ACTIONS FOR A SUSTAINABLE WORLD

FROM THEORY TO PRACTICE

BOOK OF PAPERS

THE 24th INTERNATIONAL SUSTAINABLE DEVELOPMENT RESEARCH SOCIETY CONFERENCE

MESSINA - ITALY JUNE 13/15 2018

The 24th International Sustainable Development Research Society Conference (ISDRS 2018)

ACTIONS FOR A SUSTAINABLE WORLD: FROM THEORY TO PRACTICE

13-15 June 2018, Messina (Italy)

BOOK OF PAPERS

Edited by: The Organizing Committee of the ISDRS 2018 Conference

ISBN 978-88-943228-6-6

Department of Economics
Piazza Pugliatti, 1 – Messina (Italy)

Changes and persistences of traditional architectural shapes in Burkina Faso

Tiziana Firrone

Department of Architecture, Polytechnic School, University of Palermo, Italy, tiziana.firrone@unipa.it

Abstract

The subject of this work is the result of a research conducted at the Department of Architecture of the University of Palermo, aimed at analyzing the state of the art of traditional architecture of North-West African countries and the effects that the modernization process of the habitat led on these, through the introduction of new building materials and advanced technologies imported from industrialized countries. The country examined at present is Burkina Faso, in sub-Saharan Africa, one of the poorest in the world and in Africa and, for this reason, one of the most susceptible to the economic and technological superiority of the industrialized countries that control and profit by the local resources. The research made use of the results of a study trip, during which were carried out visits and inspections in some cities and local communities of Burkina Faso. These inspections allowed us to verify if, how and to what extent the technologies of the so-called industrialized countries , have influenced the constructive tradition of developing countries.

Keywords: Sustainable development, Traditional Architecture, Burkina Faso, natural resources, innovation

1. Introduction

The country examined in this study is Burkina Faso (fig.1), one of the poorest in the world and in Africa. According to data provided by the Human Development Index report (HDI), based on the survey carried out in 2015 and published March 21, 2017, Burkina Faso is in 185th place out of 188 countries examined. This determines a high susceptibility to the economic and technological superiority of the industrialized countries that control and exploit local resources.

This susceptibility is even more accentuated by the conditions of colonial subjugation that Burkina Faso and other African countries have suffered in the past from the European powers that have exploited the territory and the African populations for a long time to obtain economic advantages.

All the colonizing countries have maintained commercial relations with the African States, importing from them raw materials at a much lower cost than that of industrial products and advanced technologies that export to the African market.

In this specific case, Burkina Faso is a former French colony, today semi-presidential Republic. The country has a population of 17,322,796 inhabitants (burkinabé), with an average density of 63 inhabitants per km². The population, 85% rural, is mostly concentrated in the central-southern area.

The research made use of the results of a study trip, during which visits and inspections were carried out in some cities and local communities of Burkina Faso that allowed to analyze the state of the art of traditional architecture and to verify if, how and to what extent new building materials and technologies imported from industrialized countries have influenced local building tradition and the process of modernization of habitat.

In the city are concentrated all economic activities, administrative and decision-making centers of the state and large public and private enterprises. Only in the city are widespread services such as higher education, health, the availability of electricity, the road network, the postal service, the drinking water supply network.

In most cases, modern African cities have been formed and developed by the colonial society which has made them the site of all their activities. It is for this reason that the cities have expressed for a long time the culture, the habits, the economic system of a foreign reality, profoundly different from that of Africa.

Figure 1. *Map of Burkina Faso.*

Even today the major anthropized centers preserve the signs of foreign domination, to which are added new connotations deriving from a process of slow and constant globalization.

The traditional architecture of Burkina Faso is undoubtedly better expressed in rural areas. About 8000 villages, spread over the territory, are witnesses of an architecture of various forms, different from region to region, according to the ethnic groups that make up the Burkinabé population. There are over sixty ethnic groups with different social and cultural characteristics. The largest ethnic group is Mossi. Other large groups are: Fulani, Gourmantchè, Bobo, Samo, Gourounsi, Lobi, Banwa, Sénoufo, Nuna, Dafing, Winiama and Tuareg (fig.2).

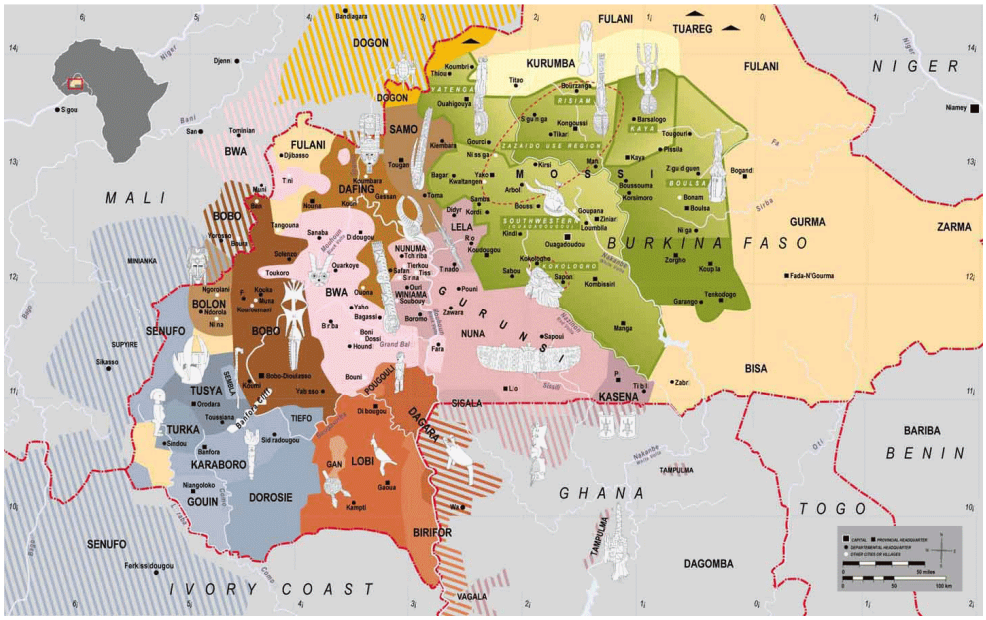

Figure 2. *Distribution of ethnic groups on the territory*

The materials used, the organization and the disposition of the dwellings on the territory express the social structure and the bonds that link the different communities to their environment, to their ethnic group and their families. Straw huts, tuareg

tents, houses in raw earth of various shapes, dot the rural territory of Burkina Faso from north to south. Each village consists of several family houses, each of which is composed of several separate buildings, generally organized around an open court and connected by walls of varying heights. The houses can be more or less compact in the territory or scattered at varying distances. Mossi, Bisa and Gurmanché built circular-shaped huts, built with raw earth bricks and thatched roofs. Bobo, Dagara, Gurunsi and Lobi built huge houses, some similar to small fortresses without windows and made with materials obtained from nature: wood, raw earth, straw.

2. Methods

For the purposes of the research, an intervention method was defined that envisaged the following activities:

1.Visits to places and inspections in urban and extra-urban communities;

2. Architectural relief of some inland housing settlements

3. Historical reconstruction of the origins of the features of coexistence and of the living structures present in the different territorial contexts;

4. Analysis of the landscape individualities and settlement traditions of the ancient local communities;

5. Identification of local resources and technologies;

6.Incidence of the use of new materials and advanced technologies;

7. Proposals for the development of the local traditional heritage and its integration in the new architectural context, through the promotion and use of local types and materials and the improvement of the technologies applied to them.

The big cities are those in which it is most possible to find the "foreign" influences in the local building tradition; but the research has gone beyond the large urban centers reaching small towns and villages scattered in the savannah, far from the most convenient roads of road communication. In this regard, five fundamental stages of the journey have been identified, each of which interprets a precise environmental, historical and cultural specificity of the anthropic settlement. The stages of the journey are: the capital Ouagadougou; Dédougou, capital of the province of Mouhoun, in the region of Boucle du Mouhoun; Sanabà, a municipality in the province of Banwa, also belonging to the Boucle Du Mouhoun region; the village of Ziga, five kilometers from Sanabà; the village of Torobà, near the homonymous forest (fig.3).

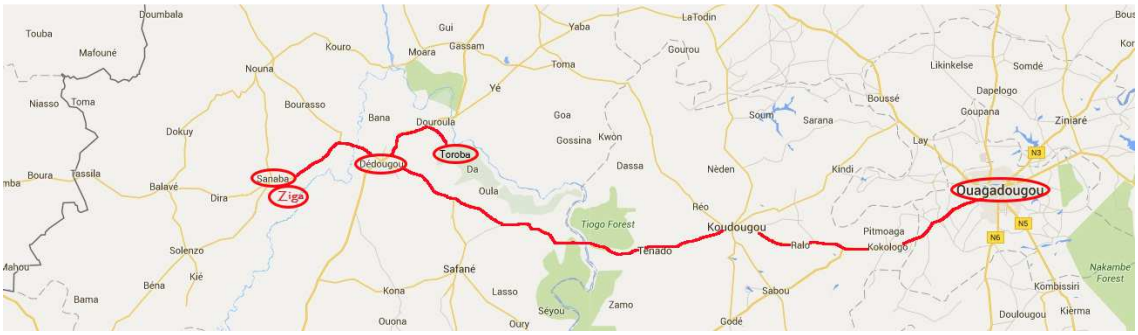

Figure 3. *Travel itinerary*

3. Results and Discussion

3.1. Ouagadougou

The first city under study is Ouagadougou, the capital of Burkina Faso. The city, founded in the eleventh century, has been part of the French colony of Alto Volta since 1896, underwent the influence and control until 1960, when Burkina Faso obtained independence. The stay in Ouagadougou allows to make the first considerations on settlement principles, the types, techniques and materials used. The colonial style of the many public, commercial and residential buildings built in the nineteenth century and during the first half of the twentieth century has been added to the traditional architecture, made of houses built with raw clay bricks, still widely spread on the outskirts of the city. Many of these buildings present architectural elements with precise functions of adaptation to the environmental conditions of the place: shutters, shaded and

ventilated verandas and tunnels integrate with the structural system, improving the thermal comfort of homes through passive cooling. Most of these buildings has maintained its target of an administrative nature use, others have taken on new uses, as needed.

More related to the local tradition, if only for the use of raw earth, is the Cathedral of Ouagadougou. The church, built between 1934 and 1936 on the initiative of the apostolic vicar Joanny Thévenoud, is one of the largest in West Africa. The building, with two bell towers of different heights deliberately, is entirely built with adobe bricks according to a mixed architectural style, inspired by both the traditional local architecture and the neo-Romanesque style. Also the old central mosque dates back to the colonial period. It was built in 1952 and subjected to a series of recovery and expansion measures over the years. It is one of the most significant buildings in the city (fig.4).

***Figure 4**. Cathedral of the Immaculate Conception of Ouagadougou and the Downtown mosque*

Contemporary architecture is imposed in Africa in the 60s of the last century. It is an eclectic architecture that sometimes presents elements borrowed from traditional architecture. This is what can be found in the city center of Ouagadougou, enclosed within a triangle bordered to the north by the train station, to the east by the presidential palace and to the south by the cathedral. The Avenue de Nelson Mandela crosses the northern half of the triangle and ends at the Place des Nations Unies, from which most of the main roads depart (fig.5).

***Figure 5**. Map of Ouagadougou*

The rest of the city is characterized by large asphalt rectilinear roads, to which orthogonal routes converge mainly in beaten earth that, crossing each other, form the various neighborhoods. In the city center, the presence of reinforced concrete buildings prevails, mainly used for public and commercial buildings such as hotels, restaurants, banks, but also for residential buildings (fig.6). Buildings with columns of Renaissance inspiration alternate with buildings covered with

ceramic tiles or plastic plasters, some of which recall the color of the earth, a material that the local architectural tradition also uses for housing.

***Figure 6**. A foreshortening of the center of Ouagadougou*

Some buildings, (in particular public and commercial buildings) trace the foreign typologies in their formal aspect even if, stylistically, they reflect some local needs such as attention to the study of solar shading systems (overhangs, brie soleil, claustre) and passive ventilation (fig.7 and fig.8).

***Figure 7**. Commercial building*

***Figure 8**. Civil housing and university buildings*

Aspects of local tradition can be found in the *Maison du People* (fig.9): a large indoor theater with 2,500 seats. Its compact architecture is made of reinforced concrete, but the contained openings, the skylights complemented by the traditional ventilating fireplaces placed in the roof and the red earth of covering, constitute an architectural mix that enhances the traditional style of Burkina Faso.

***Figure 9**. Maison du People*

The Grand Marchè (fig.10), is a large structure in reinforced concrete and brick, built on the same site of the old market, razed to the ground by a devastating fire that, in 2003, destroyed all the wooden shacks. The drawings that decorate part of the façades are particularly interesting. These decorations are made according to the Gourounsi style. The tradition of painting these houses, entrusted to women, is lost in the night in time.

***Figure 10**. The Grand Marchè*

With their hands they spread a layer of plaster on the external walls of bricks in raw earth, mixing pressed cow dung together with the clayey earth. The second layer of plaster is obtained with clay diluted with water and colored pigments (generally red) which forms the basis on which the decorations are applied. There is no lack of black and white colors. The drawings are made with the guinea fowl pen which is dipped in black (obtained from basalt) and in white (derived from a limestone). The decorations are geometric stylizations of everyday objects and rituals or anthropomorphic figures, ancestral symbols linked to the traditional animism typical of these places. The triangle indicates the calebasse, a vessel made by drying the fruit of a *cucurbitaceae*. The rectangle is the traditional dress. The circle is the full moon, a fundamental point of reference for night lighting, as the villages have no electricity. The turbot is the macaramì, a wineskin. The two triangles with the vertices that touch each other, symbolize the drum, a musical instrument widespread throughout the African continent. The anthropomorphic figures are the snake, the crocodile and the lizard, considered sacred animals for animist religions. Other signs are added to these main reasons, contributing to make visible the belonging to a family, neither more nor less as the scarification on the face in some African communities. At the end, a product obtained from carob (neré), passes on the drawings to create a shining effect. Every year, after the rainy season, the women of the village repeat the ritual, applying the decorations on the plaster of the walls, degraded by the rains (fig.11).

Figure 11. *Gourunsi Village*

The building that houses the music museum of Ouagadougou is an example of architecture made of stabilized earth that combines modern techniques and traditional materials (fig.12). The building expresses the desire to preserve the spirit of African architecture by applying innovative techniques to local materials, such as the use of compacted and stabilized earthen bricks. The architectural style is inspired by North African and Sudanese architecture, with vaults and domes covering many small rooms that intersect each other. The materials used, among which the slaked lime produced inside the building site and used for the plaster, together with the volume of the building enhance the acoustic qualities of the museum that promotes music and preserves the instruments of the local tradition.

Figure 12. *Music Museum*

A few kilometers south of Ouagadougou, the new "Ouaga 2000" district has been built in the framework of a town planning project. It is the new residential area of the capital that houses the new presidential palace, ministries, embassies and where there are impressive buildings, banks and large hotels, international schools and luxury villas hidden behind high walls embellished with ornamental plants. Ouaga 2000 was born on the occasion of the 1996 France-Africa summit with the aim of providing a comfortable accommodation to the international personalities guests of the meetings. The architecture of Ouaga 2000 is very distant from the local building tradition (fig.13). The buildings, made of reinforced concrete, steel and glass, guarantee indoor comfort through the operation of expensive technological systems that control air quality, thermo-hygrometric conditions and lighting conditions. This entails high economic and environmental costs, since these plants are highly energizing and polluting. The style of the buildings is of doubtful taste and while still inspired by the architectures of the great masters of the past does not reach a good level of expression.

Figure 13. *Martyrs Monument at Ouaga 2000. Hotel-Resort Silmande in Ouaga 2000*

On the outskirts of the city almost all homes are made of adobe. The poorest are single-family buildings, with a rectangular plan and an elevation. The thickness of the masonry is equal to a brick.

The roof is made of wooden beams resting on the wall, often ending with a stone curb. On the wooden frame there is a corrugated sheet metal cladding held by blocks of bricks resting on it. Doors and windows have rudimentary wooden and sheet metal frames. To promote ventilation and avoid overheating of the internal environments, an air space is created in the intrados of the roof which is crossed by air passing through the holes made at the top of the perimeter walls. In some cases the masonry is plastered with a mixture of raw earth. Almost all homes overlook an outer space bordered by a wall, where most of the day and daily activities take place. The interior of the house is in fact destined for the night and for the preservation of clothing, furnishings and foodstuffs. The toilet is generally outside the house, housed in a small brickwork environment and equipped with a Turkish bath. On the outskirts, along the river that borders the city, it is not difficult to find small outdoors "factories", for the production of clay bricks (fig.14).

***Figure 14**. Poor housing on the outskirts of Ouagadougou*

In the wealthiest neighborhoods on the outskirts of Ouagadougou there are single-family villas with a reinforced concrete structure and an eclectic style. These homes are generally developed on two elevations and are equipped with toilets, kitchen, water and electrical systems. The interiors have finishes such as floors and wall coverings, made with ceramic tiles (fig.15).

***Figure 15**. Rich housing in the suburbs of Ouagadougou*

3.2. Dédougou

Dédougou is located about 200 kilometers west of Ouagadougou. It is a place of transit from which it is possible to reach the villages of the whole Boucle du Mouhoun region, including those covered by this study; it is the only urban settlement in the region with electricity and drinking water. The territory between Ouagadougou and the town of Koudogou, halfway from Dédougou, is dotted with villages of the Mossi ethnic group (fig.16). These are formed by groups of family houses called zaka, not far from each other. Of circular shape, with a conical straw roof, the huts have very small dimensions. The walls are built of sun-dried raw earth, covered with a mixture of straw-ground and cow dung. The hut of the householder is square in shape.

***Figure 16**. Mossi villages*

Being a polygamous community, every wife of the householder has his own hut that he shares with his sons under the age of ten and his daughters until marriage. Children over ten years live in a common hut.

After passing Koudogou, one enters Gurunsi territory and, for a short distance in the Dafing one, up to Dédougou.

The town immediately underwent substantial differences with the capital, both in architecture and in urban organization. The roads are almost entirely unpaved and the houses, for the most part built in raw earth, are most often without plaster. The use of reinforced concrete is limited to a few public buildings, some hotels and some private houses with an anonymous style. In some cases the skeleton in reinforced concrete is emphasized compared to the infill structure, made of earthen bricks, even these left exposed (fig.17).

***Figure 17**. Dédougou*

3.3. Sanabà

The journey continues to Sanabà, a municipality in the province of Banwa, belonging to the Boucle Du Mouhoun region. Sanabà controls a territory of 920 square kilometers on which there are 28 villages more or less large, including Ziga. The houses of Sanabà are all built in adobe and covered with plaster in raw earth. Also here the material for the construction of bricks is recoverable on the site, characterized by a clayey soil. In older dwellings it is possible to find the technique used in the past for the realization of the horizontal covering. This was composed of a main arrangement of wooden beams resting on bifurcated poles, planted on the ground and placed at the internal corners and along the walls of the huts. The secondary frame of the roof was composed of joists, branches and barks arranged orthogonally to the main beams. On this there was a thick layer of well-compacted earth. This type of roof required constant maintenance due to the run-off caused by rainwater, particularly abundant in the rainy season. The ground cover was also very heavy (fig.18).

***Figure 18**. Exterior and interior of a hut with a cover in raw earth where the supporting wooden structure is highlighted.*

The most recent homes have a covering covered in corrugated iron, an easy material to carry and convenient to cover the building in a light way. The constructive process is very similar to that shown in the houses on the outskirts of the capital. There is no electricity or running water in Sanabà. You can see some photovoltaic panels, just enough for the first necessities. But the telephone connection is guaranteed by a radio-mobile telecommunications network with repeaters mounted on huge pylons that overlook the agglomeration and are scattered throughout the territory (fig.19).

The visit to a building site, conducted by members of the local community, allows to assist in the construction of a small house (fig.20).

Figure 19. *Houses in Sanabà*

The bricks in raw earth (35x20x13 cm), are made on site and are arranged on a base of about 40 cm built with blanks blocks of laterite, taken not far from Sanabà. *Laterite* is a stone that comes from an “alteration of the eruptive and schistose-crystalline rocks typical of the tropical regions, deriving from the very special climatic conditions of regions in which there is a continuous alternation of rainy and wet periods and periods of great drought”, (Italian Encyclopedia Treccani). In contact with air and sun it undergoes a cementation phenomenon which makes it compact and resistant. The best layers are the superficial ones from which it is obtained and cut by hand. The stone blocks are also used to create the curb on which rests the roof composed of wooden joists on which the sheets are placed.

Figure 20. *Sanabà*

3.4. Ziga

Ziga is only 5 km from Sanabà. The village (fig.21), does not seem to have a planimetric disposition regulated by a precise settlement principle and the houses are organized in residential areas destined to single family clans. Reliefs are made of some houses of ancient and recently built, underlining the peculiarities and differences with photographs and films. Each residential nucleus presents a planimetric distribution with a quadrangular scheme, organized around a courtyard on which the individual houses and other closed or semi-enclosed spaces overlook, intended for the sheltering of domestic animals (sheep and chickens), the cooking of food and toilets (always placed against the walls and with a smaller surface). Many family dwellings are built around a tree, so that it is in a central or lateral position with respect to the housing complex. The court is bounded by a wall in raw earth that connects all the houses.

Figure 21. *Ziga Village*

The units, made up of one or two rooms, are rectangular in plan. the furniture is limited to simple mats for sleeping. The wall structure is made with the adobe technique. Depending on the economic possibilities of the owners, some adobe walls are left exposed, others are plastered and / or decorated. Also in Ziga, as in Sanabà, there are still some houses that express the construction techniques of the tradition but most of the houses show the use of sheet metal for the realization of roofing and windows (fig.22).

Figure 22. *House in Ziga*

The closed space constitutes for the community only a part of the dwelling; domestic work and social relations take place outdoors, in the inner courtyard, for lunch, for the daily activities and for social gatherings that take place around the tree or under roofs (cases à palabres), realized with a structure made of wood supported by forked poles and covered with interwoven straw mats. When the temperature is too high even at night, it is preferred to sleep outside the houses.

Night lighting is obtained with artisan lamps powered with shea butter or, in the best case, with oil. A form of lighting widely used for travel within the village is that produced by mobile phone systems, widespread throughout the territory. In general, homes are very similar to each other in terms of shape, size and construction materials. Only the granaries, intended for storing food stocks, can be distinguished and acquire a more important relief. The barns are the only buildings located outside the fence and are raised above the ground. They have a circular or quadrangular plant: the circular-shaped granaries are made of woven wicker and always have a conical straw covering; the quadrangular ones are in raw earth and have a flat cover (fig.23).

Figure 23. *Granaries in Ziga*

3.5. Torobà

Torobà is a village located about thirty kilometers from Dédougou, reachable through a dirt track that is divided into a tortuous path that crosses the forest from which the village takes its name. Torobà is in Dafing territory, far from the main routes of communication and is in a state of extreme backwardness and poverty. Deeply different for tradition and religion from the village of Ziga. In Torobà the animist religion is still practiced and this is also reflected enormously in the architecture and the planimetric organization of the village, which respects a precise hierarchical order. Sacred and insurmountable areas destined for religious rites, sacred buildings, common houses, all ordered and regulated according to the principles of professed worship. The houses are scattered on a rather large territory. There are no foreign influences either in buildings, all in raw earth and wood, or in infrastructure. A photographic documentation, together with surveys and video footage, allow to collect as much as possible of this village in the heart of the savannah (fig.24).

Figure 24. *Torobà Village*

4. Conclusions

The visit made it possible to see the profound difference that exists between the cities and villages that, in today's African reality, represent two profoundly different and totally different worlds and ways of life. Large cities, like the capital Ouagadougou, are more influenced by foreign influence, both in the use of construction materials and in the adoption of advanced technologies, which are not always supported by an adequate energy supply system necessary for their operation. The new buildings, while trying to trace non-native types and styles, maintain an entirely singular imprint. Moving towards the smaller cities and, even more, towards the villages, there are marginal contaminations, also due to the difficulties arising from a not yet adequate road communication network. All forms of traditional housing share common characteristics albeit with differences in ethnic style; but also in rural areas, in villages and communities far from the most convenient roads communication, there is evidence of the diffusion of non-traditional materials such as metals and plastics that have almost completely replaced the materials traditionally used in specific uses. In some cases there is an attempt to propose constructive techniques that do not belong to the local tradition as, for example, in the building that houses the school of the village of Torobà, whose bearing structure, almost certainly made of blocks of *laterite*, is covered with portions of plaster laid in correspondence with what could or should be the skeleton of a reinforced concrete frame (fig.25).

Figure 25. *School in Torobà Village*

In a country where the local economic and technological level are still very low, one cannot and must not rely on what comes from extraneous realities, rather, we must act to instil trust in the communities, their abilities and available resources renouncing, when necessary, technologies incompatible with the local situation, to the advantage of technologies appropriate to the environmental and cultural conditions of the local context. This is what is done by Diebedo Francis Kerè, the well-known burkinabé architect involved in activities aimed at improving the conditions of his people through the design and construction of buildings in which the technologies, types, morphological and compositional aspects belong to the history of place, integrating wisely with materials, albeit not purely local, easily available (fig.26).

***Figure 26**. Primary School Gando. Diebedo Francis Kerè*

References

Arecchi A., 1998. Abitare in Africa, architetture, villaggi e città nell’Africa subsahariana dal passato al presente, ed. Mimesis, Milano.

Bini V., 2004, Urbanizzazione e trasformazioni territoriali nel Sahel. Percorsi di ricerca nell'altopiano centrale del Burkina Faso, CUEM, Milano.

Firrone T., 2014. Intonaci e decorazioni in terra cruda espressione di un’arte ancestrale che si rinnova nel tempo, in: Giorgi A., Guida pratica alle costruzioni in terra cruda, Aracne Editrice, Roma, pp. 116-127.

Firrone T., 2008. Nuove forme ed espressioni dell’architettura in terra cruda, in: Germanà M. L., Panvini R. (Eds.), La terra cruda nelle costruzioni. Dalle testimonianze archeologiche all’architettura sostenibile, Nuova Ipsa Editore, Palermo, pp.169-178.

Italian Encyclopedia Treccani

Kerè D.F. G. E., 2010, Fare architettura in Africa, Foschi, Forlì.

May J., 2011. Architettura senza architetti, Rizzoli, Milano.

Authors Index

UNIVERSITY OF MESSINA
Department of Economics
P.zza Pugliatti, 1 · 98122 Messina (Italy) ✆ +39 090.6767113
www.unime.it/it/dipartimenti/economia

International Sustainable Development
Research Society
www.isdrs.org

www.isdrsconference.org · isdrs2018@unime.it