

INVESTIGATING THE ADOPTION OF PROPERTY-LEVEL FLOOD PROTECTION (PLFP) BY HOMEOWNERS IN OBIO/AKPOR PORT-HARCOURT

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Abstract: The rate at which flooding ravages properties in the recent time is alarming and real properties have always been involved among the things damaged by flood. Every homeowner should make decision towards the management of flood risk from property level. Property-level flood protection (PLFP) has gained public interest and is being adopted by residential homeowners in the developed countries to minimize flood risk. Fighting flood at property level could be the best starting point for real property flood risk protection. This paper investigates the adoption of property level flood protection among residential homeowners in Port-Harcourt and as well as creates awareness of the benefits of fighting flood at property level. The various property-level protections existing in the study region were evaluated to find out the reason for such adoption; the benefits of property-level flood protection were also assessed with a view to encouraging property owners and investors to adopt property level flood protection and as well draw the attention of policy makers to assist in subsidizing the measures that can mitigate flood risk.

Keywords: Homeowners, Property Level Flood Protection, Policy Makers, Port Harcourt.

1. INTRODUCTION

The recent increase in flooding has put many homeowners at risk of flooding. Adetunji and Oyeleye (2018) stated that the most hit by flood are usually urban poor who have less choice, but to end up living in flood prone areas. Flooding which can be categorized as most dangerous water-related natural disaster has not only caused increase in the cost of management of many real estate properties but has well as robbed many homeowners of their investment profit. Flooding has the capacity to wipe off an investor's age long investment in a twinkle of an eye (Beddoes and Booth, 2010; Attakora-Amaniampong, Owusu-Sekyere and Aboagye 2016). Flood makes people vulnerable by taking away their livelihood with little or no resources to cope with the situation, (Parvin, Shimi, Shaw and Biswas, 2016). As a result of the imminent risk associated with flooding, many homeowners are at the dilemma of choosing efficient flood risk management to reverse the risk of flooding and to stay safe of its damaging effects. It can be recalled that housing provision is an important function of the government evidenced in the national housing policy. At the occurrence of natural disasters such as flood, the affected people expect to receive aid from the government which could be in terms of provision of resilience to flooding or financial aids depending on the depth of the damage sustained. The management of flood could be structural or non-structural. Structural flood risk management involves the management of flood through structural or engineering ways like drainages, culverts, etc. while non-structural measures for flood risk management involves those measures other

than structural, e.g. insurance, flood warning and flood plain mapping etc. The use of insurance as a measure in non-structural flood risk management has encountered so many criticisms while its penetration has been affected by several factors including lack of awareness, objective flood risk exposure, subjective risk perception, and socio-economic cum demographic variables (Aliagha, Jin, Choong, and Jaafar, 2014). Structural measures may not be absolute because of passage of time and depreciation due to weather (Bichard and Kazmierczack, 2009). Most times, homeowners do not get these aids and in order to save their investment, they resort to self-help, (Adetunji and Oyeleye, 2018). Property level flood risk management is one of those avenues property owners who may not be opportune to benefit from government's flood risk management through structural measures have resorted to minimize or reduce the impact of flooding on their properties. Joseph, Proverbs and Lamond (2015) recommended that at-risk population should be made aware of the limits of the responsibilities of other stakeholders in the domain of flood risk management at household levels. Property-level flood protection (PLFP) is a process undertaken by individual property owners to protect their homes and residential properties from the risk of flooding. It could be resistance measures or resilient measures. Bichard and Kazmierczack (2009) explained that they include resistance measures which involve the fitting of manufactured products, such as barrier and airbrick covers, aimed at preventing flood water from entering the property and resilience measures which are actions undertaken to minimize damage caused by flooding. Flood risk management in real estate should involve all stakeholders in the sector and the onus should be more on the owners of real properties. There are several measures of flood risk management available to residential homeowners to choose from. Most of the measures require huge amount of fund which may not be affordable to the residential homeowners and they may also be constrained in receiving subsidies for flood risk management. Some barriers could be local while some property protection could be by raising house foundation or raising the windows and other structural adjustment of the buildings both the already built ones and new house developments. Early involvement of flood risk protection of properties is fundamental to the reduction of flood risk and achievement of efficient and sustainable flood risk management. It is in line with this issue that this study seeks to investigate the adoption of property-level flood risk protection by homeowners in some cities of the Niger Delta region of Nigeria.

1.1 Statement of the Problem

The risk of flooding is on the increase due to several factors affecting the built environment. The rising flood frequency emphasizes the need for improved flood prevention and management measures (Atufu and Holt, 2018). Homeowners are not left out in this regard especially those that have their properties located in flood prone areas. Flood risk management measures differ according to the type of flood and the capacity of the developer because it can involve a huge sum of capital. Major structural flood risk management measures may be available at a flood prone area and yet there is the existence of flooding indicating that there is need for further action. Private homeowners may have different options to mitigate flooding risk which property-level flood protection is among. In their view to self help, property-level flood protection can be seen as an individual way of tackling flood risk. Many property owners may or may not have adopted the idea of managing flood from the level of their property due to non-awareness of such option or other constraints. The problem is therefore on the perception and adoption of property level flood risk protection as a flood risk management option by residential homeowners in the study area.

1.2 Aim and Objectives of the Study

The aim of the study is to examine the adoption of property level flood risk protection among homeowners in the flood prone Niger Delta region of Nigeria with a view to proffering sustainable strategies for mitigating impact of flood risk in the region.

The objectives of the study which were set to achieve the above aim include:

- i. To find out the perception of homeowners on taking actions to protect their properties against flood risk in the study region,
- ii. To determine the awareness of the usage of property level flood protection among homeowners in the study area,
- iii. To ascertain the type of property-level flood protection existing in the study region,
- iv. To determine the constraints encountered by homeowners in applying property-level flood risk protection, and
- v. To determine the benefits of including property level flood protection in building construction.

1.3 Significance of the Study

The study on property level flood protection is beneficial to homeowners in the Niger Delta region as an option in mitigating flooding. The expositions in this study would enable real property development stakeholders to appreciate the advantages of adopting property level flood protection strategy in the construction of buildings in flood prone areas.

1.4 The Study Area

Obio-Akpor is a local government area in the metropolis of Port-Harcourt. It is one of the major cities and centres of economic activities of Rivers State of Niger Delta, Nigeria. The Niger Delta is a geographical area covering about 70,000km² and the largest in Africa and third in the world. It represents about 12% of Nigeria's total surface area. The Niger Delta is located on the coast of Gulf of Guinea and is known as one of the largest and most vital wetlands in the world. It lies in the southerly part of Nigeria stretching from the Nigeria- Cameroun boundary in the East to Ondo State in the West. The area is bounded in the north by Enugu, Ebonyi, Anambra, Kogi and Ekiti States, while the Atlantic coast forms the southern boundary. The Niger Delta region is comprised of dense networks of streams, creeks and rivers. Niger Delta is the recipient of all waters of the Rivers Niger-Benue system and other drainage systems within the sub-region. It has a flat terrain and so the region is exposed to high vulnerability of flood. It comprises nine of Nigeria's constituent states namely: Abia, Akwalbom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers States. The Obio-Akpor local government area covers 260 km² and at the 2006 Census held a population of 464,789. Obio-Akpor has its headquarters at Rumuodomaya. The original indigenous occupants of the area are the Ikwerre people. Obio-Akpor is bounded by Port Harcourt Local Government Area to the south, Oyigbo to the east, Ikwerre to the north, and Emohua to the west. It is located between latitudes 4°45'N and 4°60'N and longitudes 6°50'E and 8°00'E. Obio-Akpor is one of the eight local government areas that formed the Rivers East Senatorial District.

The study area, Obio-Akpor, was selected based on the fact that for the past five years preceding the study, it has experienced consistent flooding events of very high magnitudes. The vulnerability of the Niger Delta states to flood and climate change has been confirmed by many researchers including Amangabara and Obenade (2015). The selection of the study areas therefore is further based on the level of real estate development or investment in the various urban cities of the states so as to capture the areas that have experienced high flooding and thus can be used in generalization and decision making towards proactive flood risk management.

2. REVIEW OF RELATED THEORIES AND LITERATURE

2.1 Decision Theory and Flood Risk Management Theory

Decision theory is the study of models of judgment involved in, and leading to, deliberate and (usually) rational choice, (French, 2001). Decision theory is the study of how people model "judgment" and from that how they determine their choice. It is that part of probability theory which concerns the calculation of the consequences of uncertain decisions (Versluis, 2010). These may be probability-based models; loss functions models or other forms of statistical representations of judgments. Decision theory therefore involves the models of judgment and risk perception leading to deliberate and rational choice. Decision-making therefore is about how investors perceive risk.

Modern decision theory has developed since the middle of the 20th century through contributions from several academic disciplines. Much of decision theory does not lie entirely within any one discipline: it draws upon psychology, economics, mathematics, statistics, social sciences and many other areas of study (French, 2001). Dabara, Anthony, Gbenga and Adeyanju (2014) have also stated that, despite the fact that it is now clearly an academic subject of its own right, decision theory is typically pursued by researchers who identify themselves as economists, real estate appraisers, statisticians, psychologists, political and social scientists or philosophers.

Thus decision models can be divided into three distinct types; Descriptive analysis - models which purport to describe how we do decide. Normative analysis - models which suggest how we should decide. Prescriptive analysis - models which uses normative models to guide the decision maker within other limiting cognitive parameters. The Normative models in decision theory are concerned with identifying the best decision to make assuming an ideal decision maker who is: fully informed, able to compute with perfect accuracy and fully rational. Descriptive decision theory is concerned with describing what people actually do. The distinction between normative and descriptive decision theories has been identified by Dabara, *et al.*, (2014) that a normative decision theory is a theory about how decisions should be made, and a descriptive theory is a theory about how decisions are actually made.

The models of decision theory may be probability based models; loss functions models or other forms of statistical representations of judgments. Dabara, *et al.*, (2014) identified the decision process as: identification of the problem; obtaining necessary information; production of possible solutions; evaluation of such solutions; selection of a strategy for performance and implementation of the decision. However, decisions are made relative to current expectations and current business constraints.

Risk management is an attempt to identify risks and take appropriate action to diminish their impending effects. It can be said to be the process of managing the uncertainties that influence the achievement of goal and objectives (Versluis, 2010).

Risk management and decision theory have a common ground which was identified by French (2001) to be 'uncertainties' which is the primary issue both theories attempts to deal with. Risk management deals with the assessment and management of these uncertainties through prioritization and response to risk while decision theory prioritize risk and prescribe numerical format of attending to risk through the correct course of action.

2.2 Literature Review

Flood risk management responsibility is not a sole role of the government. Stakeholders shared responsibility is necessary for effective flood risk management. It has been advocated that each stakeholder in the built environment have a role to play in achieving efficient flood risk management. Cirella, Felix, Iyalomhe and Adekola (2019) suggested that mitigating flooding is not the work of government alone and further stated that community action groups working with government and NGOs can help to ameliorate flooding in low-capital and flood-prone communities. The homeowner having spent bulk of resources in the construction of his house should not allow disaster to ravage his property. The application of flood protection at property level to prevent flood water from entering the home is property level flood protection. Property Level Protection is the taking of measures at the level of an individual property that aim to reduce a building's susceptibility to flooding and subsequent flood damage. This includes flood resistant measures that aim to prevent flood water entry into a building, and flood resistance measures that aim to minimise damage once flood waters have entered a building (Doncaster and Blanksby, 2017). The participatory effort of the homeowners can prevent or reduce the extent of flooding impact on properties. Bichard and Kazmierczack (2009) advocated that monetary reward may be used as an incentive to motivate homeowners to participate in the management of dangerous climate change through property-level flood measures, which should include awareness raising actions, subsidies and incentives promoting sustainable behaviour. Although they went further to argue that non-financial incentive may be more effective for sustainability purposes. Many researchers have pointed to the fact that there is an underlying benefit attributable to the use or adaptation of property level flood risk protection to homeowners by reducing impact of flooding. Homeowners may not be properly educated on the accruable benefits and the limits which they should expect assistance by the government. Joseph, Proverbs and Lamond (2015) discovered that there is a high level of uncertainty as to the potential financial benefit from investing in adaptation measures in the form of premium reduction by insurers. Also there is a wide range of opinion by the homeowners as to who is responsible for protecting homes from flood. They opined that at-risk homeowners should be made to be aware as to the limits of the responsibility of other stakeholders in flood risk management at household level. Therefore there is need to increase the motivation of homeowners to invest in property level flood risk protection measure through a range of actions including the provision of subsidies and incentives to achieve sustainable behavior. Their study showed that implementing adaptation measures has the potential to reduce health-related impacts such as worrying, stress and strain between families. The implementation of these measures (property level flood protection) is usually the responsibility of the building owner (although they may also have been installed during building construction) though assistance may be available from some local authorities, depending on local conditions. (Doncaster and Blanksby, 2017).

In an effort to achieve effective implementation of resilient building, the government of Bayelsa State have specified flood level building code for Bayelsa and environs for house foundation to be about 1.0 to 1.6m above previous local standard so as to protect homes from flooding and ensure adaptability, (Brisibe, 2018). Similarly, Adebimpe, Oladokun, Odedairo and Oladokun (2018) advocated that government should provide and enforce resilient building policies and codes for each area beset by flooding. This means that homeowners and builders should not just build but should incorporate the act of resilient building in flood prone areas.

Engaging flood plain residents in the process of flood risk management is an important factor in the process of achieving the aim of emerging flood risk management strategies in the UK. Flood residents must be encouraged to take actions ranging from registering for flood warning to installing their own defense and alarm system, (Joseph *et al.*, 2015). Flood

protections of properties are cost intensive and many homeowners may lack the ability to fund it but have the willingness to do so if incentivized, (Atufu and Holt, 2018). That is why Beddoes and Booth (2010) said that financing flood protection will be a problem to homeowners especially when they lack knowledge and confidence.

The adoption of property-level flood risk adaptation (PLFRA) measures as advocated by Joseph, Proverbs and Lamond (2015) involves a process in which physical improvements are made to properties to either prevent flood water from entering (resistance measures) or to minimize the damage when flood water enters (resilience measures). The study by Adetunji and Oyeleye, (2018) reveals that effective flood risk control measures for the residents of Ajibode area of Ibadan, Oyo State included proper use of drainage system, proper refuse disposal, construction of drainage, raising of building foundation, construction of bridges and river channelization. These are a combination of environmental level and property level flood protection. This type of flood protection requires both the effort of government and individual property owners. The constituents of property level flood risk may differ from place to place, types of flood risk in existence and according to the financial status of the residential homeowner. Beddoes and Booths (2010) made a review of the main factors influencing the uptake of flood protection which revealed that property owners have the desire to act but not the ability to act to which they blamed it on the tenets of decision making which require knowledge, belief and finance. Among the new innovations by researchers is the introduction of new innovative solution, known as 'The Flexible Skirting System' described as a cost-effective combination of resistance and resilience approaches, (Beddoes and Booths, 2010). The recurrence of flood should act as a wake up factor and motivate the adoption proactive measures towards flooding, yet the owners of such properties which have experienced yearly flooding have only taken minimal action. Most of the measures are ineffective towards flood control at property level, e.g. sandbags, are still perceived as flood protection by the public, (Lloyd, 2019). Other resilient construction that can be used at property level includes internal tiled wall.

Installation of flood resilience product in a property requires some steps and expert knowledge. Among the steps listed by the environment agency (2005) for flood protection on property level include: understanding the risk, planning, property survey, product supply and installation, operation and maintenance. Most properties need a combination of measures, such as door guards, garage doors and air brick covers, along with other remedial work. There is the need to involve the neighbouring homeowners as investment in flood resilience might not work if neighbours do not have similar protection, (Environment Agency, 2005).

3. METHODOLOGY

The data collections for this research were based on stratified random sampling of residential homeowners in selected towns in ObioAkpok, Port-Harcourt. A total of 400 sets of questionnaire were distributed among the homeowners in the four cities. Only 300 questionnaires were retrieved while 280 were found to be useful for the analysis. The selected neighbourhoods in each of the city experienced majorly surface water flooding due to increase in rainfall and urbanization. The construction of the East West high way road with no drainages has aggravated the occurrence of surface water flooding which have almost sacked the inhabitants of the selected study area because of its nearness to these communities. The choice of residential homeowners was informed by the fact that most of the properties in the selected cities were owned by private individuals including the position occupied by shelter or housing in the life of mankind. Research assistants were engaged to distribute and collect the questionnaires from the target respondents.

The data collected for this study were presented using descriptive statistics such as bar chart, pie chart and frequency tables while analysis was done using relative importance index (RII).

4. DATA ANALYSIS

The analysis of the data obtained from field survey is hereby presented in this section. Out of the 300 questionnaires retrieved among the homeowners in the four cities, 280 were found to be useful for the analysis. The objectives set out at the beginning of the paper were used as guide for the data presentation and analysis. The following figures and tables present the results of the data analysis.

4.1 The type of landscaping in the homeowners' compound

Every residential property homeowner chooses compound floor finishing according to the extent his capital can afford. Such compound finishing includes permeable landscape, bare ground, interlocked floor, casted floor, etc. The question of the type of landscaping was posed to the respondents to ascertain the various types and their level of usage in the study area.

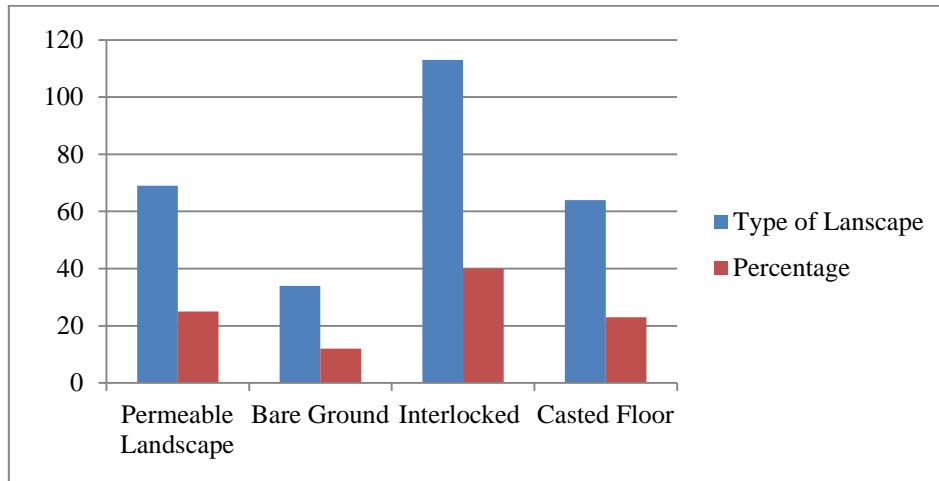


Figure 1: The type of landscaping in the homeowners' compound

The Figure 1 above shows the type of landscaping existing at the compound of residential properties in the study area. The result revealed that the use of interlocking stone is the major type of landscaping in the study area. It therefore means that the percentage of bare floor in the neighbourhood is low contributing to surface flooding which is as a result of increase in the existing residential properties.

4.2 Flood mitigation measures in the respondents' area of residence

In order to carry out effective flood risk management, identification of the causes of the flood should be made so as to employ the best mitigation measure. Flood mitigation measures could be structural or non-structural or both. A combination of both measures could yield more positive result since the advantages of both can result to greater effectiveness. The responses of the respondents are shown in the figure 2 below. Their responses indicate that the most frequent measure applied is the structural measure followed by the non-structural. Some of the homeowners were of the view that both measures can be used for the achievement of effective flood risk management.

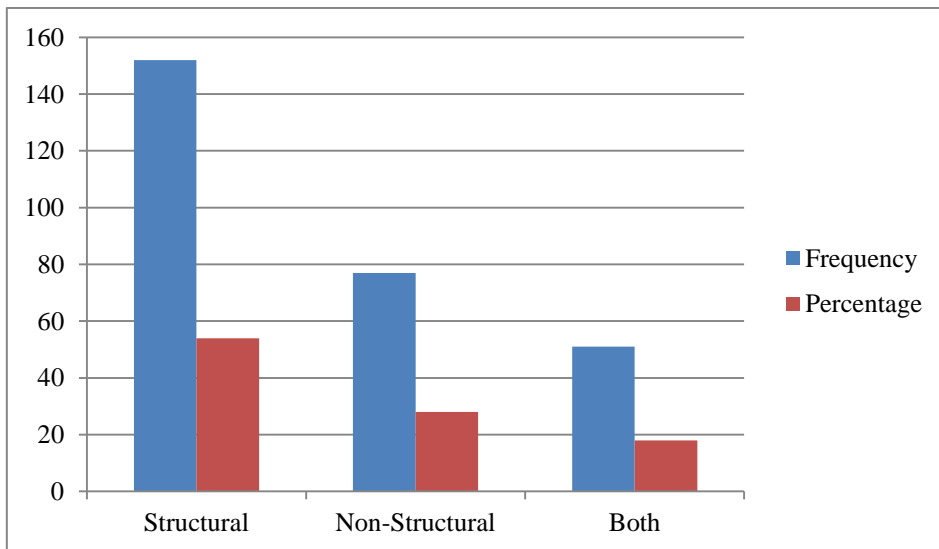


Figure 2: Flood mitigation measures in the respondents' area of residence

4.3 Awareness of the usage of property level flood protection

Property level flood protection has become of necessity to real property owners as a means of preventing flood from entering into the building. Management of flood from property level has gained public interest in most developed countries. The awareness of homeowners in this study area was surveyed to determine their awareness towards the usage of property level flood protection as a flood risk management measure including its adoption. The Figure 2 below indicates the perception and adoption of flood protection at property level. The willingness to adopt property level flood protection was observed, but the power to act is affected by lack of fund. The Figure 2 below accounts and clearly presents their response.

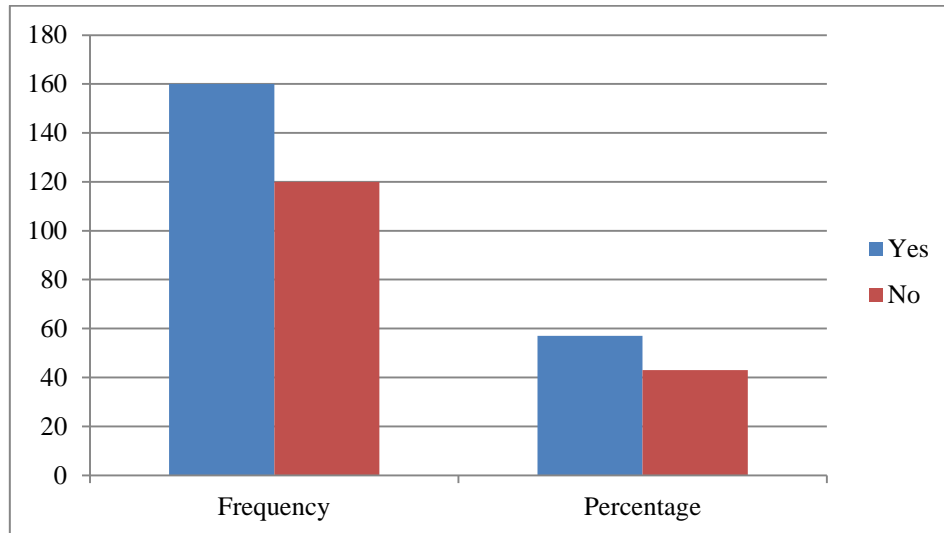


Figure 3: Awareness of the usage and adoption of property level flood protection

4.4 Types of property level flood protection existing in the study area

Property Level Flood Protection varies in types and their usage can be attributed to the level and availability of fund/capital. The developed countries have more sophisticated types of property level flood protection but in Nigeria, as a developing country and considering the capacity of the homeowners in the study area of this research, identification was made on the types of property level flood protection existing in the study area which were sandbags, raising building foundation, construction of drainages, wooden bridges, compound filling, raising of doors. The Figure 4 below shows the types existing in the study area.

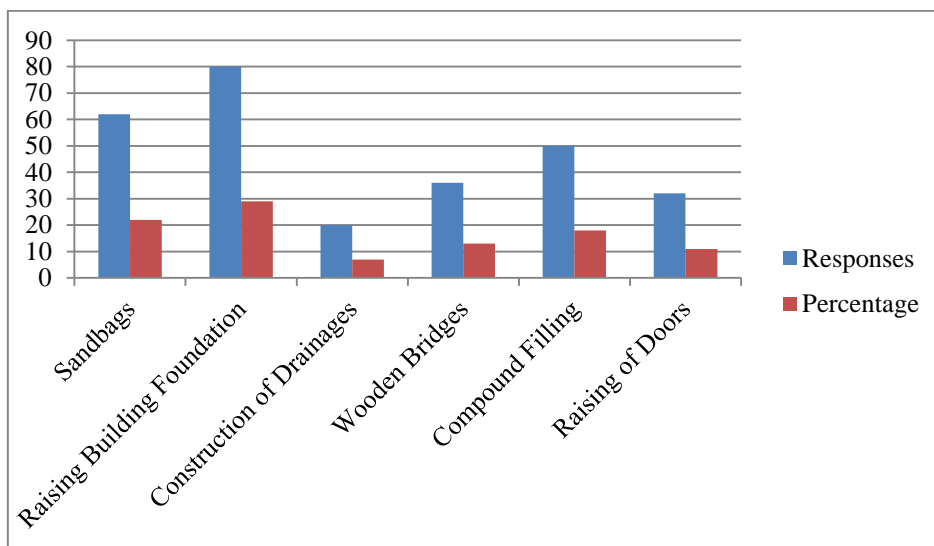


Figure 4: Types of property level flood protection measures existing in the study area

The Figure 4 above shows the types of property level flood protection measures existing in the study area. In developed countries, flood protection at property level has gained prominence but in this study area what can be found is as given in the Figure4 above. Every type of measure has its advantage and disadvantages and the cost of installation differs. Some of them are less costly while others are very costly. The cost of their installation determines the type mostly adopted in a poverty ravaged country like Nigeria. From the Table 3 above, the homeowners make use of raising building foundation more as a form of property level flood protection. The usages of sand bags ranked second in frequency, followed by compound filling with the aim of surpassing the level of flood and avoid flood water from coming in. Others are wooden bridges and raising of doors height. Some of these measures have been criticized as not being effective, e.g. sandbags, but interview with homeowners indicated the lack of fund contributes to none application of the expensive property level flood protection existing in the developed countries

4.5 Benefits of Property-Level Flood Protection

The respondents were asked to rank the benefits accruable from the adoption and implementation of flood protection at property level. Their responses were analyzed and shown in the Table 1 below.

Table 1: Benefits of property-level flood protection

Benefits	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Total	RII	Ranking
Extends Property Life	440 88	252 63	90 30	94 47	52 52	928 280	3.31	2 nd
Reduces Loss of Income	295 59	180 45	48 16	180 90	70 70	743 280	2.65	5 th
Reduces Flood Penetration into the Building	600 120	320 80	18 6	106 53	21 21	1065 280	3.80	1 st
Cheaper and Affordable	370 74	344 86	57 19	84 42	59 59	914 280	3.26	3 rd
Reduces Stress and Damage	250 50	268 67	120 40	168 84	39 39	845 280	3.02	4 th

In order to ascertain that the homeowners are aware of the benefits accruable from the adoption of property level flood protection, a list of benefits were posed to them during questionnaire survey and presented in the Table 1 above. The relative importance index revealed that the homeowners are aware of the benefit and the ranking showed that the homeowners accept that its adoption reduces flood penetration into the building. They also acclaimed that it extends the life of properties located in flood prone areas.

4.6 Constraints to adoption of property-level flood protection

The adoption of a measure of flood risk management can be affected by several factors. In the case of the possible constraints to the adoption of property level flood protection by homeowners in the study areas, the following outcomes as shown in the Table 2 below was discovered.

Table 2: Constraints to adoption of property-level flood protection

Constraints	Yes	No	Total
Financial Problems	180(64%)	100(36%)	280
Lack of Support from Government	235(84%)	45(16%)	280
Lack of cooperation by neighbours	167(60%)	113(40%)	280
Lack of Awareness	58(21%)	222(79%)	280
Lack of Knowledge of its Benefits	194(69%)	86(31%)	280

The perception, awareness adoption and benefits of property level flood protection by homeowners in the study area have been ascertained. In the Table 2 above, the homeowners expressed the constraints towards the effective adoption of the property level flood protection. They identified it as lack of support by government, lack of knowledge of its benefits by other homeowners, lack of cooperation by neighbours and financial problems.

5. CONCLUSION AND RECOMMENDATION

Homeowners' perception, adoption and awareness of benefits of PLFP in Port-Harcourt is moderately high. Although they have the awareness and willingness to adopt it to protect their properties, they have various challenges constraining its effective application. PLFP effectiveness can be better achieved if all the homeowners in an area adopt it coupled with the government assistance in providing some community based flood risk management measures like canals and drainages. It is hereby suggested that the government through her town planning offices should come up with flood level

codes for building in flood prone areas of Obio/Akpor town. A similar flood resilient code like the one specified and adopted by Bayelsa State Geographical Information System in 2017, (Birisibe, 2018), indicating the heights building foundations must exceed, should be created to suite the situation in flood prone areas of Obio/Akpor and Port Harcourt in general . It is also important that more awareness should be raised towards participation of all homeowners to adopt property level flood protection by government, enforce homeowners to incorporate resilient building and also provide incentives to encourage the homeowners so as to achieve effective implementation.

Conflict of Interest

The authors hereby declare that there is no conflict of interest. There are no financial or personal interests which have inappropriately influenced the writing of this article.

Authors' contributions

Gerald-Ugwu, G. C drafted the original manuscript, acquired and analysed the data and made interpretations. This work is part of the PhD dissertation on the impact of flooding on residential property investment returns under the supervision of Prof. Egolum, C.C, and Prof. Emoh, F. I., the co-supervisor. Both of the supervisors guided the methodology and critically revised the original manuscript and made the final approval of the version to be published.

REFERENCES

- [1] Adebimpe, O. A., Oladokun, Y. O. M., Odedairo, B. O., and Oladokun, V. O (2018) Developing flood resilient building in Nigeria: a guide. *Journal of Environment and Earth Science*, 8(3), 143-150 <https://www.iiste.org>
- [2] Adetunji, M. A and Oyeleye, O. I. (2018) Assessment and control measures of flood risk in Ajibode area of Ibadan, Oyo State, Nigeria. *International Journal of Physical and Human Geography*, 6(1), 1-16. Retrieved from <https://www.eajournals.org>
- [3] Aliagha, U. G., Jin T.E., Choong, W. W., &Jaafar, M. N. (2014) Factors affecting flood insurance penetration in residential properties in Johor Malaysia. *European Geosciences Union*
- [4] Amangabara, G. T., &Obenade, M., (2015) Flood Vulnerability of Niger Delta States Relative to 2012 Flood Disaster in Nigeria. *American Journal of Environmental Protection*, 3(3) 76-83. Doi: 10.1269/en-3-3-3
- [5] Attakora-Amaniampong, E., Owusu-Sekyere, E. &Aboagye, D. (2016) Urban floods and residential rental values nexus in Kumasi, Ghana. *GJDS*, 13(2) <https://www.ajol.info/index.php/gjds/article/download/145995/135511>
- [6] Atufu, C. E. and Holt, C. P. (2018) Evaluating the impact of flooding on the residents of Lagos Nigeria. *WIT Transactions on The Built Environment* 184(1), 81- 90, DOI:10.2495/FRIAR180081
- [7] Beddoes and Booth () Property level flood protection: a new effective and affordable solution. *WIT Transactions on Ecology and Environment*, (133).<https://www.witpress.com>, doi.10.2495/FRIAR100231
- [8] Bichard, E. &Kazmierczack, A. (2009) Resilient homes: reward-based methods to motivate householders to address dangerous climate change. Retrieved from <https://usir.salford.ac.uk/11276/>
- [9] Birisibe, W. G. (2018) Assessing architects' knowledge of flood resilient and adaptable buildings in Yenagoa, Nigeria. *Journal of Architecture and Construction*, 1(2), 16-24, <https://www.sryahwapublications.com>
- [10] Cirella, G.T., Iyalomhe, F. O., &Adekola, P. O. (2019) Determinants of Flooding and Strategies for Mitigation: Two-Year Case Study of Benin City. *Journal of Geosciences*, 9(136), 1- 15 doi:10.3390/geosciences9030136, <https://www.mdpi.com/journal/geosciences>
- [11] Doncaster, S. &Blanksby, J. (2017) Property Level Flood Protection; a guide to locating information on flood protection measures.Climate Adaptation Mainstreaming through Innovation.Pennine Water group, Department of Civil and Structural Engineering – University of Sheffield
- [12] Dabara, D. I., Anthony, A. I., Gbenga, O. A. &Adeyanju, O. (2014) Decision theory and its relevance to real estate development decisions. *British Journal of Economics, Management & Trade*, 4(12); 1861 – 1869, www.sciencedomain.org
- [13] Environment Agency (2005) Six steps to property level flood resilience: Guidance for property owners. Retrieved from <http://www.environment-agency.gov.uk/homeandleisure/floods/31624.aspx>

- [14] French, N.(2001) Decision theory and real estate investment: an analysis of the decision-making processes of real estate investment fund managers. *Managerial and Decision Economics*, 22(7), 399-410; <https://www.jstor.org/stable/3657273>
- [15] Joseph, R., Proverbs, D. & Lamond, J. (2015) Homeowners' perception of property-level flood risk adaptation (PLFRA) measures: The case of summer 2007 flood event in England. *International Journal of Safety and Security Engineering*, 5(3), 251 – 265.
- [16] Lloyd, P. (2019) Sustainable Urban Drainage Systems (SUDS): a proactive approach to reducing surface flooding. <http://www.groundsure.com>
- [17] Ologunorisa, T. E. (2009) Strategies for mitigation of flood risk in the Niger Delta, Nigeria *Journal of Applied Science and Environmental Management*, 13(2), 17- 22. Retrieved from <https://www.bioline.org.br/ja>
- [18] Owusu, S., Wright, G. B., & Arthur, S. (2013) Public attitudes towards flooding and property level flood protection measures. *Journal of Natural Hazards*, 77(3). DOI: 10.1007/s11069-015-1686-x
- [19] Parvin, G. A., Shimi, A. C., Shaw, R., & Biswas, C. (2016) Flood in a changing climate: the impact on livelihood and how the rural poor cope in Bangladesh. *Climate*, 4(60); doi:10.3390/cli4040060 <http://www.mdpi.com/journal/climate>
- [20] Versluis, V. (2010) Risk management and decision theory: a promising marriage between two wholly remarkable characters of mind-boggling lineage. Bachelor of Business Economics at Rotterdam University of Applied Sciences; <https://www3.hro.nl/final>