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The role of autochthonous architecture for the development of rural communities in Ghana

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Abstract
During the last years a number of African NGOs has started to work in order to find new ways to support the development of rural communities in sub-Saharan Africa, and give young generations the opportunity to get an education, through the collaboration with worldwide volunteers. That's why they helped a number of international teams led by young designers to build their projects using vernacular techniques and local materials. This give-and-take relation in between volunteers and local population has the aim not only to construct school complexes, and offer a practical experience to young architects, but also to teach locals how to build performant constructions in a sustainable and economic way, using techniques and methods they are accustomed too. In 2018 the village of Okorase (Ashanti region, Ghana) hosted a number of workshops, becoming a tester area for this project, and now their junior high school is open.

Keywords: Raw Earth Architecture, Africa, Vernacular Architecture.

Introduction

Ghana is a west-African country, located along the gulf of Guinea on the Atlantic ocean. It is the first African country who reached independence from colonialism, becoming free from United Kingdom dominance in 1957. A multicultural nation, Ghana has a population of approximately 27 millions, spanning a variety of ethnic, linguistic, and religious groups, who are known to live together in peace. The most practiced religion is Christianity, while the second creed is Islam, more practiced in the northern regions of the country.
On its territory, in 1966, was inaugurated the Akosombo Dam, which led to the creation of lake Volta, known to be the biggest artificial lake in the world. This structure is one of the main sources of electricity in the country, but still not enough to subsist the total demand of energy. Ghana is an average natural resource enriched country, possessing industrial minerals, hydrocarbons and precious metals. It is also the second producer in the world of cocoa beans. Other farming products are palms and peanuts, while principal subsistence agriculture regards yam and corn.

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Art and Crafts has a great importance in the national culture, especially for the production of fabrics and pottery. One of the most important art forms is the manufacture of Kente: this is a cotton fabric, entirely handmade using a wooden loom. It is representative of the Akan people, an ethnic group in the south of the country, and has its origin in the Ashanti Empire. It is used only in formal occasions such as weddings, and it is traditionally wore by the Asante king.
Tourism is helping the developing economy, with a focus on ecological and sustainable politics. In the last ten years Ghana has been a pioneer for eco-tourism, with the goal to take advantage of the benefits derived from the relation between tourists and volunteers and local communities.

Education in Ghana

The results of the "2010 Population & Housing census report – children, adolescents & young people in Ghana" show that the educational sector of the country is still in development and there is a big gap in between rural and urban areas and northern and southern parts of the country.
For 3-9 years old children, in Northern, Upper East and Upper West regions, which are mostly rural areas, there is a higher than 20 percentage of uneducated children; while in regions with urban agglomerations this percentage can be much lower. Northern region recorded the highest proportion of children with no education: 35 percent of males and 42 percent of females did not attend school. A sad data compared to the 3 percent of males in Greater Accra region and about 6 percent of females in Central region.
The results among 15-19 years old adolescents show a gender parity, where the percentages of males and females is the same in terms of educational attainments. Central region has the lowest numer of adolescents who quit school, while the northern sector is still the most disadvantaged area.
All over the country, the proportion of youths aged 20-24 years old that have attained tertiary level of education is higher among males, except in Eastern, Ashanti and Upper West regions. The number of females with no tertiary education is higher in Northern region and lowest in Greater Accra region. In terms of language proficiency, most adolescents were found to be literate in both English and Ghanaian languages (which vary from region to region). Overall, adolescents in the southern half of the country are relatively more literate in any language than those in the northern half.

Typological features of rural houses in Ghana

Three broad climatic divisions influence existing rural housing in Ghana in terms of availability of local building materials and household hierarchy. Whereas earth is found in all the three regions, timber and bamboo are abundant in the Tropical Rain Forestland but scarce in both Northern and Coastal Savannah. On the other hand, it is thatch which is abundant in the other two climatic belts, although it is now getting relatively scarce in the southern regions. Furthermore, whereas the availability of palm trees has resulted in the use of woven or plaited palm fronds in the Coastal Savannah, this practice is non-existent in the Northern Savannah.

Northern Region (1-2)

In the northern regions of Ghana the climate is hot and dry, with intermittent rainfall between March and September, and an average rainfall of about 1 meter in the most humid 3 months of the

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year. The climate and vegetation is the typical tropical savannah type, with small trees like shea and a dry land that is difficult to cultivate.
Here, being the population mostly of Islamic religion, the father is the head of the family, responsible socially and economically for the household. The current mud house is a nuclear compound, made by a number of small huts disposed around one or more courtyards. Daily life is spent outside, in the court, where meals are cooked and consumed, and all the typical daily activities occur.
These compounds are of two types: circular and rectangular. Each hut construction starts by marking the walls position on the ground. These walls are made with cob technique, using a mix of red earth, water and sometimes thatch, and almost always do not have a foundation. Each hut is then enclosed with a roof: whereas the circular types are usually covered with a timber and thatch conic roof, the rectangular ones have a flat roof made from an intertwined timber structure and a very thin clay layer to close it.
The doors are shaped like arches, while there are no windows to get a better insulation.

Tropical Rain Forestland (3)
Regions like Ashanti, Brong-Ahafo and Volta are located in the middle of the country which is hot and humid with an annual rainfall varying from over 2 meters in the extreme south-west to 1.5 meters in other areas. A tropical rain forest vegetation predominates here and that's why this is the biggest timber producing area of the whole country. Indeed there are several types of trees spanning from palms to cocoa and other tropical fruit trees, part of the extensive farming economy of the regions.
Here people of Christian and Islamic religion live peacefully together, and the woman has a major importance in the family hierarchy, thanks to the tribal traditions that have still a strong impact in private and public life of the population: indeed the law protects these customs, and the social and political life of cities and villages is still ruled by Ashanti kings and village chiefs.
The traditional dwelling type is the Ashanti compound house, which is a rough U-shaped courtyard building, usually made with wattle-and-daub technique: after assembling a timber or bamboo structure, the empty parts of the walls are filled with swish. Recently, this house-type is often constructed with cement blocks and corrugated iron sheets but the plan configuration has not changed. In both towns and villages this squared buildings have conformed a urban grid layout of streets and alleys.
Differently than the northern regions compounds, here there is the custom to build a 60 centimetres basement before starting the actual construction of the walls. This is crucial in a geographical area where rain can cause damages by rising damp. Windows and doors are made using timber formworks, and the walls, once finished, are sometimes rendered in a liquid mixture of water and earth.
The pitched roof has a timber structure, and is traditionally covered using thatch or bamboo slats.

Coastal Savannah (4)
At south, the flat Coastal Savannah is warm and dry, with two rainy seasons separated by two fairly dry spells in July and August, and a longer one from December to February. The vegetation of this area is sparse, comprising mainly palm and coconut trees, with an annual rainfall of under 90 centimetres. The main feature of this compound is that it is designed to be dismantled and get

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assembled in different places during the year. Indeed, even if this custom is less and less practiced, most of the people living in Coastal Savannah were traditionally fishermen and moved up and down the coast, depending on the fishing season.
This led to a nomad type of compound, usually built using grass, palm leaves, bamboo, and thatch: all materials abundant in the region. After the construction of a squared fence made of palm fronds, inside are assembled a number of shelters with a timber or bamboo structure, that have different functions like kitchen, bedroom or storage. The main difference with the other house-types is that even if there is an enclosed outer space, most of the daily activities occur inside the huts, where people seeks protection from the sun. No foundations are built, preferring just a 10-15 centimetres rammed earth pavement. Then the main structure is assembled and covered with wall panels made of woven palm leaves, which can be rolled up to bring them easily to the next location, and that are fixed to the framework by twigs. The pitched roof is usually covered in thatch.

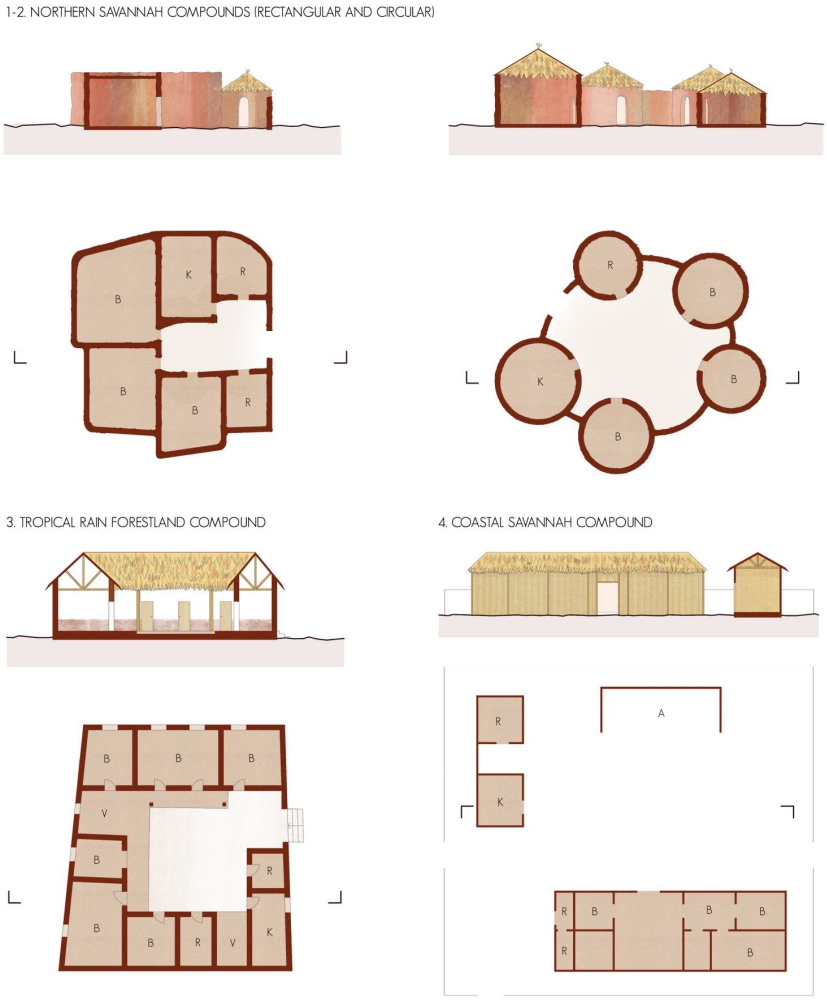

Fig.1. Schemes of the traditional compound-types in Northern Savannah (1-2), Tropical Rain Forestland (3) and Coastal Savannah (4). K: Kitchen; B: Bedroom; R: Storage; V: Veranda; A: Animal shelter.

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Autochthonous and contemporary architecture in Ghana and its role in rural areas

Traditional architecture in sub-Saharan Africa has always been based on local materials such as earth, wood, thatch. It is a great symbol of sustainability and traditions, but it is slowly disappearing because seen, even between local populations, as poor and obsolete.

Ghana is not an exception in this state of affairs. While the main cities, like the capital Accra, and then Kumasi, Sekondi-Takoradi, Cape Coast and Tema, are seeing a constant transformation that aims to mock the western world; rural areas keep being more accustomed to a social and urbanistic configuration that respects ancient customs. However this attitude is still conduct in an unrestrained way where traditional solutions are abandoned for industrial materials and techniques, that are taking place in the uncontrolled speculation that these areas are suffering, in a way that is not environmentally and economically suitable to them.

A number of NGOs in Ghana, like Nka foundation in previous years and now RADeF (Rural African Development Foundation), have started to intervene to try to turn around this approach, combining the need of the populations of these areas to build school spaces to educate young generations and revaluate vernacular architecture and natural materials.

That's why, in the last years, were proposed a number of International calls to design school projects with a particular goal: giving a new role to raw earth constructions permitting young designers to interpret vernacular architecture in an innovative way. The idea is to re-design traditional buildings in order to demonstrate that local techniques are still the best to use in terms of sustainability.

The best way to do this is to collaborate with the local community to let them realize that an harmonious union between traditional techniques and improving ideas can be the best solution to build a performant and long lasting construction. This aspiration is reached through the organization of international workshops where the designers act as site managers, the NGO takes care of the local coordination, and a group of international volunteers and local manpower collaborate to build the winning projects in a span of 3-4 months.

The experience of Okorase village

December 2017 has seen the conclusion of Nka foundation activities with their last call: "Reinventing the African Mud House, Design-Build challenge in rural Ghana". From then on the winner designers of the challenge has started to collaborate with Nka's successor: RADeF, which took care of the local organization of the 2018 workshops, occurred in the rural village of Okorase.

The village has a population of an average age of 25, but being an underserved community, most of the people did not get an education over the elementary school. Indeed the main economic activity is the production and exportation of cocoa beans and other farming products.

Until the summer of 2018, when the first international team "Aulaterra" led by Spanish architects Paco Rodriguez Zafra and Diego Peña Jurado started to build the first junior high classroom, the village had only one elementary school to host around 400 children, and who wanted to continue studying had to cover by feet a 9 kilometres unpaved road every day to reach the next city (Kwaso).

That's why RADeF chose it as a location for the yearly earth architecture workshops. From June to December 2018, in the village – with the help of the community and the village chief nana Adu Boahene – were built two classrooms (to use for junior high 1st and 2nd year) by a Spanish and an Italian Team, and two temporary art installations by a Japanese-American team and an Australian

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one. Taking in consideration the knowledge about typological configuration and daily habits of the typical Ghanaian family in the Ashanti traditional compound, the masterplan designed by teams Aulaterra and Kalì for the school area of Okorase interprets this concept, placing 4 classrooms in order to obtain a common central space for the students, which recalls the courtyard where local people spend their daily life. The entrances are placed sideways to create direct paths in between the buildings.
In the masterplan are also included a number of buildings with various functions like new restrooms, a teacher's room, and a library, that will be shared by the elementary and the junior high school.

Fig.2. Okorase village: landmarks, school complex plan and typological configuration.

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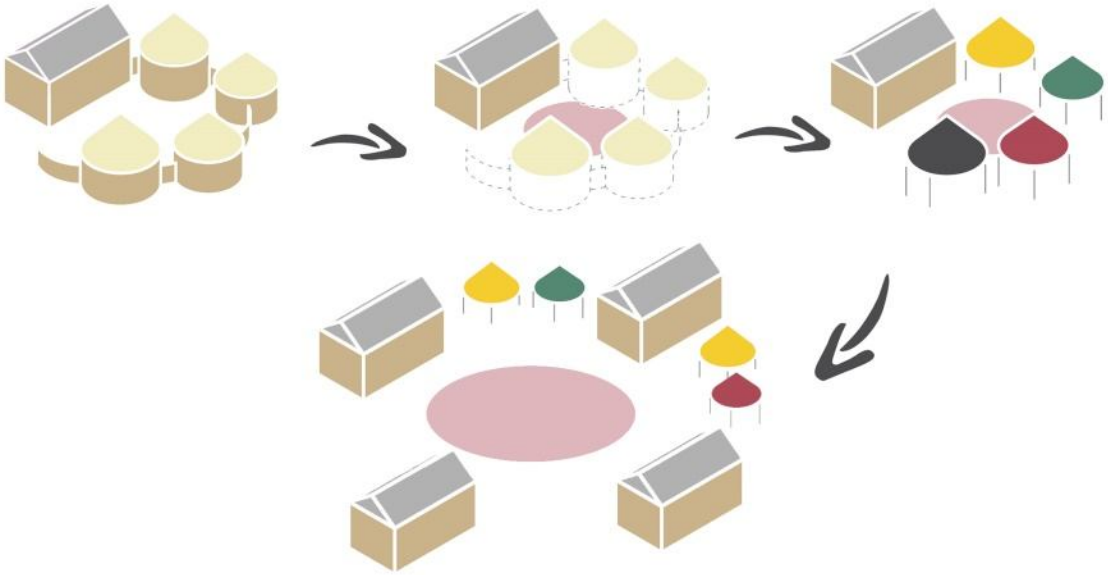

Fig.3. Transition from the typical house configuration to the masterplan design.

Kalì Pavilion

Kalì is one of the two workshops which was carried out at Okorase in 2018. The project was announced in March and realized in between September 1st and December 1st, after a crowdfunding campaign and with the help of 18 international volunteers coming from Italy, Germany, Poland, Turkey, Austria, France and Netherlands.

During the span of 3 months, with a budget of 9000 euros, the group teamed up with the local manpower to build a sustainable raw earth and wood unit, winner of the "Reinventing the African Mud House, Design-Build challenge in rural Ghana", designed by Irene Librando and Nadia Peruggi.

The classroom has an area of 66 m^2, and has been built using 133 m^3 of red earth and 3 kilometres of wood, respectively rammed and planed by hands since electricity wasn't available. Three quarters of the length of the classroom are defined by two rammed earth walls, 3 meters high and 8.5 meters long, which accommodates the student desks, while the front is completely made in wood, in order to get an illuminated space for the blackboard, where light can be modulated by a series of tents, made from traditional wax fabrics.

Indeed, traditional fabrics have been one of the inspirational themes of the project: one of the most important art forms in Ghana is the production of these colourful cloths, and the design was based on the typical woven pattern of the fabric, thinking of a space that is modular and could provide a graduated shade.

The climatic performance of the building is another theme of the projects: whether we are in the rainy or dry season, the temperatures in the Ashanti region oscillate between 20 and 40 degrees Celsius, and letting the kids study in a space that is still fresh in the hottest hours of the day is extremely important for their concentration.

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The earth walls absorb solar light preventing the inside space to get too hot, and the wooden screens together with the lifted roof, permit natural ventilation to have its course by letting enter cold air in the lower part of the building while hot one gets out from the top. Under the roof, it has been also added a layer of handmade thatch mats, that helps insulate the space from the iron sheets used to cover the classroom.
Finally, Kalì team also aimed to find innovative ways to use the waste that cannot be recycled in the village. That was accomplished by the volunteers, which collected more than 3000 plastic bags (the one used in Ghana to drink water and that usually end up being burned), washed and used them to make some screens for the side of the building, and also a volleyball net for the elementary school.

Fig.4. Making of the screens using plastic bags.

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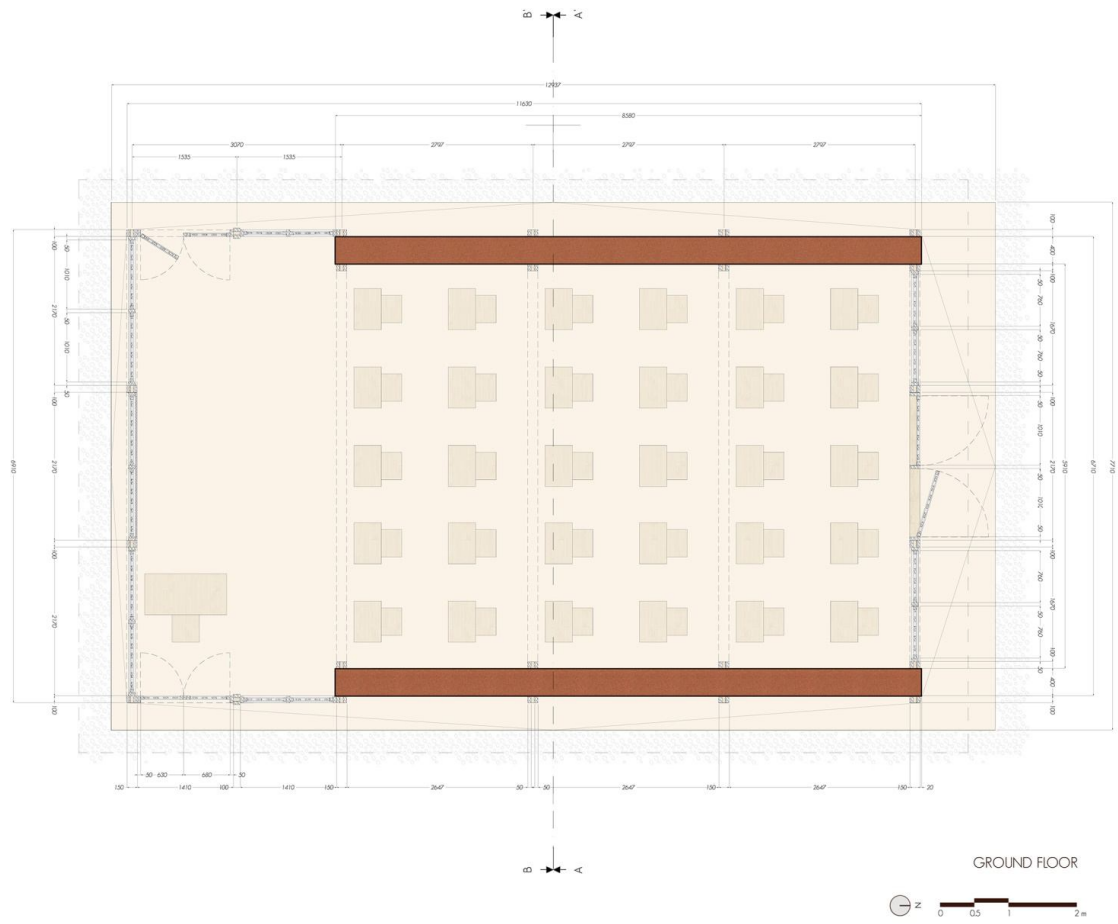

Fig.5. Kalì Pavilion: ground floor plan and west elevation.

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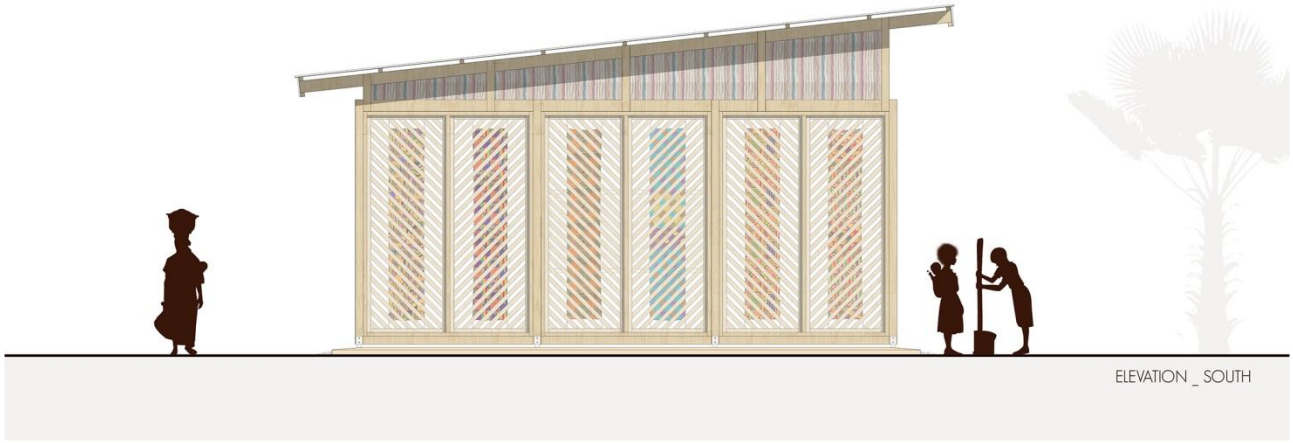

Fig.6. Kalì Pavilion: South elevation and section B-B'.

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Fig.7. Some pictures from Kalì construction site.

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Fig.8. Kalì Pavilion: completed project.

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Conclusion

What happened in Okorase is an example of how the collaboration between international designers and local manpower could bring to a new architectural result, which is sustainable and functional, because uses local materials and techniques, being environmentally suitable and having an exceptional climatic performance. The result is durable and economic, since the local community knows the skills to maintain it independently with local and almost inexpensive materials.
The cooperation outcome is that local people learn how to improve vernacular construction systems, with easy expedients like building a foundation and a basement to avoid rising damp, or make the roof broader to protect the walls from the rain. On the other side, international designers have the occasion to relate with materials and techniques that have been set aside even in countries where they were traditionally used (like raw earth techniques in some European areas).
A still embryonal consequence is the attention of local people (as privates or as public organizations) to the project started in Okorase: what was born as a way to help one rural village may become the example of how communities could work even by themselves to build their own infrastructures, and so become the "architects" of their own development.

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