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Assessment of climate change resilience strategies in some selected Industrial areas in Rivers State, Nigeria

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----------ABSTRACT----------
This study involved the assessment of the climate change perception and resilience strategies in five industrial areas of Bonny, Eleme, Omoku, Rumuolumeni and Trans Amadi of Rivers State, Nigeria. Satellite imageries, field survey and semi-structured questionnaire were utilized to obtain relevant information from 305 staff and residents in the industrial areas. Descriptive statistics were used to analyse the data. Findings showed high climate awareness level and evidence of climate in all. The most prevalent climate resilience strategies in the industrial areas were natural resource conservation (72.9%) in Bonny; urban greening in Eleme (57.1%) and Rumuolumeni (69.8%); community awareness (48.2%) in Omoku and effective waste management (50.7%) in Trans Amadi. Of the total resilience strategies used in all the areas; only 37.4% were effective, 4.3% very effective, 4.3% were poor. The survey showed that the highest percentage of the effective strategies were in Rumuolumeni (52.4%) while the greatest number of resilience strategies that were not effective were reported in Bonny. Findings showed significant variation of resilience strategies among the industrial areas in urban greening ($F=4.333$, $p<0.05$) and natural resource conservation ($F=5.439$, $p<0.05$). However, the resilience strategies employed among sampled industrial areas were not significant for effective waste management ($F=1.505$, $p>0.05$), community awareness ($F=0.808$, $p>0.05$), employment of appropriate technologies ($F=0.758$, $p>0.05$), and human capacity building ($F=1.888$, $p>0.05$). Results also showed that poor funding and lack of government commitment ranked as the greatest constraints to effective climate resilience strategies in the study area. The study concluded that industrial areas of Rivers State have been adversely affected by climate change while urban greening and use of appropriate technologies were the main strategies employed to build resilience to these changes.

Keywords: *Resilience strategies, Climate Change, Industrial areas*

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I. INTRODUCTION

The problem of climate change has been in existence since the world was first alerted on the dangers surrounding the climate disorder by Scientists (Olayemi, 2016). The increased rainfall in Southern Nigeria combined with irregular rainfall events also sparked off perennial flooding incidents, which negatively affected different economic operations such as mining, offshore drilling, manufacturing and agriculture in the region (Federal Government of Nigeria (FGN), 2003, Department for International Development (DFID), 2009). The great loss occasioned by flooding inhibit the ability them to meet their production target. This is because the sector depends largely on products as inputs that are vulnerable to climate change. Rising level of sea increases the chances of flooding and is capable of destroying infrastructure, as well raw materials needed for manufacturing plants, ultimately hindering productivity and efficiency. Yahaya et al. (2011) also submitted that the survival of industries especially infant industries and the small and medium scale enterprises are threatened by the effect of global warming because they are dependent on climate vulnerable sectors of the economy such as agriculture and coastal resources for their inputs. The Gross Domestic Product (GDP) of the country which is the total monetary or market value of all the finished goods and services produced will be affected negatively.
Forest destruction also constitutes a challenge which exposes the environment to more severe effect of climate change. Forests serve several purposes such as purification of air, water quality improvement, provision of food, keeping the soils intact, provision of wood and medicinal products as well as habitats to various species of flora and fauna including many of the world's most endangered wildlife species (Gunther, 2005; Olayemi,

2016). Globally about 1.6 billion people rely on forests for their livelihood, including 60 million people who depend on forests for their subsistence (Olayemi, 2016).). The Nigerian Environmental Study Action Team (NEST), (2008) reported that climate change is expected to potentially increase the incidence of pests and diseases that decimate forests trees. Several indigenous tree species were also reported to be reducing gradually in the forest due to climate change accelerated by forest destruction as a result of logging, crop farming and livestock rearing. Such forest trees include Iroko tree and Oil bean in the South East Nigeria, various Mahogany species in the Southwest Nigeria, the Baobab and the Locust bean in the northwest Nigeria and Gum Arabic in the Northwest Nigeria.

These are challenging times and there is a high sense of uncertainty and constant reminders of the unpredictability of natural and man-made events such as catastrophic climate events, terrorist attacks, flooding, disasters, or massive redundancies (IPCC, 2013). One of the prescribed remedies for dealing with such a state of flux, which is rapidly gaining prominence, is "resilience". (Davoudi, 2012). There is an increasing number of Governmental and Non-governmental reports which aim to develop ready-made and ready to use resilience building toolkits (Edwards, 2009; Young Foundation, 2010). Resilience is not a new concept despite the fact it is a recent addition to planners' discursive vocabulary. Resilience is from the Latin root resi-lire, meaning to spring back, it was first used by physical scientists to denote the properties of a spring and describe the stability of materials and their resistance to external shocks (Davoudi, 2012).Resilience can therefore be defined as the extent of the disturbance that can be absorbed before the system changes its structure (Holling, 1996). It focuses on "the ability to persist and the ability to adapt" (Adger, 2003; Davoudi, 2012). Thus, climate resilience can be generally defined as the capacity for a socio-ecological system to absorb stresses while maintaining its function in the face of external stresses imposed upon it by climate change or adapt, reorganize, and evolve into more desirable configurations that will improve the system's sustainability so that it is better prepared for future climate change impacts (Sharifi, 2016; Collier, 2013).

As a result of the increased national and international awareness of climate change impacts climate resilience building has become a major goal to be achieved by these institutions. Addressing the vulnerability that communities, states, and countries currently have with regards to the consequences of climate change on the environmental is the key focus of climate resilience efforts (IPCC 2012). Climate resilience efforts encompass social, economic, technological, and political strategies that are being implemented at all strata of society. From local community climate action to global treaties, addressing climate resilience is being prioritized, despite the fact that a significant amount of the theory has yet to be translated into practical climate action. Notwithstanding this, there is a robust and ever-growing movement by local and national bodies towards building and improving climate resilience (Sharifi, 2016). After all, it is obvious that being climate change resilient is desirable at all levels.

Industrialization on the other hand can be defined as the process of transformational change of the human society socially and economically from an agrarian society into an industrial one. There is a great clamour towards industrialization because of the opportunities it holds (Chigbo, 2011). Technological innovations are involved and it is a part of a wider modernization process, where social change and economic development are closely related with these technological innovations (WHO, 2016). Furthermore, with industrialization came huge gains in poverty reduction and job creation, as well as adverse industrial emission. Emissions from industries contribute almost 30% of global emissions of green house gases (GHG) according to the United Nations Industrial Development Organization (UNIDO). While the International protocol for climate change records of over one hundred (100) years agreed with the above position, other studies have shown that climatic change can manifest in four main ways namely slow changes in mean climate conditions, increased inter-annual and seasonally variability, increased frequency of extreme events and rapid climate changes which cause catastrophic shift in ecosystems (Tompkins and Adger, 2004).

In reality as climate changes, lives and means of livelihoods change with it, even with slow change in climate of between 0.2^{o} to 0.5^{o} C per decade, there are long lasting and the devastation on lives and livelihoods which may be catastrophic which can be attributed to its impact such as flooding and drought (Feldman et al, 2015). The industrial areas are usually worse hit due to huge population and thus have higher risk of the direct and indirect impact of climate change. To complete this climate resilience discourse it is imperative and expedient to also incorporate the concepts of adaptations, vulnerability, and climate change. Since climate resilience is the ability to recover from a negative impact of climate change then the advance preparations and strategies for recovery from the impact of climate change is adaptation, the vulnerable populations are those that are more or less capable of developing and implementing a resilience strategy. This is based under the assumed detrimental impacts of climate change to ecosystems and ecosystem services (Nelson et al, 2009).

Consequently, as a result of climate resilience framework, governments and policymakers are offered a rich plethora of contributions that can not only improve their understanding of environmental processes, but are also better equipped for the development of sustainable solutions to combat the climate change effects begin. Climate resilience establishes the idea of multi-stable socio-ecological systems; since resilience initially started

as an idea that extended from the stable equilibrium perspective that is systems only acted to return to their pre-existing states when exposed to a disturbance. However with modern interpretations of resilience, it has now been established that socio-ecological systems can actually stabilize around a multitude of possible states. Furthermore, climate resilience has a critical role in emphasizing the importance of preventive action when assessing the effects of climate change. Although adaptation is always going to be a key consideration, it is a reactive action since it involves making changes after the fact. It therefore has a limited capability to help communities and nations deal with climate change. However, by building climate resilience, policymakers and governments can be proactive and take a more comprehensive stance that works to mitigate the harms of global warming impacts before they happen (Nelson et al., 2007; Tschakert and Dietrich, 2010). Finally, a greater cross-scale connectedness of systems is advanced by climate resilience perspective. This perspective necessitates full-system cohesion unlike solely relying on the limiting theories of adaptation. Creating mechanisms of adaptation that occur in isolation at local, state, or national levels may leave the overall social-ecological system vulnerable while resilience-based framework would require far more multi stakeholder dialogue, and the creation of environmental protections that are more holistically generated and implemented. This is definitely the way to go if the sustainable development goal of making cities climate resilient cities is to be achieved. Most of the previous studies failed to consider the climate change resilience in the industrial areas and as a result, they are very few in the literature. Thus, the study is assessing the climate change resilience strategies in some selected industrial areas of Rivers State, Nigeria.

II. MATERIALS AND METHODS

Description of the Study area

The study area lies between latitudes 4^o 00’ 0’’ N and 5^o 40’ 00’’ N and longitudes between 6^o 20’ 00’’ E and 7^o 40’ 0’’ E (Figure 1). The study area enjoys tropical hot monsoon climate due to its latitudinal position. The climate of the area is tropical with two seasons - rainy and dry seasons. The rainy season is from Mid March to October with rainfall ranging from 2000 to 2500 mm in most areas. The highest rainfall occurs in Bonny and can be as high as 4698mm along the coast. Port Harcourt has 182 days of with high temperature all the year round which ranges between 28.5^{o}C to 33 ^{o}C and a relatively constant high humidity (Wokocha and Omenihu, 2015). September to February usually make up the dry season however significant rainfall has been observed even in the month of November. The geology of the area can be described as alluvial sedimentary basin and basement complex (Igbokwe et al., 2008; Eludoyin et al., 2011). The soil type is sandy or sandy loam underlain by a layer of impervious pan .The soil is easily leached due to the heavy rainfall (Eludoyin et al., 2011). The area had a population of more than 5,000,000 residents in 2006 which has been projected to over 7 million people in 2015, National Bureau of Statistics (NBS) (2011) (National Population Commission, (2006). There is a good transportation network comprising air, land and sea for both inter-state and intra- state movement of people (McKenna, 2018). The people of Rivers State were predominately farmers, fishermen and petty traders (McKenna, 2018). However, at present, urban growth has ushered in several socio-economic activities into the area, such as Medium and large scale trading, oil and gas activities, as well as, craftsmanship and tourism (McKenna, 2018).

Questionnaire administration

The study employed the use of semi-structured questionnaire to obtain relevant climate change information from the residents and workers in order to identify the prevalent resilience and mitigation strategies. A total of 500 copies of the questionnaire were administered in the study area, that is, one hundred (100) copies of the questionnaire were administered in each of the industrial area. The total number of copies of questionnaires administered was based on convenience and population of communities around industrial areas and participants (workers and residents) from selected industries. These population figures aided the research in obtaining a total population and sample size for the study. The questionnaires featured questions relating to type of resilience strategies employed in the study area; level of effectiveness of strategies deployed to cope and adapt to climate change issues. Preliminary questions were also asked to ascertain the literacy level as well as the climate awareness levels of respondents. Three hundred and five copies of questionnaire were retrieved and used for further analysis. The study made use of both descriptive and inferential statistics. The descriptive statistics involved the use of frequencies, percentages either in form of tables or charts where applicable for data presentation while the inferential statistics such as analysis of variance were used to test the stated hypotheses for the study. ANOVA proves as a veritable tool for analyzing significant variations among samples of interest. All analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 24.0 and Excel worksheet 2010.

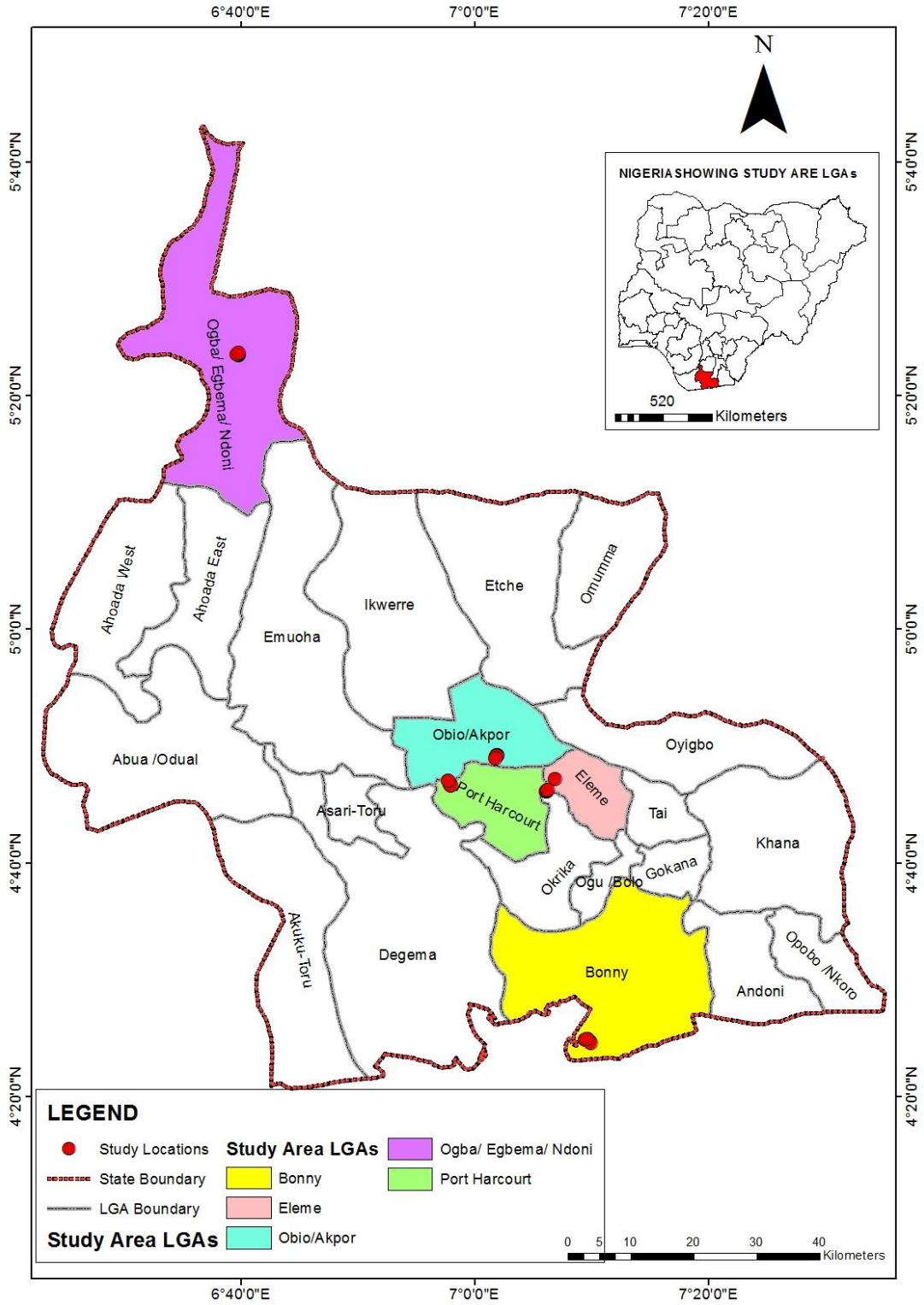

Figure 1: Administrative Map of Rivers State showing Study area LGAs

III. RESULTS AND DISCUSSIONS

Socio-economic characteristics of respondents

The results from the socio-economic characteristics in Table 1 show the respondents' gender, age, educational qualification, their residence status and the length of stay in the industrial areas. The gender was 69.2% males to 30.8% females. The age distribution showed that nearly half of the respondents (42.6%) were in their prime age of 35 years to 45 years, while 16.7 % were aged between 18 years to 25 years, 31.8% between 26 years to 35 years, 4.6% were between the ages of 46 years to 55 years and only 4.3% were above 55years.

Findings also showed that more than half of the respondents had received tertiary education (55.5%), followed by 27.5% with secondary education, 10.2 % had primary education and only 6.9% had no formal education. Furthermore, 61% of the respondents live within the industrial areas while 39% work in the Industrial area. It was further found that 25.9% of respondents have been in the area for a period that ranges between 1 to 5 years, 18% between6 to 10 years, 8.9% between 11 to 15 years and 29.5% for more than 15years while 17.7% were not sure of the length of their stay in the area.

Table 1: Socioeconomic Status of respondents

Characteristics	Bonny	Eleme	Omoku	Rumuolumeni	Trans-Amadi	Total
Gender						
Male (**%)**	33(68.8)	45(71.4)	34(60.7)	48(76.2)	51(68)	211(69.2)
Female (**%)**	15 (31.2)	18(28.6)	22(39.3)	15(23.8)	24(32)	94(30.8)
Age Status						
18-25 years	5(10.4)	12(19.0)	8(14.3)	9(3.0)	17(5.6)	51(16.7)
26-35 years	18(37.5)	13(20.1)	28(50)	16(5.2)	22(7.2)	97(31.8)
36-45 years	21(43.8)	31(49.2)	18(32.1)	33(52.4)	27(36.0)	130(42.6)
46-55 years	4(8.3)	2(3.2)	1(1.8)	3(4.8)	4(5.3)	14(4.6)
Above 55 years	0(0.0)	5(7.9)	1(1.8)	2(3.2)	5(6.7)	13(4.3)
Total	48(15.7)	63(20.7)	56(18.4)	63(20.7)	75(24.6)	305(100)
Education						
No formal	2(4.2)	8(12.7)	2(3.8)	1(1.6)	7(9.3)	20(6.9)
Primary	1(2.1)	8(12.7)	0(0.0)	5(7.9)	17(22.7)	31(10.2)
Secondary	13(27.1)	22(34.9)	8(14.3)	15(23.8)	26(34.7)	84(27.5)
Tertiary	32(66.7)	25(39.7)	46(75)	42(66.7)	25(33.3)	170(55.7)
Residence Status						
Live	29(60.4)	44(69.8)	36(64.3)	39(61.9)	38(50.7)	186(61.0)
Work	19(39.6)	19(30.1)	24(42.9)	37(58.7)	37(49.3)	119(39.0)
Length of stay						
1-5 years	17(35.4)	8(12.7)	26(46.4)	16(25.4)	12(16)	79(25.9)
6-10 years	14(29.2)	8(12.7)	10(17.9)	14(22.2)	9(12)	55(18.0)
11-15 years	4(8.3)	5(7.9)	2(3.6)	3(4.8)	13(17.3)	27(8.9)
Above 15 years	11(22.9)	24(38.1)	14(25)	21(33.3)	20(26.7)	90(29.5)
Not sure	2(4.2)	18(28.6)	4(7.1)	9(14.3)	21(28)	54(17.7)

Percentages in brackets

Awareness of climate change in the study area

Results of the preliminary questions in Table 2 show a very high level of climate change awareness amongst the respondents. About 70% of them affirmed that they understood the concept of climate change. Bonny Industrial Area recorded the highest affirmative results with 98% while the lowest results of 45.3% affirmation came from respondents in Trans Amadi industrial area. Results also showed that more than half of the respondents have observed at least one evidence of climate change in their area with Floods being the most prevalent, specifically in Bonny Industrial Area extreme of temperatures resulting in Heat waves and Floods have the highest occurrence of 72.9%, the most prevalent evidence of climate change in Eleme was floods with 71.4% while skin problems recorded the lowest prevalence of 27%. In Omoku Industrial area the results showed that heat waves had the highest prevalence with 76.8% while the least was skin problems with 25.4%, the same trend of frequent Flooding was recorded in Rumuolumeni and Trans Amadi industrial areas with 69.8% and 77.3% respectively. Generally, the highest effects of climate change were observed in Trans Amadi industrial areas that while the lowest incidents were recorded mostly in Omoku and Bonny industrial areas.

Table 2 : Climate change Awareness level

Climate Change Awareness	**Bonny**	**Eleme**	**Omoku**	**Rumuolumeni**	**Trans-Amadi**	**Total**
Yes	47 (97.9%)	27 (42.9%)	51(91%)	54 (85.7%)	34 (45.3%)	213 (69.8%)
No	1 (2.1%)	36 (57.1%)	5 (9%)	9 (14.3%)	41(54.7%)	92 (30.2%)
Total	48 (100%)	63 (100%)	56(100%)	63(100%)	75 (100%)	305 (100%)

Climate Resilience Strategies

Various resilience strategies were employed by individuals and companies found in the study areas in order to cope with the obvious effects of climate change observed. These included urban greening, effective waste management, use of appropriate technology, awareness creation in the communities (Table 3). Those who employed urban greening were 57.7% while 55.1% utilized effective waste management; community awareness

and natural resource conservation were the resilience strategies employed by 49.5% while 37% reported human capacity as their strategy. Urban greening was reported as the preferred strategy in most of the Industrial areas studied such as Bonny, Eleme and Rumuluomeni. Bonny industrial area and Rumuluomeni also had high percentage of 64.5% and 61.9% prevalence for effective waste management as a resilience strategy. The least result for human capacity building and natural resource conservation as resilience strategy featured the in Trans Amadi with 25.3% and 37.3% respectively (Table 3). Generally those in Bonny Industrial Area deployed the highest resilience strategies to cope with climate change in the study areas while those in Omoku Industrial area had the least percentage in the deployment of resilience strategies.

Table 3. Climate change resilience Strategies

Resilience Strategies	Bonny	Eleme	Omoku	Rumuolumeni	Trans-Amadi	Total
Urban Greening	33 (68.8%)	36 (57.1%)	26 (46.4%)	44 (69.8%)	37 (49.3%)	176 (57.7%)
Effective waste Mgt	31 (64.5%)	35 (55.6%)	25 (44.6%)	39 (61.9%)	38 (50.7%)	168 (55.1%)
Community Awareness	29 (60.4%)	28 (44.4%)	27 (48.2%)	32 (50.8%)	35 (46.7%)	151 (49.5%)
Appropriate Technology	24 (50%)	23 (36.5%)	24 (42.8%)	23 (36.5%)	28 (37.3%)	122 (40.0%)
Natural Resource Conservation	35 (72.9%)	27 (42.8%)	23 (41.1%)	38 (60.3%)	28 (37.3%)	151 (49.5%)
Human Capacity building	21(43.8%)	23(36.5%)	26(46.4%)	24(38.1%)	19(25.3%)	113(37.0%)

More than half of the respondents representing 51.5% of the resilience strategies employed to combat the identified climate change effects were not effective according to the results obtained (Table 4). Only 37.4% responded that they were effective, a paltry 4.3% said they were very effective, about the same number (4.3%) thought the strategies was poor while those who were not sure of the effectiveness of the resilience strategies constituted the remaining 2.3%.The survey showed that the highest percentage of the effective strategies were in Rumuolumeni (52.4%) while the greatest number of those said not to be effective were reported in Bonny Industrial area (Table 4).

Table 4. Effectiveness of Climate change Resilience strategies

Effectiveness of the Strategies	Bonny	Eleme	Omoku	Rumuolumeni	Trans-Amadi	Total
Very effective	3 (6.2%)	2(3.2%)	5(8.9%)	0(0.00%)	3(4%)	13(4.3%)
Effective	8(16.7%)	19(30.2%)	26(46.4%)	33(52.4%)	28(37.3%)	144(37.4%)
Not effective	33(68.8%)	39(61.9%)	22(39.3%)	25(39.7%)	38(50.7%)	157(51.5%)
Poor	2(4.2%)	1(1.6%)	3(5.4%)	4(6.3%)	4(5.3%)	14(4.6%)
Not sure	2(4.2%)	2(3.2%)	0(0. 0%)	1(1.6%)	2(2.7%)	7(2.3%)

Findings in Table 5 showed that significant variation was exhibited in urban greening ($F=4.333$, $p<0.05$) and natural resource conservation ($F=5.439$, $p<0.05$) were significant among sampled industrial areas as the methods applied for resilience strategies among industries to manage climate change. However, obtained responses as regards methods employed among sampled industrial areas were not significant for effective waste management ($F=1.505$, $p>0.05$), community awareness ($F=0.808$, $p>0.05$), employment of appropriate technologies ($F=0.758$, $p>0.05$), and human capacity building ($F=1.888$, $p>0.05$) (Table 5).

Table 5: ANOVA for the methods adopted for climate resilience strategies across the industrial areas

Methods Employed	Study Areas	Sum of Squares	Df	Mean Square	F-ratio	Significance level (p=0.05)
Urban Greening	Between Groups	3.487	4	0.872	4.333	*0.002
	Within Groups	60.362	300	0.201		
	Total	63.849	304			
Effective Waste Management	Between Groups	1.484	4	0.371	1.505	0.201
	Within Groups	73.978	300	0.247		
	Total	75.462	304			
Community Awareness	Between Groups	.813	4	0.203	0.808	0.521
	Within Groups	75.430	300	0.251		
	Total	76.243	304			
Employment of appropriate technologies	Between Groups	.733	4	0.183	0.758	0.553
	Within Groups	72.467	300	0.242		
	Total	73.200	304			
Natural Resource conservation	Between Groups	5.155	4	1.289	5.439	*0.000
	Within Groups	71.087	300	0.237		
	Total	76.243	304			
Human capacity Building	Between Groups	1.746	4	0.437	1.888	0.113
	Within Groups	69.388	300	0.231		
	Total	71.134	304			

* Significant at p=0.05

Discussions

To withstand the observed effects of climate change such as flooding, heat waves, acid rain, high rainfall, both individual and corporate residents in the industrial areas adapted several resilience strategies including but not limited to urban greening, effective waste management, use of appropriate technology, capacity building, Natural resource conservation and community awareness. The use of appropriate technology was more prevalent in Bonny Industrial area according to the respondents when compared to other Industrial areas. However of the different strategies, urban greening was reported as the preferred strategy with more than 50% result but this opinion was only pronounced in Trans Amadi industrial area where there was an obvious tree planting exercise along several streets in the layout. In Bonny, there was a nature park which was home to a variety of flora and fauna. Omoku had some natural forest with heterogeneous indigenous species. These findings were collaborated by the land use maps of the industrial zones. The significant variation in the use of urban greening and natural resource conservation with the various industrial areas corroborates these results where only Trans Amadi and Bonny Industrial areas have urban greening and Nature Park. Building the capacity of residents and staff in the industrial area ranks the as the lowest strategy with 37%. It underscores the non-reacognition that it is cheaper to be proactive than reactive and that by building the resilience capacity of residents and staff, they become climate smarter to take actions thus make it easier to cope with climate change effects. This is also the idea behind the World Bank/African Union Commission Resilient Investment Summit on climate action (World Bank, 2019). 49.5% of all the respondents reported that Community awareness was used as a resilience strategy with the highest number being in Bonny Industrial Area and the lowest awareness being in Eleme. This was in agreement with the high percentage of respondents who had climate change awareness in Bonny (98%) as against 42.9% in Eleme. The high level of climate change awareness reported in Bonny as against Eleme could be attributed to the fact that more than half of the Bonny respondents had tertiary education unlike in Eleme where only 39.7% of them were graduates of tertiary Institutions.

Results showed that more than half of the resilience strategies were not effective while less than 5% were very effective. These results agreed with the unpublished work on climate change perception in Trans Amadi by Nyeche and Ndukwu (2018) which also showed that majority of the climate change resilience strategies employed by most of the companies in the industrial area are not effective. Respondents listed several factors as responsible for the poor effectiveness of the strategies; they include lack of commitment on the part of government and company, poor funding, use of ineffective technology as well as lack of human capacity to tackle the climate change impact. Out of these, poor funding and lack of government commitment ranked highest as the greatest constraints. In recognition of the above and in a bid to overcome this syndrome of none effective resilience strategies, a performance-based climate resilience grant by the United Nations Capital Fund (UNCDF) was provided at local Government areas to overcome the various constraints to building climate change resilience such as limited capacity, inadequate funding and lack of standard indicators for the measurement of resilience and adaption progress (Dinshaw and McGinn, 2019). Rangwala and Burke, (2018) posited that for cities to thrive they must not only invest in climate-resilient infrastructure, information and risk-reduction programs, they must that residents are not left out of the process of planning and implementation. Very little progress has been made in combating climate change because most of the strategies employed were not effective and did not ameliorate the adverse effect of climate change. The challenge of lack of commitment

on the major actors- Government at all tiers and companies have led to poor funding and low attention to climate change problems. Inadequate awareness/lack of human capacity building was also identified as constraints militating against effective climate change resilience building strategy in the areas.

IV. CONCLUSION AND RECOMMENDATIONS

It was found that the industrial areas of Rivers State have been adversely by climate change and that urban greening and use of appropriate technology were the main strategies employed to build resilience to these changes. These strategies were not very effective due to the lack of government commitment and funding constraint. Urban greening is a cost effective resilience strategy to combat climate and should be embraced by companies, individual and government. More climate awareness and capacity building at the local government level is necessary.

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