

Vernacular Architecture of Northern Nigeria: A Review

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Abstract— Nigeria, a country located in the Western part of Africa has been the site of numerous kingdoms and tribal states over the millennia and is divided in to Northern and Southern parts. The Hausa-Fulani are diverse but culturally homogeneous group of people (tribe) living in the northern part of Nigeria with a civilization dating back to a millennium; which was evident from their cultural heritages and ancient buildings/ structures. Vernacular Architecture of the Northern part of Nigeria like any other place in the world is characterized by certain features which was shaped by the people's culture, tradition, religion, religion, artistry and the materials available within the region. The Aim of this study is to review and discuss the Vernacular Architecture of Northern Nigeria (VANN); its concept and features with a view of identifying the factors hindering the vernacular architectural practices in the northern part of Nigeria. The methodology adopted for this study was from the secondary sources such as journals, conference papers, text books, newspapers, magazines and the internet etc. The results shows that the main features of VANN as: the colorful, intricate and elaborate *Engraving* symbols, *Building materials* which were uniquely used and further subdivided into four: *Earth, Timber, Reeds/Grasses, and Stones*. Whereas, the main factors hindering the concept and practicing VANN were classified in to natural factors (such as weather and climate) and social factors (such as human neglect, economic conditions, modernization and discontinuity).

Keywords: Buildings Materials, Engravings, Vernacular Architecture, Features, Hausa-Fulani, Hindrances, Northern Nigeria, etc.

1.0 RATIONALE TO THE STUDY

Nigeria, a country located in the Western part of Africa has been the site of numerous kingdoms and tribal states over the millennia and is divided in to Northern and Southern parts. The Hausa-Fulani are diverse but culturally homogeneous group of people (tribe) living in the northern part of Nigeria with a civilization dating back to a millennium; which was evident from their cultural heritages and ancient buildings/ structures.

The Ancient structures of the Hausa-Fulani in Northern Nigeria have a special aura around them and they are of various shapes and sizes. Over the centuries a tradition of fine architecture has flourished in the area. The variety and quality of buildings in Northern Nigeria are bound to generate much delight and enthusiasm in anyone who is interested in buildings and structures. Indeed, the manner after which a building is constructed, and the sheer artistry that is deployed in the effort, combines to reveal aspects of a people's development, their history and culture, and assists in projecting the precise conditions of a people's soul [1].

The architecture of the Hausa is perhaps one of the least known but most beautiful of the medieval age. Many of their early mosques and palaces are bright and colorful, including intricate engraving or elaborate symbols designed into the façade [2]. This architectural style is known as *Tubali* which

means the traditional *architecture* in the Hausa language and globally known as Vernacular Architecture (VA). The term "Vernacular Architecture" (VA) is not an easy term to define. Many studies define it in many different ways such as:

- VA is the 'idea and technology' of a particular group's manner of constructing shelter under the conditions of scarcity of materials and operative constructional techniques Porphyros (2006) [3];
- Adhocratic's approach to Architecture (Attoe, 1979) [4];
- VA is a true reflection of how generality of people want to build, and is depictive of life style they are comfortable with. In its articulation, it is a product of age-old building traditions of a locale, amalgamated with selectively borrowed practices and features of other cultures the group has interacted with (Osasona, 1992) [5];
- VA is a "native science of building", the types of building made by people in tribal, folk, peasant and popular societies where an architect, or a specialist designer is not employed (Oliver 2006)[6];
- VA is defined as architecture that is the outcome of anonymous design period, and objective environmental surrounding that a society forms for itself (Gunce et al, 2008); [7];
- VA evolved from centuries of experience of a people living under different climatic conditions worldwide. It involves design and construction techniques using

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locally available resources based on the environmental, cultural and historical background of people (Oliver, 1983; Oliver, 1997 as cited by Chandel et al., 2016), [8], [9],[10];

- VA is an architectural style that is designed base on local needs, availability of materials and reflecting local traditions [11].
- VA also known as local or regional architecture is defined as the unconscious “realization” and “embodiment” of the culture of the society with the requirements of the people in nature (Glassie, 1990 as cited by Kirbas and Hizli, 2016) [12], [13].

From the above definitions, this research work simply defines VA as *“a building structure or a constructed shelter of a group of people according to their ethnicity, culture, traditions, religion/beliefs and environment which is constrained by their climate and locally available materials”*.

According to Oneh and Ati (2010), the present day traditional architecture takes the effort and generation of builders who make use of whatever works for them while discarding what did not [14]; In the tropics only scientific evaluation of new ideas will save its traditional architecture [15]; in Nigeria, the old earth buildings are being replaced by modern structures [16]; the state of quality control for earth construction hangs in critical balance with very limited tolerance for satisfactory performance paving the way for the use of sand-cement wall system due to their durability, wider tolerance in tropical environment and performs satisfactorily [ibid].

Vernacular Architecture (VA) in Northern Nigeria (NN) has suffered a great deal, be it from human neglect, socio-economic conditions, weather and climatic factors, discontinuity and or modernization etc.. The socio-economic conditions of Nigerians makes most people financially strained thereby making them neglect using earth for building because of the maintenance issues.

The Aim of this study is to review and discuss the Vernacular Architecture of Northern Nigeria (VANN); its concept and features with a view of identifying the factors hindering vernacular architectural practice in the northern part of Nigeria. The main sources of data were journals, conference/seminar/workshop papers, text books, newspapers, magazines and the internet etc., were used to review literatures in the VA field which helps in identifying and narrowing its concepts, features and relevance within the Nigerian and Global context.

2.0 LITERATURE REVIEW

2.1 Features of Vernacular architecture of Northern Nigeria

Vernacular architecture of northern Nigeria has many unique features which distinguish it from any other architecture. Some of the notable features are the engravings on the façade of the building walls, use of building materials such as mud, reeds, stones, and timber within the structures like foundations, walls, columns, slab, beams, doors, windows, plastering, and process of renovations. This feature forms an intricate, diverse and colorful form of architecture which can only be found in northern Nigeria. As such this research will discuss the above features of VANN in the light of sustainability.

2.1.1 Engravings

Engraving is the practice of incising a design onto a hard, usually flat surface, by cutting grooves into it. The result may be a decorated object in itself [11]. The first evidence for humans engraving patterns is a chiseled shell, dating back between 540,000 and 430,000 years, from Trinil, in Java, Indonesia, where the first Homo erectus was discovered [17].

In northern Nigeria, the wall engravings are designed by traditional builders, professional artisans and highly experienced hand engravers who are able to draw out minimal outlines directly on the wall surface just prior to engraving. The work to be engraved may be lightly scribed on the surface with a sharp point tool, or hand drawn with a fine permanent marker, transferred using various tools and skill set of the engravers. The engravers may rely on free hand drawing skills and common design elements when creating the work.

Adamu (2005), categorize decoration in Hausa traditional architecture in to three groups, namely surface design, calligraphy and ornamental [18]. Agboola & Zango (2014), argues that the Hausa practiced form of “graffito” on which decorative patterns are scratched in to smooth wall patterns resulted from texturing the interstices of the decorative layout by roughing it with a piece of metal. Hausa people decorate their street facades with intricate interlacing arabesque relief forms painted in rich colors. Hence the façade decoration usually demonstrates wealth and social prestige [19].

Unfortunately in most of the cities in Northern Nigeria, these earth buildings are considered as relics for they are being replaced by modern structures. These result in receding or vanishing of these glorious kinds of traditional earth buildings. Hence, the needs for sustaining such a VA feature. Engraving works and its final finishing are fully shown in the figure below.



Figure 1: Engraving works (as a unique feature of Vernacular Architecture of Hausa-Fulani in Northern Nigeria)

Source: www.pinterest.com[34]

2.1.2 Building materials

The materials used in the VANN has been discussed by many researchers which includes but not limited to: The three well-defined materials that are prominent in the building traditions of Africans are; stone, straw, and earth which have been independently and jointly used and skillfully applied [20]; in Hausa land, the four major building materials are: earth, timber, reeds/grasses, and stones. Though in most cities, stones are less used, apart from this mud is more tolerant to climate because of its poor conductivity [17], [14], [21]; evolution of Hausa's house form is based on availability of materials. None of the materials used by traditional architecture was company manufactured, processed or fabricated [22]; the using locally available building materials of our African ancestors deserve to be preserved. West Africa today suffers from the effects of colonization. Architecture is a field in which remarkable achievements have been made in Africa using the indigenous technology and materials. Examples of local materials to achieve outstanding architectural monuments are: Bight of Benin (stabilized mud brick and plaster, thatch, timber, shingles); The Kano wall (mud and vegetable mat); Centenary Hall, Ake, Abeokuta (stone, mud, timber) [23].

2.1.2.1 Earth as a building material

The use of earth as a building construction material dates back to 12000 BC [16], [24]. It was a phase in the historic development of human shelter. The basic house walls in most of traditional architecture in Nigeria were built of 'earth' in simple low-cost and self-help construction arrangement [16]. Ejiga et al., (2012) opined that very little of adobe/earth/mud/brick architecture have lasted, apart from some of the monuments, temples and mosques. Nevertheless, the enduring cultural practices of rural people indicates that adobe or mud surely has been one of the most common and abundantly obtainable material that influenced and sustained the rural villages as a part of environment which connected it to cyclic and delicate eco-system responsibly and carefully, while using its resources and occupying the areas responsibly created [20].

Generally, the material employed was wattle-and-daub earth technology; a method in some cases which uses solid wooden

post frame which is first made and then filled with adobe balls to create wall. Most often, the African builders construct the walls of their building layer by layer using the mud bricks and slurry mixture of earth as a mortar [17] [20] [25]. As soon as it is plastered and properly covered with overhanging roofs, these earth buildings were structurally firm, environmentally sound and could exist for years as long as the day to day maintenance was adhered to [20]. The building earth greatly differs in quality from the excellent brown clay to the blackish type with which builders make and adopt the wattle-and-daub constructions. The earth is dug out from borrow pits, carefully chosen by the builder from which bricks, mortar and plaster were made [14]. The earth is usually spread on the ground, wetted and trampled by foot until it reaches the consistency of thick paste. This is left for a couple of days to dry before being wetted and trampled on again. If the quality of the broken earth is low, it is mixed with grass called "Datsi" in Hausa language [17].

Oliver (2006) asserted that stunning examples of earth buildings in Sahara, the Middle East, Latin America, China and India, with a sprinkling from Europe and North America, underlined the universality of the employment of the material [10]. Hamed et al., (2013) also states that the use of earth was necessary to make the best possible use of other materials and fix it firmly to form the structure especially where neither wood nor stones are available, mud are used alone. The development of the adobe brick, a performed modular masonry unit of sun dried mud, came in to existence with higher civilization levels [26].

Thus, earth is the prominent building material in the vernacular architecture of Northern Nigeria because it is one of the most common and abundantly obtainable building materials in Northern Nigeria and therefore became the most utilized in traditional buildings. Earth is also used as a binder when mixed with grass to form a composite material as it surrounds the grass to form a firm and rigid structure.

2.1.2.2 Stone as a building material

Ejiga et.al (2012), states that the basic form of the use of stones/rock for dwellings had begun with the habitation of naturally occurring caves about which walls and roofs are in mud or thatch, bricks and straws were erected converting them in to livable places [20]. Hamed et al., (2013), opined that human were constantly on the move following the hunting and gathering patterns as dictated by the region in which they lived in the olden days. As their hunting and gathering patterns were refined, humans repeatedly visited the same desirable locations such as caves and cliff sites, with proximity to food and water [26]. Karpuz, (1984) as cited by Kirbas&Hizli, (2016) states that the main materials in traditional houses are stones, wood, bricks and metals. Stones are the most utilized materials; some of them prevent moisture and humidity which are used in building foundations, walls and facades etc. [27], [28].

In some parts of Northern Nigeria, stones are used in building foundations because of its moisture proofing property. In

some areas with heavy rainfall, layers of stones or un-coursed rubbles are used in other to reduce the amount of the moisture movement from the foundation upwards [14].

2.1.2.3 Thatch and Grass as building materials

According to Eneh (2006), the grass and earth forms a composite material. While the grass is the reinforcement, the earth serves as a matrix or binder as it surrounds the straw or thatch. The thatch/ straw possess a tensile strength while the earth has compressive strength [29]. Thatch is one of the oldest of building materials known; grass is a good insulator and easily harvested. Many African tribes have lived in homes made completely of grasses and sand year-round [11].

According to Ejiga et.,al (2012), thatch has in most case being used with adobe bricks or masonry walls or singularly. Even today nomad tribes within these regions still use this form of construction. Thatch construction uses matted or baled straw from wheat, oats, barley, rye, rice and others as wall or covered by earthen or lime stucco [20]. Thatching methods have traditionally been passed down from generation to generation, and numerous descriptions of the materials and methods used over the past three centuries [11]. Various natives of Africa use thatch as a construction material for the most suitable use and Hausa people are not an exception, they use thatch which are traditionally waste materials because it is a dry stalk, left in their farms after harvesting for construction and in mixing or binding with earth to form a composite building material. It is also used as a roofing material in some areas of Northern Nigeria.

2.1.2.4 Timber as building materials

Wood has been used as a building material for thousands of years in its natural state. Today, engineered wood is becoming very common in industrialized countries. Wood is a product of trees, and sometimes other fibrous plants, used for construction purposes when cut or pressed into lumber and timber, such as boards, planks and similar materials. It is a generic building material and is used in building just about any type of structure in most climates [11]. The best timber used in Hausa traditional buildings are obtained from the trunks of male palm tree (Daleb or Giginya). The timbers are commonly called "Azara" beams. They are rigid and heavy, resistant to termite attack, and very durable because they took several years to decay. They serve as wooden reinforcement to strengthen the structures of the wall and pillars [14].

According to Dmochowski (1990) as cited by Eneh and Ati (2010), the "Azara" beams are also used to make frames constructions, beams, brackets and corbels as elements for carrying flat and domed roofs. The ashes of the timber are often used as an insulating layer when spread on top of flat roofs, treated with in fusions from pods or roots to water proof the top of flat roofs [17], [14]. Various natives of Africa use timber as a construction material and Hausa people are not an exception. They usually harvest their timber from the locally available tree trunks mostly male palm tree (Daleb or Giginya) tree and use them in construction as beams and columns. They also use the ashes for insulation and water proofing on flat

roofs.

As such, the main features of VANN are: colorful, intricate and elaborate *Engraving* symbols drawn or carved in the building facades as decoration which demonstrates wealth and social prestige of the owner of the building; *Building materials* which were uniquely used by artisans and master builders, further subdivided into four: *Earth, Timber, Reeds/Grasses, and Stones* with earth as the most prominent of these materials because it has been one of the most common and abundantly obtainable material.

Below are some buildings exhibiting the Vernacular Architecture of northern Nigeria in Traditional Palaces, Prison and city gates.

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The table below summarized the features of VANN identified from the literature:

Table1: Features of Vernacular architecture of Northern Nigeria

S/N	Features of VANN	Description	Sources
1.0	Engravings	<ul style="list-style-type: none"> · Form of “graffito” on which decorative patterns are scratched in to smooth wall, · Surface design, calligraphy and ornamental · Interlacing arabesque relief forms painted in rich colors. 	[18], [19]
2.0	Building materials	<ul style="list-style-type: none"> · Architecture is a field in which remarkable achievements have been made in Africa using the indigenous technology and materials, · The major building materials are: earth, timber, reeds/grasses, and stones, · Evolution of Hausa’s house form is based on availability of materials. 	[14], [17], [20], [21], [23]
2.1	Earth as a building material	<ul style="list-style-type: none"> · The most common and abundantly obtainable material that influenced and sustained the rural villages as a part of environment, · The method employed was wattle-and-daub earth technology, · Stunning examples of earth buildings worldwide underlined the universality of the employment of the material · Earth was necessary to make the best possible use of other materials where neither wood nor stones are available, mud are used alone. 	[16] [17] [20], [24], [25]
2.2	Stone as a building material	<ul style="list-style-type: none"> · Basic form of the use of stones/rock for dwellings had begun with the habitation of naturally occurring caves, · Stones are the most utilized materials; some of them prevent moisture and humidity which are used in building foundations, walls and facades · Layers of stones or un-coursed rubbles are used in other to reduce the amount of the moisture movement from the foundation upwards. 	[14], [20], [27], [28]
2.3	Thatch and Grass as building materials	<ul style="list-style-type: none"> · The grass and earth forms a composite material while the thatch/straw possess a tensile strength while the earth has compressive strength, · Thatch is one of the oldest of building materials known; grass is a good insulator and easily harvested · Thatch construction uses matted or baled straw from wheat, oats, barley, rye, rice and others as wall or covered by earthen or lime stucco. 	[11], [20], [29]
2.4	Timber as building materials	<ul style="list-style-type: none"> · The best timber used in Hausa traditional buildings are obtained from the trunks of male palm tree (Daleb or Giginya) commonly called “Azara” beams, · The “Azara” beams are also used to make frames constructions, beams, brackets and corbels as elements for carrying flat and domed roofs · The ashes of the timber are often used as an insulating layer when spread on top of flat roofs, treated with in fusions from pods or roots to water proof the top of flat roofs. 	[14], [17]

Source: Authors, from literature review

2.2 Factors affecting Vernacular Architecture of Northern Nigeria

Vernacular Architecture of any place is affected or impacted by many different things and vernacular architecture (VA) in Northern Nigeria (NN) is no exception. Vernacular architecture in Northern Nigeria has suffered a great deal from many different factors like human neglect, socio-economic conditions, weather and climatic factors, discontinuity and modernization.

Various architectural concepts have certain factors hindering their sustainability and vernacular architecture of Northern Nigeria is no exception, some of the factors are; human neglect such as neglect of heritage buildings, forgetting and ignoring of traditional architectural element [30], [31]; socio-economic conditions such as financial wherewithal, social class factor, and high cost of maintenance of traditional buildings [16], [20]; modernization such as replacement of the old buildings with new ones using modern building materials, poor social acceptability of traditional buildings, and societal advancement somehow had downgraded these practices of using traditional building materials in favoring the machine intensive [16], [32];

discontinuity such as lack of qualified artisans and master builders, disappearance of traditional buildings in the cities, and many of the traditionally significant buildings of earth have weathered badly and are partially derelict [16], [30]; weather and climatic conditions such as surface erosion, partial crumbling, unhealthy conditions due to constant humidity and hollowed bases and wear and tear of the buildings, constant humidity, and moisture from underground [16], [33].

As such, the main factors hindering VANN can be classified in to natural factors (such as weather and climate) and social factors (such as human neglect, economic conditions, modernization and discontinuity). The factors and their impacts are described in the table below.

Table 2: Factors hindering VAAN and their Impacts

S/N	Factors hindering VAAN	Impacts	Sources
1	Human neglect	Neglect of heritage buildings, Forgetting and ignoring of traditional architectural element.	[30], [31]
2	Socio-economic conditions	Financial wherewithal, Social class factor, and high cost of maintenance.	[16], [20]
3	Modernization	Replacement of the old buildings with new ones, Poor social acceptability.	[16], [32]
4	Discontinuity	Lack of qualified artisans and master builders, Disappearance of traditional buildings in the cities, Traditionally significant buildings of earth have weathered badly and are partially derelict.	[16], [30]
5	Weather and climatic conditions	Surface erosion, partial crumbling, unhealthy conditions due to constant humidity and hollowed bases, Wear and tear of the buildings, Constant humidity, and moisture from underground.	[16], [33]

Source: Authors, from literature review

3.0 DISCUSSION, RESULTS AND CONCLUSION

Vernacular Architecture of the Northern part of Nigeria like any other place in the world is characterized by certain features which was shaped by the people's culture, tradition, religion, religion, artistry and the materials available within the region. The literature reviewed in this work was used to identify and tabulate the main features of VANN and also the Factors Hindering the concept and its practices. The main identified features of VANN are: colorful, intricate and elaborate *Engraving* symbols drawn or carved in the building facades as decoration which demonstrates wealth and social prestige of the owner of the building; *Building materials* which were uniquely used by artisans and master builders, further subdivided into four: *Earth, Timber, Reeds/Grasses, and Stones* with earth as the most prominent of these materials because it has been one of the most common and abundantly obtainable material. Whereas, the main factors hindering the concept and practicing VANN were classified in to natural factors (such as weather and climate) and social factors (such as human neglect, economic conditions, modernization and discontinuity).

REFERENCES

- [1] URL: <http://allafrica.com/stories/200202200154.html> accessed on 31/10/2016.
- [2] Kano chronicle, 1970-72 accessed 10/29/16.
- [3] Porphyrios, D., 2006. Classicism is not a style. In : Jencks, C. and K. Kroopf, (Eds.), *Theories and Manifestoes of Contemporary Architecture*. 2nd Edn., John Wiley and Sons Ltd., Sussex, pp: 179-180.
- [4] Attoe, W.O., 1979, *Theory, Criticism and History of Architecture*. In: Snyder, J.C. and A.J Catanese, *Introduction to Architecture*. McGraw Hill Book Company, New York, pp:30.
- [5] Osasona, C.O., The concept of the "traditional" in African architecture (Chapter 2). *Principles of Traditional Culture*, ed. M. Okediji, BARD Books: Ibadan, pp:18-25, 1992.
- [6] Oliver P., 2006, *Built to Meet Needs Cultural Issues in Vernacular Architecture*. Elsevier Ltd., Oxford, UK. 2006.
- [7] Kagan Gunce, & Zafer Ertuk & Sevic Ertuk., *Questioning the "prototype dwellings" in the framework of Cyprus traditional architecture*, available online at www.Sciencedirect.com, Elsevier Ltd. 2007.
- [8] Oliver P. *Encyclopedia of Vernacular Architecture of the World*. Cambridge University Press,; 1997 pp 14.
- [9] S.S Chandel, V. Sharma & B.M. Marwah., *Review of energy efficient features in Vernacular Architecture for improving thermal comfort conditions*, available online at www.Sciencedirect.com.
- [10] Oliver P. *Earth as a building material today*. 5. Oxford Art J Arch,; 1983. Pp 2.
- [11] URL: Wikipedia.org accessed 10/29/16
- [12] Glassie, H. (1990), *Architects, Vernacular Traditions and Society, Traditional Dwellings and Settlement Review* Vol, 1, No 2 (spring), 9-21. Retrieved in August 17 from: <http://www.jstor.org/stable/23566248>.
- [13] Kirbas and Hizli, 2016, *learning from Vernacular Architecture: Ecological solutions in traditional Erzurum Houses.*, available online at www.Sciencedirect.com, Elsevier Ltd. 2016.
- [14] Anselm E.O, & O.F Ati., 2010., *The influence of rainfall on Hausa traditional architecture*. Research journal of applied science, engineering and technology. Maxwell Scientific organization 2010.
- [15] Fatty H., 2006. *Natural energy and Vernacular Architecture*. In: Jencks, C. and K. Kroopf, (Eds.), *Theories and Manifestoes of Contemporary Architecture*. 2nd Edn., John Wiley and Sons Ltd., Sussex, pp: 144-145.
- [16] C. Egenti, J.M. Khatib, & D. Oloke., *Conceptualization and Pilot Study of Shelled Compressed Earth Block for Sustainable Housing in Nigeria*, 2014. Publication source, 2212-6090/c 2014 the gulf Organization for research and development.
- [17] Dmochowski, Z.R., 1990. *An introduction to Nigerian architecture-Northern Nigeria*. Ethnographica Ltd., London. pp: 1.4,-1.10, 1.2, 1.39, 1.45, 4.20.
- [18] Adamu, M.S.T (2005): 'interpretation of significant and messages in Hausa traditional architecture. Case of "zaure" entrance hall. Journal of association of architectural educators in nigeria. Vol4, No 1. January -March, 2005. Pp10-21'.
- [19] O.P. Agboola & M.S. Zango. (2014) *Development of traditional architecture of Northern Nigeria; A Case Study of Hausa house form*. International Journal of African Society Culture and Traditions. Vol.1, No 1, pp 61-74, June 2014.
- [20] O. Ejiga, O. Paul, O.O. Cordelia. *Sustainability in traditional African architecture: a springboard for sustainable urban cities*. June 2012. Sustainable futures: architecture and urbanism in global south Kampala, Uganda 27-30 June 2012.
- [21] Moughtin, J.C., 1985. *Hausa Architecture*. Ethnographica Ltd., London, pp: 1-123.
- [22] Adeyemi, E. A. (2008): *Meaning and Relevance in Nigerian Traditional Architecture: the Dialectics of Growth and Change*. Public Lecture Series one. (21), pp 1-33.
- [23] T.O. Odeyale & T.O. Adegunle. *Innovative and sustainable local material in traditional African architecture - Socio cultural dimension*. Structural Analysis of Historic Construction - D'Ayala & Fodde (eds) © 2008 Taylor & Francis Group, London, ISBN 978-0-415-46872-5.
- [24] Pacheco-Torgal, F., Jalili S., 2012. *Earth construction: lessons from the past for future eco-efficient construction*. Constr. Build. Mater. 29, 512-519.
- [25] Fathy, H. (1973). *Architecture for the poor; an experiment in rural Egypt*. The university of chicago press, Chicago. ISBN:0-226-23916-0.
- [26] Hamed. N., M.F.M. Zain., M. Jamil., S. Niroumad. *Earth architecture from ancient until today*. 2nd Cyprus international conference on educational research 2013.
- [27] Karpuz, H. (1984a), *Turk Islam Meskin Mimarisinde Ezerum Evleri*, Ankara: ministry of culture and tourism publication.
- [28] Kirbas and Hizli, 2016., *Learning from Vernacular Architecture: Ecological solutions in traditional Erzurum Houses.*, available online at www.Sciencedirect.com, Elsevier Ltd. 2016.
- [29] Eneh, A.E.O., 2006. *Composite materials and their uses: A review*, An unpublished paper, pp2.
- [30] C.O Osasona., F.O. Ewemade. *Upgrading Ille-Ife's vernacular architecture heritage*. WIT Transactions on the Built environment, V109, 2009 WIT Press, ISSN 1743-3509.

- [31] H.G.A. Ibrahim. Regeneration of sustainability in contemporary architecture: approach based on native function and activities strengthen identity. Urban planning and architecture design for sustainable development, UPADSD 14-16 October 2015.
- [32] Khalil, N. (1999) Ceramic houses and earth architecture, how to build your own, california: calEarth press.
- [33] UNCHS Habitat (1986). Earth construction technology: Manual on surface protection. Nairobi: UNCHS (Habitat).
- [34] URL: www.pinterest.com

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