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# Climate Change and Urban Productivities

# Impact of Climate change on road transport operators' productivities in Ilorin, Kwara State, Nigeria

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***Abstract*—This study examined the impact of climate change on road transport operators' productivities in Kwara State, Nigeria. Specifically, the level of awareness of the impact of climate change on revenue obtained by transport operators, the relationship between long raining day and revenue obtained by transport operators, the influence of long precipitation on revenue were examined. Convenience sampling techniques was adopted for this study, whereby a total of 50 copies of questionnaire were administered on respondents, commercial transport operator. Both descriptive and inferential statistics were employed for the analysis. Percentage, bar chart and pie chart were the descriptive statistics utilized while chi-square is the inferential statistics employed. Conclusively, the level of awareness of the impact of climate change on transport operation revenue was low among transport operators, precipitation affects revenue and that there is a significant relationship between raining day and transport operators' revenue. Thus it was recommended that programmes to encourage transport operators on exhibition of environmental friendly habit should be embarked on by Government and Transport union was conversed for.**

***Keywords—Climate change, Transport operators, Revenue***

## 1. Introduction

Climate change is a significant physical and seasonal change occurrence of the atmosphere in the earth planet (Angie Farrag-Thibault 2014). It is regarded as unusual occurrence of rain fall, heavy heat due to sunlight and too much cold due to ozone layer depletion. Françoise and Demirel (2012) opined that, climate change has impact on road maintenance costs and damage costs. Thus, it was established that climate change has effect on natural and human systems. Reports have shown that, the impacts of climate change on livelihood and agriculture in countries of the world are inversely proportional to the nation's responsibility for the problems (Ozor, 2009) as cited in (Ogbo and Onyedinma, 2011). Weather is an important factor that can impact both positively and negatively on transport infrastructure life span and transport safety measures. Cost of vehicle maintenance and repair / replacement of wore-out spare part are unavoidable by transport operators. Findings have revealed that rail, road, maritime and other transport infrastructures are constantly exposed to various degradating factor of climate change (Françoise and Demirel 2012). Hence, attention should be paid to the effect of climate change on transport operators' productivity in developing nation like Nigeria.

Transport Research Board (2008) pin pointed the fact that climate change will affect transportation primarily through increases in several types of weather and climate extremes, such as very hot days, intense precipitation events, intense drought and rising sea levels. The impacts will vary by mode of transportation and region of the country, but they will be widespread and costly in both human and economic terms and will require significant changes in the planning, design, construction, operation, and maintenance of transportation systems.

Past work done and scientific research laid emphasis on road deterioration due to traffic and weather, climate change on transport, while same cannot be said on climate change and transport operators' productivity. Angie Farrag-Thibault (2014) said, even if emissions are stopped immediately, temperatures will remain elevated for centuries due to the effect of greenhouse gases from past human emissions already present in the atmosphere. Limiting temperature rise will require substantial and sustained reductions of greenhouse gas emissions. It is against this background that this work dived into the quest of uncovering, testing, validating and understanding the impact of climate change on road transport operators' productivities. It was hypothesized that there is no relationship between rain day and revenue obtained by transport operators. Ogbo and Onyedinma (2011) justified the need to integrate people's knowledge and understanding on climate change and potential response measures into existing development frameworks, particularly those which promote participation of stakeholders in Nigeria.

## 2. Literature Review

Transportation is the movement of people, goods, services and information from place of origin to destination through physically known mode/modes for

a specific purpose which usually results in change in place utility and spacio-temporal consumption. Nevertheless, transport operations are the activities needed for the actual movement of goods and service and have four major components which include route, motive power, terminal and vehicle( ). Each of the components has their peculiar function(s):

Road transport is an over-land transport system; it is one aspect of land transport that cannot be overemphasized as it provides a special service *"call door-to-door"* service. It is the most important mode of transport that completely satisfies the purpose of linkage to other modes of transport without reservation. The road transport system demonstrates some features that differentiate it from other modes of transport. It operates along a fixed track known as the road or highway which usually form a network that links house to house, street to street, neighborhood to neighborhood, town to town, city to city, state to state and country to country. It is the most flexible of the entire transport modes.

The motive power in road transport is the engine. The route can be tarred or untarred. The terminal in road transport system is motor park and/or bus-stop, where loading of goods and boarding are done or boarding and disembark of passenger are made.

The impact of climate change on each of these components might be too negligible to observe, however, its effect on the road transport operators' productivity is well pronounced. For instance, the importance of excess precipitation and heavy rain on revenue of road transport operators is an issue that bothers the mind, the occurrence of heavy rains in the early hour of the day may influence the peak and off-peak period for commuting of passengers which might have effect on the revenue of the road transport operators in the study area.

Generally speaking, transport is highly vulnerable to several types of weather conditions induce or inducible by climate change, Many of them relate to extreme weather conditions ( For instance. unusual high temperature change for longer period, storms, precipitation, excess rain fall and over flooding,) may in turn lead to serious physical and environmental challenges to transport operators and transport operation for the purpose to which they serve the transport users. According to Françoise and Demirel, (2012), heat stress induces deterioration on road pavement and rail track need to be routinely repaired. Deterioration caused by climate change affect the performance of infrastructure of road transport. The cost of maintenance is an additional burden to the transport infrastructure provider, usually government. Call for adaptation of transport infrastructural design to climate change is low.

Dore et al (2005) analyzed the contributions of traffic and weather conditions to the wear and tear of road pavement in Canada and they also reviewed similar information in other countries For Canada, the share for climate induced damages was in 30%-80% range whilst, USA, based on two different sources, the percentage for highway is suggested to be lower (10%-15%) than for normal roads (up to 70%). The higher share for normal roads was explained by the fact that highways were subject to more stringent designs. Also in Australia a 35%-45% range was reported. For that country, precipitation-related costs and temperature-related costs account for 4% and 36% of current maintenance costs for roads respectively. Miradi, (2004) pointed out the fact that traffic and weather contributions represent the bulk of road degradation.

Extreme weather events represent an important influencing element in transport infrastructure design and management. Infrastructures are designed to cope with various stresses along their life, including extreme weather events as currently experienced. Transport services also have to be managed in such a way that it will reduce as much as possible disruption and maintain minimum safety standard in case of adverse weather conditions.

Nevertheless, the costing of the impact of climate change on transport infrastructure is always a delayed costs. One major challenge incurred when estimating cost of the impact of climate change on transport infrastructure is the fact that some parts of the costs are incurred later after the damage has occurred. Take for instance, in Australia, the Queensland Government (2002) estimates the damages by floods, including initial repairs to roads subsequent accelerated deterioration of roads (that is, reduced pavement life) initial repairs to bridges (based on one-third of road damages) subsequent additional maintenance required by bridges. This suggests that the initial repairing operation represents 54% of the total cost for example, 27% and 19% relate to the subsequent repair and maintenance for road and bridge respectively. (Françoise and Demirel 2012).

## 3. Methodology

The study was carried out in Ilorin metropolis in Kwara State, Nigeria. The study area falls to the middle belt of the nation and it is highly affected by climate change in the country. Also, it is the administrative seat and economic centre of the state where road transport is well pronounced. Multistage Sampling Technique was adopted for the study whereby copies of well-structure questionnaire were administered on taxi drivers and truck operators in Ilorin metropolis. A total of 50 copies of questionnaire were administered on respondents in Ilorin West Local Government Area of Kwara State. Descriptive statistical technique was adopted in analyzing the collected data.

## 4. Results and Discussion.

In as much as climate change has led to increase in rain fall and heavy precipitation, the research looked into the relationship between a raining day and revenue obtained by transport operators. Furthermore, the level of awareness of the occurrence

of climate change among the transport operators was appraised. The result of the analysis is presented as follows.

It was observed that from the 50 sampled transport operators, 70 percent were not aware of climate change and it effects on their operation while 30 percent of the sampled transport operators are aware. This is clearly shown in Table 1 and Figure 1

**Table 1: Level of climate change awareness by transport operators**

| | Frequency | Percent |
|---|---|---|
| YES | 15 | 30.0 |
| NO | 35 | 70.0 |
| Total | 50 | 100.0 |

**Source:** Field Survey, 2016

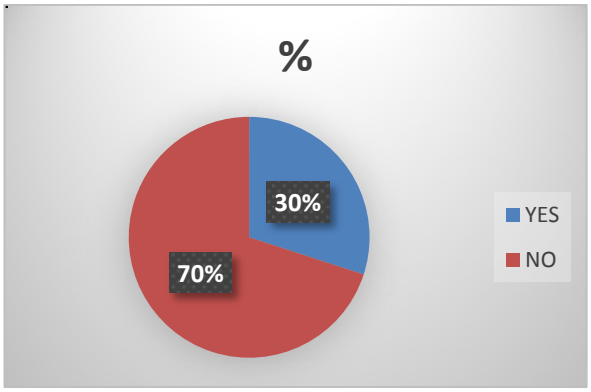


**Fig. 1: Level of climate change awareness by transport operators**

**Source:** Field Survey, 2016

The view of transport operators were sampled and the effect of long precipitation on their revenue. The response from the 50 sampled transport operators is 70 percent accounted for the operators that said long precipitation had a bad effect on their revenue, while 16 percent said long precipitation had good effect on their revenue. Nevertheless 7 percent accounted for the fraction that said their opinion is indifferent. This is as presented in table 2 and Fig 2.

**Table 2: Effect of long precipitation on revenue of transport operators**

| | Frequency | Percent |
|---|---|---|
| BAD | 35 | 70.0 |
| GOOD | 8 | 16.0 |
| INDI | 7 | 14.0 |
| Total | 50 | 100.0 |

**Source;** Field survey 2016

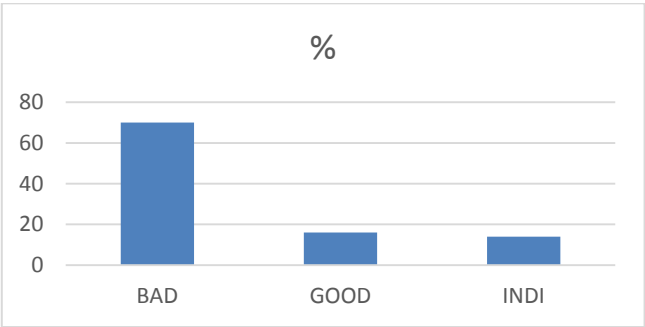


**Fig 2: Effect of long precipitation on revenue of transport operators**

**Source;** Field survey 2016

**Table 3: Relationship between rain day and revenue obtained by transport operators Cross tabulation**

| | | EERFP | | | Total |
|---|---|---|---|---|---|
| | | HIGH | LOW | INDI | |
| IRD | YES | 14 | 5 | 5 | 24 |
| | NO | 1 | 1 | 8 | 10 |
| | INDI | 11 | 3 | 2 | 16 |
| Total | | 26 | 9 | 15 | 50 |

**Source;** Data Analysis 2016

**Table 4: Relationship between rain day and revenue obtained by transport operators Chi-Square Tests**

| | Value | Df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 15.547[a] | 4 | .004 |
| Likelihood Ratio | 15.140 | 4 | .004 |
| Linear-by-Linear Association | .102 | 1 | .750 |
| N of Valid Cases | 50 | | |

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 1.80.

**Source;** Data Analysis 2016

**Table 5: Relationship between rain day and revenue obtained by transport operators Symmetric Measures**

| | | Value | Approx. Sig. |
|---|---|---|---|
| Nominal by Nominal | Phi | .558 | .004 |
| | Cramer's V | .394 | .004 |
| N of Valid Cases | | 50 | |

**Source;** Data Analysis 2016

Testing for the relationship between raining day and revenue obtained by transport operators was carried out using chi-square. The pre-set null hypothesis was that, there is no relationship between raining day and transport operators' revenue. It was however observed that, the critical value p was 0.004

lower than the level of significant 0.05 (i.e p = 0.005<0.05). The null hypothesis was rejected and the alternate hypothesis which implied that there is a relationship between raining day and the revenue obtained by transport operators. Also the Phi and Vramer's values were significant at 0.05 level of significant( p=0.004<0.05, p=0.004<0.05)

## 5. Conclusion and Recommendation

Conclusively, majority of transport operators were of opinion that, heavy precipitation / rain fall do have negative effect on their turnover. This is in consonance with the fact that, there is a significant relationship between rainy day and transport operators' revenue and it corroborate earlier findings of Francoes and Demiral (2012) where it was established that climate change has impact on the rate at which transport infrastructure deteriorate.

Based on the findings of this study, it was concluded that the level of awareness of the impact of climate change on the revenue obtain by transport operator is considerable low. There is a need for strong awareness of the effect of impact climate change on transport operators in Kwara state and other neighbouring States in the middle belt of Nigeria that are proned to climate change . In addition, it was recommended that programmes to encourage transport operators on exhibition of environmental friendly habit should be embarked on by government and transport unions. The need to promote the general adoption of vehicles with extremely low carbon emission is conversed for public and private transportation.

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