Design Statement

Project: Abetenim Sustainable Art Village “Gye Nyame”
Client: Nka Foundation

Giuseppe Calabrese – Architect

I was interested in the problem of tradition, Africa is a place where the religion has a tremendous force. So I tried to make an african architecture rich in symbolism that evokes an african village, creating an organic complex of streets, buildings and open spaces. The Art Exhibition centres as well as the other earth domes are conceived with a central skylight to offer diffused light from above.

The spine of the building seems to be moving just like an organism to embrace along its movement all the various art episodes, from the entry to workplaces to the services area at the very end of the spine. This Arts Village will certainly have a high aesthetic appeal and be recognised worldwide as a benchmark for modern design.

The spine, being oriented at 20 degrees in relation to the prevailing winds offers optimum cooling of the building, the timbrel vaults being open at both sides allow the hot air to evacuate the building before the heat is absorbed by the materials themselves.

Internally adjacent to the entry and closer to the carpark is the performing art and conference centre, externally an open theatre has been also included to cater for open air exhibitions and concerts.
To achieve sustainability the project was based on the principles of designing for climatic comfort with low-cost construction, making the most of local materials and the potential of the local community. The Art Village has been conceived as an exemplar that would raise awareness in the local community of the merits and enormous potentials of traditional materials.
On the fringes of environmental issues, earth with its innate thermal and environmental qualities needs to be rediscovered not as a ‘poor’ material, but a modern material, as the entire world is starting to embrace this ultimate sustainable material as never before.

Climatic considerations largely determined the buildings form and materials. The prevailing winds have been analysed in the various seasons to take advantage of its direction and improve the ‘coolth’ of the entire Art Village.

The structure comprises traditional load bearing walls made from stabilised and compressed interlocking CSEB bricks made with a simple Cinva RAM manual press. These walls are along the main spine of the entire Art Village. Beams are made from composite earth and cement in the Auroville Earth Institute method in India. Domes are realised with earth bags with a top lantern allowing ingress of diffused light. The walls leading to the domes are made from cast earth less labour intensive to construct than rammed earth.

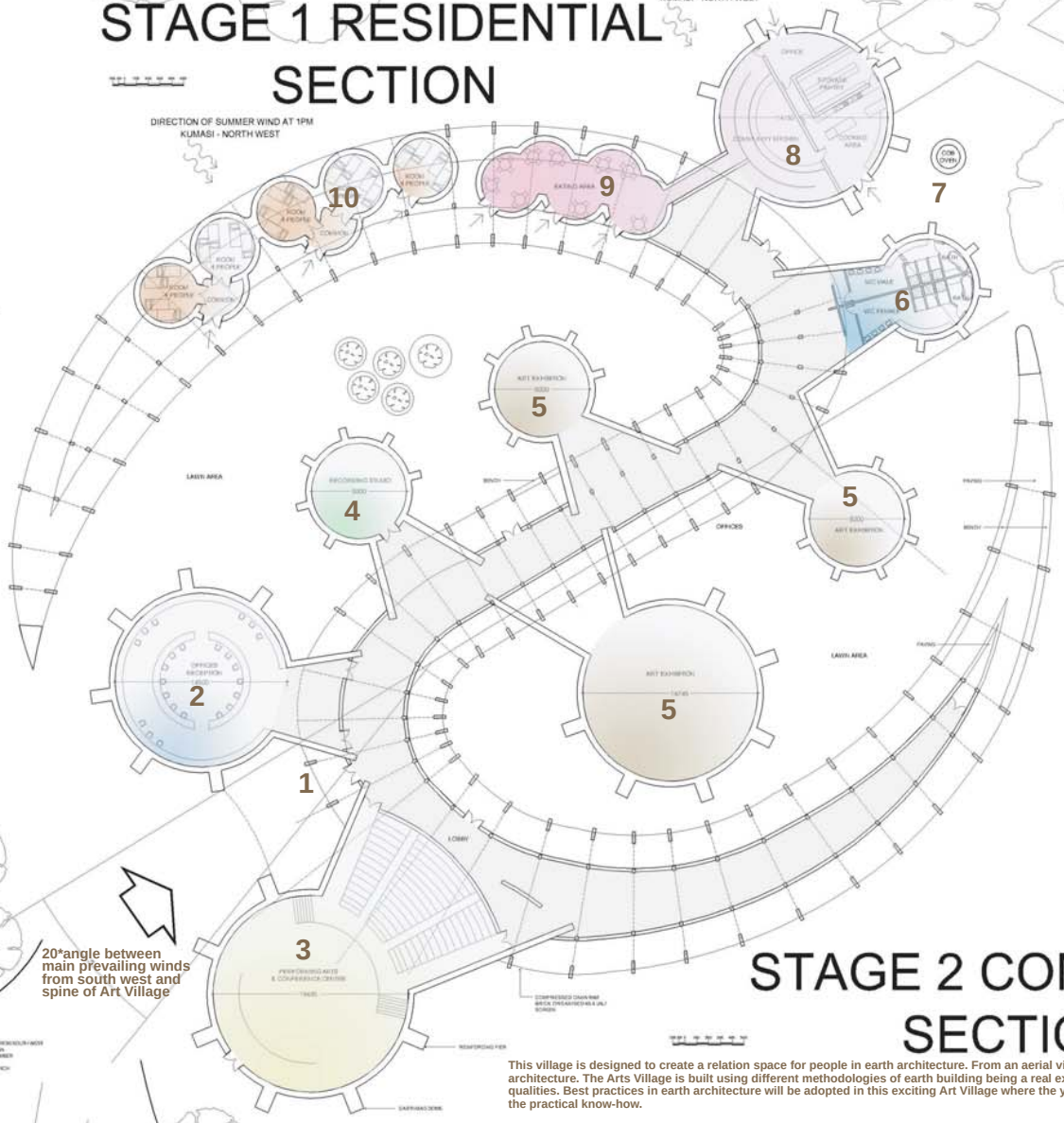
The timbrel vault allow for structures that today no architect would dream to build without steel reinforcements. The technique is infact cheap, fast, ecological and durable. The amount of formwork necessary to build these amazing vaults is minimal compared to other vaults and domes and will be reused. The timbrel vault does not work by gravity as the roman arch but on the adhesion of several layers of overlapping bricks which are woven together with fast setting mortar. Adding two or three layers makes this laminated shell almost as strong as reinforced concrete. The result defies common sense because a timbrel vault is very thin compared to a roman vault, while at the same time it is capable of bearing much higher loads, this enables wider spans and gentler curves. The vaults have been also designed in relation to the prevailing winds and are organised in three sections at different heights, the highest being the centre of the spine. The varying heights allow for breeze acceleration and rapid egress of warm air, creating air pressure to flush the building of any hot air.

summer wind at 1pm will remove odours from service areas away from building

DIRECTION OF SUMMER WIND AT 1PM
KUMASI - NORTH WEST

STAGE 1 RESIDENTIAL SECTION

DIRECTION OF SUMMER WIND AT 1PM
KUMASI - NORTH WEST



20*angle between main prevailing winds from south west and spine of Art Village

EXISTING TALL TREE

DESIGN CONCEPT

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LEGEND

1. MAIN ENTRY
2. OFFICES / RECEPTION
3. PERFORMING ARTS & CONF CENTRE
4. RECORDING STUDIOS
5. ART EXHIBITION
6. BATHROOM
7. EXTERNAL COB OVEN
8. COMMUNITY KITCHEN / OFFICE STORAGE / COOKING AREA
9. EATING AREA
10. SLEEPING AREA

STAGE 2 COMMUNAL SECTION

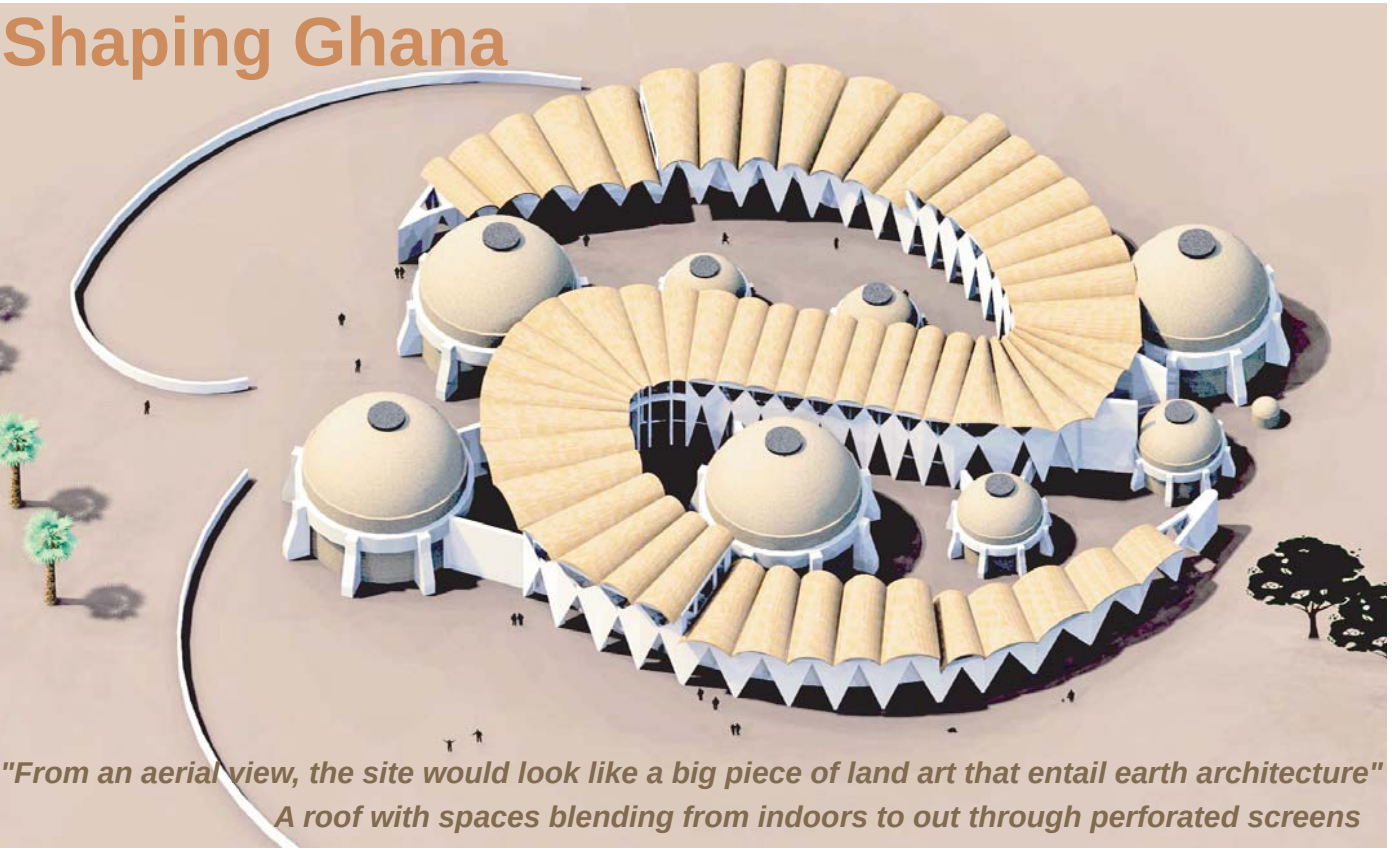
This village is designed to create a relation space for people in earth architecture. From an aerial view the model Arts Village will look like a big piece of land art with many parts that entail earth architecture. The Arts Village is built using different methodologies of earth building being a real example of what can be achieved with this universal medium with its innate thermal and environemntal qualities. Best practices in earth architecture will be adopted in this exciting Art Village where the younger generation can learn the old skills of earth construction, recapturing lost skills and tradition via the practical know-how.

From the study of african dwellings, villages and compound came the inspiration of the Gye Nyame symbol that symbolises the power of God where all is made equal, just like the artists that will be coming from various nations under the same roof to share their experiences. This unique and beautiful symbol is ubiquitous in Ghana. It is by far the most used in decoration and artwork, ideal for an Art Village setting, a reflection on the deeply religious character of the Ghanian people. The woven palm leaf sails recall the Mframadan symbol of wind resistant house symbolising fortitude and readiness to face life's vicissitudes.

Project: Shaping Ghana - Gye Nyame Abetenim Sustainable Model Arts Village

Giuseppe Calabrese - Architect

Shaping Ghana



"From an aerial view, the site would look like a big piece of land art that entail earth architecture"

A roof with spaces blending from indoors to out through perforated screens

Sustainability

All labour is low cost and will be quality work, the best Ghana has to offer. The use of local resources will be maximised. Earth will be extensively used throughout the building from the foundations to the timbrel vaults. On the fringe of environmental issues, the model Arts Village of Ghana will display to the world how it was and is still possible to utilise Earth as a resource for modern sustainable designs.

EARTH BAGS: DOMES

Usually called earthbag, goes up quickly and is very easy to learn. Used bags from plaster, grains or cement are available around the world. Unlike other earth techniques, a wide range of soils can be used to build with bags. Three ordinary people can take about an hour to lay 12 square feet of wall. preparing soil, filling, placing, and tamping bags do not require special strengths or skills. Earthbags don't use any scarce resources.

WOVEN PALM LEAVES: SUN SHADE SAILS

First cut both the ends off the palm leaf. Second split the stem through the middle. Now weave one side at a time to make a large woven band of mat. This technique is very common also in Saudi Arabia for construction of the floor layers but is being forgotten due to the advent of 'modern' materials. People that still have the knowledge to weave palm leaves will be called in this project to share the knowledge to the rest of the workers enabling to learn lost skills and cultural expression

CAST EARTH: FOUNDATIONS

Cast earth is of much lower labor costs than adobe or rammed earth with a structural plasticity comparable to concrete. Little or no maintenance is required of cast earth foundations because they have a high resistence to the deteriorating effects of water and sun. Up to 20% cement can be used for the foundation as this will assist with durability and shrinkage control. Juaben has a palm oil mill that yields palm fibre-ash a real resource that needs to be utilised in this pump priming project. Lime and pozzolanic material such as palm-ash, may be added to the red earth mixture to produce the amount of cement required. Test samples will be necessary on site, but fresh palm-ash will react with red earth minerals to form water insoluble bonds imparting high strength

HOLLOW INTERLOCKING CSEB: WALLS

Hollow interlocking CSEB bricks are the perfect solution for the Arts Village. The advantage compared to normal CSEB blocks is that each brick has a key that interlocks with the others. Thus these walls offer more resistance to shear and the building will be even stronger. The building will better resist earthquakes with minor damage. Interlocking blocks can resist cyclones, tsunamis, floods and earthquakes provided that they are hollow. They are also self aligning to reduce construction time and improve accuracy. Mural wall decorations would then be applied by the artists in residence themselves.

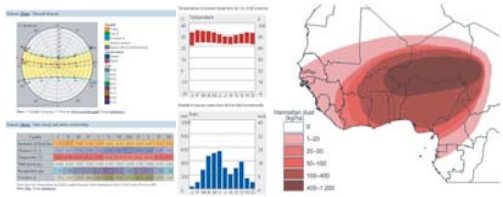
TIMBREL CSEB: ARCHES

The Timbrel vault allowed for strutures that today no architect would dream to build without steel reinforcements. The technique is infact cheap, fast, ecological and durable. The amount of formwork necessary to build these amazing vaults is minimal compared to other vaults and domes and will be reused. The timbrel vault does not work by gravity as the roman arch but on the adhesion of several layers of overlapping bricks which are woven together with fast setting mortar. Adding two or three layers makes this laminated shell almost as strong as reinforced concrete. The result defies common sense because a timbrel vault is very thin compared to a roman vault, while at the same time it is capable of bearing much higher loads, this enables wider spans and gentler curves.

JALI PERFORATED CSEB SCREEN: CORRIDORS

The corridors for this modern Art Village will be made of CSEB brick. Brick can be formed into beautiful openwork called 'jali', as Sri Laurie Baker created in India. Jali walls lets in subdued light, allows ventilation and glimpses out, but keeps the inside private and secure. Small scale jali keeps driving rain out, but may cost only 10% as much as a window. Direct light is often not pleasant especially when then reflected from other surfaces. The Jali walls allow all the interiors to be well lit with diffused light while avoiding glare and reflection.

Climate



Ventilation

Planning for comfort - When the temperature of the air is higher than thes kin temperature, the cooling effect by evaporation is not possible.

In order to catch the breeze from the prevailing winter and summer winds from south west 'Hamattan Trade Winds' (between 5 km/h and 8km/h) the building has been positioned at an angle of 20 degrees to the prevailing breezes. This angle has been demostrated to be the optimum angle of orientation for humid tropical regions.

Buildings have been spaced out and breezeways have been added in them, with doors strategically placed.

Mosquito netting curtains will be used in the brick screens or 'jali' and to close the vault sides above the corridor walls whilst allowing the hot air to escape.

Low curved walls have been strategically placed to accelerate the breezes through the entry by channelling the wind from the prevailing directions from a wider area.

This strategy of orientation allows natural ventilation to run trough the building, where the coolness can be picked up from the cast earth floor, up through the cement stabilised earth blocks and through the perforated jadi walls.

The design is oriented to take as much advantage as possible from the wind direction, discouraging air conditioners. The jadi walls will function like Sausi Arabia's ventilation holes along the facades of the building. The foliage will filter any dust and cool teh air before it penetrates the building.

Landscaping

Landscaping will play an important role in achieving an energy efficeint Art Centre. Outdoor air temperature around the building will have a significant impact on energy use within the building.
In the tropics there is no such thing as too much shade. The design reduces solar reflection from ground surfaces by shading, planting ground cover and lawn.
The design avoids continuous concrete or bitumen in favour of mulch and ground covers, light coloured gravel or block or brick paving to allow evaporative moisture exchange between the ground and the air to minimise ground surface temperatures of ground exposure to the sun. The landscaping has been strategically designed to filter the Harnattan dust before it penetrates through the jadi walls.

Sun Shading

All doors and windows will be shaded from direct sunshine via the Timbrel arches and the jadi walls. The palm leave 'mats' woven in triangular shapes will not only filter the dust, but will provide protection from the direct sun. The fit palm leave mats will also reduce the temperature when exposed to the solar radiation by reducing absorption and increasing heat loss via their light colour. All windows and doors are infact recessed from the facade and will be shaded throughout the day.

Window and Door Type

All windows will have casement sashes, hinged on the side that will enable the sash to catch the prevailing summer breeze to improve air flow. The design allows window openings to extend as close as possible to ceiling level to encourage venting of hot indoor air.

Ventilation grilles above door frames will allow hotter air to flow though and vent externally.

art village main entry

view from services area

timbrel vaults, woven palm sails

The design is embedded in the local cultural context, it aims at providing local employment and know-how while striving to minimise need for transportation and import.

The work is simple and uses common supplies, ordinary people will find a way to work on this project by themselves without external imput.

Cement has caused a widespread mental paralysis, increasing the numbers of those without shelter by preventing earth building technology from being transmitted and improved. In Europe or America a worker can buy ten bags of cement with a day's wage while in rural Africa to buy one bag of cement, ten days of work are necessary. To achieve sustainability, the project was based on the principles of designing for climatic comfort with low-cost construction, making the most of the local materials and the potential of the community.

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ALL EXISTING TREES TO REMAIN TO AVOID SOIL DEGRADATION

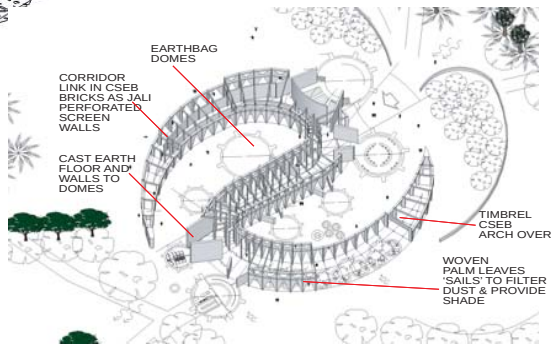
EXISTING CHURCH

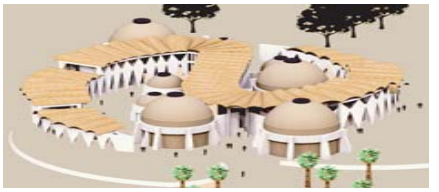
POULTRY

ARTS VILLAGE

OPEN THEATRE

VEHICLE ENTRY & CARPARK





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Woven Palm leaves will be utilised to produce triangular sails to filter the dust from the prevailing winds and work in conjunction with the vegetation. This technique is very common also in Saudi Arabia for construction of the floor layers but is being forgotten due to the advent of 'modern' materials. People that still have the knowledge to weave palm leaves will be called in this project to share the knowledge to the rest of the workers enabling to learn lost skills and cultural expression. The woven sails will recall Mframadan symbol of “wind resistant’ house, symbol of fortitude and readiness to face life’s vicissitudes. This symbol suggests infact a well built reinforced building, one built to withstand windy and treacherous conditions.

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All people involved in the project will be native to the village, and the skills learned here will be applied to further initiatives in the village and elsewhere. This pump priming Art Village project will see the community organise itself in a cooperative effort to realise this exciting Arts Centre. The local authorities may also recognise the project’s worth providing and paying for the teaching staff. The biggest challenge may be explaining the design and drawings to the people who can neither read or write, but possibly also be an exciting opportunity for the architect to teach and also learn from the fascinating Ghanian community.

I believe the design of the Art Village is practical, thoroughly explores the relationship between art and architecture, creating an impression for the artists of walking in an organism, a living sculpture and has a high aesthetic appeal. All spaces have been designed with artists and designers in mind and international visitors will certainly be impressed with the high standard of finish achieved with the most sustainable of materials: Earth.

Time for construction: the project will be completed before June 2012, if construction starts no later than mid 2011. The local community once taught the various construction methods of building with earth, will be able to start building immediately. At the beginning the construction may advance at a slower pace as the community gets more and more involved and becomes proud of this Arts Village construction will advance rapidly.

Time / Budget & Financial Components / Areas:

1. **Main Entry** (no area)
2. **Offices reception** 186sqm
3. **Performing Arts and Conference Centre (internal)** 347sqm
4. **Recording Studio** 50sqm
5. **Art Exhibition** 225sqm
6. **Bathroom Male/Female** 60sqm
7. **External Cob Oven** 7sqm
8. **Community Kitchen with Office Storage & cooking Area** 156sqm
9. **Eating Area** sqm93
10. **Sleeping Area** sqm165
11. **Exhibition Area along corridors, external areas between colonnade** 1710sqm

TOTAL AREA= 3000sqm
Budget $62,000/3000sqm= $20sqm which is totally realistic and achievable

Site preparation and road access= $4,000
Local building material Earth = no cost
Barbed Wire for earth domes = $3,000
Temporary reusable formwork for timbrel vaults = $2,000
Plumbing = $4,000
Sewerage = $2,000
Electrical Installations = $5,000
Furniture/bathroom white goods = $8,000
Labour = free, community involvement
Woven Palm Matts = free, community involvement
Cement for earth stabilisation= $10,000
CinvaRam press = $5,000
Landscaping (trees, mulch) = free, community involvement
Open Theatre (external) = free, community involvement
Carpark area = free, community involvement

Total cost = $43,000 which is totally realistic and achievable