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IMPACT OF BAD WEATHER PHENOMENON ON AIRLINE OPERATIONS IN LAGOS, NIGERIA

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Abstract

This study examines the influence of bad weather phenomenon on airline operations at Murtala Muhammed International Airport in Lagos. Rainfall, cloud cover, relative humidity, sunlight length and intensity, wind speed, temperature, and other weather-related factors such as a thunderstorm, clear air turbulence, and so on are all investigated in this study. These conditions are monitored throughout the day and night at the airport. In order to better assess the effects of bad weather phenomenon on airline operations, a questionnaire covering all stakeholders was created and sent to the appropriate parties. Tables and percentages were employed for data analysis. The study discovered, among other things, that bad weather poses a problem to the aviation business. It reduces visibility, increases the likelihood of a plane accident, and can potentially inflict damage to airplane parts. The study found that the impact of bad weather phenomenon in the study area is seasonal. Bad weather has also been linked to aircraft delays, diversions, and cancellations, which drive passengers to spend more money. Finally, the study revealed that passengers' health is jeopardized when bad weather phenomena are announced in flight. The study recommended that the airport should install the most recent weather monitoring systems, build a paved runway, and make credible weather forecast information available to passengers before departure to reduce flight delays and cancellations.

Keywords: Air transport; Bad weather phenomenon; Climate change; Flight delay.

1. Introduction

Climate change is indeed a general issue that is negatively affecting the climate and ecosystems (Arora, 2019). When compared to the previous century, the rate of climate change has accelerated in recent years (Akpodiogaga & Odjugo, 2010;

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Omigbodun, Familusi, Akinsola et al., 2026; Ugochukwu et al., 2019). Globally, the average temperature has risen by 0.9 degrees Celsius since the eighteenth century (Arora, 2019). Warming is expected to continue, with an average increase of 3-4 degrees Celsius probable over the next century (FAO, 2015). Arora (2019) made prediction of average temperature increase (warmness of the earth) in 2019, but the increase may be greater in some seasons than others.

Climate change causes seasonal cycles to be distorted, resulting in changes in rainfall, snowfall patterns, and temperature (Chikezie et al., 2019; Olaniyi, Bamise, Gbadegesin *et al*., 2026). The bad weather phenomena is among the most difficult hurdles in airline operations. It is a phenomenon that is characterized by fog, sandstorms, heavy rain, or haze. When analyzing aviation mishaps caused by bad weather and other connected impacts, it is clear that aviators did not always realize the hazards associated with bad weather (Adeniran, Olaleye, & Gbadegesin, 2026). Weather and its vagaries have a considerable impact on air traffic safety and operational efficiency, particularly in terminal regions. Flight delays, diversions, and cancellations are inevitable outcomes of weather conditions (Adeniran, Njoku & Stephens, 2023; Onyejiri, 2019).

The impact of weather variance caused by climate change is a major problem for the aviation sector (Fadare & Adeniran, 2018; Olorunfemi & Adeniran, 2024). According to Kulesa (2002), numerous airlines have been inactive and workers have been let off, while others provide skeletal services as a result of harsh weather disasters. A terrible weather phenomenon is an anomalous atmospheric state or scenario that makes regular human activities difficult (Adeniran, Olorunfemi, Akinsehinwa & Azrour, 2024). This is a natural occurrence that might be beneficial to both man and the environment (Adeniran & Fadare, 2018a). The occurrence of bad weather phenomena is more prevalent in the tropical area than in any other part of the planet (Adeniran & Fadare, 2018b; Adeniran, Olorunfemi & Akanmu, 2025). Thunderstorm activity, for example, is more intense in the tropics than in any other part of the planet. Thunderstorms have been observed to be harmful to aviation (Pawar et al, 2010).

Thunderstorms are thermodynamic phenomena in which the potential energy of latent heat of condensation in moist unsuitable air is turned into the kinetic energy of powerful vertical air currents marked by thunder, lightning, gusty wind, and occasionally hail (Olorunfemi & Adeniran, 2020). It is one of the climatological occurrences that causes problems for humans; material losses caused by thunderstorms are generally the result of high-intensity electrical discharges, powerful winds accompanying cumulus clouds, and severe precipitation that generates local floods and hail (Adeniran & Olorunfemi, 2020; Alexander, 2015; Kolendowicz, 1998). According to Ayoade (2004), low visibility is a threat to all modes of transportation, particularly the air transportation.

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Furthermore, associated weather factors such as thunderstorms have the potential to disrupt aviation routes from several kilometers away. Thick fog, snow, rain, thunderstorm, harmattan, sandstorm, dust, mist, volcanic ash or dust, urban smoke, low ceiling, and even smog can all contribute to poor visibility (Adeniran, Olorunfemi & Njoku, 2022). Rainfall may limit visibility to nil, making it impossible for a pilot to see the runway, according to studies. If a pilot decides to take off or land under such conditions, it will be a massive tragedy. A investigation of the reasons responsible for the air disaster finds that adverse weather, including rainfall and thunderstorms at the time of the incident, are the primary causes of the crash (Olorunfemi, Adeniran & Amoako-Sakyi, 2024; Remi, 1987). It should be noted that it is important to note that severe rainfall is as destructive as a whirlwind, or a tornado.

According to the National Oceanic and Atmospheric Administration (NOAA), severe weather has a substantial impact on airline operations in Nigeria. Weather conditions other than rain can also have an impact on air travel. Air Traffic Control (ATC), for example, may delay take-off or landing due to cloudage or when the cloud ceiling is decreased, resulting in limited acceptance of flights. Similarly, excessive cross factor caused by high surface winds leads to limited acceptance of aircraft at the airport. According to the NTSB (2012), low-level wind (Shear wind) circumstances might cause the stoppage or cancellation of takeoff and landing. The impact of weather on aviation travel extends beyond landing and takeoff. Jet stream winds, clear air turbulence, and temperature inversions all have a substantial influence on fuel use and on-time performance during the trip.

In general, weather conditions in the tropics can vary or evolve unpredictably across a large geographical demission. These fast developments have an impact on air travel (Houle, 2015). Weather is a significant factor causing delays and flight inefficiency. It is quickly becoming the leading source of delays in Nigeria (Adeniran, Ilugbami, Olorunfemi & Ojo, 2024). It is crucial to understand that airplanes might have delays whether in the air or on the ground prior to takeoff. This occurs for a variety of causes, the most common of which being terrible weather, particularly in Nigeria (Schaefer & Millner, 2001). Bad weather can produce situations that make visibility difficult. Fog, snow, rain, thunderstorm, sandstorm, shear wind, haze, volcanic ash or smoke, urban smoke; smog, and other meteorological conditions can all produce impaired vision etc. can impact heavily on transport (Adeniran, Olaleye & Gbadegesin, 2026; Akinloye, 2024).

Weather-related disruptions to transportation have been mitigated by advances in science and technology. Human experience has also aided in the security and safety of the aviation sector in the face of poor weather. Because aviation is weather-sensitive, no decision is made without first taking the weather into account (Dare, 2025; Ewent Consortium, 2012; Eze, 2015; Pan African News, 2016). The fluctuations of the weather have made air safety around the world fairly complex, particularly in the tropics. Similarly, the National Transportation Safety Board (NTSB) of the United States of America noted that in the air transport business,

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unfavorable meteorological phenomena conditions are a major cause of aviation accidents (NTSB, 2012).

Clear Air Turbulence has been identified as the most prevalent defining cause of air accidents in Nigeria as governed by Part 121 regulation in 2010. (CAT). According to Klein (2009), the most significant source of unavoidable delays in the aviation sector is bad weather. The advancement of science and technology has resulted in the most up-to-date and accurate weather information. This current meteorological information has assisted pilots in avoiding CAT during flight, minimizing the number of air mishaps, particularly those caused by weather. A greater awareness of weather improves flight operations by reducing the issue of unexpected flight deviation caused by bad weather.

According to Ahlstorm (2005), greater communication between the office and the pilots is critical and can assist aviation management in scheduling flight arrival and departure times while avoiding re-routing due to weather. Bad weather is a threat that have endangered the lives of many people. The funniest thing is that despite the ugly experience of sudden inormation regarding bad weather during flights, the same set of passengers continue to travel by air. Planes are often grounded for safety concerns to avoid experiencing bad weather such as snowstorms, hurricanes, fog, strong wind, or high temperatures since aircraft are not fit for flight when the temperature is too high (Dare, 2024; Enete et al., 2015).

Despite the known problems associated with weather in air transport, especially in the tropical regions of the world. Not even the technological improvement in weather forecasting and understanding of weather could eliminate the bad weather phenomenon condition or the challenges that come with it. Many scholars have worked on accidents due to weather, some looked at the effect on passengers. But this study seeks to analyse the effect of bad weather phenomenon on airline operations at Murtala Muhammed International Airport, Lagos.

2. Literature Review

There is a growing recognition that climate change and air transportation operations are inextricably linked. On the one hand, anthropogenic climate change is exacerbated by emissions from aircraft and ground infrastructure. These emissions might be decreased in the future as a result of technical advancements and more effective aircraft routing tactics (Adeniran & Kanyio, 2018; Adeniran, Kanyio, & Owoeye, 2018; Wells et al., 2021). Aircraft, on the other hand, operate totally inside the troposphere and lower stratosphere and are thus potentially directly affected by changes in those layers of the environment. These changes include horizontal spatial patterns and vertical distributions of temperature and pressure (which contribute to variations in density), wind intensity and direction, weather features,

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turbulence, and humidity. The several ways in which high-impact weather might affect aviation have recently been highlighted in a study of (Gultepe et al., 2019).

There is widespread scientific agreement that anthropogenic global warming is most certainly driving global climate change (climate being weather averaged over a sufficiently long period of time, generally many decades) (National Air Traffic Services, 2011). There is also strong data on historical climate change, particularly from the late 1970s to the current day. However, the magnitude of future changes is less certain because, regardless of model confidence, The changes in global emissions (and other forcing factors such as land-use change) in retrospect can only be revealed, and predicting them is primarily a problem for social scientists rather than physical climate scientists (Akinloye, 2024; Wells et al., 2021).

The weather has a significant impact on the aviation sector and related activities. Sasse & Hauf (2003) noted that weather influences aviation efficiency, airline performance, aircraft and airport capacity, and aircraft safety, and it can have a detrimental impact on airline operations. Unfavorable weather conditions cause 71% of flight accidents in Nigeria, according to the International Air Transport Association (IATA). Many aspects of airport operations are affected by weather conditions, including aircraft fuelling, cleaning, luggage handling, catering, aircraft maintenance, and flight scheduling. Inclement weather may drastically reduce the operating capacity of airports and even a whole region's airspace, resulting in aircraft delays, diversions, and cancellations (Sasse & Hauf, 2003).

Considering the fact that Nigeria have a considerable weather, there has been a steady increase in the number of confirmed flight delays, diversions, and cancellations, the vast majority of which are caused by inclement weather (Spyrou, 2010). Unfavorable weather conditions, such as thunderstorms, reduced visibility (owing to fog, dust haze, and so on), wind shear, and squalls, caused the bulk of aviation accidents, delays, and cancellations (Akinloye, 2026; Weli & Ifediba, 2014). Although other indices such as human ,operational, and technical factors cause flight disruptions, various researches have identified weather-related factors as the major cause of interruptions in airline operations in Nigeria, with more devastating losses (Emenike and Weli, 2016); thus, the International Air Transport Association (IATA) stated that 71% of air accidents in Nigeria are caused primarily by poor weather conditions, with human errors and aging aircraft also contributing to the issue.

Between 2003 and 2010, the Nigerian aviation sector saw its worst period, with multiple aircraft accidents resulting in fatalities. According to the Aviation Safety Reporting System (ASRS), Nigeria accounted for 225 of the 376 aviation deaths that occurred in Africa in 2005 alone, accounting for 9.3% of all air accidents in Africa. Investigations, however, found that the aviation crashes that happened between 2003 and 2006 were caused by adverse weather and wind shear. Many of those crashes were caused by bad weather, error from the pilot , or a technical malfunction (Knecht, 2005; Koetse & Rietvield, 2009). Generally, flight delays,

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cancellations, and aircraft accidents harm the Nigerian aviation business as Ayoade (2004) has highlighted that 'the vagaries of weather with references of the many meteorological factors play wickedly against most of man's socio-economic operations.

The three principal severe weather phenomena that threaten air transportation in Nigeria (fog, harmattan dust haze, and thunderstorms) occur at various times of the year, with thunderstorms happening during the rainy season and fog and harmattan dust haze occurring during the dry season. This suggests that the phenomenon is linked to Nigeria's two major seasons. Weather has an impact on aircraft operations, according to the National Oceanic and Atmospheric Administration (NOAA). They further noted that wind shear crashes have resulted in about 500 lives lost and 200 injuries since 1964, and that since 1985, wind shear has also caused several near accidents in which aircraft recovered just before ground impact. Griffiths (2006), Hardy (2011), and ASRS, NASA (2007), identified dust haze-induced visibility conditions, fog, harmattan dust haze, and thunder-associated wind shear, as well as severe thunderstorms with associated electricity (lightning and thunder), hailstones, icing, low-level wind shear effect, and gustiness, as weather-related phenomena responsible for aircraft accidents worldwide.

Nigerian Meteorological Agency NIMET (2011) reported that the year 2010 witnessed a few instances of flight operation disruptions due to severe weather conditions. The month of March saw a severe dust hazy period that limited horizontal vision to between 200m and 800m for many days, causing numerous interruptions in aircraft operations around the country. Flight operations were disrupted at Lagos, Abuja, Kano, Kaduna, Minna, Maiduguri, Sokoto, and Enugu, as well as Owerri, Port Harcourt, and Calabar airports. There were been instances of complete cancellations. Early morning fog was observed in Lagos, Port Harcourt, and Jos in January and December, reducing horizontal vision to 200m-800m. As a result, flights at these airports were delayed. Furthermore, as severe snow hammered European airports in December, hundreds of Nigerians flying to Europe were stuck at Lagos airport.

During the time, the number of inbound and outgoing flights at Murtala Muhammed International Airport (MMIA) was impacted by the extreme weather conditions. Fog, mist, haze, and smog are all examples of phenomena that might reduce vision at an airport. MMIA experiences both advection and radiation fog (SAWS, 2012). Poor vision is the single most serious weather hazard to all modes of transportation, particularly air transportation (Shadere, 2005; Ayoade, 2004), indicates that poor visibility is maybe a larger threat to safe plane landings since control is more difficult than floods on the runway. Thick fog, snow, rain, thunderstorm, harmattan dust, mist, volcanic ash or smoke, urban pollution, low ceilings, and even smog can all contribute to poor visibility.

According to Riehl (1965), low ceilings and visibility generate substantial traffic interruptions at airport terminals, and the problem has remained consistent

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throughout the years. Furthermore, Smith (1975) adds that, despite the growing complexity of autonomous landing technology, poor vision from a layer of fog, mist, or heavy haze, as well as low cloud ceilings, is probably the most significant hindrance to airport operations worldwide (Ayigbe, 2006; Olaniyi, Bamise, Gbadegesin & Oloyede, 2026). Due to the numerous elements that impact the reaction, the operational response to a delay frequently differs, even under comparable weather and traffic circumstances. These include the accuracy of terminal and en-route weather prediction products, airspace design, airline scheduling times, traffic flow management, airport procedures, and over-scheduling and constraints (Klein et al., 2009).

Delays can be classified as preventable or unavoidable. Unavoidable delays are directly tied to weather severity and airspace procedures and rules (Klein et al., 2009). The preventable fraction of delays, cancellations, and diversions is caused by a variety of causes, the most common of which is the accuracy of a weather prediction (Klein et al., 2009; Olaniyi, Ayomide, Ogieva & Ogwuche, 2026). An overestimation may result in needless ground delay programs, while an underestimation may result in last-minute air traffic flow management (ATFM) activities such as unanticipated delays and re-routes, which can have a substantial ripple impact across the national airspace (Klein et al., 2009). According to the National Center for Atmospheric Research (NCAR), weather, particularly convective weather, is responsible for up to 60% of today's delays and cancellations, are potentially avoidable (Adeniran & Stephens, 2018; Klein et al., 2009).

Despite advanced avionics on board aircraft and automated equipment on the ground supporting airport operations, weather remains an important factor in aviation operations decision-making and has an impact on the safety and efficiency of flight (Dalton, 1992). At all phases of a flight, the pilot requires precise and up-to-date weather information. Weather information is provided to the aviation sector by national weather agencies and air traffic control (ATC) personnel. The data is utilized by aircraft operators and ATC centers to help with effective aircraft operations (Dalton, 1992). ATC services are extremely vulnerable to weather risks, particularly thunderstorms, fog, and snow, and need specialized assistance from weather forecasters during crucial conditions (Dalton, 1992).

Over the years, there has been a growing awareness, concern, and research into how inclement weather causes interruptions in airline operations. The significance of such research cannot be overstated if air safety is to be attained. However, there has been minimal study on the influence of adverse weather on airline operations in Lagos, Nigeria, particularly using primary data. As a result, this research focuses on the influence of inclement weather on airline operations at MMIA in Lagos.

3. Methodology

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The MMIA, owned and administered by the Federal Airport Authority of Nigeria (FAAN), is located in the Ikeja district of Lagos, 22 kilometers northwest of the city center. The airport's coordinates are 06°34'39"N and 03°19'16"E. According to the Köppen climate classification, Lagos has a tropical wet and dry Savannah climate. The heavy rainy season lasts from April to June, while the milder rainy season lasts from October to November. A brief dry season occurs in August and September, followed by a protracted dry spell from December to March. The average rainfall between May and July is about 300 mm, whereas August and September only receive 75 mm to 100 mm. The average rainfall in January is approximately 35 mm. The lengthy dry season is followed by the dry wind from the Sahara Desert, which is more intense from December to February (Pospichal, et al., 2010).

Lagos's temperature does not change considerably. March is often the warmest month, with average highs of 29°C. July is often the coldest month, with temperatures averaging 25°C. In January, the average temperature is 27°C. The temperature in Lagos seldom drops below 20°C and rarely rises beyond 30°C. March has the greatest average low temperature (23.8° C). August is the coolest month (with the lowest average low temperature) (21.7°C). Furthermore, most of the year, Lagos state is influenced by the southwest trade wind, which accounts for the state's mild temperature. The maximum average wind speed recorded was above 6 m/s in July and August.

This study employed descriptive statistics such as tables and percentages for analysis. The research instrument used for the study entails a well-structured questionnaire. The questionnaire contained fifteen (15) items which were administered to respondents through personal interviews. The questionnaire was constructed based on a five-point Likert scale. The target population were departing passengers, airline staff and pilots operating from the MMIA, Lagos. The sample was selected using the convenience sampling technique which is a form of non-probability sampling. Convenience sampling was adopted because of the time value characteristics of air passengers, pilots and airline staff. The interview was conducted by students who were on their Industrial Training (IT) program.

4. Discussion

The crucial point of the study is the causes of delay, cancellation and diversion of flights, and their consequences on passengers. 50 participants were selected for this study, however, valid responses were retrieved from only 38 participants. This represents 76% of the respondents. The participants were passengers, pilots and airline staff, representing 60.5%, 7.9% and 31.6% respectively as they will be suitable to reveal the subject matter regarding the effect of bad weather phenomenon on airline operations. In this section, only 10 participants were interviewed based on their experience over time. Among those interviewed, 28 were male and 10 were female, representing 73.7% and 26.3% respectively. Concerning

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their destinations, they were travelling to Abuja, Akure, Asaba, Calabar, and Ilorin, representing 28.9%, 10.5%, 15.8%, 31.6% and 13.2% respectively. as shown in Table 1 below.

Table 1. Respondents' classification and characteristics

Indices	Sub-Indices	Frequency	Percentage
Gender	Male	28	73.7
	Female	10	26.3
	Total	**38**	**100**
Origin (MMIA) - Destinations	Abuja	11	28.9
	Akure	4	10.5
	Asaba	6	15.8
	Calabar	12	31.6
	Ilorin	5	13.2
	Total	**38**	**100**
Respondents	Pilots	3	7.9
	Airline staff	12	31.6
	Passengers	23	60.5
	Total	**38**	**100**

Source: Field survey (2022)

This section address the implication of bad weather phenomenon condition on airline operations in Lagos, Nigeria. This was addressed with the following indices (Bad weather phenomenon is a challenge to airline operators; Flights delay, flight cancellations and flight diversion usually emanates due to bad weather phenomenon; Bad weather phenomenon cause poor visibility for flight operators; Bad weather phenomenon increase the occurrence of an accident; Traveling under bad weather phenomenon cause damage to aeroplane; Bad weather phenomenon occur throughout the year; The occurrence of heavy rainfall and thunderstorm is seasonal; The occurrence of low visibility is seasonal; Sandstorm and dust storm affect airline operations; Flight cancellations, diversion or delay incur additional cost on passengers; Flight cancellations, diversion or delay reduces customer's patronage; Bad weather phenomenon results to landing in the alternate airport; and Sudden announcement of bad weather phenomenon during flight affect passenger's health) which were targeted at Passengers, Airline staff and Pilots as shown in Table 2.

Table 2. Result from questionnaire

Questions	SA	A	D	SD	U

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The bad weather phenomenon is a challenge to airline operators	9	21	4	3	1
Flights delay, flight cancellations and flight diversion usually emanates due to bad weather phenomenon	6	17	9	7	0
Bad weather phenomena cause poor visibility for flight operators	16	14	5	1	1
Bad weather phenomena increase the occurrence of an accident	10	15	7	6	0
Travelling under bad weather phenomenon cause damage to an aeroplane	9	14	7	2	6
Bad weather phenomena occur throughout the year	3	4	16	15	0
The occurrence of heavy rainfall and thunderstorm is seasonal	14	13	8	3	0
The occurrence of low visibility is seasonal	17	9	9	4	1
Bird strikes affect airline operations	5	17	14	2	0
Flight cancellations, diversions or delays incur additional costs for passengers	12	9	6	9	2
Flight cancellations, diversion or delay reduces customer’s patronage	6	5	18	9	0
Bad weather phenomenon results in landing in an alternate airport	3	11	13	11	0
The sudden announcement of bad weather phenomenon during flights affects passenger's health	11	27	0	0	0

Source: Field survey (2022)

Table 2 depicts the respondents' perception on the five-point scales of strongly agree, agree, disagree, strongly disagree, and undecided. By merging the respondents’ responses under strongly agree and agree, thirty (30) respondents representing 78.9% acknowledged that the bad weather phenomenon is a challenge to airline operators. Twenty-three (23) respondents representing 60.5% acknowledged that flight delay, flight cancellations and flight diversion usually emanates due to bad weather phenomenon. Thirty (30) respondents representing 78.9% acknowledged that bad weather phenomena cause poor visibility for flight operators. Twenty-five (25) respondents representing 65.5% acknowledged that bad weather phenomena increase the occurrence of an accident.

Furthermore, Twenty-three (23) respondents representing 60.5% acknowledged that travelling under bad weather phenomenon causes damage to an aeroplane. Twenty-seven (27) respondents representing 71.1% acknowledged that the occurrence of heavy rainfall and thunderstorm is seasonal. Twenty-six (26) respondents representing 68.4% acknowledged that the occurrence of low visibility is seasonal. Twenty-two (22) respondents representing 57.9% acknowledged that bird strikes affect airline operations. Twenty-one (21) respondents representing

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55.3% acknowledged that flight cancellations, diversions or delays incur additional costs for passengers. Thirty-eight (38) respondents representing 100% acknowledged that sudden announcement of bad weather phenomena during a flight affects passengers' health.

Finally, by merging the respondents' responses under disagree and strongly disagree, thirty-one (31) respondents representing 81.6% acknowledged that bad weather phenomena occur throughout the year. This implies that bad weather phenomena occur at certain times of the year. For instance, heavy rainfall and thunderstorm occur during the last three months of the rainy season, while harmattan, and haze occur during the first three months of the dry season. It is expedient to note that during these periods there are frequent flight cancellations, delays and diversions. The result of this study is in agreement with the result of Akanni et al, (2016) whose study showed that there has been a trend of thunderstorms in Lagos state and showed that there has been an increasing trend in the occurrence of thunderstorms within 2004-2013 in Lagos State. Meanwhile, the findings of Enete et al. (2015) showed that thunderstorm occurrence was fluctuating without either a decreasing or increasing trend the difference in the result of Enete et al, (2015) with this study could be due to the difference in the location and the period of the study.

By merging the respondents' responses under disagree and strongly disagree, twenty-seven (27) respondents representing 71.1% acknowledged that flight cancellations, diversion or delay reduces customer patronage. This implies that flight cancellations, diversion or delay does not necessarily reduce customers' patronage of the airline. Twenty-four (24) respondents representing 63.2% acknowledged that bad weather phenomenon results in landing in an alternate airport. This implies that bad weather phenomenon does not only cause a flight to land in the alternate airports. Other factors influence pilots to land in an alternate airport. This result does not agree with the study of Weli and Emenike (2016) which found that climate change is a major factor that influences pilots to land in an alternate airport. This difference may be a result of different study areas.

5. Conclusion

The recent situations of bad weather which oftentimes lead to flight cancellation, delay and diversion have become a critical issue in Nigeria aviation. Primary data were elicited from passengers, airline staff and pilots at the Murtala Muhammed International Airport in Lagos, Nigeria. This study has found among other things that the bad weather phenomenon is a major impediment to air transport in Nigeria and Murtala Muhammed International Airport in particular. Air transport suffers delays in take-off or landing, diversion to a different destination and cancellation of flights as a

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result of bad weather phenomena. The airline companies and passengers loss economically due t this issue. Also, the study found that pilots' visibility is usually obstructed by bad weather phenomena even with the use of Instrument Landing System (ILS).

It is important to note that bad weather phenomenon is seasonal occurrence, hence it can be forecasted based on previous happenings. This study observed that delay as a result of poor weather conditions does not force passengers to make alternative arrangements for air transport, which implies that the bad weather phenomenon cannot be manipulated by airlines to gain more customers. It is important to note that bird populations are shifting, in some cases causing increased bird strike risks, and thus increased safety hazards.

Based on the findings, it was suggested that:

Not only should reliable and well-equipped weather stations with exact prediction equipment be constructed at the airport, but also in crucial sites around the state.

Passengers in poor health should not be permitted to travel during terrible weather phenomenon-prone periods, unless medically necessary.

Passengers must be taught to be more patient and calm.

Flight itineraries should be planned based on the weather prediction report from the region, especially during the peak poor weather phenomena time.

Because aircraft delays, diversion, or cancellation are not caused by passengers, the airlines should compensate passengers with lighter packages such as light snacks, mobile recharge, and free data.

Finally, weather forecasting should be delegated to experts, and this information should be provided days before departure.

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Conflicts of Interest

The author declare no conflict of interest.

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OA: Conceptualization, Writing - original draft, Introduction, Methods, Analysis, Discussion, Conclusion. The author read and approved the final manuscript.

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