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International Journal of Engineering & Scientific Research

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International Journal of Engineering & Scientific Research

(Volume No. 12, Issue No. 1 January - April 2024)

Contents

No.	Title / Authors Name	Pg. No.
1	Effect of Quaternary Binder Systems on Mechanical Properties of Concrete – <i>Shyam Dhrangadharia, Sagar Vishwakarma, Abhishek Kumar, Bhagirath Saran</i>	01 - 10
2	Critical Success Factors To Procure A Own House – <i>Ramanigopal C S, Murugesan. G, Muralidharan.S & JayaramaChandran. P</i>	11-15
3	Ramanigopal C S, Murugesan. G, Muralidharan.S & JayaramaChandran. P – <i>Dr. Sandhya Aravind C. A. and Dr. H. Sylaja</i>	16-21
4	"Awareness towards Environmental Education and Sustainable Development: A case study of High School teachers of District Kupwara of Jammu and Kashmir State, India". - <i>Ajaz Ahmad Naikoo, Dr. Shahataj Begum,</i>	22-31
5	Sustainable Materials And Elements In Low Cost Housing In North Central Nigeria - <i>Usman Bukar Nuhu, Assoc. Prof. Dr. HalilZafer Alibaba,</i>	32-45

Effect of Quaternary Binder Systems on Mechanical Properties of Concrete

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ABSTRACT

This paper presents the results of an experimental study on the effect of mechanical behavior of quaternary cementitious system prepared from a mixture of cement additives. Fly ash (FA), blast furnace slag (BFS), metakaolin (MK) and silica fume (SF) were added simultaneously in different proportions by replacing 50% and 30% of Portland cement (PC) by weight. Tests were carried out to characterize the mechanical behavior of binary and quaternary blended concretes at 7, 28, 56, 90, 180 and 365 days. In this study the quantification parameters of strength of quaternary blended system are compressive strength test, tensile strength and flexural strength test. The synergistic action of the cement additives has a positive effect vis-a-vis the mechanical properties of the mix combinations with quaternary binders are better than that of the control concrete. Test results showed that the incorporation of FA, SF and BFS/MK as partial replacement to the PC resulted in improved mechanical properties of hardened concrete.

Keywords: cement additives, compressive strength, flexural, fly ash, metakaolin

1. INTRODUCTION

The use of mineral additives as partial replacement to Portland cement in concrete is a better step towards sustainable development because of their technological, economic, and environmental benefits. Inert and pozzolanic cement additives modify the properties of concretes by their physical and chemical activities. When the cement additives are added, three effects can be quantified including, filler, heterogeneous nucleation and pozzolanic reaction depending on the amount and solubility of amorphous silica. The filler action involves incorporating additives/mineral admixtures that are finer than the PC, so that these occupy small pores previously left vacant. Heterogeneous nucleation is a physical process leading to the chemical activation of hydration of PC such that the cement addition particles act as nucleation centers for the hydrates, thus enhancing cement hydration (1). Pozzolanic action takes place between the amorphous silica of the cement additive and the calcium hydroxide/portlandite (CH) produced by the cement hydration reactions to produce non-water-soluble calcium silicate hydrates (C-S-H). As the density of C-S-H is lower than that of CH and pure silica, a consequence of this reaction is a swelling of the reaction products. Concrete should be resistive from all weathering actions, therefore mechanical, durability and microstructure study of concrete should be considered [2-4].

The use of mineral additions such as limestone fillers, blast furnace slag and natural pozzolana improves the resistance of concrete to the attack of aggressive agents (sulfuric acid), because they reduce the presence of calcium hydroxide, which is the most vulnerable component to acid attacks (5). The slag has several advantages in the manufacture of cement. First, it has a relatively constant chemical composition compared to fly ash, silica fume, natural pozzolana etc. In addition, it has other advantages such as, low heat of hydration, resistance to acids and sulfates, better workability, and higher ultimate strength (6-8).

The cements standards allow only the introduction of only small quantities (less than 5%) of secondary components, in cements. The main objective of this research is to achieve information about the effect of the simultaneous incorporation of fly ash, blast furnace slag, metakaolin and silica fume as partial replacement to the Portland cement on the sulphate resistance and chloride ion resistance of concretes.

2. MATERIALS AND METHODS

The properties of different materials used were determined in the laboratory as per relevant codes of practice. The materials used in this research programme are PC (53 Grade), crushed gravel as coarse aggregates and natural sand as fine aggregates. The cement additives, which were used as partial replacement of PC to produce binary and quaternary mixes, are FA, BFS, MK and SF. Ordinary Portland cement of 53 grade satisfying the requirements of IS: 8112-1989 was used in the study. The physical properties of the cement and cement additives as determined from various tests conducted are listed in Table-1. Figure-1 presents the particle size distribution of all powders used in the study. Table 3 presents the slump test results of all fresh concretes prepared in this investigation.

Table 1 Physical and chemical properties of the PC, FA, SF, MK and BFS.

Description	PC	FA	BFS	SF	MK
Physical Characteristics					
Specific gravity	3.13	2.26	2.86	2.23	2.51
Blaine's Fineness, cm ² /gm	2285	3720	3250	16018	8735
Compositions					
CaO	67.81	2.01	36.80	1.28	1.56
SiO ₂	18.58	62.32	41.55	88.31	51.48
Al ₂ O ₃	9.92	26.18	16.21	0.89	47.83
Fe ₂ O ₃	3.01	3.40	0.69	1.60	0.39
MnO	0.03	0.02	0.04	0.00	0.00
MgO	1.34	2.70	3.56	0.15	0.10
K ₂ O	0.49	0.99	0.68	1.98	0.19
Na ₂ O	0.23	0.06	0.20	0.40	0.07
LOI	0.88	2.98	1.09	2.00	0.56

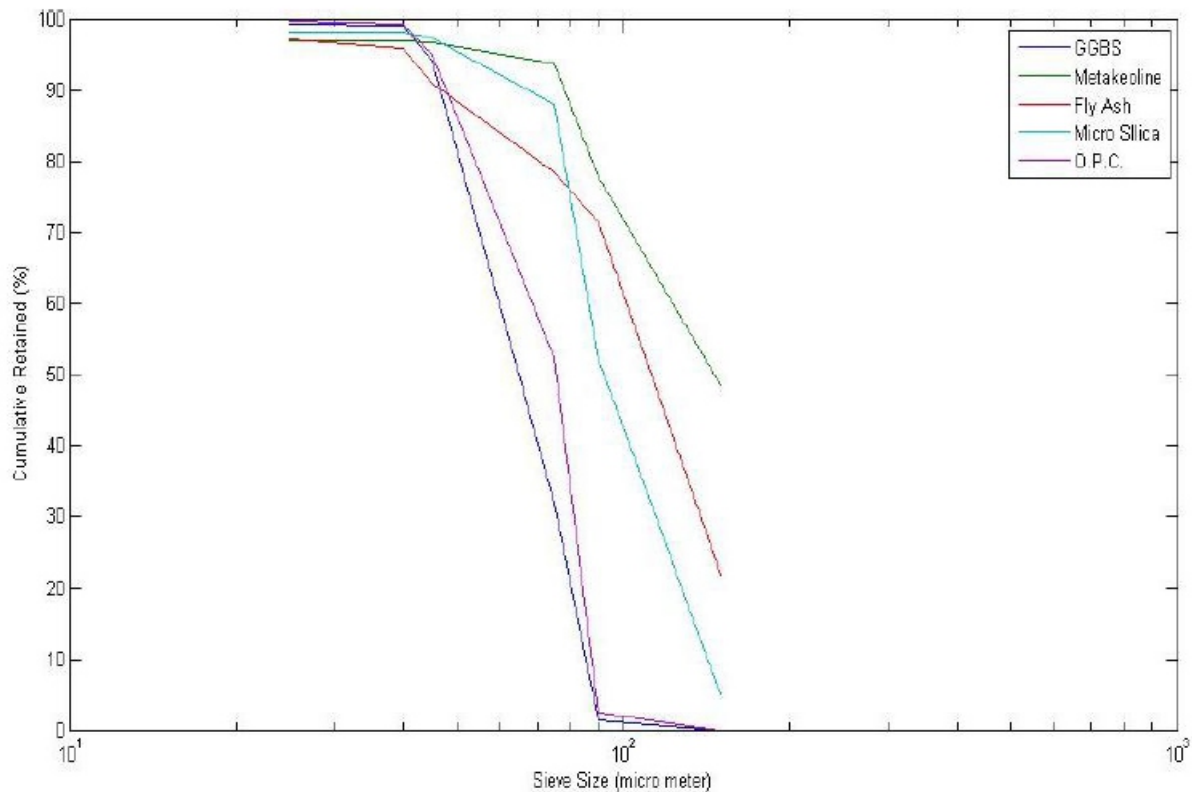


Figure-1 Particle size distribution of all powders used in the study.

The present investigation on the strength performance of mix combinations containing BFS, FA, MK and SF as cement additives in different proportions, involved preparing twelve mixes - control concrete (100% PC); binary blended mix combinations (70% PC + 30% FA) and (50% PC + 50% FA); quaternary blended mix combinations (70% PC + 20% FA + 5% SF + 5% BFS); (70% PC + 15% FA + 7.5% SF + 7.5% BFS); (50% PC + 30% FA + 10% SF + 10% BFS) and (50% PC + 20% FA + 15% SF + 15% BFS); (50% PC + 15% FA + 20% SF + 15% BFS); (70% PC + 20% FA + 5% SF + 5% MK); (70% PC + 15% FA + 7.5% SF + 7.5% MK); (50% PC + 30% FA + 10% SF + 10% MK); (50% PC + 20% FA + 15% SF + 15% MK) and (50% PC + 15% FA + 20% SF + 15% MK). The mix combinations incorporating cement additives were prepared by replacing 30% and 50% of PC by weight with these additives in binary and quaternary mode.

Table-2 summarizes the mix proportions used in this investigation. Table-3 presents slump test measurements of all mix combinations.

Table-2: Concrete mix combinations used in the present investigation.

MIX	Weight of constituents (kg) of concrete (M40)								
	OPC	PFA	SF	BFS	Water	Admixture	FA	CA (10mm)	CA (20mm)
100% Control	440	-	-	-	167	2.64	677	391	839
70% OPC + 30% FA	308	132	-	-	167	2.64	621	394	838
50 % OPC + 50 % FA	220	220	-	-	167	2.64	647	374	803
70%OPC + 20%FA + 5%SF + 5% GGBS	308	88	22	22	167	2.64	613	419	851
70% OPC + 15% FA + 7.5% SF + 7.5% GGBS	308	66	33	33	167	2.64	613	420	850
50% OPC + 30%FA + 10% SF + 10% GGBS	220	132	44	44	167	2.64	603	419	851
50%OPC+ 20%FA + 15%SF + 15% GGBS	220	88	66	66	167	2.64	603	419	851
50%OPC + 15%FA + 20% SF + 15% GGBS	220	66	88	66	167	2.64	603	419	851
70%OPC + 20%FA + 5%SF + 5%MK	308	88	22	22	167	2.64	568	409	880
70%OPC + 15%FA + 7.5% SF + 7.5% MK	308	66	33	33	167	2.64	577	415	893
50%OPC + 30%FA + 10% SF + 10%MK	220	132	44	44	167	2.64	560	403	867
50%OPC + 20%FA + 15%SF + 15% MK	220	88	66	66	167	2.64	560	403	867
50%OPC + 15%FA + 20% SF + 15% MK	220	66	88	66	167	2.64	560	403	867

Compressive strength was measured as per I.S. 516-1959 using 200 T capacity universal testing machine using standard 150 X 150 X 150 mm cubes. The load was applied at the rate of 14 N/mm²/minute, approximately. The average of three specimens was taken as the representative value of compressive strength of each batch of concrete. Split tensile test was carried out as per IS: 5816-1999. Concrete cylinders of size 150 mm diameters and 300 mm height were casted. During casting, the cylinders were mechanically vibrated using a table vibrator. After 24 h, the specimens were removed from the mould and subjected to water curing for 28 days. After the specified curing period was over, the concrete cylinders were subjected to split tensile test by using universal testing machine. Tests were carried out on triplicate specimens and the average split tensile strength values were recorded. Flexure strength was measured using standard 100 X 100 X 500 mm beam specimens, simply supported on an effective span of 400 mm and loaded at the third points after 90 days of curing. The test was carried out as per IS: 516-1959 (Reaffirmed 2004).

Table-3: Slump results of all mix combinations

Mix Combinations	Slump (mm)
100% Control	110
70% OPC + 30% FA	130
50 % OPC + 50 % FA	140
70%OPC + 20%FA + 5%SF + 5% GGBS	102
70% OPC + 15% FA + 7.5% SF + 7.5% GGBS	115
50% OPC + 30%FA + 10% SF + 10% GGBS	175
50%OPC+ 20%FA + 15%SF + 15% GGBS	170
50%OPC + 15%FA + 20% SF + 15% GGBS	190
70%OPC + 20%FA + 5%SF + 5%MK	140
70%OPC + 15%FA + 7.5% SF + 7.5% MK	145
50%OPC + 30%FA + 10% SF + 10%MK	143
50%OPC + 20%FA + 15%SF + 15% MK	142
50%OPC + 15%FA + 20% SF + 15% MK	145

3. RESULTS and DISCUSSION

3.1 Compressive Strength Test

The averaged compressive strength results of cube specimens of each batch of different concrete cubes were measured at 7, 28, 56, 90, 180 and 365 days of curing are presented in Figs. 2 and 3. It was observed that the compressive strength of all mix combinations increases continuously over time. At all ages, the strength of quaternary concretes is more than that of the control concrete. Quaternary mix combinations (50% PC +30% FA+ 10% SF+ 10% MK), (50% PC +30% FA+ 10% SF+ 10% BFS), (70% PC +15% FA+ 7.5% SF+ 7.5% MK) and (70% PC +20% FA+ 5% SF+ 5% MK) has shown best performance amongst others at higher ages. The increase in the strength of concretes containing cement additives is attributed to the reaction of silicates of mineral additives with released lime to form additional C–S–H that contribute to the development of compressive strength.

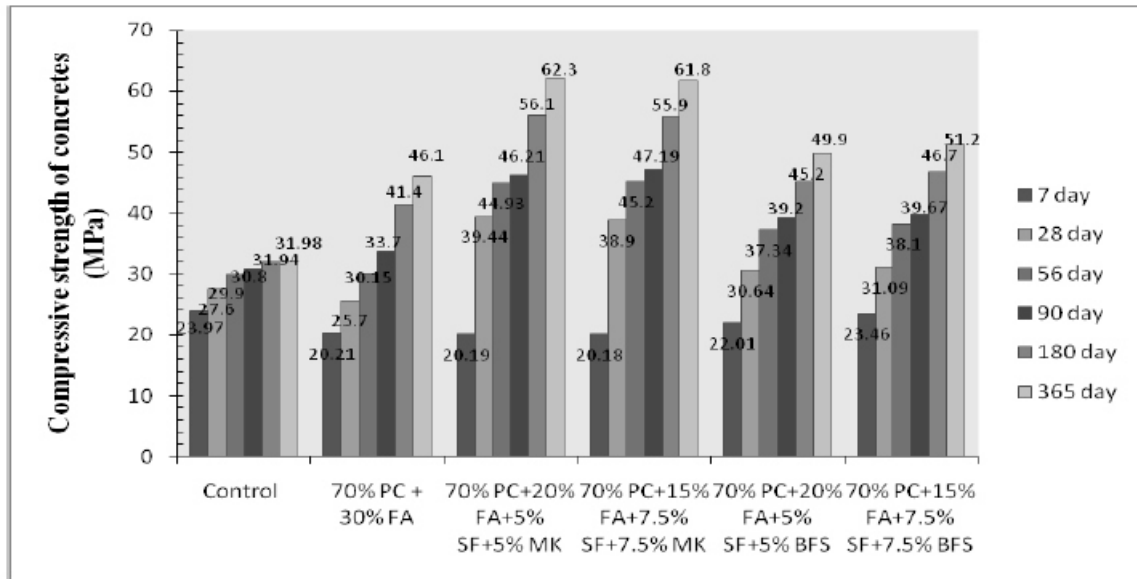


Fig. 2. Compressive strength results of (M 40) concretes containing 30% of mineral admixtures

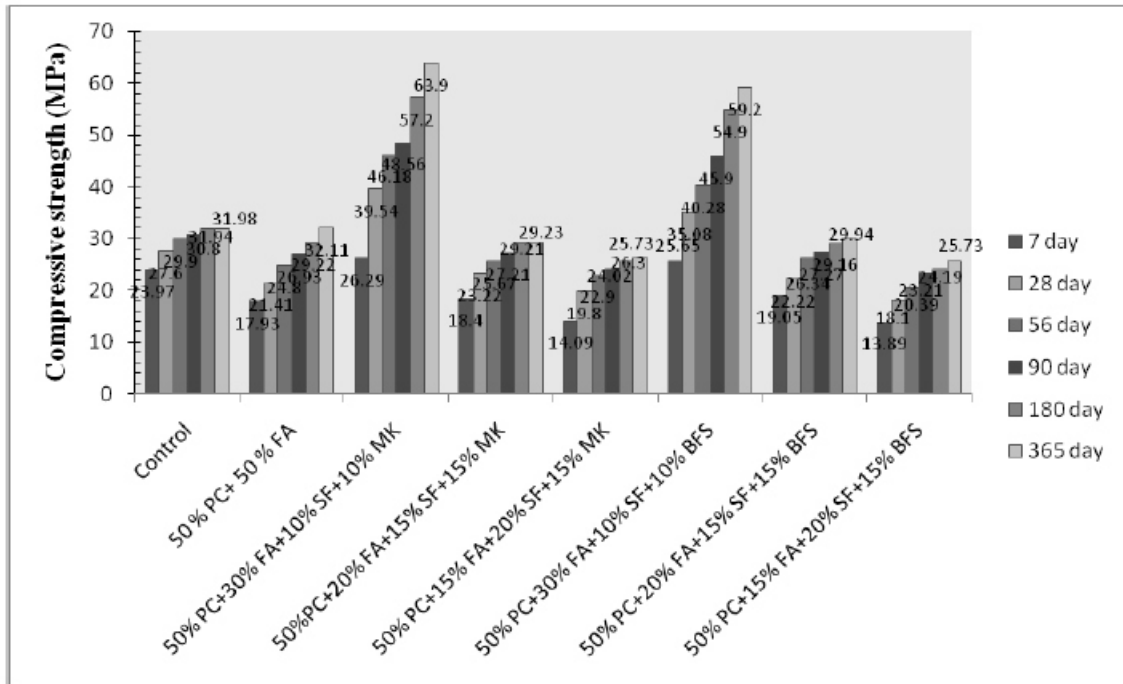


Fig. 3. Compressive strength results of (M 40) concretes containing 50% of mineral admixtures

3.2. Tensile Strength Test

It was also observed that the tensile strength of all mix combinations increases over time as evident in Figs. 4 and 5. In few cases, i.e. (70% PC +20% FA+5%SF+5%MK), (70% PC +15% FA+7.5% SF+7.5% MK), (50% PC +30% FA+10%SF+10%MK) and (50% PC +30% FA+10%SF+10%GGBS) shown good tensile strength. From the observed test results the effect of using mix combinations of supplementary cementitious materials in quaternary mixtures on the tensile strength is clear, almost similar behavior was observed with the 30% replacement of OPC with supplementary cementitious materials.

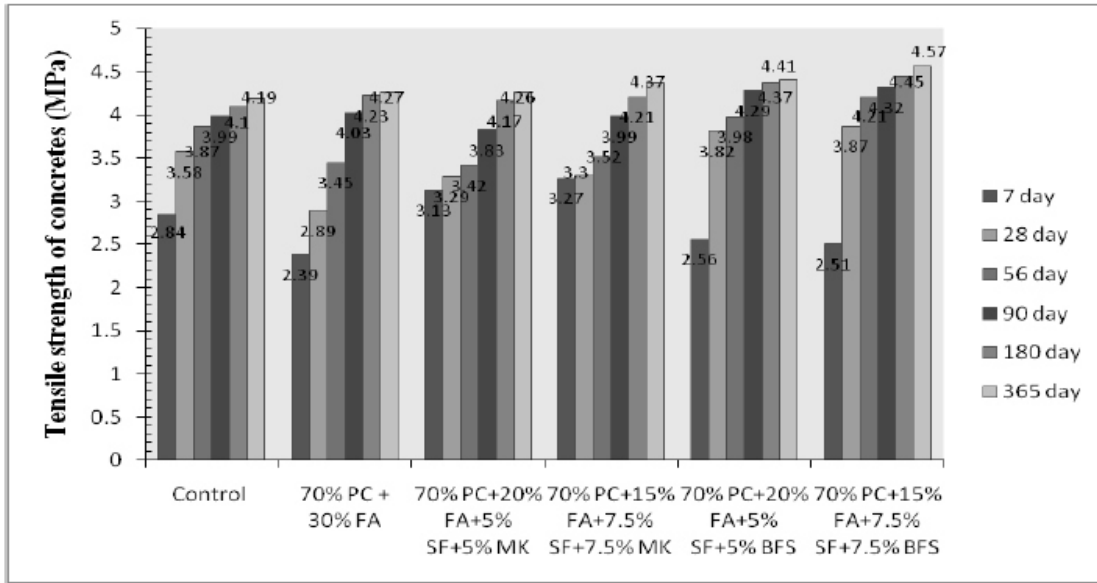


Fig. 4. Tensile strength results of (M 40) concretes containing 30% of mineral admixtures

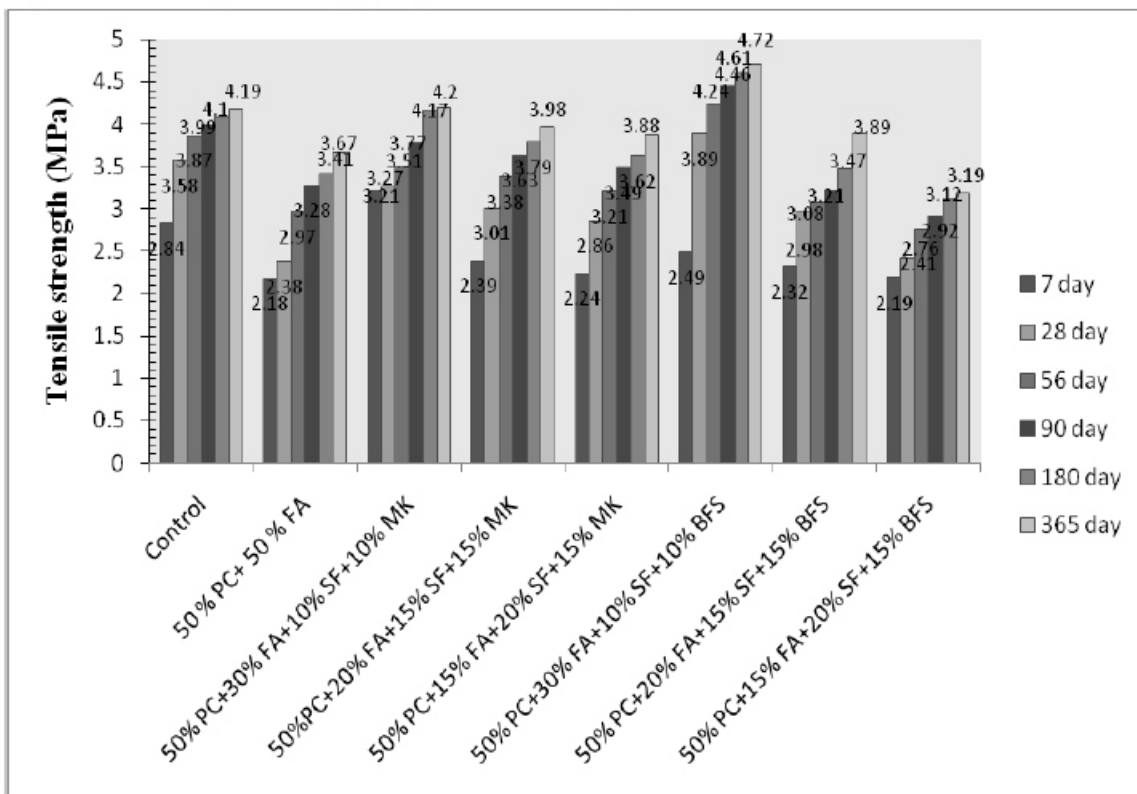


Fig. 5. Tensile strength results of (M40) concretes containing 50% of mineral admixtures

3.3. Flexural Strength Test

Figs. 6 and 7 shows the static flexural strength test results of all quaternary concretes at given test days. Quaternary mix combinations containing FA, SF and MK have shown best performance amongst others

at higher ages at 30% of mineral admixtures. Mix8 and mix 11 (50% OPC + 30% FA + 10% SF + 10% MK/GGBS) has shown best flexural strength among other proportions. Also, it was observed that 50% replacement of OPC with supplementary cementitious materials shows better performance as compare to 30% replacement.

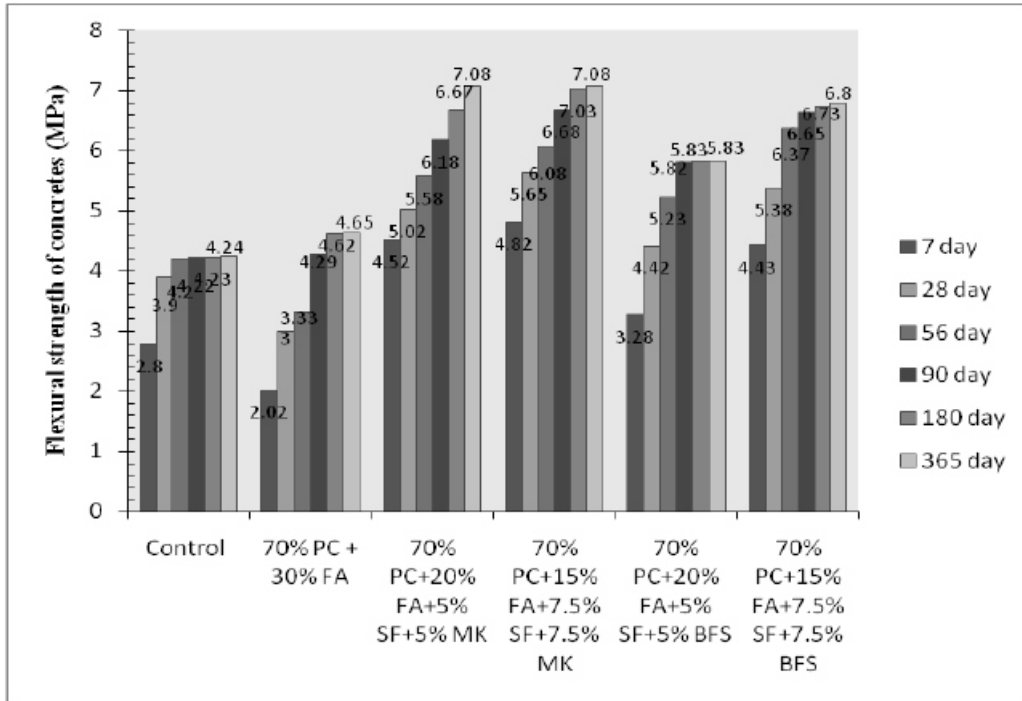


Fig. 6. Flexural strength results of (M 40) concretes containing 30% of mineral admixtures

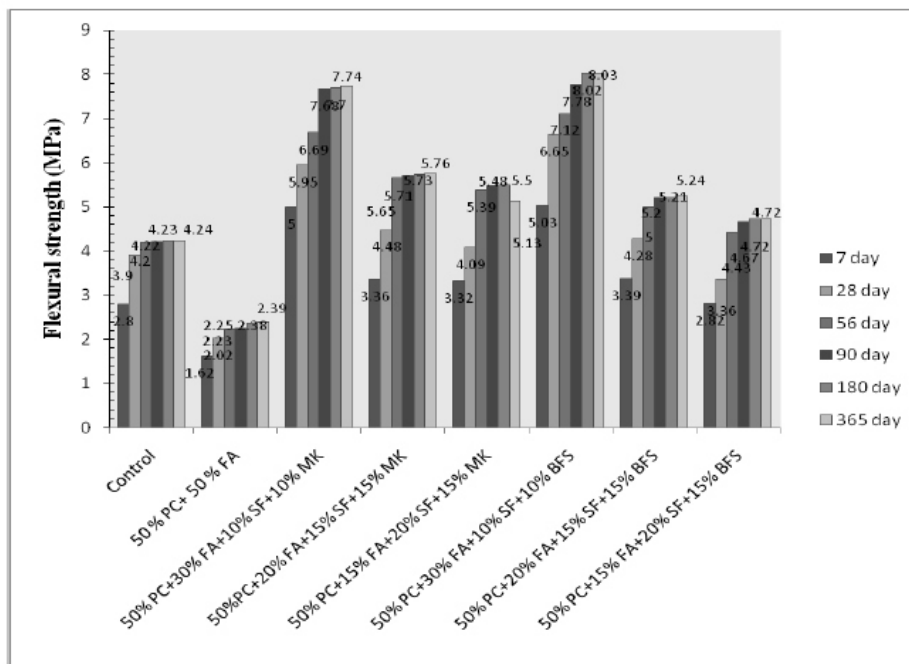


Fig. 7. Flexural strength results of (M40) concretes containing 50% of mineral admixtures.

4. CONCLUSION

This study investigates the behavior of quaternary concrete after incorporating FA, SF, GGBS and MK. The experimental results revealed that the addition of supplementary cementitious materials, such as, FA, SF, GGBS and MK in cement affects the properties of concrete. Based on the test results, the following conclusions can be drawn:

1. The compressive strength of quaternary concrete increases with the addition of pozzolanic materials and the improvement of strength indicates that the pozzolans are more effective with low water/binder ratio. The quaternary concrete with (50% OPC + 30% FA + 10% SF + 10% MK) and (50% OPC + 30% FA + 10% SF + 10% GGBS) have shown the best results in terms of a good compressive strength. 2. In all cases, the flexural strength and tensile strength of quaternary concrete have shown acceptable results. The optimum Mix 8 and Mix 11 have shown 25% and 10% higher flexural strength as compare to control mix and around 11.9% and 11.2% higher tensile strength than control mix at the age of 365 days. 3. Quaternary concrete could be the best substitute of OPC concretes. It's utilization in construction may help in reducing the burden on natural raw materials used in OPC and promote the utilization of waste materials in construction.

REFERENCES:

- [1] P. Pipilikaki, M. Katsioti, *Study of the hydration process of quaternary blended cements and durability of the produced mortars and concretes*, *Constr. Build. Mater.* 23 (2009) 2246–2250. [2] K. Githachuri, M. Alexander, *Durability performance potential and strength of blended Portland limestone cement concrete*, *Cem. Concr. Compos.* 39 (2013) 115–121. [3] K. Vance, M. Aguayo, T. Oey, G. Sant, N. Neithalath, *Hydration and strength development in ternary portland cement blends containing limestone and flyash or metakaolin*, *Cem. Concr. Compos.* 39 (2013) 93–103. [4] P. Pipilikaki, D. Papageorgiou, Ch. Teas, E. Chaniotakis, M. Katsioti, *The effect of temperature on the thaumasite formation*, *Cem. Concr. Compos.* 30 (2008) 964–969. [5] Z. Makhloufi, T. Bouziani, M. Hadjoudja, M. Bederina, *Durability of limestone mortars based on quaternary binders subjected to sulfuric acid using dryingimmersion cycles*, *Const. Build. Mater.* (2014) 579–588. [6] Z. Chang, X. Song, R. Munn, M. Marosszeky, *Using limestone aggregates and different cements for enhancing resistance of concrete to sulphuric acid attack*, *Cem. Concr. Res.* 35 (8) (2005) 1486–1494. [7] J. Monteny, N. De Belie, L. Taerwe, *Resistance of different types of concrete mixtures to sulfuric acid*, *Mater. Struct.* 36 (258) (2003) 242–249. [8] M. Georgescu, N. Saca, G. Voicu, *Hydration–hydrolysis processes in blended cements with limestone filler and fly ash content*, *Rom. J. Mater.* 38 (2008) 260–270. [9] K. Vance, M. Aguayo, T. Oey, G. Sant, N. Neithalath, *Hydration and strength development in ternary portland cement blends containing limestone and fly ash or metakaolin*, *Cem. Concr. Compos.* 39 (2013) 93–103. [10] Z. Makhloufi, M. Bederina, T. Bouziani, E.H. Kadri, M. Bouhicha, *Formulation of superplasticized limestone concrete of Turonian*, *Int. Rev. Mech. Eng.* 7 (6) (2013) 1103–1114. [11] B.S.M. Person, *Shrinkage of high performance concrete*, in: *Proceedings of International Workshop on Autogeneous Shrinkage of Concrete, Hiroshima, Japan, E & FN Spon, London, 1988, pp. 105–115.*

REFERENCES:

- [12] P.J. Kamann, *Porosity and Permeability in Sediment Mixtures (Masters thesis)*, Department of Geological Sciences, Wright State University, Dayton, OH, 2004.
- [13] A.B. Yu, N. Standish, A. McLean, *Porosity calculation of binary mixtures of nonspherical particles*, *J. Am. Ceram. Soc.* 76 (11) (1993) 2813–2816.
- [14] M. Thomas, *Optimizing the Use of Fly Ash in Concrete*, http://www.cement.org/docs/default-source/fc_concrete_technology/is548-optimizing-the-useof-fly-ash-concrete.pdf, 2007 (last accessed date 30th Jan, 2017).
- [15] Z. Makhloufi, T. Bouziani, M. Bederina, M. Hadjoudja, *Mix proportioning and performance of a crushed limestone sand concrete*, *J. Build. Mater. Struct.* 1(2014) 10–22.
- [16] A. Elkhadiri, A. Diouri, J. Boukhari, F. Aride, F. Puertas, *Mechanical behaviour of various mortars made by combined fly ash and limestone in Moroccan Portland cement*, *Cem. Concr. Res.* 32 (2002) 1597–1603.
- [17] S. Yazici, H.S. Arel, *Effects of fly ash fineness on the mechanical properties of concrete*, *Sadhana* 37 (3) (2012) 389–403. *Indian Academy of Sciences*.
- [18] Niragi Dave, Anil Kumar Mishra, Surendrakumar Kaushik, *Experimental analysis of strength and durability of quaternary cement binder and mortar*, *Constr. Build. Mater.* (2016) 117–124.

Critical Success Factors To Procure A Own House

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ABSTRACT

Owning a house is an important desire of every Individual. Owning a house becomes easy to some people and challenging to some people. These all depends upon the awareness about the land procurement process and its formalities. That too, if the buyer belongs to middle income group, he can invest only on budgetary houses. If the location of the buyer is rural based his investment may be sufficient to procure an individual house. Similarly if the investor is located in city, then it will become a challenging one to meet out the budget required to own an individual house. Then the alternate choice of the investor may be towards apartment houses. While this is the case on investment side, his investing ability alone is not sufficient to procure a house. Investor needs to aware or consider some of the most essential factors to procure house investment irrespective of the property proposed. This study explores the most essential critical factors a housing investor has to consider to have secured investment. This study may enlighten every common man to handle his investment carefully in the real estate sector. Also these critical factors may provide knowledge to make a secured property management.

Keywords: *Investor, Real Estate Sector, Construction Industry, Apartment, Housing, Property Management.*

INTRODUCTION

Every individual wants to own a house and willing to have that own house as an individual house. Owning an individual house is not that much trivial to a middle class investor, that too in cities. In big cities, it is a big challenge to common man and is not so easy to achieve his target. Especially to middle class investors, hence they are all inclined to apartment houses that can meet out their financial sources. Hence, the demand for middle class budget apartments grows to meet out the need of the middle class population. Hence, Real estate promotion business lies in promoting apartments projects for middle class budget. So, Business promoters also inclined towards promoting apartments projects, targeting middle class investors. So that, the technocrats also moves to promote their housing business promotion in middle class budget houses. So, new housing business promotion entrants also focused towards apartment promotions as their targeted business opportunity. Construction Engineers having lesser experience in construction industry also started targeting in promoting apartment construction at budget based.

CORPORATE SELLER OR ENGINEER BASED

Every investor should have their own buying strategy or strategy for promoter analysis while procuring apartments. They should have sufficient negotiation skills and analytical ability to justify their suppliers. They should have clear awareness about their choice of choosing their suppliers as whether they are going to procure a house that was planned and promoted by an experienced engineer or corporate housing promoters. There should be a sufficient clarity about the housing promotion was done by direct supervision of a construction engineer or a corporate housing promoters those who are promoting their houses as a corporate entity.

If the housing project is promoted by a construction engineer, the buyer should consult that engineer and may collect sufficient information directly from the engineer promoting that housing project. The buyer could collect technical information that can provide implied information about the expertness and experience of the construction and business promoting engineer. If the housing project is promoted by a housing promoting corporate, a representative representing that corporate may explain the technical details about the housing in promotion. The investor cannot take it as granted, all the promoters commitments that he provides during the process of selling the house projects. He may apply some false commitments as his marketing strategy just to promote the project. Those false commitments may be or may not be fulfilled at the end of the project. Hence, the investor should have ability to explore and assess the promoter, before deciding the promoter with all the possible decision making efficiency.

CREDIBILITY

The investor should have sufficient ability to assess the promoting engineer or corporate based on their credibility and their sustainability in the housing project promotions. The investor should not justify this factor based on the size of the project but based on the credibility of the promoter. The investor should assess the quantum of experience of the promoter in the construction industry. If a promoter exists in a market for tenure of five years or more, it is an indication that their credibility is better that can be assessed by verifying their existing customers those who invested earlier from that project promoters. The investor can approach those customers and may collect their expert opinion and experience about the particular housing promoter to conclude the promoter. Also it is always better to take opinion from the recent customers of the current project in which the investor proposed to procure a house. This assessment should be physical visit to the site proposed and conversion in person; it should not be just oral confirmation or telephonic conversation.

NATURE OF THE SITE

It is investor's responsibility also to assess the nature of the site proposed or construction done. Investor should visit to the spot and verify the nature of the site. He should collect about the site, such as whether site is a new housing promotion area, or already promoted. If the site is a past project, the stability of the soil can be easily verified. If the site is located in a promoted area, investor can claim the stability information about the existing construction. If the project is a, to be promoted one and apartment based, the investor has to verify with the promoter about the soil stability test, and the confirmation about the soil test were conducted in at least six locations. The report should reflect the eligibility of the soil as per industry standards. Those soil test report may help the investor to understand the condition of the soil, size of the eligible pillars, size, and related standards to be followed etc. investor should collect the report and keep clarity with the consultation of a known engineer or market experts.

CONSTRUCTION STRUCTURE

Investors have to verify the nature of the construction and its nature, based on the report of the soil test, and its standards. Because based on the soil report only construction project approval of the proposed construction project and its approval of the local authorities. The approval report of the propose construction will reflect about the technical details about the materials required and its specifications. Investors should understand and verify the specifications in the approval and the construction in process. The investor should verify materials used, depth of the pillars, applications of the technology, diameter of the pillar, rods used to form pillars, blue metals proposed, quality of the cement recommended and its grade, construction materials and size of the materials to be used., density of the of the concrete and etc., should also be verified.

LEGAL DATA

Investor has to verify the blue print approval of the housing proposed has to be verified that whether it has been stated as per the plan approval of the local body authority. This approval should be within the approved period and its expiry has also to be verified by the investor. Also investor has to cross verify whether the construction is as per the specifications stated in the approval of the plan. Also he has to check the approval specifications that includes no of floors if it is a multistory building. Investor has to do regulation analysis about the existence and quantum of violation if any; that violation has to be noted in the aspect of viability for solving etc. The investor should aware of these violation in the construction, and also should cross verify those violations against the approved one, and all the possibilities for ratification or the quantum of penalty should also be noted if any.

COMPLETION CERTIFICATES

If the investor is interested towards a project that too a completed one, then he has to verify the construction completion certificates from respective local body authorities for the eligibility to occupy. Completion and Occupancy certificate should express as if there is no violation or incompleteness, and if any, that has to be ratified or not etc.; that completion certification should be issued by the respective authorities with appropriate field and physical verifications of the site certified. Such certificate should also express that the respective site has been constructed as per the specifications of the approval and nothing has been violated etc., In practical, these types of tests are becoming rarest, but it is always better to have the same appropriately without fail. But at the same time utilizing those improperly approved housing for residence without appropriate approval is also a risky one. Only Apartment housing projects can fulfill the housing need of the city resident's, especially middle class investors in the cities. These are the reasons why an investor has to consider the experience of the individual promoter or the credibility of the corporate promoter has to be taken into consideration while choosing the housing promoter analysis. Hence the investor needs to apply all the most important critical factors that have to be adopted, from the approval of the site proposed to construct to till getting the construction completion certification, and occupying the apartment or individual house. Then only the investor can feel secured in his investments and residence.

CONCLUSION

Earning is easy but securing the hardly earned money thru investment is a challenging one. Every individual wants to fulfill his desire, in which owning a house property is one of the most essential as well as social status of every one. To fulfill his desire investor has to explore the housing market according to his need and budget. According to the budget and location the size and nature may defer. Investors' affordability makes him to take decision accordingly. Investor needs to possess sufficient awareness and skills to procure a house. He has to consider so many critical factors while deciding the investor, choosing the location, finalizing the cost, concluding the quality, desiring the facilities, verifying the legal documents, resourcing the finance and executing his decision etc., this study provides the most essential critical factors that can provide successful investment in a housing property in the real estate sector.

REFERENCES

[1] Akintoye, A.S. and Macleod, M.J. (1997). *Risk analysis and management in construction. International Journal of Project Management. 15(1), 31-38.*

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- [2] D'arcy, E. and Keogh, G. (2002). *The market context of property development activities, Development and developers: Perspectives on property*, Blackwell Publishing, 19-34.
- [3] Geltner D. and MILLER N.G. (2001). *Commercial Real estate Analysis and Investments*, Ma-son.
- [4] Hewlett C. and Kaufmann, G. (2008). *Strategy for real estate companies*, Urban Land Institute.
- [5] Isaac D. and O'leary, J. / Daley, M. (2010). *Property Development: Appraisal and Finance*. 2nd ed., Palgrave Macmillan.
- [6] Miles, M. E., Berens G. and Eppli M., Weiss, M.A. (2007). *Real estate development: principles and process*, 4th ed., Urban Land Institute.
- [7] Peiser, R. and Frej, A. B. (2003). *Professional Real Estate Development, The ULI Guide to the Business*, 2nd ed., Urban Land Institute.
- [8] Ratcliffe, J., Stubbs, M. and Keeping, M. (2009). *Urban planning and real estate development*, 3rd ed., Routledge.
- [9] Shun, C. K. L. (2000). *Review of risk management techniques for property development*, Henley Working Paper.

Behavioral Pattern and Level of Aggression in people with Speech Disorders

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ABSTRACT

Speech disorders can affect the way that a person creates sound to form words and then to sentences. The most common experienced speech disorder is stuttering. The personality profile of a stutterer is more or less complicated. The behavioral pattern varies with restlessness, impatience and tension. They may show more tendencies to suppress their anger and aggression with the belief that they were not able to express words before other people. The present study is an attempt to find out the behavioral pattern and the level of aggression in people with stuttering. The subjects were 120 male adults (60 stutterers and 60 non stutterers) from different districts of Kerala. The tool used in the present study are Type A/B Behavioral Pattern Scale (ABBPS) developed by Upinder Dhair and Manisha Jain (2001) and the Aggression Questionnaire developed by G.C Pati (1976). The analysis was done in SPSS version 20, and t-test was the main statistical analysis employed. The results showed that majority of the adult stutterers belongs to type A behavioral pattern and the level of aggression was not found to be significant while comparing adult stutterers with adult non stutterers.

Keywords: Behavioral Pattern, Aggression, Speech Disorder

INTRODUCTION

Speech disorder is a communication disorder in which the normal speech is disrupted also termed as speech impediments. Stuttering is the common type of speech disorder experienced. The American Speech and Hearing Association (ASHA) define communication disorder as: "Impairment in the ability to receive, sends, process, and comprehends concepts or verbal, nonverbal and graphic symbol systems. A communication disorder may be evident in the processes of hearing, language, and/or speech. A communication disorder may range in severity from mild to profound. It may be developmental or acquired. Individuals may demonstrate one or any combination of the three aspects of communication disorders. A communication disorder may result in a primary disability or it may be secondary to other disabilities" (ASHA, 1993). Communication disorders may range from sound substitutions to the inability to use speech and language. Speech difficulties in adult are common and come in many forms including stuttering, dysarthria, voice problems and articulation difficulties. The speech disorder involved in the current study is stuttering. In stuttering the flow of speech is disrupted by involuntary

repetitions and prolongations of sounds, syllables, words or phrases as well as involuntary silent pauses or blocks in which the person who stutters is unable to produce sound. Wingate's (1964) definition of stuttering is probably the most accepted one by professionals in this area. He defines stuttering as a "disruption in the forward flow of speech which is characterized by involuntary, audible or silent, repletion or prolongation in the utterance of short speech elements, namely sounds, syllables and words of one syllable. These disruptions usually occur frequently or are marked in character and are not readily controllable". This definition included descriptions of accessory movements of the speech mechanism or other parts of the body. These accessory features of stuttering accompany the disruptions of verbal fluency and may be seen as being related to the struggle behaviors of stuttering. Wingate stated that the individual who stutters often experiences alterations in emotion that may be as general as an increase in tension or excitement or as specifically negative as the occurrence of fear, embarrassment, or similar emotions. Chronic stuttering may be accompanied by ocular, auditory or physiological manifestations such as eye movements, grimaces or linguistic circumlocutions which may occur when the speaker tries to avoid certain words. The presence and severity of stuttering vary and may be predicted to some extent by the communicative environment and the words being uttered.

The behavioral patterns of people who stutter are characterized by restlessness, impatience, tenseness and time urgency. Like any frustrating experience, stuttering can cause anger. It is one of the personality trait in which a stutterer is unwilling to express their anger openly. The more anger they feel, they are less willing to express it openly. Hence they are likely to stutter more severely. Some individuals may direct the feelings of anger inwards that is they hate themselves which leads to a vicious cycle or self fulfilling prophecy or failure. Some stutterers direct their feeling of anger outward to other people and this can affect their relationships in their work settings and in their society and create a vicious cycle of failure. They may also express their anger in terms of aggressive activities towards the environment. So in the current study an attempt has made to understand the behavioral pattern and aggression of people with stuttering.

Objectives

1. To find out the behavioral pattern of adult stutterer.
2. To find out the significant difference in the level of aggression between adult stutterer and adult non stutterer.

Hypotheses

1. The behavioral pattern of adult stutterer will be type A.
2. There will be no significant difference in the level of aggression between adult stutterer and adult non stutterer.

Method

Participants

The participants of this study consist of 120 subjects, 60 stutterers and 60 non stutterers. Only male stutterers were included in the study whose age ranges from twenty five to fifty. The data were collected from various stutterers belonging to different districts of Kerala. Purposive random sampling method was used for data collection.

Instruments

1. Type A/B Behavioral Pattern Scale (ABBPS) - This scale was developed by Upinder Dhair and Manisha Jain (2001) and this scale has two parts – Form A and Form B to measure Type A and Type B behavior patterns separately. The scale constituted 33 items, 17 items in form A and 16 items in form B. The form A measures six characteristics of a person such as tenseness, impatience, restlessness, achievement orientation, domineering and workaholic. The form B measures five characteristics of a person such as complacent, easygoing, non- assertive, relaxed and patience. The reliability coefficient of form A was found to be .54 and for form B also, it was found to be .54. The validity was found to be .73 for both form A and form B.
2. The Aggression Questionnaire- The Aggression Questionnaire was developed by G.C Pati (1976).The questionnaire consists of 16 questions, which describes 16 different situations relating to family, peers, certain outside persons, antisocial characters, police and court. The reliability of the questionnaire was found to be .71 and the validity was found to be .82.
3. Personal Data Sheet- Personal information like age, sex, religion, occupation, marital status, type of family, birth order of the participants were collected using personal data sheet.

Procedure

The investigator collected the data from Stuttering Foundation Kochi. Then the participants were directly contacted and explained about the aim of the study and the procedure prior to collecting the data. After completion the research instruments were collected back and checked for incompleteness. Scoring was done as per the manual and entered into a spread sheet for further statistical analysis. Similarly data was collected from the non stutterers also who were matched on the basis of age, sex, educational qualification, monthly income, birth order and marital status.

Results and Discussion

The first objective of the study was to find out the behavioral pattern of adult stutterer, whether they belongs to Type A behavior pattern or Type B behavior pattern. The results are presented in the following table.

Table 1

Percentage of type A and type B behavioral pattern of adult stutterers

Behavioral Pattern	Percentage of stutterers
Type A	80%
Type B	20%

Table 1 shows the percentage of stutterers belonging to type A and type B behavioral pattern. Among the 60 adult stutterers majority of them, i.e, 80% comes under the category of Type A personality. The remaining 20% of adult stutterers comes under the category of Type B personality. This may be because most of the stutterers had a high tendency towards hostility, sense of immense time urgency and impatience that seems to be the characteristics of a Type A personality person. They may speak fast, act fast, see goals and challenges everywhere and may be due to these they stutters. In the case of Type B stutterers, they may work hard and may have considerable drive but they feel no conflict with people or time. They may be more relaxed and easy going than Type A stutterers. They may accept situations and work within those situations rather than fight them competitively.

Level of Aggression between adult stutterer and adult non stutterer.

The second objective of the study was to find out the significant difference in the aggression between adult stutterer and adult non stutterer. To find out the significant difference, descriptive statistics was calculated and the results are presented in the following table.

Table 2

Means, standard deviations and t value relating to the significance of the difference between the stutterers and non stutterers on aggression.

Variable	Group	N	Mean	Std. Deviation	t-value
Aggression	Stutterers	60	471.22	51.089	0.439
	Non stutterers	60	475.50	55.801	

Table 2 gives the means, standard deviations and t value relating to the significance of the difference between the stutterers and non stutterers on aggression. It can be seen that there is no significant difference in aggression between stutterers and non stutterers. But by comparing the mean value of aggression between stutterers and non stutterers, it can be seen that non stutterers (Mean= 475.50) are more aggressive than stutterers (Mean= 471.22). The result was opposing the finding of Blood and Blood (2007). They conducted a study of self-reported experience of physical aggression and bullying of boys who stutter: Relation to increased anxiety. This study examined the relationship of self-reported anxiety and vulnerability to bullying for 18 children who stuttered and 18 children who did not stutter. More children who stuttered were at significantly higher risk of experiencing bullying behavior (61%) than children who did not stutter (22%); 39% of children who stuttered scored at least one standard deviation above the mean on the Revised Children's Manifest Anxiety Scale, suggestive of higher anxiety. In contrast, only 6% of children who did not stutter scored at least one standard deviation above the mean. The correlation was .82 for children who stuttered between greater vulnerability to bullying and self-reported anxiety. A bidirectional relationship is hypothesized between high anxiety and bullying of children who stutter.

CONCLUSION

Most of the people with speech disorders share somewhat similar characteristics. Their mode of speech was very rushed which can lead to more stuttering. Same time they share the characteristics of impatience and time urgency. Their impatience can add on to their anger and follows lower levels of aggression when compared with that of those who do not stutters. A speech therapist and psychologist can develop some feasible strategies that may enable the stutterers to deal effectively with other peoples and also to develop a better functioning of their life. The findings of the present investigation is helpful for clinicians to get an awareness that people presenting for help with managing their stuttering are likely to have chronically raised levels of various psychosocial and many adjustment problems. Through the present study, it is possible to know more about the factors affected to a stutterer and can give a better ability to understand the disorder and help the individual to cope with it in positive and healthy ways.

REFERENCES

American Speech- Language- Hearing Association. (1993). Definitions of communication disorders and variations (Relevant Paper). Available from www.asha.org/policy, doi: 10.1044/policy.RP1993-00208.

Blood, G. W., & Blood, I. M. (2007). Preliminary study of self-reported experience of physical aggression and bullying of boys who stutter: Relation to increased anxiety. Journal of Perceptual and Motor Skills, 104(3), 1060-1066.

Pati, G. C. (1976). Manual of directions for the Aggression questionnaire. Varanasi: Rupa Psychological Centre.

Upinder, D., & Manisha, J. (2001). Manual for the Type A/B Behavioral Pattern Scale. Indore: Prestige Institute of Management and Research.

Wingate, M. E. (1964). A standard definition of stuttering. Journal of Speech and Hearing Disorders, 29, 484-489.

"Awareness towards Environmental Education and Sustainable Development: A case study of High School teachers of District Kupwara of Jammu and Kashmir State, India".

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ABSTRACT

This study provides a detailed description of the awareness of High School teachers towards environmental education and sustainable development. The study surveyed 600 teachers in 50 different high schools of the district and after the analysis of the collected data, it was found that majority of the teachers (93%) have awareness regarding environmental education and sustainable development.

INTRODUCTION

Environmental Education constitutes a comprehensive lifelong education, one responsive to changes in a rapidly changing world. The United Nations Educational, Scientific and Cultural Organization (UNESCO) states that environmental education is vital in imparting an inherent respect for nature amongst society and in enhancing public environmental awareness. UNESCO defines environmental education as a process of developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones (UNESCO, 1976). UNESCO emphasizes the role of environmental education in safeguarding future global developments of societal quality of life (QOL), through the protection of the environment, eradication of poverty, minimization of inequalities and insurance of sustainable development (UNESCO, 2014 a).

Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, in 1972, declared Environmental Education must be used as a tool to address global environmental problems. In 1977, the Intergovernmental Conference on Environ-

-mental Education in Tbilisi, Georgia emphasized the role of Environmental Education in preserving and improving the global environment and sought to provide the framework and guidelines for environmental education. The Conference laid out the role, objectives, and characteristics of environmental education, and provide several goals and principles for environmental education. After the 1970's, non-governmental organizations that focused on environmental education continued to form and grow, the number of teachers implementing environmental education in their classrooms increased, and the movement gained stronger political backing. A critical move forward came when the United States Congress passed the National Environmental Education Act of 1990, which placed the office of Environmental Education in the U.S. Environmental Protection Agency and allowed the EPA to create environmental education initiatives at the federal level.

In India, to promote environmental awareness across the nation, the Centre for Environmental Education (CEE) was established in August 1984 with a support from the Ministry of Environment and Forests, Government of India. One of the tasks of the CEE is to put efforts to give due recognition to the role of environmental education. The CEE runs many educational programs in this regard. The National Policy on Education 1986 has also given a special place of significance to education and environment. So, a great need is being felt to create awareness for the protection of the environment by redesigning the objectives, methods and curriculum in the field of education. In 1987, sustainable development became well known after the publication of "Our Common Future" (The Brundtland Report) by the UN. According to Banerjee (2003) and Pearce, Barbier and Markandya (1990), sustainable development emerged from a realization of the need to balance economic and social progress with environmental concerns. This means that the Environmental Education has been used in starting a dialogue between environmental, social and economic worlds. The importance of Education for Sustainable Development was emphasized by the Agenda 21, a document produced from the Rio Earth Summit. Education for Sustainable Development aims at raising public awareness of the concept of sustainable development so as to develop enlightened, active and responsible citizens locally, regionally and internationally (UNESCO, 2009). In December 2002, the UN General Assembly declared the year 2005 to 2014 as the Decade for Education for Sustainable Development (DESD). This declaration calls for the integration of sustainable development aspects such as ecological, social and economic into educational plans across all sectors of education. Sustainable development is defined as "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (Kates et.al, 2005).

Ban Ki-moon, the United Nations Secretary General from 2007 to 2016, has stated that "We don't have plan B because there is no planet B". This thought has guided the development of the Sustainable

Development Goals (SDGs). Negotiations on the Post-2015 Development Agenda began in January 2015 and ended in August 2015. A final document was adopted at the UN Sustainable Development Summit in September 2015 in New York, USA. On 25 September 2015, the 193 countries of the UN General Assembly adopted the 2030 Development Agenda titled "Transforming our World: the 2030 Agenda for Sustainable Development". India has played an important role in shaping the Sustainable Development Goals (SDGs). Therefore, it is no surprise that the country's national development goals are mirrored in the SDGs. As such, India has been effectively committed to achieving the SDGs even before they were fully crystallized. From India's point of view, Sustainable Development Goals need to bring together development and environment into a single set of targets.

The present study was done by the researcher to find out the awareness towards environmental education and sustainable development among the secondary school teachers. The researcher developed a tool for the purpose of collecting data regarding the awareness towards environmental education and sustainable development and applied the same on 600 secondary school teachers of Kupwara district of Jammu and Kashmir State, India. The researcher used the descriptive type of survey method and simple random sampling procedure to select the sample (participants) for data collection.

General Profile of the Study

The below mentioned section will study the general profile of the collected sample i.e., 600 secondary school teachers. Figure I indicate the gender distribution of the collected sample of teachers in which 70% teachers are male and 30% teachers are female.

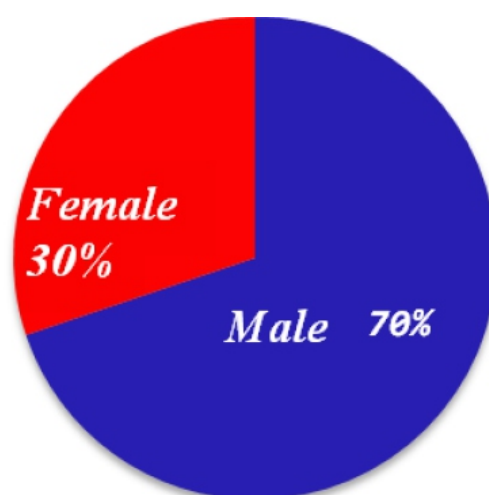


Fig: I Distribution of Teachers By Gender

According to the distribution of teachers by locality, the research findings shows that majority of the teachers (68%) are working in rural areas and only (32%) are working in urban areas of the district (Fig. II).

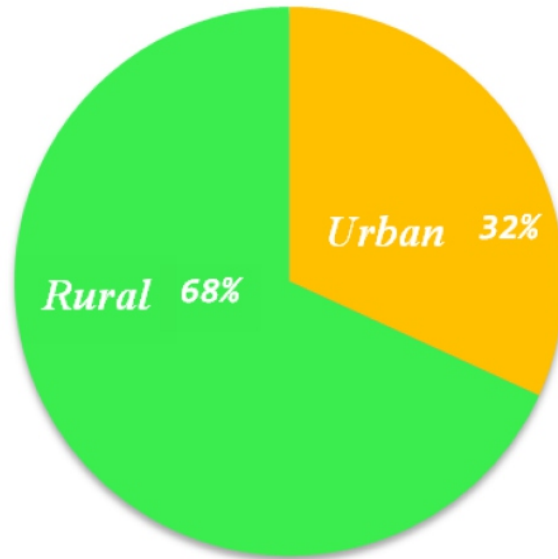


Fig: II Distribution of Teachers By Locality

Based on the teaching experience of the sampled teachers, they were categorized into five groups viz; 0-5 years, 6-10 years, 11-15 years, 16-20 years, and 21 years and above. The research findings shows that 35% teachers belong to 0-5 years of teaching experience category , 32% belong to 6-10 years , 15% belong to 11-15 years , 12% belong to 16-20 years and only 6% belong to 21 and above years of teaching experience category (Fig III).

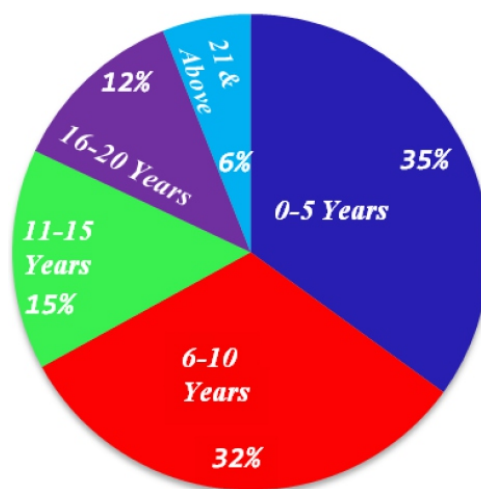


Fig: III. Distribution of Teachers by Teaching Experience

According to the teaching subject of the sampled teachers, the research shows that 60% belong to Arts category and only 40% belong to Science stream.(Fig IV).

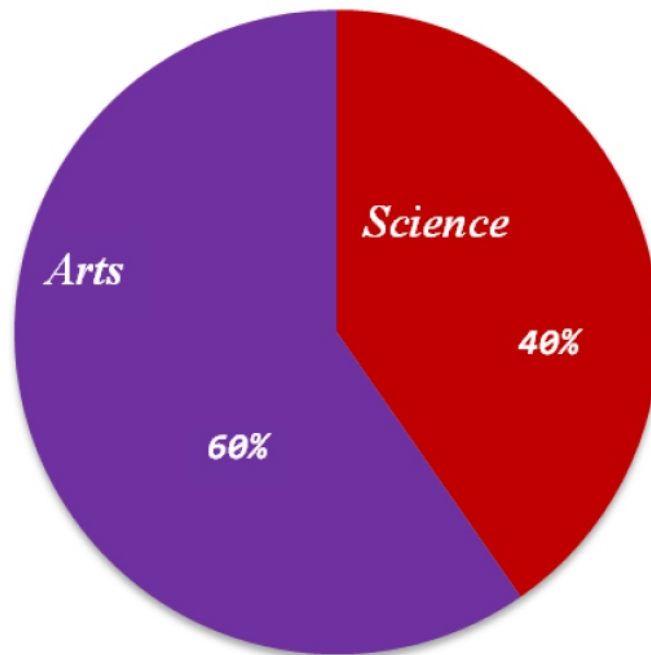


Fig: IV Distribution of Teachers by Teaching Subject

Fig:V represents the Marital Status of the sampled teachers which shows that 66% teachers are married and 34% teachers are unmarried.

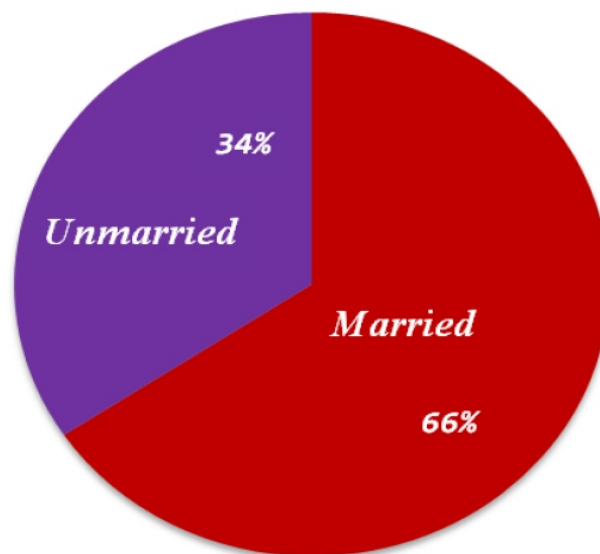


Fig: V Distribution of Teachers by Marital Status

Out of the total surveyed teachers, the type of management of the schools indicates that 52% teachers are working in private educational institutions and only 48% teachers are working in government schools.(Fig VI).

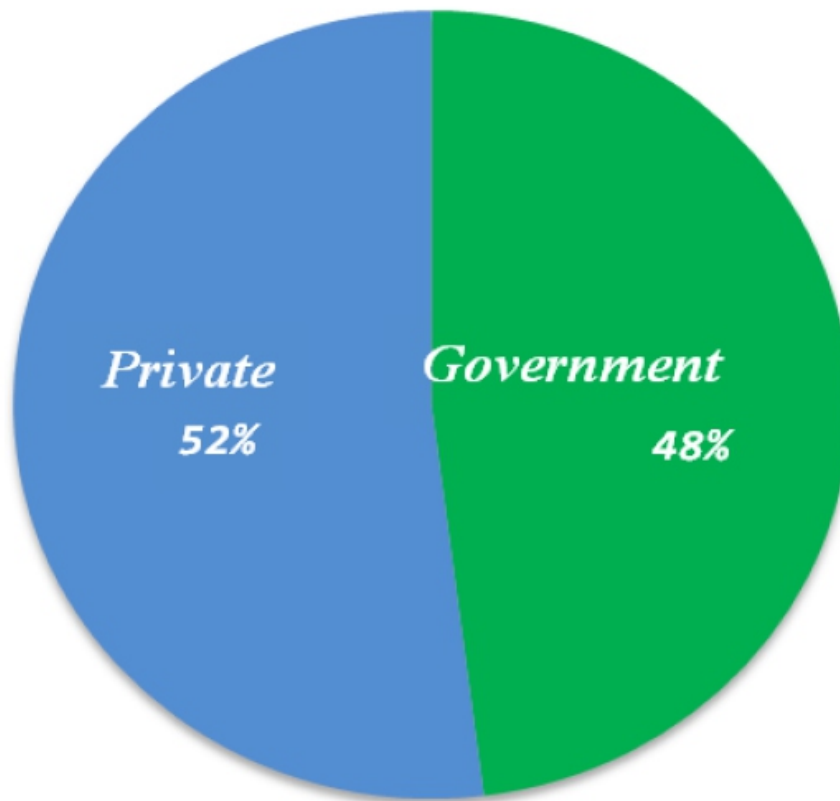


Fig: VI Distribution of Teachers by Type of Management

Discussion and Results

An awareness inventory was prepared by the researcher to collect the data regarding the awareness of high school teachers towards environmental education and sustainable development. The inventory consisted of 30 items in which both positive and negative items were selected and was administered to 600 secondary school teachers of district Kupwara of Jammu and Kashmir State. After the statistical analysis of the collected data, the results reveal that majority of the teachers (93%) have awareness regarding environmental education and sustainable development.

Fig: VII shows the distribution of all teachers (600) responses for awareness assessment test on environmental education and sustainable development.

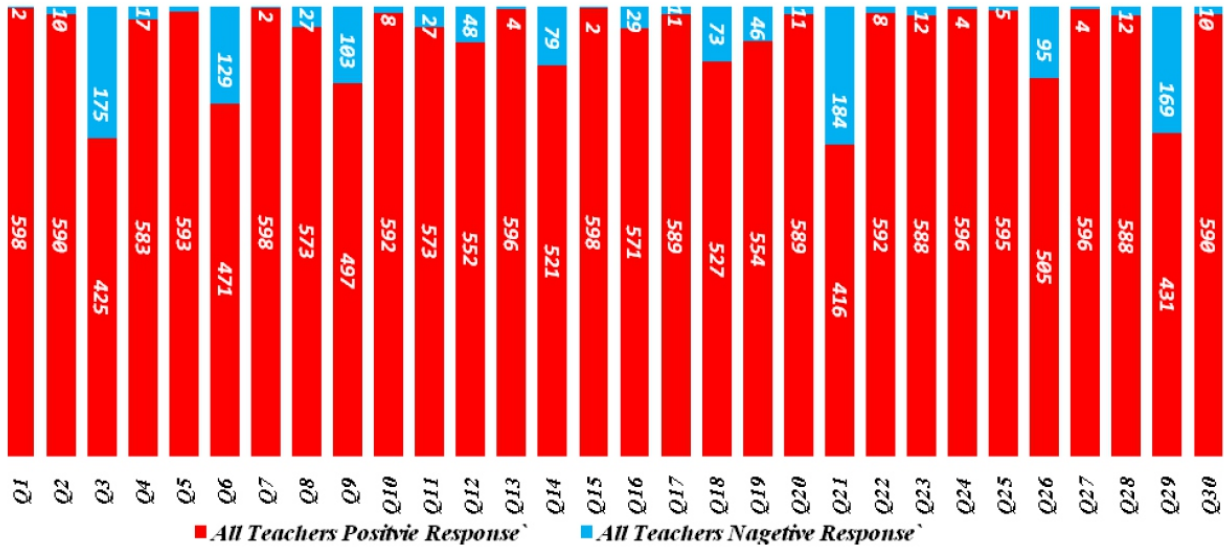


Fig:VII Distribution of all teachers (600) responses for awareness assessment test on Environmental Education and Sustainable Development.

Fig VIII & IX shows the distribution of percentage correct vs. incorrect teachers responses to all questions for awareness assessment test on Environmental education and sustainable development.

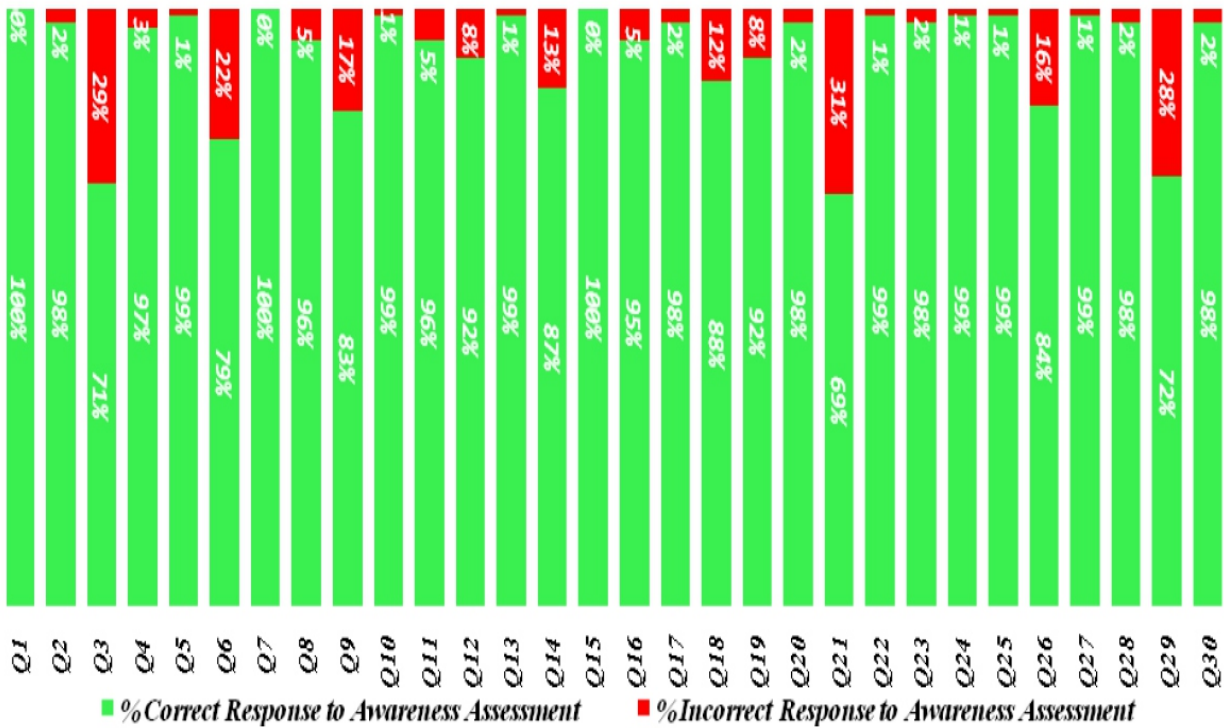


Fig:VIII

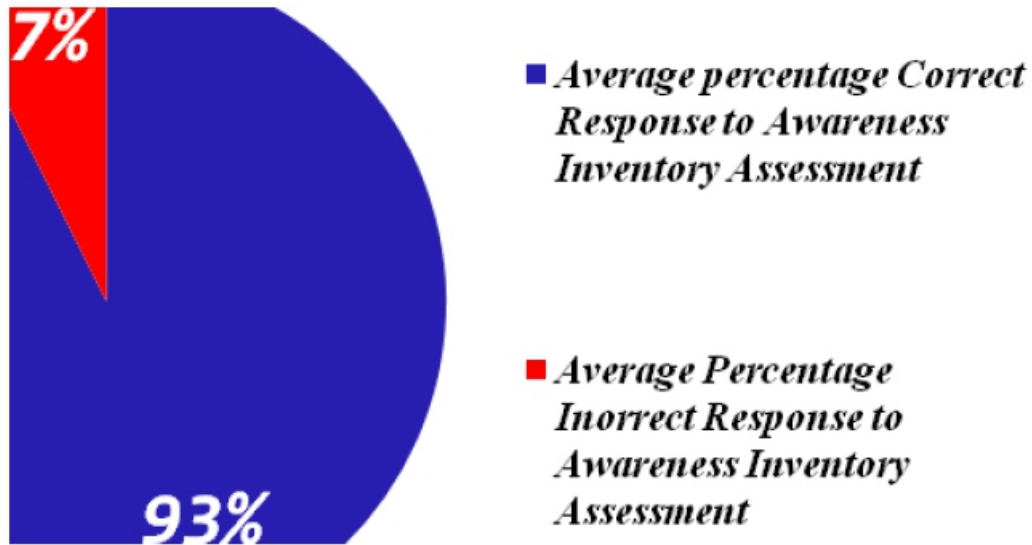


Fig: IX

The researcher has done the Chi Square Test of the awareness inventory for independent variables like gender, locality, type of management of the school , subject of specialization and teaching experience results of which are shown in the below mentioned table I.

Criteria	Test applied	Value	Df	P.value
Gender	Pearson Chi-Square	12.539541	1	0.00000
Locality	Pearson Chi-Square	47.50565	1	0.00000
Type of Management	Pearson Chi-Square	11.91654	1	0.01936
Subject	Pearson Chi-Square	6.347573	1	0.36011
Experience	Pearson Chi-Square	41.46807	4	0.00000

Table: I Chi Square Test

CONCLUSION

Education for sustainable development or environmental education for sustainable development is a concept encompassing a vision of education that seeks to empower people of all ages to assume responsibility for creating a sustainable future. Environmental education for sustainability acknowledges what has always been true, " that how people perceive and interact

with their environment (their worldviews) cannot be separated from the society and the culture they live in". The teacher should be aware of the environmental education and sustainable development aspects, only then he can make the future generation aware of the environmental problems and their solutions. Taking this into consideration, the researcher felt a need to conduct a study to know about the extent of awareness of high school teachers towards environmental education and sustainable development, with respect to gender, area, type of management, teaching experience, subject of specialization and marital status. The research tool administered by the researcher on 600 teachers of the district and the data collected and analyzed therefore reveals that majority of the teachers 93% have awareness regarding environmental education and sustainable development.

The analysis of the collected data indicates that 70% teachers are males and only 30% are females and majority (68%) of the sampled teachers are working in rural areas and 32% are working in the urban areas of the district. The data shows that 60% teachers belong to arts stream and only 40% belong to science stream, 66% teachers are married and only 34% are unmarried teachers. Similarly the data also shows that 52% teachers are working in Private schools and 48% teachers are working in Government schools whereas the data shows that majority of the teachers (35%) according to their teaching experience have 0-5 years of teaching experience.

REFERENCES

- Abraham M, Arjunan NK (2005) *Environmental interest of secondary school students in relation to their environmental attitudes. PerspectEduc* 21(2):100–105.
- Alexander R (ed) (2009) *Children, their World, their Education*. London: Routledge alone: Cooperative, competitive, and individualistic learning. 2nd Edition. Englewood Cliffs, NJ: Prentice-Hall Inc.
- Alsop, S., and M. Watts. (2000). *Facts and feelings: Exploring the affective domain in the learning of physics. Physics Education* 35: 132–38.
- André, T. M. Whigham, A. Hendrickson., and S. Chambers. (1999). *Competency beliefs, positive effect, and gender stereotypes of elementary students and their parents about science versus other school subjects. Journal of Research in Science Teaching* 36: 719–47. ASCD.
- Bailey, S., & Watson, R. (1998). *Establishing basic ecological understanding in younger pupils: A pilot evaluation of a strategy based on drama/role play. International Journal of Science Education*, 20(2), 139-152.
- Barratt Hacking, E., R. Barratt, and W.A.H. Scott. (2007). *Engaging children: Research issues around participation and environmental learning. Environmental Education Research* 14, no. 2: 529–44.
- Bartosh O, Tudor M, Ferguson L & Taylor C (2006) *Improving Test Scores Through Environmental Education: Is It Possible? Applied Environmental Education & Communication*, 5(3) 161-169
- Bas, G. (2010). *Turkiye., decokluzekakuraminunuygulanmasındayasanansorunlar. Eğitirim*
- Centre for Environmental Education (1998). *Greening Formal Education: Concerns, Efforts and Future Directions. Ahmadabad: CEE*
- Centre for Science and Environment (1985). *The State of India"s Environment 1984-85: A Second Citizen"s Report. New Delhi: CSE.*
- Chan, K. L. (1995). *Implementation of Environmental Education in Primary and Secondary Schools of Hong Kong: Current Status and Barriers, unpublished MEd Thesis, University of Hong Kong, Hong Kong.*

-
- *Palmer, J. A. (1998). Environmental Education in the 21st Century: Theory, Practice, Progress and Promise, Routledge, London.*
 - *Pande L (2000). Environmental Education in India: A Critical Assessment of Development to Date and Suggestion for the Future. Almora: Uttarakhand Environmental Education Centre.*
 - *Patel DG, Patel NA (1994) Environmental awareness of the primary school teachers. ProgEduc 68(10–11):234–236*
 - *UNESCO-UNEP (1976). —The Belgrade Charter¶. Connect: UNESCO-UNEP Environmental Newsletter, Vol. 1 (1) pp. 1-2.*
 - *UNESCO-UNEP (1976). —The Belgrade Charter¶. Connect: UNESCOUNEP*
 - *United Nations, (2010). The Millennium Development Goals Report 2010. New York: United Nations.*

Sustainable Materials And Elements In Low Cost Housing In North Central Nigeria

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ABSTRACT

The basic need for human being is shelter. The hitch of shelter is a major concern in Nigeria sequel to high population, where a major challenge for tenants is the high cost of housing. The city capital of Nigeria known as Abuja, located in the north central region will be considered for the purpose of this paper, as the study will assess housing affordability challenges and media of achieving low energy consumption in the low cost houses including the utilization of natural materials in the construction phase, because occupants well-being, productivity and efficiency is defined by low living cost and indoor thermal comfort.

North central Nigeria, having a tropical wet and dry climate with its high temperatures and intense solar radiation, is becoming hotter and drier in this era of climate change and global warming. Solar water heating and the rainwater harvesting system will be considered to achieve affordable housing of good quality within the urban poor. These elements are widely recognized as an essential method of creating sustainable built environment especially in the context of developing world cities. The paper will profer possible ways low cost housing can be achieve through simple change and amendments to the current practices.

1. INTRODUCTION

To produce a low cost housing has always been a major challenge in the construction industry inspite of government interventions in the provision of affordable housing. In Nigeria, housing started for long before the country's independence, yet a large percentage of its citizens still live in very bad conditions [1]. The provision of adequate shelter is a necessity and important to the well-being as well as survival of human beings[2]. These can be achieved towards a sustainable housing approach.

Sustainable development is an activity that "fulfill the needs of the present without compromising the ability of future generations to meet their own needs" [3]. Sustainable housing development provides a framework for the integration of environmental policies and development strategies. The sustainable residential design is made to lessen environmental impact and to improve environmental quality [4].

The idea of sustainable housing development initially focused on issues such as inadequate resources, especially energy, and how to reduce environmental effects on the natural surroundings. Sequel to these needs, sustainable housing development can be considered as a helpful means to protect natural resources and provide a cheap and affordable cost throughout the lifecycle of a building by using energy efficiency parameters to minimize energy consumption [5] [6]. Architecture today has been almost universally designed in terms of energy efficiency performance. Suitable vernacular design of elements are incorporated into a building, which will improve its energy efficiency and as well comfort [7].

Thus, global efforts at meeting human needs for shelter found expression in its inclusion among the objectives of sustainable development program. Thermal comfort in residences, as well as providing a low living cost housing in north central Nigeria where the federal capital (Abuja) is located is a major task at hand. In order to achieve a real affordable house which is cost and energy efficient, sustainable building materials and elements would be considered, in light of the difficulties experienced in having access to portable pipe borne water and lack of constant power supply, Rain water harvesting system and solar water heating would be the main elements to be discussed as it will take advantage of high amount of annual sunshine and rainfall recorded in this region. Also the potential of making the appropriate choice of building materials that are sustainable will be considered because the sustainable elements alone without considering sustainable materials and other passive design strategies will not give the required outcome of a sustainable development.

Generally, Nigeria like any other developing country is faced with challenges within the urban housing sector, thus many attempts to solve the challenges of low income housing by governments have failed over the years [8]. In order to cope with such challenging issues, informal housing units are erected, forming the slums and tenement settlements that often in the scenery of major cities around the world. It's now a fact that the vast majority of the world's homeless and poorly sheltered reside in developing countries that lack the resources and technology required to take a large scale action, housing conditions are seriously deteriorating and conditions are at their worst in major cities of most developing countries [9]. Even after making certain provisions, the challenges of thermal comfort and the cost of servicing these houses becomes a major challenge as much power is needed for water heating using electric water heaters and a major issue of inadequate pipe borne water with little or no alternatives is most cases.

At the end of the study it is expected that a great amount of knowledge would be acquired which will foster quality, affordable and sustainable housing schemes in future low-cost housing projects. Relatively, these parameters can improve economic sustainability imperatives such as life cycle costs and housing affordability. For example, the solar water heating or the application of lighting choices to

save energy can reduce energy consumption. Less energy consumption not only means reducing the cost of required energy, but also results in increased affordability of housing. According to EERE (2010), houses in the U.S.A. are highly insulated and solar water heating, as well as photovoltaic is added on top[10]. As such, implementing the concept of sustainable development, user participation in the process, innovative design methods that include; design for the local climate, culture and economy. Thus providing for indoor thermal comfort and reducing energy use in buildings is becoming increasingly difficult. This has called for new ways of thinking and re-evaluation of the existing methods of tackling this problem.

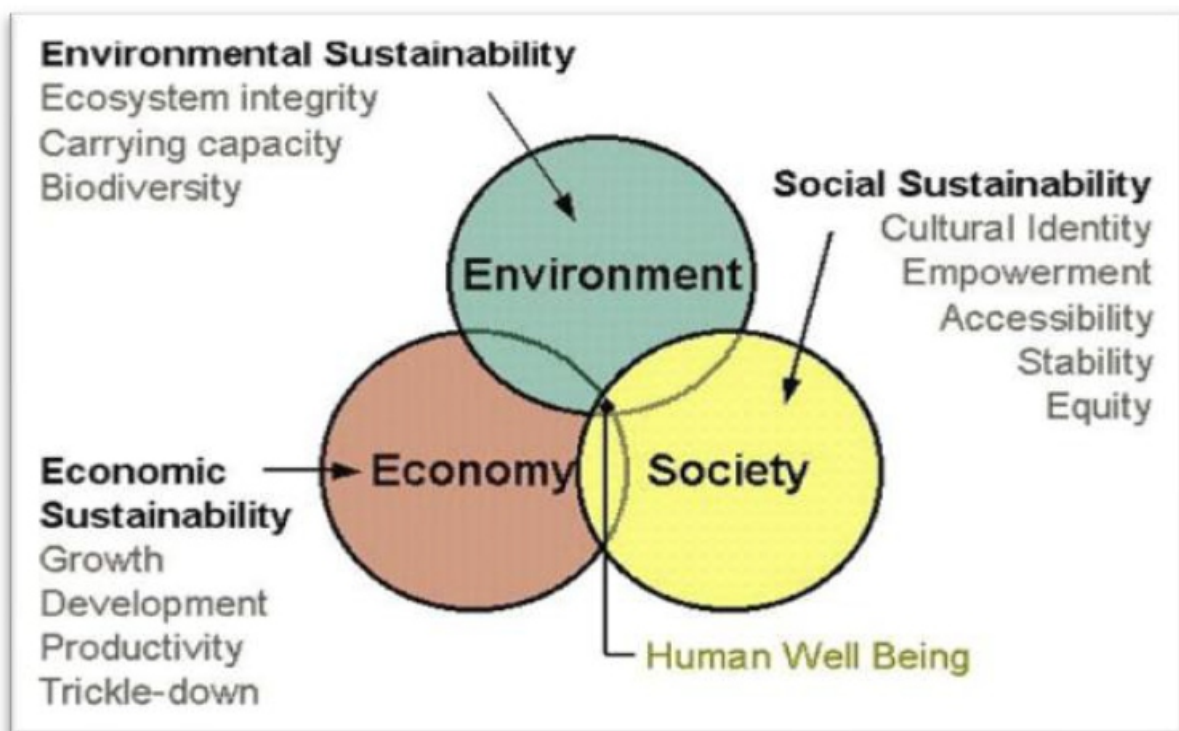


Figure 1. Three Themes of Sustainable Development (source: BEER, 2000)

1.1. Description of Study Area

Abuja is the capital city of Nigeria, in the north central region of the country. It is the city skyline, featuring a tropical wet and dry climate with a warm and humid season and an intense dry season. Precipitation measure 1.221, 2mm on average. The dry season is experienced from November to March, associated by a scorching heat, clear skies and occasional sandstorms caused by the harmattan wind. Hot temperatures reads around 35°C (95°F) and low temperature around 15°C (59°F), meaning large temperature variations between day and night. The warm and humid season lasts from April to October and is characterized by sweltering days, cool nights and pouring rain. Days still have highs around 30°C (86°F), but the feeling of the heat is much stronger, due to very high relative humidity

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1.2. Objectives of the study

This study intends to establish and bring to fore sustainable construction practice to both the government and professionals towards achieving a low cost and energy efficient housing design. It addresses a relatively neglected area of research in the building industry of Nigeria. This is partly due to inadequate housing policies, limited knowledge and understanding due to perceived high cost of implementation and integration of sustainable elements required in the building industry. This paper aims to determine the challenges and prospects for low-cost housing within the context of sustainability by investigating the social, economic and environmental aspects of sustainable housing developments. In the context of the topic discussed, the major goal of this study is to come up with strategic recommendations that will facilitate the quality of sustainable development of low-cost housing in Abuja.

2. RESEARCH METHODOLOGY

For the purpose of this paper, data for the study was carried out through case studies, questionnaires, observations and photographic prints. Abuja been the largest city in the north central was considered due to the prominence of modern building materials used in these cities. Residential buildings exhibited the use of modern materials in enhancing thermal comfort under the changing climatic challenges which still do not meet the tenants need, hence, alternative methods were proposed with much consideration of the natural environment including analysis of the high energy cost required for comfort. These elements demonstrated the application of sustainable building materials in adaptation of buildings to climate change scenario in their environment and the basic needs for living as it will be discussed under the findings and discussion section.

2.1. Sustainable Building Materials

Sustainable building materials and elements seeks to minimize the negative environmental impact of buildings by efficient energy use and moderation in the use of materials, and the ecosystem at large. Sustainable building materials should be materials that can be recycled from waste in an energy efficient method, they should have a minimum energy consumption and mostly depend on the use of Natural materials like stone, lime, sand and bamboo as well as materials that require less energy consumption for their production [11]. For instance; The „Hydraform“, which is environmentally friendly as blocks are produced under high compression from subsoil, without the need for the fuel-wood used to burn bricks. The material is characterized with excellent thermal capacity (the ability to absorb and hold heat) characterizes the blocks.

Furthermore, materials found within the locality of the construction should be selected in order to minimize transport costs, more so, the longevity, durability, and maintenance costs must be kept to a bare minimum since it defeats the purpose of standard yet affordable housing if major renovation expenses are incurred as soon as possible.

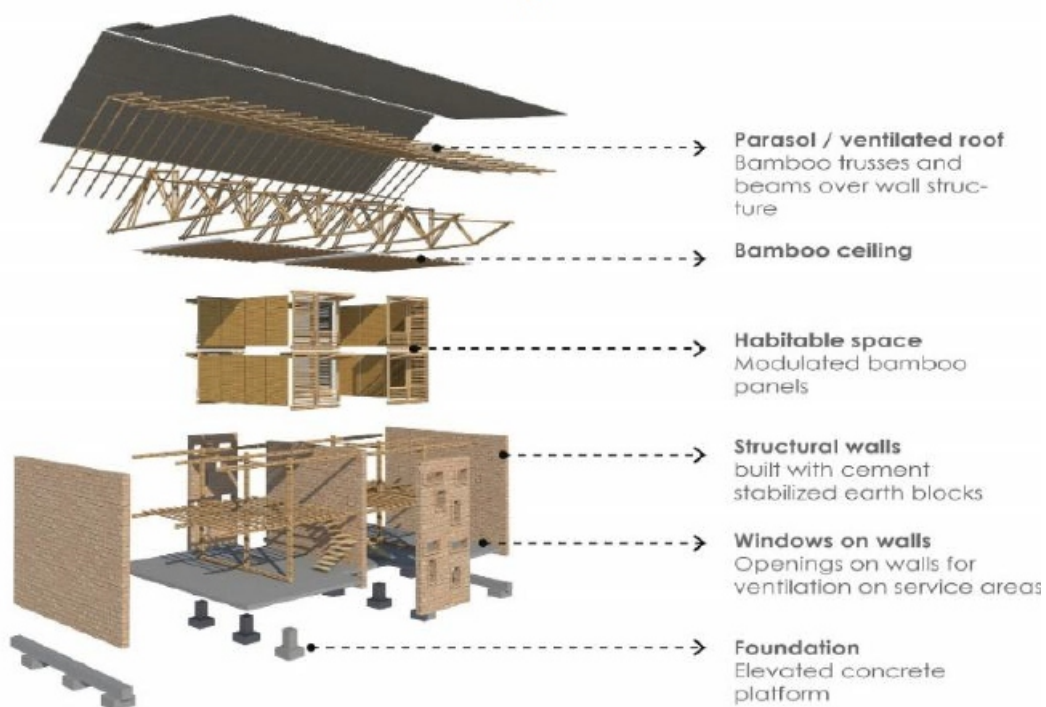


Figure 2. Showing a simple development by the utilization of sustainable materials (Source: <http://pr2013.aaschool.ac.uk/SUSTAINABLE-ENVIRONMENTAL-DESIGN/Self-built-Social-Housing>)



Figure 3. Sample Unit of Nigerian Army Retired Officer's Quarters showing material of wall construction

2.2. Sustainable Building Elements

Thus, the selected sustainable building elements considered in this paper having considered the weather and climatic condition and as well the economic and social factors of the north central region of Nigeria includes;

2.2.1. Rainwater Harvesting system in residential buildings involves the direct collection and storage of the rain water in surface or the underground water storage system for domestic uses. It entails the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to run off. Rainwater can be collected from rivers or roofs, and in many other places, where the water collected is redirected to a deep pit (well, shaft, or borehole), a reservoir with percolation, or collected from dew or fog with nets or other tools. It can be also utilized to water gardens, livestock, for irrigation, and much more, with proper treatment. The general installation cost of the rainwater harvesting system is lesser than conventional water pumping and purification systems, and it requires very little energy for maintenance purposes all with the intention of collecting water that may even be used in substantial ways without purification. Although the initial cost of installing this system ranges between \$200 to \$2000, the benefit from the systems may be derived after a period above 7 years of installation all depending on the average rainfall through out the year and as well the system sophistication [12].

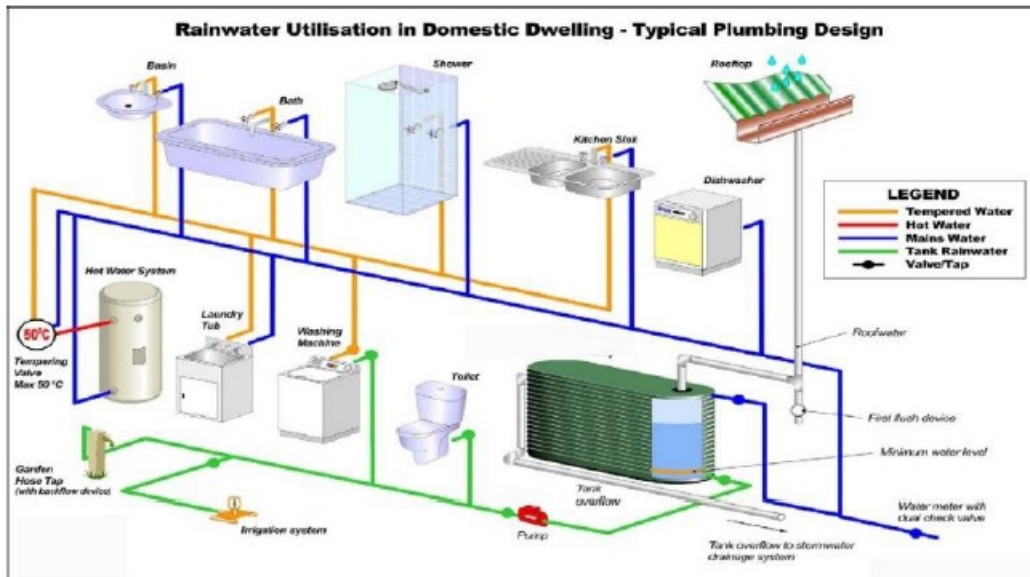


Figure 4. Showing how the Rain Water Harvesting System works. (Source:http://www.dewater.com/water_recycling/greywater.html)

2.2.2. Solar water heating (SWH) entails the utilization of solar thermal collectors for the conversion of natural sunlight into heat energy for water heating. Variable configurations are available at respective cost to fit in different climates and latitudes. SWHs are widely used for residential and some industrial applications. Domestically, without water life would be pretty miserable. This system provides an option for the high amount of energy needed for water heating, as it is believed that 18% of domestic energy is utilized for water heating [13]. The initial installation cost is required, which in turn saves 50% to 100% on the utility bills, but it may take a period of three to five years to pay back relative to the installation cost and depending on the annual sunshine.

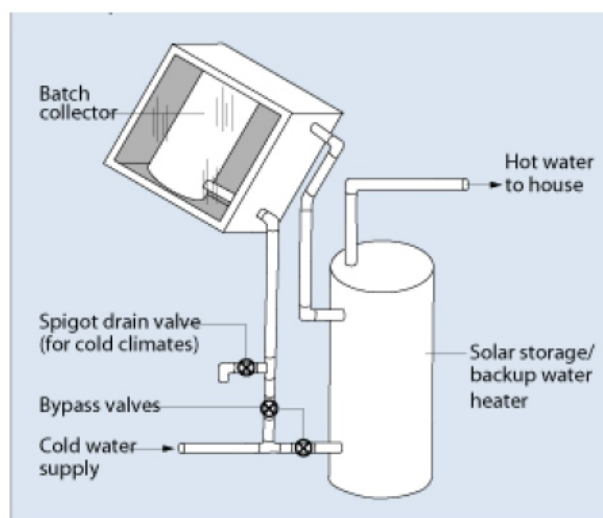


Figure 5. Showing how the Solar Water Heating system works Source:<http://solarheatcool.sustainablesources.com>

The system entails solar collectors and water storage tanks, which are generally divided into the active solar water heating that includes water controls and circulation pump and also the passive solar water heating which does not include controls and circulation pumps [14]. For the purpose of the low cost housing schemes the passive solar water heating is recommended because they are less expensive, and they are more reliable but not as efficient as the active system but can still serve the purpose in a low cost housing schemes.

2.3. Case Study

Case study involves analysis of collected data from questionnaires and oral interview of respondents and pictorial illustrations. In addition theoretical descriptions of a selected study area. Descriptive statistics were used for analysis; this creates an avenue for easy deduction to be done.

The Jibi low-cost housing scheme which is a police quarters is located about 33 kilometers away from the city center was considered as a case study. It was built to accommodate the low-income indigenous staffs of the Abuja administration and Federal government, whose houses were marked for demolition, but it was later transferred to the Nigerian police force, to accommodate the growing number of the police officers deployed to the capital city.

The design of the housing scheme consists of about 600 units of single bedrooms and double bedroom apartments, which are all proto-type of detached bungalow units. The design was a compact style that comprises of bedroom, living area, combine toilet and kitchen in each detached unit.

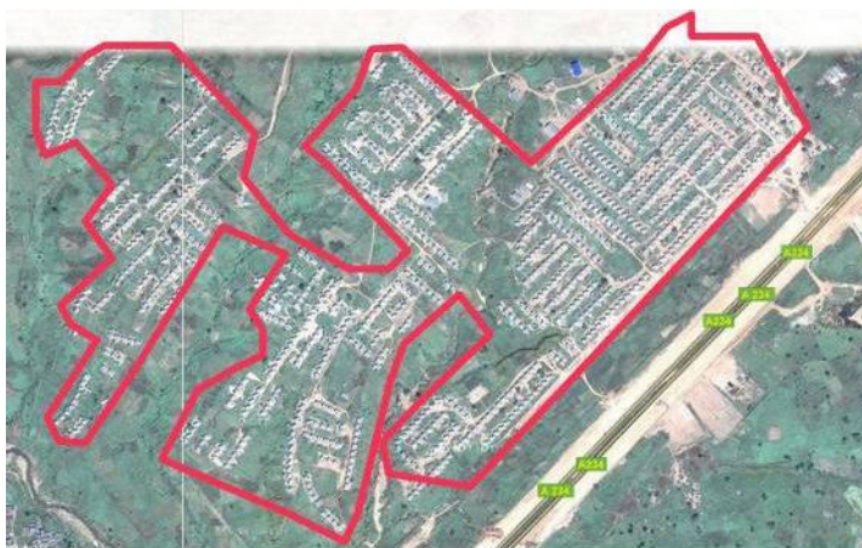


Figure 6. Satellite image showing Jibi Low-cost Housing Scheme



Figure 7. Image showing a view of Jibi Low-cost Housing Scheme

Jibi low-cost housing scheme has a several severe problems, no water supply is provided, no even consideration for security and privacy.

Table 1. Residents source of water to Jibi Low-cost Housing Scheme

S/No	Level	Frequency	Percentage %
1.	Well	4	26.7
2.	Tanker service	11	73.3
3.	Borehole	0	0
4	Pipe borne water	0	0
	Total	15	100%

However, several other problems are discovered as follows:

- Houses are too hot in summer and usually too cool in hamattan
- Buildings have no cultural attachments to its users, both in planning, design and construction.

Finally, the research finding indicated that the residents' perception towards their dwellings was not positive

Table 2. Perception of housing Quality by residents of Jibi Low-cost Housing Scheme

S/No.	Level	Frequency	Percentage %
1.	Poor	12	80
2.	Fair	3	20
3.	Good	0	5.3
4.	Very good	0	0
	Total	15	100%

3. RESULTS AND ANALYSIS

General findings were also made at various low cost houses around Abuja in consideration of selected factors to satisfy the reason for the installation of the Rainwater harvesting system and the Solar water heating for low cost housing schemes as follows;

Table 3. Showing respondent of the study area.

Residence	Respondent
Jibi low-cost housing	21
Nigerian Army Retired Officer's, Kurudu	25
Brick city, Kubwa, Abuja.	09

Table 4. Response on availability of power supply for water heating

	Yes	No
Respondants	19	36
Percentage	34.54	65.45

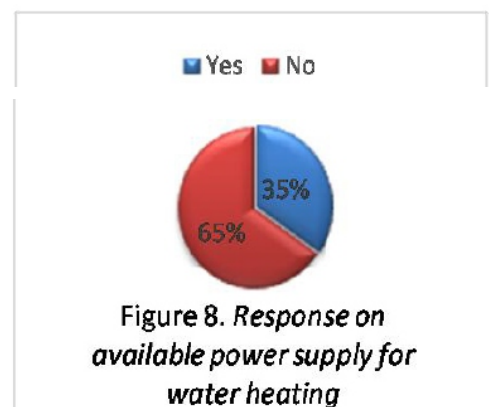
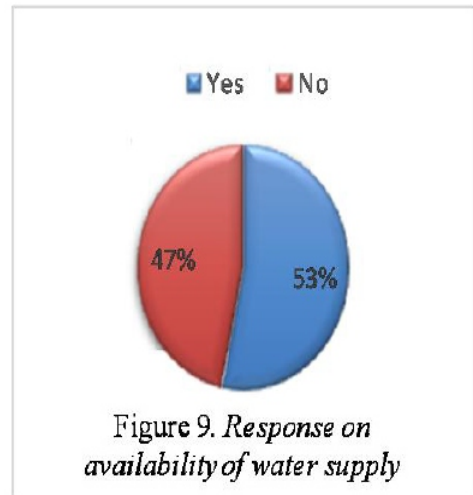


Table 5. Response on availability of pipe-water supply

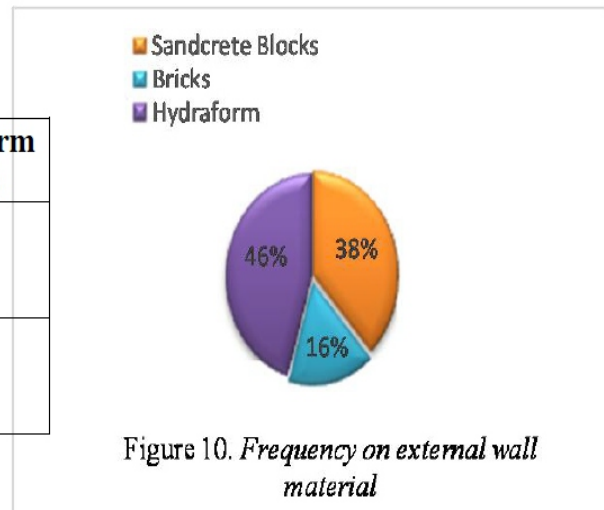
	Yes	No
Respondants	35	40
Percentage	46.67	53.33



borne

Table 6. Response on the most common kind Of building material forexteriorwalls

	Sandcrete	Bricks	Hydraform bricks
Respondant	21	9	25
Percentage	6.67	21.33	72.00



The survey was conducted in November, 2017, with a total of 55 questionnaires and interviews. Thus, more than 53 percent of the residents living in the low cost housing scheme do not benefit from the amenity of pipe borne water, the few residents with constant water supply are sourced from privately sunk boreholes and often supply form water tanker services. Although some areas have all the necessary connections and services for the pipe borne water but it becomes available only from time to time and some area do not even have the necessary services for the supply but rather pay daily for water of which money is also needed daily for this supply. Water being a basic need for life should be prior, and should be made available through the easiest and cheapest medium to acquire for our day to day activities.

The jibilowcost housing, built for the low income earners experience a lot of challenges in their day to day living activities. Residents have to search for water in nearby well and streams or buy from truck pushers around, they have no pipe borne water, hence to ease the need for water as a basic need in life, the rainwater harvesting system sequel to a longer duration of the raining season in Abuja will go a long

way in reducing daily cost of living, but a challenge is the high cost of installing the rainwater harvesting system. Government intervention can play a vital role in this aspect of providing funds for the low cost housing scheme, as well, various rainwater collection cisterns can be channeled to serve a single storage tank where it is further purified and in exchange it can serve numerous residents of the Jibi housing units thereby making the collective installation cost sustainable as no other cost will be required daily or monthly except on rare maintenance cases. Fire wood is hence needed as a source of energy for water heating which constitute to issues of global warming and also money is required for the daily purchase of the firewood. Since the issue of water cost would be solved by the rain water harvesting system, then the solar collectors can also give a solution for the water heating, no man made energy will be required, but the natural energy from the sun will be utilized for water heating, and depending on the volume of hot water needed for each housing unit, a considered size of the collector could also serve multiple houses so as to incur low installation cost, and a zero cost during the life cycle of the building after the installation. Another a major challenge is the comfort of the people staying in this houses, apart from the inadequate electricity, the wall materials used for this houses are not good enough interms of indoor thermal comforts and sequel to the high cost of electricity and even if they can afford to pay the electric bills, they do not have a constant electric supply to serve.

The Nigerian army retired officer's housing scheme at kurudu was started in consideration of the low military officer but was also allocated to interested civilians but still looks unfinished, although the hydraform been a very good walling materials, even better than the bricks was used, It still has the same issues of pipe borne water like the Jibilowcost housing with an improvement in electricity, and can also be improved by the rainwater harvesting system and the solar water heating systems for a sustainable water heating.

The red bricks city built by the Urban Shelters have far more ad vantages compared to other considered low cost housing schemes. They were built in consideration to various economic hierarchies, but at a highier standard compare to „Kurudu“ and „Jibi“ lowcost housing. As the the name implies, Bricks wete utilized as a wall material which improves the indoor thermal comfort and improves the level of efficient energy use within the building units. Although there is a far better condition of electricity here, but the cost of these electricity needed for water heating is high and thus it is among the utmost issue that needs alternatives like the solar water heating, so that they could heat their water free of charge excluding installation and a very rear maintenance cost. The issue of in availability of pipe borne water still exist even with the improved living standard, and residents have to spend a lot of money to go into borehole drilling to have access to water or utilize water from tanker services which can be reduced and eased by the rainwater harvesting system.

Hence, sequel to longer days of wet season, the rainwater harvesting system will ease the availability of water. Furthermore the high cost of electricity required for water heating by electric water heater will be eased by the installation of the Solar water heaters which utilizes the natural solar radiation for water heating as only initial cost will be required for the installation and no other cost required for daily heating except for maintenance purposes. Thus, the solar water heating will work together with the rainwater harvesting system for the water supply.

4. CONCLUSION

Rain water Harvesting System and solar water heating are measures of occupant's satisfaction. Like discussed earlier, it is deemed as important as the structural stability and safety of a building's design. These sustainable element must then be considered and implemented in the very early stages of design. According to analysis of the selected buildings, the integration of these elements have more positive effects than negative on the comfort levels of a building. For better effectiveness rates of these elements, they should be done in conjunction with proper building orientation, use of lightweight and sustainable building materials and they must be incorporated in the design as early as possible. This is a very important consideration when a designer wishes to produce a sustainable and reliable design.

However, as the priorities for each city in relation to sustainable development certainly vary, there are no simple, ready-made or uniform solutions to low-cost / affordable housing problems. However, for the urban poor in Abuja, the priority should be the attainment to basic socio-cultural, economic and political goals within the context of seeking to minimise demands for environmental resources. In line with this, it can be suggested that for quality and adequate housing to be affordable and sustainable, the government's housing commitments should include educating the professionals involved about sustainable development, reforming and devising sustainable policies and community involvement in housing provision.

Generally, the use of available local materials for building to develop any given culture should be encouraged by the concerned bodies within the building industry, sequel to the availability of these traditional building materials in Nigeria. The government should encourage the use of local materials in housing schemes like the „Hydraform“ for partitioning, in order to reduce the deficit on housing and also produce affordable housing. Thus, it is important for people living in hot weather like the north central Nigeria to implement the use of these local materials for their housing in order to improve their indoor thermal comfort and as well the sustainable elements for an efficient energy use.

REFERENCES

- [1] Jiboye A. D. (2011). „Achieving Sustainable Housing Development in Nigeria: A Critical Challenge to Governance”. *International Journal of Humanities and Social Science*. Vol. 1 No. 9 [Special Issue]
- [2] United Nations. (1992). *Promoting Sustainable Human Settlement Development, Chapter 7. In Earth Summit Agenda 21, the United Nations Programmes of Action from Rio*. UN Department of Public Information, New York.
- [3] Brundtland., 1987. *Our Common Future*. Oxford University Press, London.
- [4] Manoliadis, O., Tsolas, I., Nakaou, A., 2007. *Sustainable construction and drivers of change in Greece: a Delphi study*. *Cons. Manage. Econ.*
- [5] Bakar, A.H.A., Arman, A.R., Shardy, A., Awang, A., Peruma, V., 2010. *Critical successfactors for sustainable housing: a framework from the project*. *Asian J. Manage.Res.*, 66-80.
- [6] Ding, G.K.C., 2008. *Sustainable construction e the role of environmental assessment tools*. *J. Environ. Manag.* 86, 451e464.
- [7] Oktay, D., 2002. *Design with the climate in housing environments: an analysis in Northern Cyprus*. *Build. Environ.* 37, 1003-1012.
- [8] Oruwari, Y. (2006). *Lest We Forget: The poor people need housing in urban areas in Nigeria too: A reflection on low-income housing provision*. *Proceedings of the Conference on the Built Environment: Innovation Policy and Sustainable Development*. Covenant University, Ota, Nigeria
- [9] UN-Habitat (2003). *The Challenge of Slums Global Report on Human Settlements U.K and U.S.A: Earthscan Publications Ltd*.
- [10] EERE U.S. Department of Energy, 2010. *Office of Energy Efficiency and Renewable Energy. Building America e Resources for Energy Efficient Homes, Washington, DC*.
- [11] Aribigbola, A. (2006) *Housing affordability as a factor in the creation of sustainable environment in developing world: The example of akure, nigeria*.
- [12] https://www.conserve-energy-future.com/advantages_disadvantages_rainwater_harvesting.php(retrieved 15/12/2017)
- [13] <http://www.greenpower-technology.co.uk/news-and-advice/advantages-and-disadvantages-of-solar-water-heating-panels/> (retrieved 15/12/2017)
- [14] <https://energy.gov/energysaver/solar-water-heaters> (retrieved 16/12/2017)

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