Journal of Information Engineering and Applications
ISSN 2224-5782 (print) ISSN 2225-0506 (online)
Vol.4, No.8, 2014

Awareness and Protection of Human and Electronic Library Resources from Lightning Disaster: A Survey of Selected Nigerian Libraries

Samuel Olu Adeyoyin[1*] Bosede A. Ajiboye[2] Florence O. Agbeze-Unazi[3] Olusegun A. Onasote[4] Basirat O. Akintunde[5]

1. Federal University of Agriculture, PMB 2240 Abeokuta, Ogun State, Nigeria.
2. Federal University of Agriculture, PMB 2240 Abeokuta, Ogun State, Nigeria.
3. University of Abuja, Federal Capital Territory, Nigeria.
4. Olabisi Onabanjo University, Ago-Iwoye, Ogun State, Nigeria.
5. Moshood Abiola Polytechnic, Abeokuta, Ogun State, Nigeria.

*E mail of the corresponding author: soade2003@yahoo.ca/samueladeyoyin@gmail.com

Abstract
Disaster prevention and management is a crucial aspect of library management. Creating awareness and protecting human and electronic library resources from lightning disaster require immediate attention of library managers. Lightning strike is a deadly natural disaster that poses serious danger to both human and electronic library resources, hence the need for creating awareness about its threat to human and material resources. This study was focused on creating awareness and protecting human and electronic library resources from lightning strike disaster in Nigerian university libraries. A descriptive survey method was adopted to elicit information from the respondents of this study. A questionnaire was designed with 29 structured questions including the demography of the respondents. Eighty (80) copies of questionnaires were distributed among the staff of the selected university libraries. Seventy two (72) questionnaires returned were all found usable. This study finds that majority of the respondents do not have awareness programme about protection from lightning disaster in their libraries. The study also finds that majority of the respondents are not aware that lightning strike can kill or cause serious health injury. The study also finds that human resources in the libraries require adequate protection from lightning strike and the advent of more electronic ICT equipment in the libraries necessitates the deployment of lightning protection equipment. The study finds that the libraries cannot ignore lightning strike equipment installation as this will be detrimental to the safety of human and material resources. Some recommendations were made based on the findings of the study and conclusions drawn.
Keywords: Awareness and protection, Human and electronic library resources, Lightning disaster, Nigerian libraries

1. Introduction

Lightning, an electrical discharge, which is released from mature clouds, is an exciting and even beautiful natural phenomenon with many different forms, shapes and colours. Every minute of every day 1,800 thunderstorms are taking place somewhere on the earth, releasing around 100 lightning bolts apiece. During these storms, it is likely that one person out of every 700,000 will be struck by lightning.

Though the amount of people struck by lightning might appear very minor, lightning is one of the leading natural disasters that cause deaths in the United States. In an average year 73 people are killed in the United States due to lightning strikes and 300 people are injured. The survivors of lightning strikes often suffer from long term memory loss, attention deficits, sleep disorders, numbness, dizziness, stiffness in joints, fatigue, muscle spasms, irritability, and depression.

A single lightning bolt is very powerful, releasing enough energy to light a 100-watt light bulb for more than three months. This electrical surge is created by a buildup and discharge of positively charged and negatively charged electrical energy. Air rising and descending from the thunderstorm and water and ice particles separate the positively charged areas and the negatively charged areas. The lightning strike begins as an invisible channel of electrically charged air trying to get to the ground. Then a surge of electricity from the ground moves upwards, creating a lightning strike.

2. Problem Statement

Lightning strike is a natural disaster that deals a great blow of devastating effects on its victims. Irreparable damages, total destructions and even death are the trademarks of lightning strike. The adverse effects of these calamities are sometimes unquantifiable, even in the developed nations where advances in science and technology are deployed to forestall or at least reduce the effects of lightning strike as a disaster. The developing nations, Nigeria inclusive, are far from facing the realities of this natural disaster in terms of awareness creation, preparations and deployment of lightning protection equipment that could minimize the effects of this disaster whenever it occurs. Libraries and information centres accommodate both human and material resources, especially electronic resources, now that library and information services are being delivered through information and communication technology (ICT) equipment. It is in the light of this that this study intends to carry out a survey on the awareness and protection of human and electronic library resources from lightning disaster in selected Nigerian libraries.

3. Objectives

This study sets out to achieve the following objectives:

1. Find out the rate of knowledge of lightning strike as a natural disaster.
2. Examine the level of awareness of the dangers of lightning strike as a natural disaster.
3. Find out if the information available about lightning strike and protection is adequate.
4. Investigate the type of lightning protection equipment available in the libraries.
5. Determine if the deployment of lightning strike equipment is cost effective to the libraries.
6. Find out if the library human and material resources require adequate protection from lightning strike disaster.
7. Find out if there is any awareness programme on lightning strike disaster in the library.

4. Literature Review

Lightning comes in many forms such as forked lightning. This is one of the most visible parts of a thunderstorm. The lightning stroke is branched and usually follows a zigzagging pattern. Forked lightning can go from cloud-to-ground, cloud-to-cloud, or cloud-to-air. The lightning mostly travels from cloud-to-cloud and only goes from the cloud to the ground 20% of the time. Cloud-to-air is the most uncommon form of forked lightning, but when it does happen it may appear that the lightning appears from nowhere if the sky above the cloud is clear and the lightning may reach up to ten miles away from the cloud.

Streak lightning is very similar to forked lightning. It follows the same zigzag formation, but it doesn't have any branches. Sheet lightning on the other hand, occurs within a cloud, but the observer is too far away from the storm to hear the thunder. Observers have to be at least a distance of ten miles away from the storm to not hear the thunder, but they can be a distance of five miles away, because tall buildings and trees can distort the sound. Heat lightning is most often seen on hot summer nights, because the sky around might be clear, but in the distance, a thunderstorm might be visible.

Ball lightning is an extremely rare form of lightning that takes the form of a slow moving sphere. It is usually less than three feet wide or around the size of a basketball and people have reported it being many different colours, including blue, yellow, and a pinkish orange. These spheres of lightning usually occur during a violent thunderstorm after a previous flash of lightning. Ball lightning can last for several seconds, to several minutes, but in the amount of time very little damage is reported due to ball lightning and no deaths. Witnesses have reported ball lightning breaking a window or entering their house through a screen. Some witnesses say that ball lightning broke through a screen or window and slowly floated in their house until it vanishes or leaves through a different window. Other witnesses say that they saw it slowly falling from the sky and disappearing before it hits the ground. Since there is no proof that ball lightning really exists, except a few photographs or eyewitness accounts, some scientists are skeptical about if it is really real or just an illusion. Others believe that it is possible for ball lightning to exist, backing their selves up with the damage reports and even drawings and reports made by ancient people who have seen sphere shaped lightning falling out of the sky.

Saint Elmo's fire isn't actually a form of lightning, but an electrical discharge, which forms above tall pointy objects above the ground, like the masts of ships, power poles, and airplane wings. This form of lightning gives off a bright bluish greenish glow. It is made from tiny sparks, which are positively charged, heading upwards, because of the growing negative charge in the clouds above. Instead of lightning forming, the "corona discharge" tries to get away from the object that it is near, causing the glow. The three forms of high-altitude lightning were recently discovered. They take place above the clouds, shooting upwards, while the cloud gives off a lightning discharge. The three types of high-altitude lightning are red sprites, blue jets, and green elves. Red sprites take

the shape of a carrot and occur in the middle of the atmosphere. Blue jets are very small streaks of lightning with flared ends and green elves are a barely visible form of high-altitude lightning that spreads across the atmosphere and looks similar to a jellyfish.

5. Lightning Protection

Lightning protection in an absolute sense is impossible because of the arbitrary nature of lightning strikes. Some twenty five million of them striking in all the continents of the world annually each have unique characteristics. The protection approach is highly site-specific, with many designs unique to individual facilities and structures. Mitigation of lightning insults is attempted through the deployment of a combination of exterior and interior defences. The purpose of this study is to describe and illustrate those defensive systems as they are applied in various situations. When employed in various situations and when employed in combination, the following sub-systems represent a layered defensive strategy, commonly called a Lightning Protection System (LPS).

5.1 Lightning Protection System

5.1.1 Air Terminals: Lightning usually terminates on grounded objects sticking up in the air. Franklin rods are air terminals. Overhead steel cables and metal masts are air terminals. Steel towers are air terminals. Trees are air terminals. In the absence of taller objects fences and blades of grass are air terminals. Old Ben's design developed in 1752 carried lightning from rods in the air via conductors to rods in the ground. This rod-configuration on buildings was and is based upon the Path of Least Resistance laws of physics. Nowadays, some vendors are promoting unconventional air terminal designs (ESE/DAS/CTS) seeking to gain advantage over competitors. Caveat emptor. Of course, should lightning strike across the street from a protected facility centre and couple into sensitive electronics via underground wiring, then no air terminals design of any classification has performed its role in protection.

5.1.2 Grounding: Low impedance and resistance grounding provides an efficient destination for the Lightning Beast. If site soils are composed of sand or rock they are resistive, not conducive. If surrounding soils are clay or dirt, they may be conducive. "Good Grounds" are achieved with properly configured volumetric efficiencies. We recommend buried bare 4/0 copper wire-the so called ring electrode or ring ground. Cadwelling security fences, tower legs, and other adjacent metallics to the buried ring will augment the earth electrode sub-system. NEC 250 describes other grounding designs such as rods, plates, water pipes (beware plastic pipes underground), metal frame of buildings, and concrete-encased electrodes. Choose your grounding design based upon localized conditions and the amount of available real estate at your location. NEC 250.56 suggests a target earth resistivity number of 25ohms. Lower is better.

5.1.3 Bonding: Without proper bonding, all other elements of the LPS are useless. Bonding of all facility incoming metallic penetrations-cables, conduits, pipes and wires-assures all of them are at equal potential. There are many interior "grounds" in modern building, such as computer grounds, AC power grounds, lightning grounds, single point grounds, and multi-point grounds. All must be bonded so as to achieve the same potential. When lightning strikes, all grounded equipment must rise and fall equipotentially. This will eliminate the differential voltages in separate sensitive signal and data systems. Bonding serves to connect all conductors to the same "Mother Earth".

5.1.4 Surge Suppression: Surge suppression devises (SPDs) all function either by absorbing the transient as heat or crowbaring the transient to ground (or some combination thereof). SPDs should be installed at main panel entries, critical branch or secondary panels, and plug-in outlets where low voltage transformers convert AC power to DC current and voltage. SPDs also should be installed at signal and data line facility entry points and at electronic equipment. Telephone punch blocks should be SPD-protected. Beware the junk SPDs which proliferate the marketplace. SPDs rank right behind Bonding in the hierarchy of important steps to mitigate the lightning hazard.

6. Codes and Standards

There are excellent codes and standards, helpful codes and standards and superficial codes and standards. No one such document by itself provides comprehensive guidance for the lightning protection engineer. Familiarity with many recognized codes and standards is vital for competency in lightning problem-solving.

Lightning is arbitrary, capricious, random, stochastic and unpredictable. Science does not fully understand its phenomenology. However, investigations from today's researchers are considerable. While lightning creates major upsets and significant financial losses to the economy, safety from its effects is rarely employed

proactively. Absolute protection is impossible but deployment of a holistic, systematic approach can mitigate the hazards. In general, many errors and misunderstandings dominate lightning protection efforts. To say that "lightning never strikes twice" is not correct. "Lightning rods provide safety for people" is not correct. New information slowly is altering the Century Convention Wisdom.

7. Resistive, Magnetic Field and Electric Coupling

The coupling of lightning transients into sensitive electronics can arise from different mechanisms as a result of direct and /or indirect (distant) lightning.

7.1 Resistive Coupling

When a facility is struck by lightning, the current flow into the earth usually generates high voltages between the power supply and the remote earth. Partial lightning currents then flow in electrical and signal and data conductors which are a part of the structure and which are connected to remote earth.

7.2 Magnetic Field Coupling

Lightning current, flowing either in a conductor or in the lightning channel itself, produces a high magnetic field. Where the magnetic field attaches to electrical and signal and data conductors it causes voltages in loops formed by these conductors.

7.3 Electric Field Coupling

The nearby lightning stroke contains a high electric field which charges electrically-conducive objects like large capacitor. The air becomes a dielectric medium. High voltage arises in electrical and signal and data conductors, even though the structure was not directly struck. When lightning strikes at or nearby to a critical or high value facility, stroke currents will divide up among all parallel conducive paths between the attachment point (s) and earth.

A risk management approach to lightning safety must assume the facility will be struck by lightning. By adopting a judicious combination of defences, the lightning safety engineer can attempt to mitigate lightning's consequences. Since each facility is unique, as is each lightning flash, site-specific designs must be applied. Application of integrated approaches for air terminals, ground terminals, conductors, bonding, shielding, surge protection devices, etc. will depend on the geographic location and the perceived risk to the facility.

8. Lightning Protection Systems Provide Limited Protection

When reporting the result of rocket triggered testing sponsored by US Government, Morris (1997) noted that "What we found out was that the lightning protection system played a limited role in directing current from lightning strike…[instead] current traveled through the rebar, through concrete, through pipes, through cables, through vent stacks, and through the electrical system…" - Lopez and Holle (1998) also reported that "the average distance between successive flashes is greater than previously known". Old data said successive flashes were on the order of 3-4 km apart. New data shows half the flashes are some 9 km apart. The National Severe Laboratory report concludes with a recommendation that: "It appears the safety rules need to be modified to increase the distance from a previous flash which can be considered to be relatively safe, to at least 10 -13 km (6-8 miles). In the past, 3-5 km (2-3 miles) was as used in lightning safety education".

Shii, et. al. (1998) also reported that "many cloud-to-ground lightning flashes have forked or multiple attachment points to earth". Tests carried out in both the USA and Japan verify this in at least half of negative flashes and more than seventy percent of positive flashes have forked characteristics. Many lightning detectors cannot acquire accurate information about these multiple ground lightning attachments. In the same vein, Sandia National Laboratory (1993) discovered that lightning can spread out some 60 ft. upon striking earth's surface. The organization reported in their triggered lightning test programme that environments within 20 meters of the lightning channel and small are temporary protection concepts. They also reported that radial horizontal arcing has been measured at least 20m from the point where lightning enters the earth. Depending upon soils characteristics, safe conditions for people and equipment near lightning termination points (ground rods) may need to be re-evaluated.

9. Need for protection

Before proceeding with the detailed design of a lightning protection system, the following essential steps should be taken:

1. It should be decided whether or not the structure needs protection, and if it does what the special requirements are

2. A close liaison should be ensured between the architect, the builder, the lightning protection system engineer and the appropriate authorities.
3. The procedure for testing, commissioning and future maintenance should be agreed.

In many cases, the need for protection may be self-evident, for example:

- where large number of people congregate;
- where essential public services are concerned;
- where the area is one in which lightning is prevalent
- where there are very tall or isolated structures;
- where there are structures of historic or cultural importance;
- where there are structures containing flammable or explosive contents.

However, some factors cannot be assessed and these may override all other considerations. For example, a desire that there should be no avoidable risk to life or that the occupants of a building should always feel safe may decide the question in favour of protection, even though it would normally be accepted that there was no need. No guidance can be given in such matters but an assessment can be made taking account of the exposure risk (that is the risk of the structure being struck) and the factors such as use to which the structure is put; nature of its construction; value of its content or consequential effects; the location of the structure and the height of the structure.

10. Personal Protection

A hazard to persons exists during thunderstorm. Each year, a number of persons are struck by lightning particularly when outdoors in an open space such as an exposed location on a golf course, or when out on the water. Others receive electric shock attributable to lightning when in doors. In built-up areas protection is frequently provided by nearby buildings, trees, power lines or street lighting poles. Persons within a substantial structure are normally protected from direct strikes but may be exposed to a hazard from conductive materials entering the structure (e.g. power, telephone or TV antenna wires) or from conductive objects within the structure which may attain different potentials.

Lightning strikes direct to a person or close by may cause death or serious injury. A person touching or close to an object struck by lightning may be affected by a side flash, or receive a shock due to step, touch or transferred potentials. When moderate to loud thunder is heard, persons out of doors should avoid exposed locations and should seek shelter or protection in accordance with the guidance for personal safety, particularly if thunder follows within 15secs of a lightning flash (corresponding to a distance of less than 5 km).

Gbadamosi and Shobayo (2011) reported that two women married to the same husband, and their two children were killed at Soro, a village in Ganjuwa Local Government Area of Bauchi state, Nigeria. They reported that the women were grinding corn with their babies on their backs, when they were struck dead by lightning. A lightning strike at a primary school in Western Uganda killed 19 students and injured 50 in 2011. Lightning hit Runyanya Primary School in Kiryandongo district, about 225 kilometres (135 miles) Northwest of Kampala, killing 18 children outright with a further child dying from burns. Local media reported that a further 21 pupils were burned after lightning struck at a secondary school in Zombo district of Kampala. Basalirwa (2011) said, as the head of the meteorological unit at Kampala's Makerere University, although Uganda has seen deadly lightning strikes in the past, the frequency has increased dramatically. He said the sharp increase in the number and strength of lightning strikes was one more sign, along with increased droughts and flooding, of the extreme weather conditions being caused by climate change in the region. Although, he said it was still too early to tell whether these conditions were becoming normal, he urged the Uganda government to put in place measures to deal with weather extremes, such as building more lightning rods.

Nabakooba said the children killed had been sheltering from the rain in the school as they waited to go home when the lightning struck. She could not provide an exact figure for the total number killed countrywide by lightning in recent weeks, but local newspaper reported a total of 28 killed and scores injured in the past week. According to her, Uganda is experiencing unseasonably heavy rainstorms and concern about the number of recent lightning strikes has prompted lawmakers to demand an official explanation from government. Topher Mugumya, advocacy manager with Save the Children in Uganda, called for awareness campaigns to make sure people have the material to put conductors on their homes, and said the government should support such measures as the rate of deaths from lightning was alarming. He also called for reforestation in areas that have been cleared of trees.

11. Protection of persons and equipment within buildings

Persons and equipment within buildings can be at risk from lightning currents and associated voltages which may be conducted into the building as a consequence of a lightning strike to the building or associated services. Some equipment (e.g. electronic equipment, including computers) is especially susceptible to damage from overvoltages transferred from external connections caused by lightning and such damage may occur even when the lightning strike is remote from the building, e.g. from a surge conducted into the building via the power and telecommunication cables.

Measures may therefore need to be taken to protect persons and equipment within buildings. The decision has to be whether to provide protection specifically directed to equipment which will depend on the value placed on that equipment and on the cost and inconvenience which might result from the equipment being out of service for an extended period.

12. Safety Precautions

It is important to know how to protect oneself from lightning during a thunderstorm. We normally hear a loud crack of thunder after we see a flash of lightning. Many people don't know how we hear thunder, but it is actually very simple. When lightning strikes the air around it quickly heats to 43,000 degrees, causing the air around it to expand. Then it quickly cools causing the air to contract quickly. The rapid expansion and contraction causes air molecules to move back and forth, creating the noise that we recognize as thunder. To find out how many miles away a thunderstorm is count the number of seconds between a flash of lightning and a crack of thunder. Then divide that number by five. The number you get is the distance the storm is from your location.

Although it may seem that a storm is too far away for lightning to affect you, you should wait thirty minutes before going back outside again.

13. Lightning Safety Standards

- ✓ All thunderstorms produce lightning and are dangerous.
- ✓ Lightning often strikes as far as 10 miles away from any rainfall.
- ✓ You are in danger from lightning if you can hear thunder.
- ✓ You are in danger if you can see lightning.
- ✓ Lightning injuries can lead to permanent disabilities or death.
- ✓ Look for dark cloud bases and increasing wind.
- ✓ Blue Skies and Lightning. Lightning can travel sideways for up to 10 miles and strike when skies are blue.

Soccer fields or playing grounds are a dangerous place to be during a lightning storm. When lightning is seen or thunder is heard, or when dark threatening clouds are observed, quickly suspend the game and/or practice and move to a safe location.

14. Methodology

Survey method was adopted as the research design for this study. Questionnaires were designed and used as survey instruments. The population for this study includes the staff of Federal University of Agriculture, Abeokuta (FUNAAB), Olabisi Onabanjo University, Ago-Iwoye (OOU) and Tai Solarin University of Education, Ijebu-Ode (TASUED). The population was made up of 72 staff selected from the sampled institutions for this study. They were randomly selected from Acquisitions, Readers Services, Cataloguing and Classification, Automation, Serials and Admin departments. They were chosen based on their experience. They were chosen through purposive sampling technique. The findings were presented in tabular form. In this investigation, simple percentage analysis was employed.

15. Data Analysis

A total number of 80 questionnaires were administered on 80 subjects. The 80 subjects that made up the sampled population were drawn from three selected tertiary institutions in Ogun state. 72 questionnaires which represents 90% of the entire sample were returned, found appropriate, and fell into needed sample. Hence, 72 questionnaires were used for this analysis. The research questions were analyzed based on the institutions studied. Data analyses were presented in tabular form using simple percentage analysis.

Section A: Demographic Information

Table 1: Distribution by Institution

Institutions	FUNAAB	OOU	TASUED	TOTAL
No of Respondents	20(27.8%)	32(44.5%)	20(27.8%)	72(100%)

Table 1 shows the distribution of respondents by institutions. 20 respondents which represents 27.8% were from FUNAAB, 32 respondents (44.5%) were from OOU while another 20 respondents (27.8%) were from TASUED.

Table 2: Respondents' Section

Acquisition	Readers Svc	Cat and Class	Automation	Serials	Admin	Total
10(13.9%)	21(29.2%)	10(13.9%)	11(15.3%)	10(13.9%)	10(13.9%)	72 (100%)

The table above shows that Acquisition section has 10 respondents (13.9%), Readers' Services 21(29.2%), Cataloguing and Classification 10 (13.9%), Automation 11(15.3%), Serials 10 (13.9%) and Administrative section (13.9%).

Table 3: Respondents' Age

>60	50-59	40-49	30-39	20-29	No Response
-	6(8.33%)	27(37.5%)	20(27.8%)	13(18.1%)	6(8.33%)

This table reveals that respondents between age 50-59 were 6 (8.33%), age 40-49 were 27 (37.5%), age 30-39 were 20 (27.8%) and age 20-29 were 13 (18.1%).

Table 4: Respondents' Sex

Male	Female	No Response
26(36.1%)	33(45.8%)	13(18.1%)

This table also shows that only 59 out of 72 respondents indicated their sex. Male 26 (36.1%) and female 33 (45.8%).

Table 5: Respondents' Status

Librarian	Library Officer	Library Assist.	Library Porters	Admin Staff	Others
15(20.8%)	13(18.1%)	22(30.6%)	4(5.6%)	11(15.3%)	7(9.7%)

The respondents' status are shown in this table. Librarian 15 (20.8%), Library Officer 13 (18.1%), Library Assistants 22 (30.6%), Library Porters 4 (5.6%), Administrative staff 11(15.3%), others 7 (9.7%)

Section B: Awareness of Lightning Strike Disaster

Table 6:

Questions	Yes	%	No	%
Do you know what lightning is?	65	90.3	7	9.7
Have you experienced lightning strike before?	47	65.3	25	34.7
Have you experienced lightning disaster before?	30	41.7	42	58.3
Do you hear/read about lightning disaster?	59	81.9	13	18.1
Do you know anything about lightning protection equipment?	30	41.7	30	41.7
Do you have lightning protection equipment in your library?	42	58.3	30	41.7
Is there any awareness programme about protection from lightning disaster in your library?	25	34.7	47	65.3
Are you aware that lightning strike can kill or cause serious health injury?	26	36.1	46	63.9
Do you believe that lightning disaster can be averted to a large extent?	63	87.5	9	12.5

Table 6 reveals the respondents' level of awareness on lightning strike. While 65 (90.3%) affirmed that they know what lightning is, 7 (9.7%) responded negatively. 47 (65.3%) have experienced lightning strike before while 25 (34.7%) have not. 30 (41.7%) have also experienced lightning disaster before while 42 (58.3%) have

not. 59 (81.9%) hear and read about lightning disaster while 13 (18.1%) do not hear or read about lightning disaster. 30 (41.7%) know about lightning protection equipment while 30 (41.7%) do not know about lightning protection equipment. 42 (58.3%) have lightning protection equipment in their libraries while 30 (41.7%) do not have lightning protection equipment in their libraries. 25 (34.7%) have awareness programme about protection from lightning disaster in their libraries while 47 (65.3%) do not have awareness programme about protection from lightning disaster in their libraries. 26 (36.1%) are aware that lightning strike can kill or cause serious health injury while 46 (63.9%) are not aware that lightning strike can kill or cause serious health injury. 63 (87.5%) believe that lightning strike can be averted to a large extent while 9 (12.5%) do not believe that lightning strike can be averted.

Section C: Protection from Lightning Strike Disaster
Table 7:

Items	SA	A	SD	D	UNDEC
Lightning strike is a natural disaster also referred to as the act of God.	24(33.3%)	27(37.5%)	8(11.1%)	9(12.5%)	4(5.6%)
Many people are not aware of the dangers being caused by lightning strike.	14(19.4%)	39(54.2%)	8(11.1%)	8(11.1%)	3(4.2%)
Lightning equipment are not easily acquired.	9(12.5%)	31(43.1%)	13(18.1%)	16(22.2%)	3(4.2%)
Lightning equipment are not easily deployed.	9(12.5%)	31(43.1%)	16(22.2%)	12(16.7%)	4(5.6%)
Electrical/electronic equipment should come with lightning protection equipment.	33(45.8%)	27(37.5%)	5(6.9%)	5(6.9%)	2(2.8%)
Organizations should include lightning protection in their maintenance policy.	36(50%)	29(40.3%)	3(4.2%)	2(2.8%)	2(2.8%)
Library management should prepare against natural disaster such as lightning strike.	43(59.7%)	22(30.6%)	3(4.2%)	2(2.8%)	2(2.8%)
Library management should evolve maintenance policy that includes lightning protection.	36(50%)	31(43.1%)	1(1.4%)	2(2.8%)	2 (2.8%)
Human resources in the libraries require adequate protection from lightning strike	36(50%)	26(36.1%)	2(2.8%)	3(4.2%)	5(6.9%)
Advent of more electronic ICT equipment in the libraries necessitates the deployment of lightning protection equipment.	26 36.1%)	29(40.3%)	10(13.9%)	3(4.2%)	4(5.6%)
The economic advantage of lightning protection equipment deployment is greater than installation cost.	13(18.1%)	35(48.6%)	7 (9.7%)	14(19.4%)	3(4.2%)
The deployment of lightning strike equipment is cost effective to the libraries.	14(19.4%)	31(43.1%)	12(16.7%)	8(11.1)	5(6.9%)
Library can ignore lightning strike equipment to the peril of their human and material resources.	11(15.3%	8(11.1%)	26(36.1%)	23(31.9%)	4(5.6%)

Table 7 reveals the respondents' opinion about issues relating to protection of library human and materials resources from lightning strike disaster. The table shows that 51 (70.8%) agreed that lightning strike is a natural disaster also referred to as the act of God while 17 (23.6%) disagreed. 53 (73.6%) agreed that many people are not aware of the dangers being caused by lightning strike while 16 (22.2%) disagreed. 40 (55.6%) agreed that lightning equipment are not easily acquired while 29 (40.3%) disagreed. In the same vein, 40 (55.6%) agreed that lightning equipment are not easily deployed while 28 (38.9%) disagreed. Some of the respondents 60 (83.3%) opined that electrical equipment should come with lightning protection equipment while 10 (13.9) respondents disagreed. 65 (90.3%) agreed that library management should include lightning protection in their maintenance policy while 5 (6.9%) disagreed. 65 (90.3%) agreed that library management should prepare against

natural disaster such as lightning strike while 5 (6.9%) disagreed.67 (93.1%) agreed that library management should evolve maintenance policy that includes lightning protection while 3 (4.2%) disagreed. 62 (86.1%) agreed that human resources in the libraries require adequate protection from lightning strike while 5 (6.9%) disagreed. 55 (76.4%) respondents agreed that advent of more electronic ICT equipment in the libraries necessitates the deployment of lightning protection equipment while 13 (18.1%) disagreed. 48 (66.7%) agreed that the economic advantage of lightning protection equipment deployment is greater than installation cost while 21 (29.2%) disagreed. 45 (62.5%) respondents agreed that the deployment of lightning strike equipment is cost effective to the libraries while 20 (27.8%) disagreed. 19 (26.4%) respondents ironically opined that library can ignore lightning strike equipment to the peril of their human and material resources while 49 (68.1%) respondents disagreed.

16. Discussion of Findings

16.1 Awareness of Lightning Strike Disaster

Majority of the respondents know what lightning is and have experienced lightning strike before. Although, only few of the respondents have experienced lightning disaster before, majority of them have heard/read about lightning disaster. Half of the respondents do not know anything about lightning protection equipment while the remaining half had a prior knowledge of what lightning protection equipment are. The study also revealed that majority of the respondents' libraries have lightning protection equipment although further investigation shows that some of those equipment are weak and obsolete. The study finds that majority of the respondents do not have awareness programme about protection from lightning disaster in their libraries. The study also finds that majority of the respondents are not aware that lightning strike can kill or cause serious health injury. However, majority of the respondents also believe that lightning disaster can be averted to a large extent.

Part of the investigations of this study was to know how often the respondents hear/read about lightning disaster. The findings also show that majority of the respondents, 64 (88.9%) never heard or read about lightning disaster before, 8 respondents (11.1%) seldom hear and read about lightning disaster. We also desired to know what type of lightning protection equipment is installed in the respondents' library. This study found that the installation of earthen rod meant for small houses were the commonest form of lightning protector by some of the libraries studied.

16.2 Protection from Lightning Strike Disaster

This study also finds that lightning strike is a natural disaster also referred to as the act of God. The study also reveals that many people are not aware of the dangers being caused by lightning strike. It was also discovered that lightning equipment are not easily acquired as well as deployed. The study also finds that human resources in the libraries require adequate protection from lightning strike and the advent of more electronic ICT equipment in the libraries necessitates the deployment of lightning protection equipment. It was also discovered that the economic advantage of lightning protection equipment deployment is greater than installation cost and the deployment of lightning strike equipment is cost effective to the libraries. The study finds that the libraries cannot ignore lightning strike equipment installation as this will be detrimental to the safety of human and material resources.

17. Recommendations

- ✓ Awareness should be created about lightning strike disaster among library staff.
- ✓ Electrical/electronic equipment meant for library usage should come with lightning protection equipment.
- ✓ Parent institutions and libraries should include lightning protection in their maintenance policy.
- ✓ Library management should prepare against natural disaster such as lightning strike.
- ✓ Library management should evolve maintenance policy that includes lightning protection.
- ✓ Experts should be consulted at regular interval to ascertain the reliability of the lightning strike equipment as its failure could cause devastating damages to the library human and material resources.
- ✓ Every individual should be conscious of the fatal effect of lightning strike on both human and material resources and therefore take some precautions.

18. Conclusion

Disaster management is a crucial aspect of library management. Creating awareness and protecting human and electronic library resources from lightning disaster require immediate attention of library managers. Lightning strike is a deadly natural disaster that poses serious danger to both human and electronic library resources, hence the need for creating awareness about its threat to human and material resources. This paper has revealed that more awareness should be created about lightning strike disaster among library staff while management should

evolve maintenance policy that includes lightning policy. Above all, every individual requires adequate knowledge of lightning strike and the possible devastating effects it might cause to human and material resources if not adequately protected.

References

Basalirwa, C. 2011. Uganda districts experience lightning strike. Daily Monitor, 29th June.
Daily Monitor 2011. Lightning strike kills 19 children in Uganda. 29th June, 2011
Gbadamosi, S. and Shobayo, S.I. 2011. Lightning kills 4 persons, 9 cows in Bauchi. The Nigerian Tribune. Thursday, 30 June.
Lopez & Holle 1998. Separation between Successive Lightning Flashes in Different Storms Systems: 1998, , from proceedings 1998 Intl Lightning Detection Conference, Tucson AZ, November 1998.
Morris, M. 1997. Electromagnetic Test and Analysis Dept., as quoted in Sandia Lab News, April 25, Sandia National Lab, Albuquerque NM.
Proceedings 1998. International Lightning Protection Conference, Birmingham, UK, Sept.1998.
Shii, et. al. 1998. Termination of Multiple Stroke Flashes Observed by Electro-Magnetic Field. In: Proceedings 1998 International Lightning Protection Conference, Birmingham, UK, Sept.1998.
Sandia National Laboratory 1993. Triggered Lightning Test Program: Environments within 20 meters of the Lightning Channel and Small are Temporary Protection Concepts: 1993, SAND94-0311, Albuquerque NM.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar