forest, with an average age of ten years, it is characterized by close upper canopy at height of about 9m with a number of growing soft wooded trees and few hard woods. It has less open undergrowth of spiny shrubs and climbers. The major tree species are *Terminalia Spp*, *Funtumia Spp*, *Ceiba pentandra*, *Bambax Spp*, *Archonia Spp*, *Corfolia*, *Celtis mildbraedii*, *Triplochiton scleroxylan*, *Elaeis guineesis*, *Trema senegalensis* And *Ficus Spp*.

Thicket corresponds to forest areas of about five years with relatively impenetrable mass of shrubs, climbers, coppice shoots and young trees. They are difficult to clear. The mass is dominated by *Chromolaena odorata* (Acheampong Weed) with few trees above the mass. Other plant species are *Trema senegadensis*, *Alchomea cordifolia*, *Accasia pennata*, *Mallotus oppositifoluis*, *Ficus Spp.*, *Elaeis guinnensis* with remnants food crops of cassava, plantain, cocoyam etc.

The Forb regrowth consists of soft-stemmed leafy herbs mostly *Chromolaena odorata* and weeds which appear on farm and have to be cut down regularly and remnants of food crops and coppice shoots re-growth from stumps of felled trees.





## Fauna

### Mammals

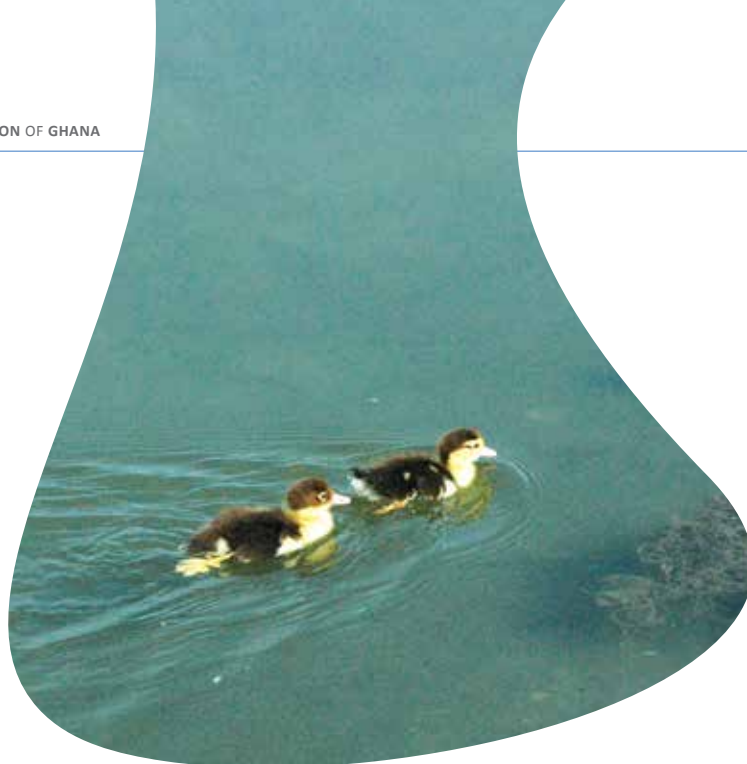
Five mammal taxonomic groups, representing 17 Families, 26 Genera, and 29 Species have been confirmed during the during a baseline survey in 2013.

Rodents were the most widespread and diverse family and accounted for 38% of all mammals compiled. Giant rats and grasscutters represented the most abundant species. Brush-tailed porcupines and forest squirrels were however restricted to the proposed core areas, in abundance and distribution. Bats were the least number of species, representing about 10% of the total mammals. Most of the mammal species were forest dependant and thrived in forest habitat. The only species of serious conservation importance of Near Threatened (IUCN, 2012); the tree pangolin was recorded in the core area of the Bosomtwe Range Forest Reserve. Both Tullberg's soft furred mouse (*Proamys tullbergi*) and the shrew (*Crocidura gradiceps*) are endemic to West Africa.

Confirmed carnivores were mongooses, civets, genets and pangolins. Although, these species occurred in lower densities, they were largely restricted to core zones. Major ungulate species including bushbucks, Maxwell's duiker, royal antelopes and black duikers were also restricted to areas that have had minimal disturbance.

A few indirect recordings of primate activity were made in core areas represented by the Bosomtwe Range FR. These were largely of pottos, galagos, lesser spot-nosed and Lowe's monkeys. Several hunters interviewed also confirmed the presence of these primate species in the Bosomtwe Range FR.





## Birds

Twenty-nine (29) bird species, belonging to 25 genera and 16 Families were recorded in the study area. Fourteen percent (14%) of the species recorded belonged to the Family Accipitridae. Phasianidae, Columbidae and Ploceidae were represented by 10% each. Rare families included Ardeidae, Strigidae, Caprimulgidae, Pycnonotidae, Meropidae, Capitonidae, Hirundinidae and Dicruridae with a record of 3% species each. Village weaver, lesser striped swallow, common bulbul, brown night jar, Senegal coucal, red-chested cuckoo, green turaco, green fruit pigeon and black kite were also recorded during the base line studies.

## Butterflies

Nineteen (19) species, belonging to 6 Genera were identified. Most of the specimen collected and recorded belonged to the Families Limenitidinae (32%) and Satyrinae (32%). Another Family included Charaxinae (26%). Rarer Families were represented by Coliadinae (5%) and Nymphalinae (5%). The unfavourable weather conditions that characterised the sampling period might have accounted for the striking absence of Hesperidae (skippers) from the list.

*Eurema senegalensis* recorded the highest number of individuals in the survey but was not recorded in the proposed core and buffer zones possibly due to the occurrence of wetter conditions than other parts of the study area. The activity of the Family Charaxinae known to be canopy dwellers was much recorded on the road side more than the forest interior. They presumably make frequent flights in the open canopy (road) due to light and as a fruit feeder recorded their highest numbers along the roadside.

All butterfly species that were recorded in the entire study area, belong to species of the lowest priority in conservation categories.

## Herpetofauna

Five (5) amphibian species were recorded in the entire study area belonging to 3 Genera and 3 Families. Seventeen species were recorded in the proposed core area, six in the buffer area and three in the transition area. Sixty percent (60%) of the species recorded belonged to the Family Phrynobatrachidae.

Amphibians were generally difficult to encounter in the study area and individuals encountered represented a variety of habitats including forest, and areas with degraded vegetation. It is expected that with an increase in re-forestation programmes in the core areas, a shift in species is likely to occur

The activities of reptiles (forest cobra, green mamba and puff adder) were among the least recorded animal signs. Whilst the green mamba was recorded in all the management zones, forest cobras were recorded only in the proposed core and buffer zones and puff adders were restricted to areas in the core zone.

The most significant species with conservation relevance of Near Threatened (IUCN, 2012) is the tree pangolin (*Phataginus tricuspis*) that was recorded in the core area of the Bosomtwe Range Forest Reserve. Both Tullberg's soft furred mouse (*Proamys tullbergi*) and the shrew (*Crocidura gradiceps*) are endemic to West Africa.

*Tilapia busumana* is also endemic only to the Lake and there is the need to protect it from extinction through regulation of fishing effort.



## Culture and socio-economy

The lake constitutes an important natural and cultural heritage for the Ashanti kingdom. It is believed to have been formed when a meteorite hit its present site about a million years ago. The crater (hole) from the asteroid's impact later got filled with rainwater, and the lake was formed. The lake was discovered about 360 years ago by a hunter from Asaman when he was chasing an antelope he had shot. According to the account, the game vanished in the lake which the hunter found to contain some edible fish.

The hunter informed his chief (Asamanhene) of his discovery who informed the king of Ashanti. The lake is therefore considered sacred with its conservation supported by many theories of indigenous knowledge. It is renowned for its unique fishery of all wooden non-motorized vessels used for artisanal fishing.





Traditional rites are performed along the lake for communication with the gods before development activities are allowed in the water.

The future Lake Bosomtwe Biosphere Reserve includes sixty communities located around the Lake. The main communities located along the lakeshore are: Duase, Ankaase, Bansa, Esaase, Apewu, Detieso, Nkowi, Pipie, Brodekwano, Abono, Anyinatiase, Adjamam, Amakom, Atafam, Beposo, Konkoma, Mim, Asisiriwa, Obo, abase and Adwafo.

The main ethnic group in the area of the Lake Bosomtwe is the Akan, corresponding to 97.9%. The distribution of the Akan tribe includes 96.8% Ashanti, 0.8% Fantes and 0.3% Akuapims with the Northern tribes including the Frafas, Mamprusi, Dagaati and Kusaasi and accounting for 1.3% of the respondents to the surveys while the Bonos and Ga account for 0.8%.



Agriculture is the main land use activity with the majority of people depending on farming as their source of livelihood and the principal means of employment. Shifting cultivation characterized by slash and burn is the major practice. The major agricultural land uses are:

- Cocoa farming
- Food crop farming, and
- Bush fallow

The non-agricultural land uses include:

- Human settlements (towns, villages and hamlets)
- Small scale mining
- Feeder roads and tracks.





## Organization

In order to ensure an adequate and participative management model, the area was designated as Lake Bosomtwe Resource Management Area (CREMA), under the Bosomtwe and Bosome Freno District. This corresponds to “a geographically defined area which is endowed with sufficient natural resources, and the communities have organized themselves for the purpose of sustainable natural resource management.” This designation process follows the existing traditional community decision-making structures and processes. It also has an executive and a constitution, which is legalised by the District Assembly by-law to guide and regulate its activities . Women were also part of the CREMA management structure composed about 30 people.

## Functioning and Management

The community committee will be in charge of the management of the future Biosphere Reserve in close cooperation and with the administrative support from all regulatory and research institutions with the WRC acting as the coordinating institution as the WRC is the government institution responsible for the management of water resources in Ghana.

The management committee will include representatives of all relevant institutions (EPA, WRC, Fisheries Commission, District Assemblies) and stakeholders such as the traditional leaders honorary members and others.

## Proposed projects

Within the management plan, several projects were designed aiming to support and promote the sustainable use of the natural resources and the community development reinforcing the balance of women's and men's responsibilities. The participation of women in the different project promoted under this project to achieve the nomination of the Biosphere Reserve, indicated as well the engagement of women in the social life. The creation of this new Biosphere Reserve will be promoting gender equality and women's empowerment. Some of the proposed projects are describe below, addressing natural, cultural, economic and development topics.



## Vegetation management

Annual fires are a serious threat to the vegetation and all effort must be undertaken to control occurrence. Continuous clearing of the remnant forests is a serious problem in the project area. This situation will be addressed through a set of actions aiming to stop illegal logging and the clearing of forest and other activities that degrade the vegetation. Encouraging the introduction of agroforestry on farms, promoting diversity of cultures and the use of indigenous trees will be developed in order to restore the forest and prevent erosion, specially along the lake shore. Education and awareness on best practices and forest fire prevention will complement these actions.

## Habitats and wildlife management

There is generally high abundance of wildlife in forested areas than open areas. The abundance and diversity of fauna species is substantially determined by human activities. Wildlife habitats (forest) continue to be converted to farmlands and degraded land in most areas. Very little forest remains outside of the Bosomtwe Range Forest Reserve.

Hunting regulations will be enforced despite community members have come to rely upon bush meat as their source of food and off-reserve areas for economic activities.

Also in the Lake itself, at the moment there are too many fishermen who fish everyday throughout the year. It has been shown that pressure from over 1000 fishermen in the 24 communities surrounding the lake has led to a drastic reduction of fish stocks. The sizes of fish being caught presently are becoming increasingly smaller resulting in the use of net mesh sizes as low as mesh size of mosquito nets which is 2mm, with the obvious impacts of non selective fishery.

The establishment of refuge areas and better regulation of off-take inside the Biosphere Reserve will be implemented in conjunction with awareness, education and provision of alternative sources of livelihood and protein.







### Farming and domestic animals

The indiscriminate clearing of the forest for farming is one of the major factors of environmental degradation in the area. Logging and clearing of forests for new farms are a common threat to the habitats in most of the communities. Illegal logging and chain-sawing activities for instance, are relatively higher in the Bosomtwe Range Forest Reserve, part of which is to be designated as a core zone.

Rearing of animals close to the shores of the lake or near streams is becoming a significant source of soil and water pollution exacerbated during the rainy season.

Regulations and control mechanisms in order to avoid and reduce clearing the forest for new farms should be implemented, possibly through new legislation. Training and awareness on livestock management will be provided including the management of wastewater and residues resulting from livestock.

## Waste management

Currently, the disposal of waste both solid and liquid is a major concern in all the communities resulting in direct and diffuse pollution of soil and water courses and in particular in the Lake. There is an urgent need of proper water management in all communities with adequate infrastructures, equipment and community engagement and participation.

Public toilets or pit latrines should be installed in all communities and managed properly. Containers and collection of waste should be ensured for all communities and for those that are presently inaccessible, alternative solutions should be found, such as pits, after careful choose of their locations and size.

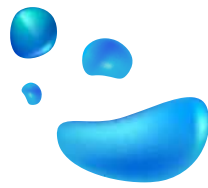
## Heritage and culture

The Ashantis consider Lake Bosomtwe as a god, thus representing a sacred place. However there are several other sacred sites around the lake that are of cultural importance to the people in the Ashanti region.

A detailed inventory of all historic and cultural sites should be developed identifying the possibility of their potential use for economic activities such as tourism and establishing regulations and control mechanisms. A maintenance and protection programme should be established for these sites.







## **The Biosphere Reserve and community development**

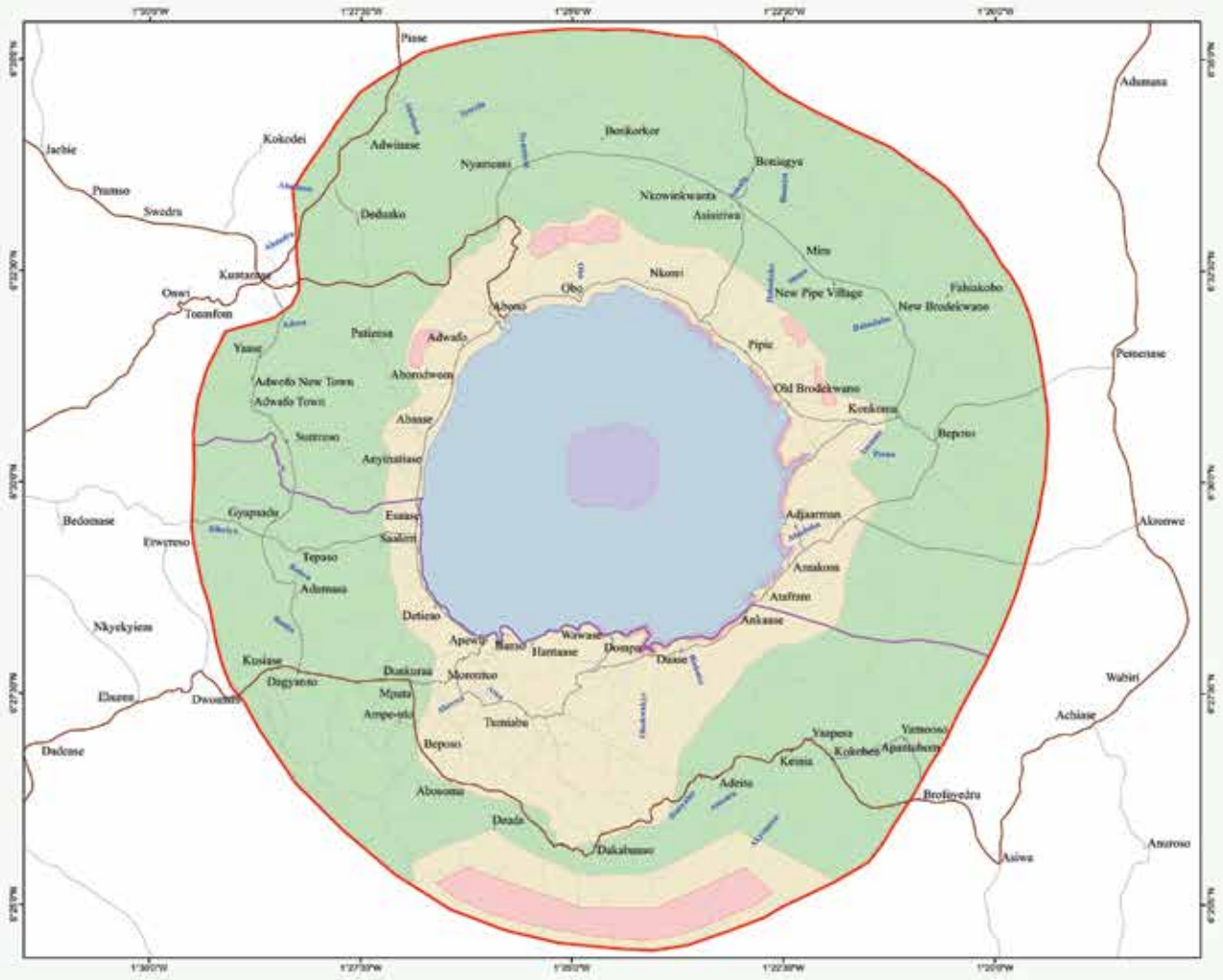
As an overall goal of the project, the application of Lake Bosomtwe Community Resource Management Area as a future UNESCO Biosphere Reserve aims to secure a tool for an integrated sustainable management of the Lake and its communities. The lessons learned from the project provides demonstration activities, knowledge and ideas that can be combined and promoted in order to ensure the ecological and social sustainability of the Lake Bosomtwe.

The concept of Biosphere Reserve was introduced and well perceived by the communities and it is highly recognized by communities, authorities and traditional leaders.

The ecological and social base line studies enabled a solid characterization of the Lake Bosomtwe and identified the relevant natural, social and cultural values.

The integration and analysis of all relevant biophysical and socioeconomic base line information was used to support a proposal of design of the future Lake Bosomtwe UNESCO Biosphere Reserve, with a functional design of the three types of zones. Core ones (land an aquatic) are proposed aiming to ensure an adequate conservation function of the most relevant natural values supported by buffer zones and complemented with transition zones where the socio-economic activities take part.

# HYDRO AND THE PROPOSED ZONATION MAP OF THE LAKE BOSUMTWE STUDY AREA



Location Map



Legend

	Settlement		Project Area Boundary
	Trunk Road		District Boundary
	Feeder Road		Lake Boundary
	Track/Footpath	<b>ZONES</b>	
	River/Stream		Core Area
			Buffer Zone
			Transitional Area





Project Implemented by:

