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# SOCIO- ECONOMIC HAZARDS OF PLASTIC PAPER BAGS LITTER IN PERI- URBAN CENTRES OF KENYA; A CASE STUDY CONDUCTED AT ONGATA RONGAI TOWNSHIP OF KAJIADO COUNTY

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## ABSTRACT

*This study examined implications of plastic paper bags litter as a major environmental and public health problem, particularly in the urban and peri-urban areas of Kenya. Due to the many problems caused by plastic litter the main objective of the study was to establish on the social - economic hazards occasioned by plastic bags litter in peri- urban centres of Kenya. This study used questionnaires to collect empirical data from the obtained sample size. Each item in the questionnaire was developed to address a specific objective and research questions. Data analysis was done as per questionnaires that were used to collect data and the results presented in tables and figures to highlight the major findings. They are presented sequentially according to the research questions of the study. This study found out that the condition of plastic paper bag littering has gone from bad to worse due to unchecked littering. Besides visual pollution, plastic paper bag litter is non-biodegradable and thus accumulates. Its disposal method is a challenge as plastic paper bag waste recycling is not economically viable. Plastic paper bag litter contributes to blockage of sewers and drainages, poses threat to biotic species and abiotic components when incinerated, buried or damped. Furthermore, when filled with rainwater, plastic paper bags litter become breeding grounds for mosquitoes, which cause malaria. In landfills, it acts as a habitat for vectors that transmits pathogens like flies and rodents. There is no immediate alternative paper bag that is likely to replace plastic paper bag in the near future. Due to the enormous environmental problems caused by the plastic paper bags litter, this study recommended that immediate public awareness be made to the consumers on the hazards that are occasioned by the plastic paper bags. Other strategies to curb the behavior of litter-louting include the reduction in manufacturing of plastic paper bag, re-use, recycling and re-collection of the plastic paper bag litter.*

**Key Words:** *Plastic paper bags; environmental degradation; health hazards; re-use; recycling; re-collection; litter; non-biodegradable.*

## I: INTRODUCTION

Plastic shopping bag was designed and made from plastic by Swedish Engineer Gustaf Thulin in 1960s ([http://www.answerbag.com/q\\_view/1905324](http://www.answerbag.com/q_view/1905324), accessed on 13 June 2010). The design was patented worldwide by Celloplast; well-established company in plastics processing in 1965 (Cherrier, 2006). Cherrier (2006) noted that the Company's patent position gave it a virtual monopoly on plastic shopping bag and associated materials production, and the company set up manufacturing plants across Europe and in USA. Cherrier (2006) further indicated that other companies saw the attraction of the plastic bag

and associated products, too, and the USA petrochemicals group Mobil overturned Celloplast's USA patent in 1977. The Dixie Bag Company of College Park, Georgia, owned and operated by Jack W. McBride, was one of the first companies to exploit this new opportunity and it introduced plastic carrier bags to all major shopping stores. The Dixie Bag Company, along with similar firms such as Houston Poly Bag and Capitol Poly, were instrumental in the manufacturing, marketing and perfecting of plastic bags in the 1980s. Kroger, a Cincinnati-based grocery chain in USA, began to replace its other paper shopping bags with plastic bags in 1982. It was followed by its rival, Safeway. From the mid-1980s onwards, plastic bags became common for carrying groceries from the store to vehicles and homes throughout the developed world (Aadland, 2006).

Plastic bags are made from LDPE, (<http://www.answerbag.com/q.view/1905324> 26, Retrieved 17 April 2012.) .One of the main problems of polyethylene is that without special treatment it is not readily biodegradable, and thus accumulates. In Japan getting rid of plastics in an environmentally friendly way was the major problem discussed until the Fukushima disaster in 2011. It was listed as a \$90 billion market for solutions. Since 2008 Japan has rapidly increased the recycling of plastics, but still has a large rate of plastic wrapping that goes to waste, (Strife, 2010). Strife (2010) indicated that during the 1980s and 1990s it was shown that many endangered marine species including birds that habituate in the marine environment were at extra hazard of suffocation from swallowing plastic bags litter or waste. In 2009 it was discovered by a resident of Hawaii upon returning from a ship race that degraded plastics bags were a major cause for marine life destruction .Plastic bags were found to constitute a significant portion of the floating marine debris in the waters around southern Chile in a study conducted between 2002 and 2005. *If washed out to the rivers by runoff water, it can be drained to lakes and seas, thus,* plastic bags can be carried long distances to oceans and lakes, and can strangle marine animals (Clover, 2007)

Plastic carrier bags are sometimes called single-use bags, referring them as tools for carrying shopping goods from stores to homes. The use of plastic carrier bag created new alternatives and opportunities for carrying groceries at home as well as problems for waste and disposal (Mesthane, 1986). Each year millions of discarded plastic shopping bags end up as litter in the environment when improperly disposed of. Due to their durability, plastic bags waste in form of litter takes centuries to decompose. On land, waste plastic bags are one of the most prevalent types of litter in inhabited areas. Waste plastic bags when carried by run-off water can clog drainage systems and contribute to flooding, as occurred in Bangladesh in 1988 and 1998 and almost annually in Manila .Littering is often a serious problem in developing countries, where waste collection infrastructure is less developed than in wealthier nations.

The trade in plastic bag is an international business for capitalists, (Giddens, 2006). Giddens (2006) proposed that, capitalism was not created to save the earth; it was created to turn nature into wealth, as fast as possible through the creative dynamics of exploitation and non-preservation which are both disruptive to the society and the natural world. Capitalists belief in the culture of accumulation of wealth and do not believe they owe anything to nature, (Waste Digest, 2006). In this regard, those engaged in the business of plastic bag trade are in pursuit of making profit from the business and they disregard harmful effects of plastic bags to the biotic and abiotic components in the ecosystem that are related to its disposal.

Plastic bag littering is prevalent in urban settings. Urbanization initiates a long term historical process of detaching individuals from comprehensive and familiar shared networks of interrelations embedded in rural folk communities marked by greater degree of functional interdependence, (Graves, 1984). Rapid rate of urbanization has given rise to the concept of over-urbanization, (Amani, 1992). Amani (1992)

stated that as migrants flock to urban areas, the diversity and heterogeneity of urban areas increase and new arrivals often identify more closely with their native villages or with such social cultural groupings as tribes, race or religion than with the urban life and what the city can offer. They ignore the norms and values of hygiene and discard plastic bag litter in the environment.

Peri-urban and urban are characterized by unplanned, large sizes of urban settlements, high population density, anonymous and specialized interrelationship (Wirth, 1938). Wirth (1938), reasoned that the greater the number of people interacting in the urban set up, the greater the potential for differentiation, bringing about lesser dependence on particular persons, less intimate relations, more freedom from the personal and emotional control of intimate groups, and no individual alliance to a single group. Because of a high degree of differentiation, no common set of values exists in the urban areas. As a consequence of these factors, urban dwellers develop characteristic personality attributes and attitudes. Because of the many lifestyles and kinds of people, they develop a “*relativistic perspective*”, they become secularized and free from intimate ties; they lack a strong sense of integration and participation, thus, the city or urban areas are characterized by *anomie*. Individuals in urban set up feel lonely, sense friction and irritation, and experience personal frustration and nervous tension, (Wirth, 1938). For these reasons, Wirth (1938), suggested that the incidence of personal disorganization and disorder tend to be higher in cities than in rural communities.

The use of Plastic carrier bag by consumers is a form of social change, (Park, 1975). Accordingly plastic shopping bags are not only durable, versatile and convenient, but also inexpensive, easy to store and transport on account of their thinness and lightness. Plastic carrier bag is popular to the consumers because they are “functional”, light weight, strong, inexpensive and hygienic. Because plastic carrier bags are cheap, there is excessive consumption and a tendency of mis-use. In peri-urban centres of Kenya, an individual shopper uses about 3 new plastic carrier bags per day because they are “given free”. While it is “free” to the customer, the cost of plastic bag is passed on to the consumer in form of “consumption cost” by the retailers and other supermarkets (UNEP, 2005).

The city of Nairobi is inhabited by over 3 million inhabitants who generate a combined total of over 2,400 tons per day of solid wastes, out of which 20% comprises of plastics. This amount of solid waste generation is getting worse by the day as a result of increasing population that is fuelled by large-scale rural-urban migration into the city. A Japan International Co-operation Agency (JICA) study estimated that about 1,450 tons of Municipal Solid Waste (MSW) was generated daily in Nairobi in the late 1990s (UNEP 2005). The study put the Municipal Solid Waste (MSW) per capita generation at the time at 0.67kg/day, which translates to about 245 kg per person per year. A recent study by Intermediate Technology Development Group, (ITDG,) puts the daily solid MSW generation at a relatively higher value of 2,400 tones. The study estimates a per capita solid waste generation of about 253kg per person per year. This figure falls within the range specified by International Environment Technology Centre (IETC) for African urban centres. The City Council of Nairobi estimates for daily waste generation is between 1,600 to 2,400 tons which appears to be a projection based on the JICA study. The corresponding estimate of per capita generation is 0.65kg/person day and is again based on the JICA study (Maranga, 2005).

## **II: Problem Analysis**

The problem with plastic paper bag is that the bags most used by consumers are designed for single use, (NEMA News, 2007). Ninety-nine percent of carrier bags used around the world follow the cradle to grave cycle (Clover, 2007). This use pattern means that carrier bags, like most other consumer goods, finish their lives decomposing in landfills, (NEMA, 2005). There are several social, economic and

environmental hazards associated with plastic bag littering, (UNEP, 2005). According to the report, plastic bag litter causes, visual, noise and thermal pollution that affects sectors like tourism. Plastic bag litter also blocks drainage that occasion “traffic clogging” and urban flooding. Waste plastic litter blocks gutters and drains that creates serious water flooding, causes death to animals and marine life when ingested and it takes approximately 20 to 1000 years for waste plastic carrier bag to decompose. When filled with rainwater, plastic bag litter has been breeding grounds of mosquitoes, (KIPPR, 2006). The most destructive by-product of plastic carrier bag litter when incinerated, is the emission of “*dioxins*” and “*furans*”, which are persistent organic pollutant in the environment (Lindens, 2010). Their health impacts include cancer and acting as “*endocrine disruptors*” that affects the reproductive system of human and other living organisms, (NEEMA news, 2005). The disposal methods of plastic paper bag pose serious environmental challenges due to its non-biogradable characteristics. Plastic paper bags are disposed of into the environment by two methods: deliberate and inadvertent littering. Deliberate littering can be everywhere in the city, parks, beaches, roads, and open spaces (Cherrier, 2006). The most popular agent that aid in inadvertent littering is wind. Because their low weight and flimsiness plastic bag litter discarded in the environment are easily carried by wind and blown everywhere especially on trees, drains and ponds. Even when disposed of properly in bins, plastic bags frequently are taken by the wind and end up as litter. Not only is litter aesthetically displeasing, but it can also cause environmental hazards. Littered plastic bag contain Municipal Solid Waste (MSW) .The contents of the Municipal Solid Waste contained in plastic bag litter can have negative impacts on the social and natural environment (Ritch, 2009).The Environment Protection Heritage Council (EPHC) report says that the threat to animals is through ingestion and entanglement by plastic litter, and that both marine, livestock, and wildlife are at risk. Likewise, humans are affected when littered plastic bag waste blocks drainage and sewer systems, leading to health hazards. (Waste Digest, Jan-July 2007). It is observed that the current behavioral practices of littering by the residents of the Ongata Rongai are largely unsustainable. Plastic bag littering at Ongata Rongai is an indicative of material possession and irresponsible wasteful. Consequently, majority of the residents suffer from “*affluenza*” as they consume more than they actually need, (Waste Digest, July-December 2006). It is estimated that in Nairobi, the release level of plastic bag is over 11 million plastic carrier bags per year, with supermarkets contributing 73% ( Bahri, 2005). Plastic bag litter at Ongata Rongai is noticeable by the bright colours and persistence in the environment, (Waste Digest, July-December 2005) .The ever increasing plastic litter generation in Ongata Rongai Township has by far outstripped the ability of the Kajiado County Council to collect and dispose of the waste in safe and acceptable manner. There is inadequate collection of waste with at least 55 per cent coverage, (NEMA News, 2005). The uncollected waste is burnt, buried or dumped haphazardly in unfit places. These disposal methods have serious long term consequences on the environment.

### **III: Note on Methodology**

Research design adopted for this was a descriptive research design; Bogdom (1992) defines descriptive research as a process of collecting data in order to answer questions concerning the current status of the study subject. Descriptive research designs are used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret it for the purpose of clarification,(Borg,1989). According to Borg (1989), the purpose of descriptive research is to determine and report the way things are. Borg (1989) noted that descriptive research is intended to produce statistical information about aspects of education that interest policy makers and educators. The steps involved in descriptive research are: formulating the objectives of the study, designing the method of data collection, selecting the sample, data collection and analyzing the results, Borg (1989). This study fitted within the provisions of descriptive research design because the researcher employed all the steps of descriptive research in his study in evaluating the problem of plastic bag littering at Ongata Rongai

Township and the social-economic hazards of plastic bag littering. This design attempted to describe such things as sample of population in relation to behavior of plastic bag littering, attitudes, values and characteristics as it exist at Ongata Rongai Township. The design was concerned with the collection, organization, description and analysis of plastic bag littering data from the sample and making inference to the entire population. Its objective was to get a snapshot view of social-economic hazards of plastic carrier bag litter as it is on the ground at Ongata Rongai Township without looking at the past trends. The design provided a room for generation of findings in form of descriptive statistics such data coding, measures of central tendency, measures of dispersion, distributions and relationships to the problems .and also reliable data for presentation and analysis. The goal of the study was to acquire factual, accurate and systematic data to account on the problem as it exist on the ground. Data analysis was done using descriptive statistics. Social-economic data included respondents' background, causes of plastic bag littering, the extent of plastic bag litter, effects of plastic bag litter and the possible solutions to plastic bag littering. Descriptive statistics involved the collection, organization and analysis of all data relating to some population or sample under study. For quantitative data analysis processing and editing ensured that the data collected is free from inconsistencies and any incompleteness. After cleaning, the data was coded. Coding of data involved developing a code book, pre-testing code book, coding the data and verifying the coded data. Once the data was coded, a selected few responses from the instruments were recorded and examined to identify any discrepancies in coding. Finally, content analysis which involved identify the main themes, assigning codes to the main themes, and classify responses under the main themes was to analyze qualitative data, (Chandran, 2004).

#### **IV. Results and Discussion**

Data analysis was done as per questionnaires that were used to the collect data. The study targeted a population of 120 respondents and they all responded giving a response rate of 100% which according to Mugenda and Mugenda (1993) a response rate of more than 80% is sufficient enough for the study. Data collected from the field was sorted and later analyzed using statistical package for social sciences (SPSS) software. The results are presented in tables and figures to highlight the major findings. They are also presented sequentially according to the research questions of the study. Mean scores and standard deviations analysis was used to analyze the data collected. The raw data was coded, evaluated and tabulated to depict clearly the results obtained on the social - economic hazards of plastic bags litter at Ongata Rongai peri- urban centre in Kajiado County.

#### **Demographic Characteristics**

The study sought to establish the information on the respondents employed in the study with regards to the gender, age, how long they have stayed in Ongata Rongai. These bio-data points at the respondents' appropriateness in answering the study questions.

#### **Gender of the respondents**

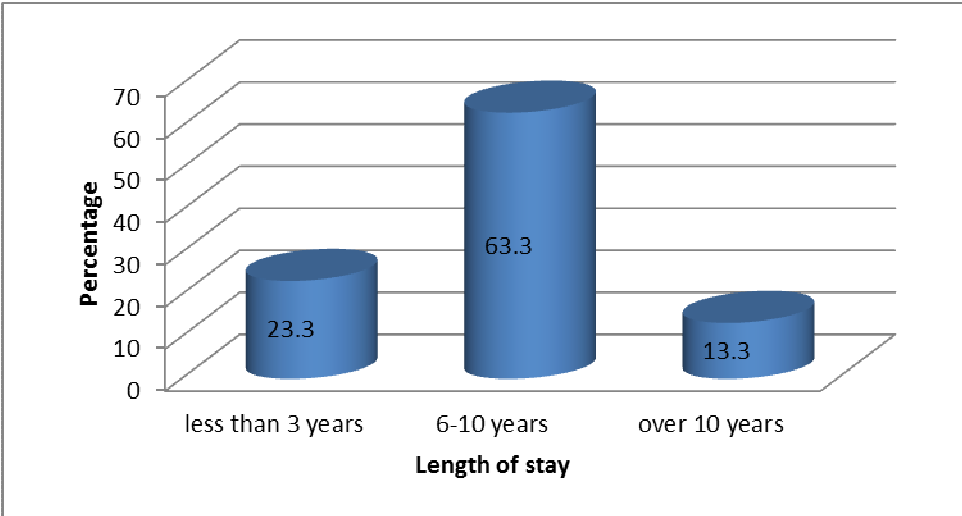
The respondents were asked to show their gender. This was expected to guide the researcher on the conclusions regarding the degree of congruence of responses with the gender characteristics. Figure 4.1 below shows the study finding.

between 31-40 years. 8.3% were aged 41-50 years, 5% were aged 18-20 years 4.2% were aged 61-70 while 2.5% were aged between 51-60 years. The conclusion drawn from the above table indicates that the majority of the Ongata Rongai residents are primarily young people who should be given adequate considerations in finding solutions to plastic paper bag littering.

**Length of stay in Rongai**

The respondents were asked to indicate their length of stay as a residence of Rogai. Figure 3 shows the study findings.

**Figure 1: Length of stay at Ongata Rongai**



From the figure above, 63.3 % of the respondents said they had stayed in Rongai for 6-10 years, 23.3% had stayed in Rongai for less than 3 years while 13.3% had been residents for over 10 years. This is indication that majority the residents interviewed had stayed in Rongai for over 6 years and therefore were in a position to give accurate information on the socio economic effects of plastic litter in the peri urban center.

**Way of disposing plastic Paper Bag litter**

The respondents were asked to indicate their way of disposing plastic litter. Table 4.1 shows the study findings.

**Table 1: Way of disposing plastic Paper Bag litter**

Description	No. of respondents	Percentage
Re use	11	9.2
Discard as litter	59	49.2
Burying	24	20
Burning	26	21.7
Total	120	100

From the results in table above, 49.2% of the respondents indicated that they dispose their litter by discarding it, 21.7% indicated they burn their plastic litter, 20% burry their plastic litter while 9.2% re use they plastics. The above data indicates that the most prevalent method of plastic paper bag littering at Ongata Rongai is deliberate littering.

**Average no of bags used each week**

The respondents were asked to indicate the Average no of bags used each week. The table below shows the study findings.

Table 2: Average no of bags used each week

Description	Frequency	Percent
0-5	16	13.3
6-10	35	29.2
10-15	12	10
16-20	19	15.8
21-25	25	20.8
25+	13	10.8
Total	120	100

The results in table above shows that majority 29.2% of the respondents use an average of 6-10 plastic bags in a week, 20.8% use 21-25% of plastic bags in a week, 15.8% use 16-20 plastic bags in a week, 13.3% use 0-5 plastic bags in a week, 10.8 use 25 and more plastic bags in a week while 10% use 10-15 plastic bags in a week.

**Plastic products use**

The respondents were asked to indicate which kind of plastics products they used excessively. The figure below shows the study findings.

Figure 2: Plastic products use

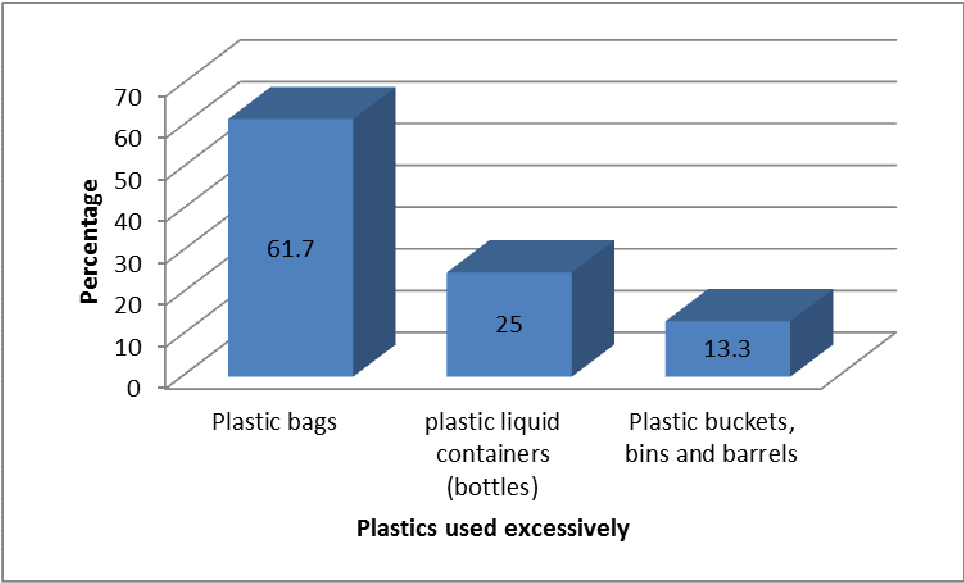


Figure 4 presents the findings on the Plastic products used excessively. The findings show that majority of the respondents 61.7% used plastic bags excessively; this was followed by those who use plastic liquid containers (bottles 25% while 13.3% used plastic buckets, bins and barrels excessively. The data

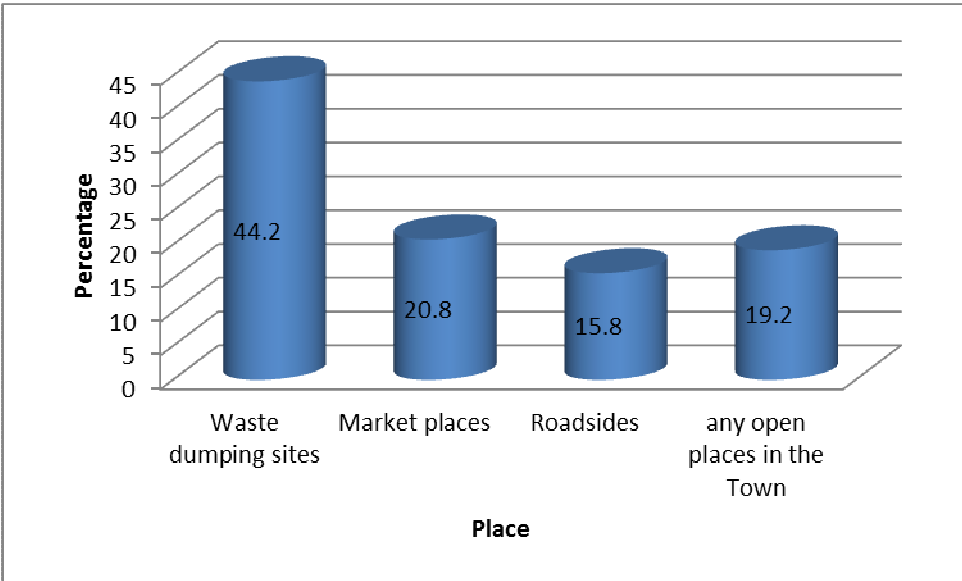


The results show that 90% of the respondents were aware that plastics bag litter causes social-economic problems in the ecosystem, 5% did not know that plastic bag litter causes problems to the ecosystem while another 5% also had no idea whether plastic bag litter cause problems in the ecosystem. It can be concluded from the above figure that majority of the population contributes to plastic paper bag littering despite knowing that plastic paper bag contributes to environmental hazards.

**Places where plastic carrier bag litter commonly found at Ongata Rongai**

The respondents were asked to indicate the places where plastic carrier bag litter is commonly found at Ongata Rongai. The figure below shows the study findings.

Figure 5: Places where plastic litter is commonly found



The results in figure above show that plastic bag waste that contributes to littering is commonly found in the waste dumping sites. Plastic paper bag litter is also common in market places and roadsides.

**Effects of charging for plastic bags**

The respondents were asked to indicate how they would respond if charges were introduced on the plastic bags. The figure below shows the study findings.

Table 3: Effects of charging for plastic bags

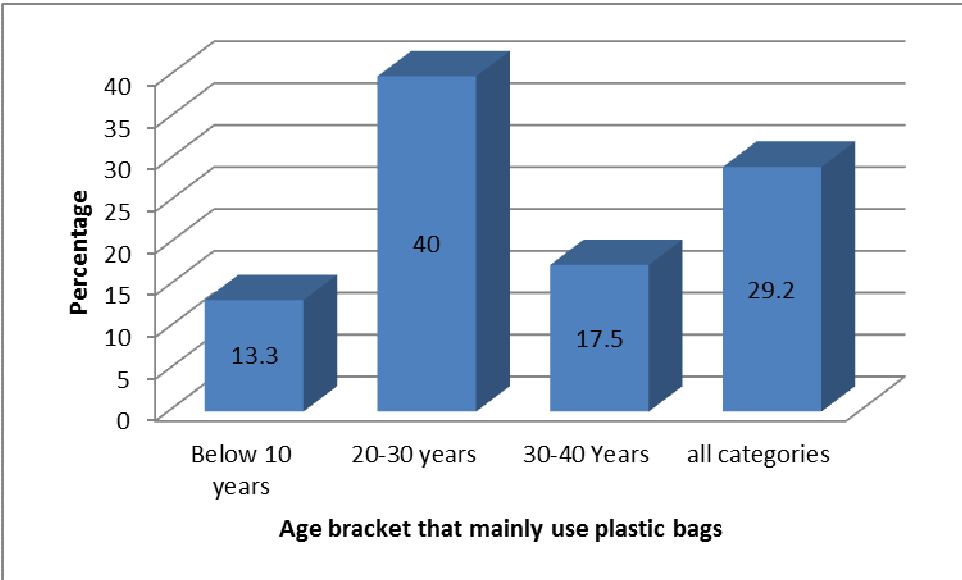
Description	No. of respondents	Percentage
Pay the small charge for each bag I use	22	18.3
Buy reusable bags and stop using plastic bags	38	31.7
Stop using bags	22	18.3
Bring my own bags from home	38	31.7
Total	120	100

The table above depicts that the problems of plastic paper bag littering can be minimized if the people are encouraged to re-use the plastic paper bags.

### Use of Plastic Paper Bag by Age

The respondents were asked to indicate the age bracket which they think mainly use the plastic bags. The figure below shows the study findings.

Figure 6: The Use of Plastic Paper Bag by Age

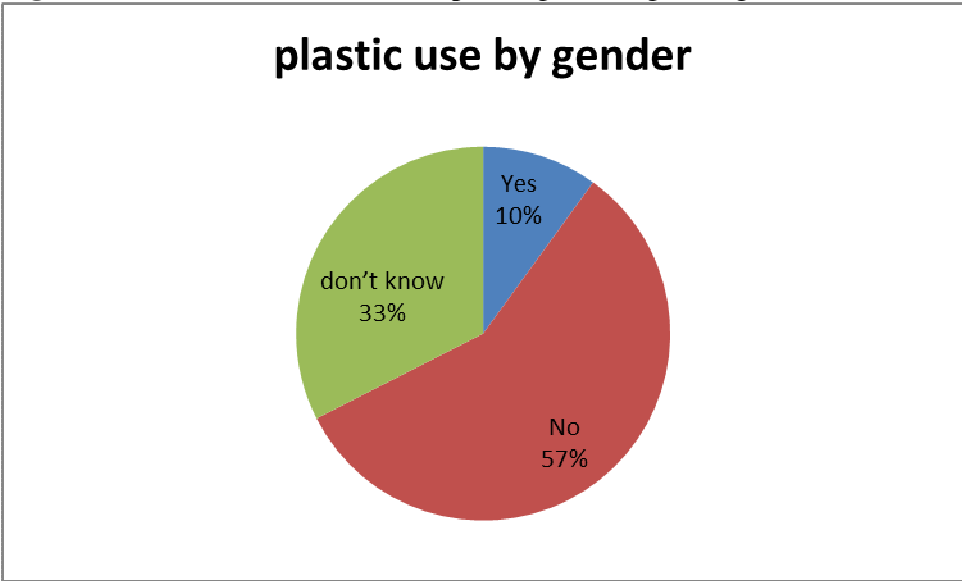


The results show that 40% of the respondents indicated that those aged 20-30 years used the plastic bags more often, 29.2% indicated that it was all age brackets, 17.5% indicated those who were 30-40 years used plastics more often, while 13.3% indicated those below 10 years. The table indicates that the best age bracket to target while addressing the problems of plastic paper bag litter is 20-30 years in age.

### Association of Plastic Paper Bag littering with gender

The respondents were asked to indicate whether plastic littering associated with any type of gender. The figure below shows the study findings.

Figure 7: Association of Plastic Paper Bag littering with gender

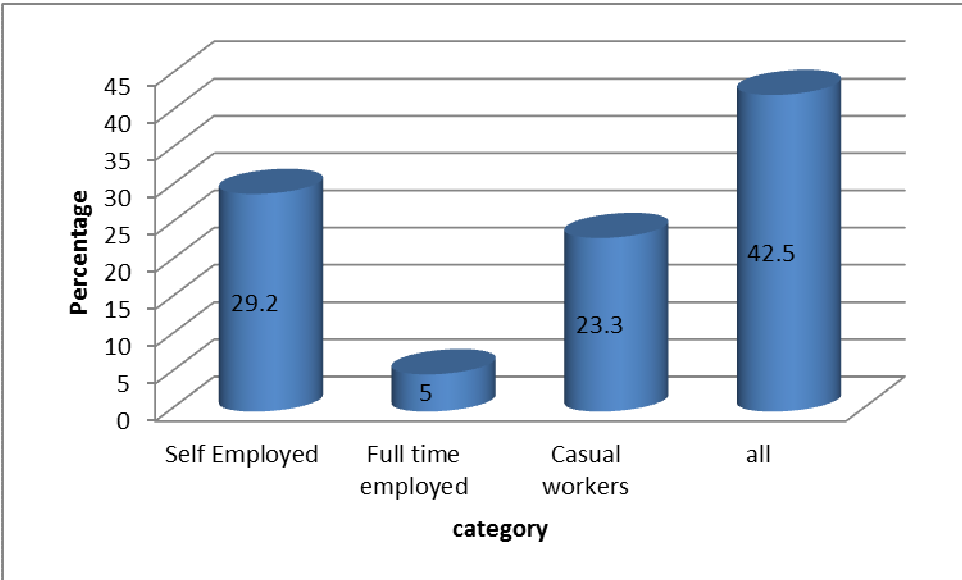


The results show that majority 57% of the respondents indicated that plastic littering was not associated with any gender, 33% indicated that they did not know while 10% indicated that plastic littering was associated with the gender characteristics. The results from the above figure indicate that plastic paper littering is not associated with any gender.

**Social class associated with plastic bag littering**

The respondents were asked to indicate the social status class associated with plastic bag littering. The figure below shows the study findings:

Figure 8: **Social class and plastic Paper bag Use**



The results in the figure above shows that majority42.5% of the respondents indicated all categories of classes use plastic bags. 29.2% indicated that plastic littering was associated with self employed people, 23.3% indicated that plastic littering was associated with casual workers and 5% indicated plastic littering was associated with full time employed people. The result concludes that the social status of individuals in the society does not contribute significantly to littering behavior.

**Causes of plastic Paper Bag littering**

The respondents were asked to show their level of agreement with the following statements on plastic littering. The results are shown in the table below.

Table 4: **Rating of Causes of plastic Paper Bag littering By Criteria**

Description Of Criteria	SD	D	M	A	SA	Mean
Plastic bags have become overly cheap fuelling present-day use and throw away consumerism.	5	7	8	70	30	4.3511
The spread of plastic bag littering is associated with urbanization	7	8	5	60	40	4.1342

The amount of plastic wastes keeps on increasing due to the increase of population and life style of the people	8	10	2	35	65	4.4583
Absence of life cycle considerations amongst manufacturers	10	15	35	40	20	3.8534
There is no well organized way of disposal of solid wastes. People dispose the wastes in their own ways, wherever they find it necessary to dispose them	7	8	10	55	40	4.4235
plastic bags are manufactured from non-renewable and non-biodegradable materials also adds to the overall environmental burden	10	15	20	45	30	4.2917
Low public awareness on the responsible disposal of waste	5	12	4	60	39	4.1333

From the descriptive statistics presented in table above show that majority agreed with all the statements in the following order. The amount of plastic wastes keeps on increasing due to the increase of population and life style of the people (m=4.4583). There is no well organized way of disposal of solid wastes and therefore people dispose the wastes in their own ways, wherever they find it necessary to dispose them (m=4.4235). Plastic bags have become overly cheap fuelling present-day use and throw away consumerism (m=4.3511). Plastic bags are manufactured from non-renewable and non-biodegradable materials also adds to the overall environmental burden (m= 4.2917). The spread of plastic bag littering is associated with urbanization (m= 4.1342). Low public awareness on the responsible disposal of waste (m= 4.1333) and Absence of life cycle considerations amongst manufacturers m= 3.8534).

### **Own opinion**

The respondents were asked to give their own opinion on what causes plastic bag littering in Rongai. The report indicates that Plastics bags have been used extensively in both food and water packaging because of their inherent properties such as low bulk densities and inertness that make them convenient carrier materials and low risk contaminants. Plastic bottles and sachets used to package water to people in transit points and in moving vehicles have become widespread in the Rongai. The adoption of a more hygienic mode of food, beverages, and other products brought plastic packaging to replace the existing other cultural packaging methods (leaf wrappers, brown paper and metal cup uses) in cities and towns. As a result of their unique properties, plastics have become the most favoured packaging materials in commerce with firms making windfall profits and transferring the environmental cost associated with cleaning plastic waste on the general public.

### **Causes of plastic bag litter in Ongata Rongai**

Supermarkets, kiosks and outdoor markets are the sources of plastic paper bags that litter Ongata Rongai environment. The situation is even worse in informal settlements and slums in Ongata Rongai where plastic consumption is higher. Since the level of re-use and recycling of post-consumer flexible in Ongata Rongai is very low, tones of year of plastic paper bag waste are released into the waste stream.

Tuskeys, Uchumi and Cleanshelf and are the three biggest supermarket chains operating in Ongata Rongai. They provide customers with free, branded- and plain plastic shopping bags. A discussion with the staff from chain stores revealed that, these chain store do not encourages customers to bring back used plastic shopping bags and they do not have facilities or bins for disposing plastic

### FGD on causes of plastic waste

The results from Focus group discussions shows that some of the reasons that has made Ongata Rongai a place of litter includes Limited focus on plastic paper bag pollution control mechanisms and inadequate waste collection services. This has caused adverse effect on the environment and public health. There is also fragmented approach with single media focus and a lot of conflict of interests, the residents has insufficient information and the authorized bodies have inadequate environmental planning, and also inadequate research and development programmes, there exists fragmented regulatory approach and regulations are inadequately enforced.

### Extent of Plastic Paper Bag pollution

The respondents were asked to show their level of agreement with the following statements on extent of pollution. The results are shown in the table below.

Table 5: **Rating of Extent of Plastic Paper Bag pollution**

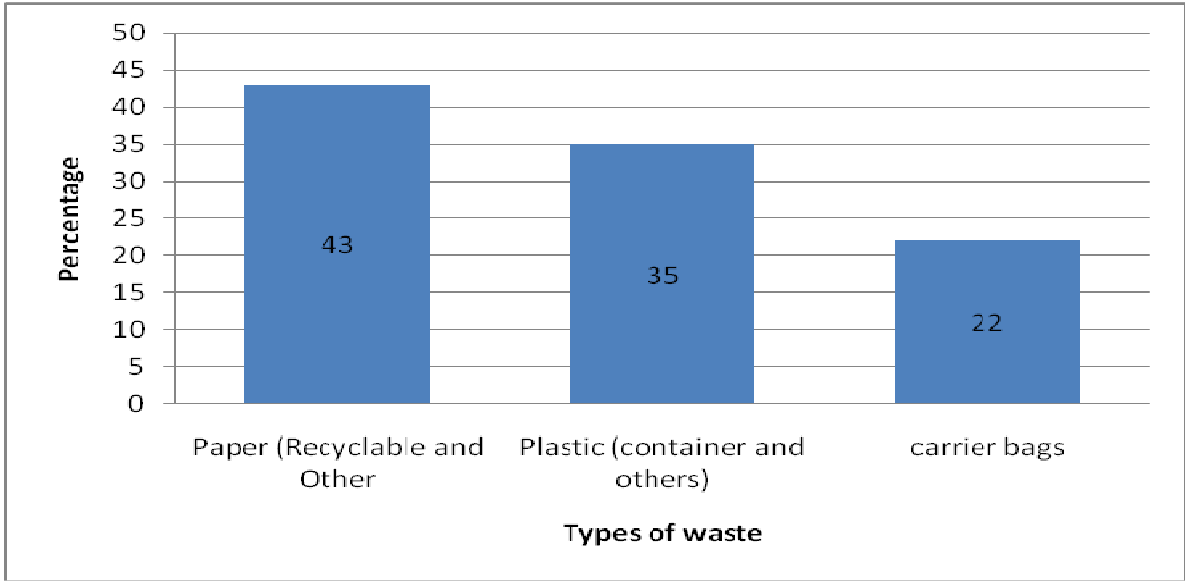
<b>Description of Criteria</b>	<b>SD</b>	<b>D</b>	<b>M</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
While more techniques and improvements to the recycling process arise, so do more people and more waste	10	8	8	62	32	4.1167
Hazards caused by plastic and plastic bag pollution create everlasting, detrimental effects upon the environment	10	10	5	50	45	4.4917
The extent of harm created by the disposed bags is not widely recognized by recipients	8	5	2	40	65	4.0583
Effects are currently causing global warming and "climate change" is often used to describe human-specific impacts	5	10	20	50	35	4.0833
Ordinary municipal landfills are the source of many chemical substances entering the soil environment	10	15	10	50	35	4.3167
Dioxins have been considered highly toxic and able to cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer	10	15	20	45	30	4.1833

The descriptive statistics show that the respondents agreed with the statements on the extent of pollution in the following order. Hazards caused by plastic and plastic bag pollution create everlasting, detrimental effects upon the environment (m= 4.4917). Ordinary municipal landfills are the source of many chemical substances entering the soil environment (m=4.3167). Dioxins have been considered

highly toxic and able to cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer (m=4.1833). While more techniques and improvements to the recycling process arise, so do more people and more waste (m= 4.1167). Effects are currently causing global warming and "climate change" is often used to describe human-specific impacts (m =4.0833). The extent of harm created by the disposed bags is not widely recognized by recipients (m=4.0583).

The report from Key informants in Ongata Rongai drawn from chain stores operating at Ongata Rongai that includes Tuskeys Supermarket,Uchumi and Cleanshelf indicates that history view plastics bag as one of the most important technical developments of the 20th century. Use of plastics have opened the way for new inventions and have replaced other materials in existing products. Plastic materials are light, durable and versatile, as well as resistant to moisture, chemicals and decay. Yet these of plastic properties can also bring challenges to plastic waste management. Worldwide, policies are being introduced that demand recycling that diverts plastic waste from landfills that increases greater levels of resource conservation. It is clear that the use of plastics reduces the mass of materials needed in many applications and many sectors. However, the more numerous, specialized, engineered and differentiated become plastics materials, the more difficult will be their recovery especially by material recycling which must be a first choice after reuse and prevention.

Figure 4 : Plastic Paper bag Waste Levels

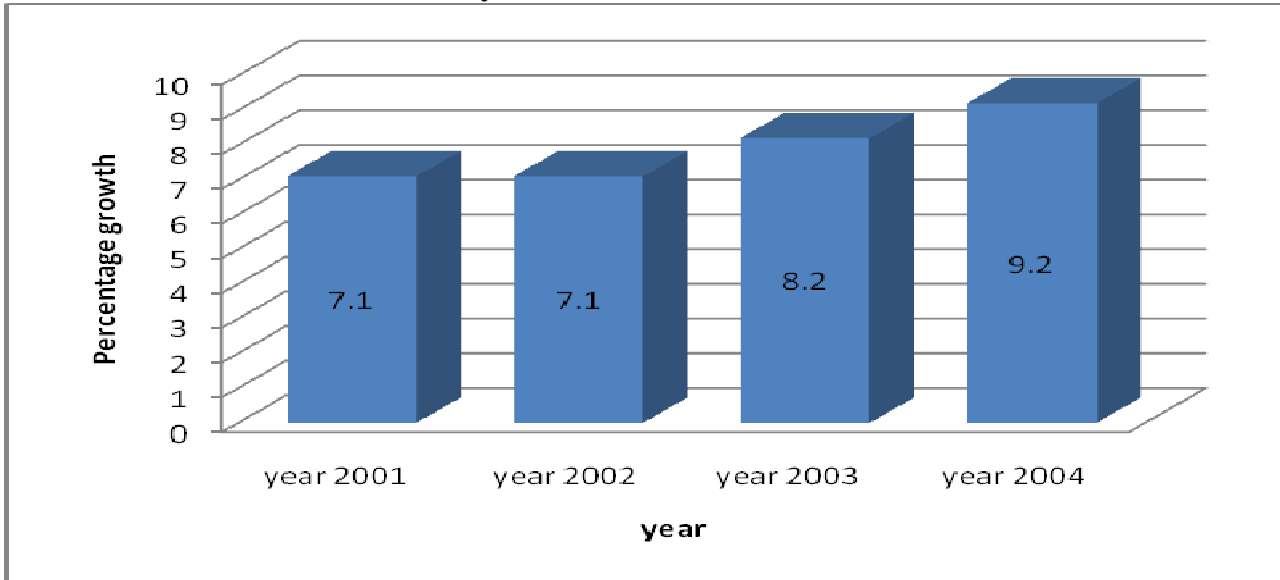


The amount of plastic bag waste generated in Ongata Rongai is getting worse by the day as a result of large scale urbanization and lack of adequate capacity by Kajiado County council to manage MSW.

A discussion with retailers of plastic bags , indicated that the bags most responsible for littering at Ongata Rongai environment are carrier bags of between 6 and 7 microns (known locally as *juala*) for which there is a very high demand due to their affordability. The County MSW disposal site at Ngong Township is overfull with plastic bags waste at the dump site being scattered with the help of wind due to their light weight, which again makes them difficult to collect. As a result, the thin plastic bag litter is

now scattered in Ongata Rongai environment, polluting and contaminating the ecosystem. In the Ongata Rongai, plastic bag litter is major causes of drainage blockage and water stagnation. In open dumpsites at Ngong, the accumulation of plastic bag waste has greatly increased due to their poor degradability. The plastic waste problem is exacerbated by lack of effective collection and recycling infrastructure in Ongata in the County.

Table 4: **Plastics Production in Kenya**



Kenya does not have petrochemical industries and hence the virgin raw materials for plastics and polythene industries are imported from overseas. Plastics are imported and exported either as raw materials or as finished plastic products. Most of the plastics manufactured in Kenya are consumed locally while the remaining portion is exported to Uganda, Tanzania, Burundi, Democratic Republic of Congo (DRC), Zimbabwe, Sudan, Ethiopia, Ghana, Rwanda, Zambia, Burkina Faso, Egypt, Cameroon and Mauritius, Norway, Taiwan and Cyprus.

The first plastics factory in Kenya was inaugurated on November 16th 1968. At the time, the then minister for Commerce and Industry (Retired Former the President of the country), Mr. Mwai Kibaki, is reported as having hailed the use of plastics as “a new boon to young Developing Nations”. Since then, the plastic manufacturing industry has grown rapidly due to the increasing demand of plastics products. The plastic manufacturing sub-sector grew by 7.1% in 2001, 7.1% in 2002, 8.2% in 2003 and 2.9% in the year 2004. There are about 50 plastic manufacturing industries located in Nairobi.

**Table 6:** Effects of plastic paper bags

The scale is illustrated in the table as 1=strongly disagree (SD), 2= disagree (D), 3=moderately (M), 4= agree (A) and 5= strongly agree (SA).

Description	SD	D	M	A	SA	Mean
The plastic wastes do not affect only the people but also animals such as sheep, goats, cows, fowls.	10	20	8	42	40	4.5025
Plastic wastes find their way into the water bodies thus polluting the water	15	5	7	45	48	4.5225
Marine animals are killed by plastic waste that finds their way in water bodies as they mistakenly eat plastics as food.	5	8	2	40	65	4.3583
Every bag that ends up in the woodlands of the country threatens the natural progression of wildlife	20	10	5	50	35	4.1333
Without the balance of the ecosystem food sources dry up and starvation occurs	15	20	10	40	35	4.1245
There is no way to strictly limit the effects of plastic bags on the environment because there is no disposal method that will really help eliminate the problem	10	15	20	30	45	2.2125
Throughout the world plastic bags are responsible for suffocation deaths of woodland animals as well as inhibiting soil nutrients	5	12	4	50	49	4.6083

The results show that respondents strongly agreed with the following statements: Throughout the world plastic bags are responsible for suffocation deaths of woodland animals as well as inhibiting soil nutrients (m=4.6083). Plastic wastes find their way into the water bodies thus polluting the water (m=4.5225). The plastic wastes do not affect only the people but also animals such as sheep, goats, cows, fowls (m= 4.5025). the respondents agreed with the following statements ; Water animals are killed by plastic waste that finds their way in water bodies as they mistakenly eat plastics as food (m=4.3583). Every bag that ends up in the woodlands of the country threatens the natural progression of wildlife (m=4.1333). Without the balance of the ecosystem food sources dry up and starvation occurs (m= 4.1245). The respondents disagreed with the following statements: There is no way to strictly limit the effects of plastic bags on the environment because there is no disposal method that will really help eliminate the problem (m=2.2125).

### Possible solutions

The respondents were asked to show their level of agreement with the following factors possible solution of plastic littering. The results are shown in the table below.



**Table 7: Possible solutions**

<b>Description</b>	<b>SD</b>	<b>D</b>	<b>M</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
Effective collection of plastic waste can be done by identifying the sources of plastics wastes, the contributors of the plastic wastes	5	10	15	40	50	4.4655
The plastic wastes can be collected for recycling from people in residential areas by putting recycling plastic waste bins in vantage places for easy collection later and also collecting from the roadside	10	15	5	55	35	3.9667
Plastic waste management is basically a welfare and development matter and it is commonly accepted that public participation is essential for its success	10	20	5	45	40	4.5125
Awareness can be created through formal and non-formal education with the assistance of both the print and electronic media	5	10	20	40	45	3.9833
Extensive and intensive sensitization is essential in enabling people to bring sound environmental practices into focus	8	15	4	44	49	4.0667

From the descriptive statistics presented in table above shows that the mean are above 3.5 for all the factors on possible solutions to the plastic litter. The respondents strongly agreed that Plastic waste management is basically a welfare and development matter and it is commonly accepted that public participation is essential for its success (m=4.5125). They agreed that Effective collection of plastic waste can be done by identifying the sources of plastics wastes, the contributors of the plastic wastes (m=4.4655). Extensive and intensive sensitization is essential in enabling people to bring sound environmental practices into focus (m= 4.0667). The plastic wastes can be collected for recycling from people in residential areas by putting recycling plastic waste bins in vantage places for easy collection later and also collecting from the roadside (m=3.9667). Awareness can be created through formal and non-formal education with the assistance of both the print and electronic media (m=3.9833).

### **Opinion on possible solutions**

The respondents indicated that the possible solution would include: Shops should only stock plastic bags thicker than 60 microns (a micron is 1 thousandth of a millimeter). Stronger, thicker plastic bags are re-useable and easier to recycle than thin bags. Shoppers should pay for the stronger bags, so that they would be more likely to re-use them than throw them away. Manufacturers should make sure that plastic bags are made of materials that can be recycled more easily. Manufacturers, distributors, and retailers of plastic carrier bags should apply environmental policies for the management and disposal of plastic bags .The use of recycled paper bags and cloth bags should be promoted.

### **Plastic Waste Management Initiatives**

Since its inception in 2003, the National Environmental Management Authority (NEMA) has received numerous complaints from members of the public abbut the significant adverse environmental impacts of plastic materials. There have been reports of sewer blockages and livestock deaths attributed to plastics waste. The additives contained in plastics such as colorants, stabilizers, and plasticizers often

contain toxic constituents such as lead and cadmium posing varying level of health hazards. According to NEMA, discarded plastic products and packaging materials make up a growing portion of municipal solid waste. In response to the expanding scope of the problem and the growing concern expressed by the public, NEMA initiated stakeholders discussions taking into consideration the provisions of the Environmental Management and Coordination Act issued in 1999. The consultation which has been carried out with the active participation of the plastic sector under the Kenyan Association Manufacturers (KAM) identified a 10-point action plan covering such areas as plastic recycling, introduction of a standard thickness, development of economic measures, legal measures on littering and selection of disposal methods as reflected in the table below:

### **Challenges faced when implementing the action plan**

The NCC was to implement the strategic initiatives developed by NEEMA. However, the City Council of Nairobi faces several challenges in (plastic) waste management, namely, very high consumption levels of different types of plastics, particularly of the flimsy type; absence of an overall solid waste management policy, weak institutional capacity to handle plastic waste and other types of wastes, inadequate enforcement of anti-littering by-laws, and inadequate awareness and recycling technologies. Given the magnitude of environmental impacts of plastics waste in Nairobi, this comprehensive strategy was developed with the expectation that it was to lead to overall Reduction of plastics use, increased Reuse of plastic products as well as Recycling levels of plastic wastes.

### **Key elements of the comprehensive strategy**

The strategy involves creating awareness and education on litter avoidance, reusing and recycling of plastic products. Streamlining and strengthening of the waste management services through the active involvement of the private sector and the community-based organizations. Development of the waste management infrastructure of the city by establishing liner collection systems, solid waste collection and transfer points, and landfills development. Promotion of plastic recycling by providing support to community-based recycling groups. Due to lack of commitment to reduce the plastic paper bag litter by the Government, the present state of plastic bag littering remains in the peri-urban areas of Kenya.

### **Recommendations**

The focus group discussions came up with the following recommendations; the government and the people in the community should focus on integrated and comprehensive approach (prevention, minimization and recycling). There should be adequate waste collection services for all and come up with a sustainable protection of the environment and public health. The media should use consolidated approach and there should be transparency in conflict resolution. There should be integrated waste information system, Holistic integrated environmental planning and capabilities, Focused investigations that take cognizance of cross-cutting implications, Integrated regulatory approach and they should make sure there is an enforcement body which ensures all the plans are effected. The polluter should pay principle amount and total cost accounting

### **Conclusions**

The process of urbanization in Kenya has provided impetus for social disorganization or anomie. The result is that the collective purposes of society are less fully realized than they could be under a different, better organized system. When there is no provision of a shared set of priorities among these competing obligations, the individual's behavior has become unpredictable in the urban set up. The anomy existing in the urban set up has been exploited by capitalist to sell their merchandize uncontrollably. Capitalism is open-ended, internally contradictory process and it produces manifest and

latent functions that are difficult to predict and control. Capitalism has dynamics that are driving social changes that are full of new risks called “*manufactured risks*” that are incalculable in origin and indeterminate in their consequences. These risks are created by the impact of human knowledge and technology to the natural world. They are the outcome of human interventions into the nature. Manufactured risks manifest themselves in form of environmental and health risks that include urbanization, pollution, contamination, global warming, flooding, and consumption of genetically modified organisms, use of non-bio gradable materials. The collective outcome of capitalism has been creation of widespread environmental destruction whose precise cause is indeterminate and whose consequences are similarly difficult to calculate phenomena called “*technological disaster*” .The dichotomy of plastic paper bag characteristics is that at micro-level, it has latent functions but at macro-level, it has manifest functions. The behavior of litter-louting is acquired through classical conditioning, operant conditioning or through social learning. The purpose human’s behavior is to fulfill certain kinds of needs. , behavior can also be un-learned through positive reinforcement, negative reinforcement or by extinction. Behavior occurs in response to an identifiable event or stimuli, behavior is weakened or strengthened by the consequences that follow the behavior, behavior is a form of communication and behaviors serve a function and have a purpose. If benefits do not result from displaying certain behavior, n individuals would stop doing them.

### **Recommendations**

Because there is no roadmap to these new dangers and risks for capitalism, modernity or urbanization that has resulted in plastic paper bag littering impacting on biotic species and abiotic components adversely, individuals, counties, organizations and the government of Kenya including the international community of states also known as “*global risk society*” must negotiate risks as they make choices how live is to be lived. The risks of plastic paper bag litter are not restricted spatially, temporally or socially but they affect the global community and the environment and all social classes. They have global consequences. Manufactured risks caused by plastic paper bag litter are controllable when individuals act responsibly.

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# **MEDIA SURVEILLANCE FUNCTION WITHIN THE CONTEXT OF THE EBOLA OUTBREAK IN NIGERIA: INFLUENCES AND PERCEPTUAL FRAMES**

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## **Abstract**

*Lasswell had identified the surveillance function of the media as instructive in meeting society needs, such as in the process of disease control and prevention. Relying on the survey design and a 32-item structured questionnaire which focused on the tenets of the diffusion and agenda setting model as well as the surveillance functionality, and distributed purposively to 600 respondents, the study evaluated what influence surveillance campaigns had on disease control and prevention in Nigeria with emphasis on the EVD. The questionnaire was structured using the Likert scale. The data gathered was analyzed using the weighted mean for the individual items; and the Pearson 'r' to test the three hypotheses. After analysis, the study established three points of influence of surveillance campaigns on the society. First is that it could result in negative consequences such as panic if not well managed; it could provide sufficient support for disease management as seen in the EVD incidence in Nigeria if properly managed; and that effective and well thought-out surveillance campaign will correlate positively in controlling and preventing diseases such as EVD to the point of heightening health education, health promotion and health literacy. All the citizens needed to do is acquire, activate and apply these information to the phenomenon, and, information managers should ensure strategic management of information on health and diseases.*

## **Introduction and Problem Statement**

In the wake of the Ebola Virus Disease (EVD) re-emergence in August, the Attah of Igala, HRM Idakwo Michael Ameh Oboni II, prescription of salt solution as magical vaccine against the Ebola virus went viral (Emmanuel, Ibeh and Audu, 2014). The lesson from the incident was not the scientificity of the prescription, but the speed at which a significant segment of the population caught the bug and to a reasonable extent acted in accordance to the prescribed antidote. This indicates media strength in the social-media-age. If this was translated to the surveillance function of the mass media with regards to disease control, what would be the extent of influence? If the same vigour with which the EVD issue

was addressed in the media-sphere in Nigeria was applied to other diseases in previous times, what would have been the extent of influence?

In dealing with disease control and prevention, WHO (2012) outlined communication actions for outbreak readiness where essential knowledge is disseminated before an outbreak; actions needed in terms of communications during outbreaks; tools and templates for data collection and analysis and other essential resources and fact sheet. The essence, it contends, was to ensure successful communication for behavioural impact. Communication for behavioural impact is a planned framework and implementation method for communication based on behavioural models and communication theories and practices to achieve behavioural results in public health programme. Communication was expected to focus on the risky aspects of outbreaks, to be proactive, definitive towards health education, health promotion and health literacy. Levels of communications expected to drive the dynamics towards behavioural change include intrapersonal, interpersonal, group, organizational and social communications with the media agents providing relevance for all levels through the surveillance function. Information was expected to align with these principles in design and execution when it deals with diseases.

So many scholars have spoken against the surveillance function of the media, especially in the area of privacy violation and invasion (Rosen, 2012), but the *Oxford Reference* (2014) contend that the role of circulating information and news which is one of the most important general roles that the mass media can be seen as serving for society, and very germane in crisis time as well as mobilization against life-threatening-diseases is sacrosanct. This is the surveillance domain, one of the functions of social communication listed by Lasswell in 1948. Dominick (2012) stated that surveillance refers to what we popularly call the news and information role of the media since it has taken the place of sentinels and lookouts. The digital platform presented as well as the offering of the social media have made the media impressive in this functioning but not without concerns. The surveillance function can be divided further into two main types. Warning or beware surveillance, occurs when the media inform us about immediate or long term and the instrumental surveillance which has to do with the transmission of information that is useful and helpful in everyday life. Identified consequences include speed of delivery which sometimes leads to problems since inaccuracies and distortions travel just as fast as truthful statements; prescreening of news which condemns our conception of reality to second generation information, whose authenticity we do not usually question. On the dysfunctional side, media surveillance can create unnecessary anxiety, thus suggesting the praxis that this functionality could be double-edged.

With the outbreak of the EVD in Nigeria, the role and efficiency of the media in performing her surveillance function has come under scrutiny. The expectation was that the media are expected to be drivers in this regards and with the platform provided by the social media, the media should be light years with higher scores in the campaigns on disease prevention and control. Consequent on the foregoing, the study evaluate responses on surveillance campaigns on disease prevention and control in Nigeria carried out by the media and its adjuncts to ascertain what is the extent of influence with focus on the Ebola Virus Disease?

The hypotheses that will guide this study are:

1. Mass media surveillance campaigns on disease prevention and control leads more to negative influences such as panic, phobia than to managing the Ebola disease.
2. Mass media information processes have provided sufficient support towards health education, health promotion and health literacy in the management of the Ebola Virus Disease (EVD).
3. Extent of mass media surveillance campaign on the EVD correlates positively with the extent of health education, health promotion and health literacy in the management of EVD gained by the public.



## Literature

Sherpa (2014) noted that the EVD which was formerly known as the Ebola haemorrhagic fever is fatal for humans and nonhumans primates. From its first recognition in Zaire (now Democratic Republic of Congo) in 1976, the nonsegmented, negative sense, single-stranded RNA virus has assumed various forms reflective of the areas where it was detected. There is the Zaire species (EBOV), Sudan virus (SUDV), Ivory Coast virus (ICOV), Bundibugyo virus (BDBV), Tai Forest Ebola virus (TAFV) and the Reston virus (RESTV) (Choi and Croyle, 2014; CNN, 2014).

The virus is hypothesized to originate from contact with infected animals – chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines – whether dead or alive and is transferable through human-to-human transfusion occasioned by direct contact with blood, body-fluids, objects that have been contaminated with infected fluids (WHO, 2014). Incubation period ranges from 2 – 21 days and progresses through stages. Health workers and their families are mainly at risk.

The current re-emergence of the disease that have defied cure for over four decades in Guinea, Sierra-Leone, Liberia and Nigeria has witnessed more than 5,357 suspected and confirmed cases with 2,630 confirmed dead (WHO, 2014). In Nigeria, 7 cases have been confirmed dead after the series of quarantining. Symptoms of the virus include fever (greater than 38.6<sup>0</sup> C), severe headache, muscle pain, weakness, diarrhea, vomiting, abdominal pain, lack of appetite, non-pruritic maculopapular rash, conjunctival injection and dark red discoloration of the soft palate, hiccups, cough, sore throat, chest pain, difficult breathing, difficult swallowing, progressive worsening of prostration, stupor, hypotension, impaired kidney and liver infection, and internal and external haemorrhages.

These no doubt call for proper surveillance campaigns to get the people activated if desired influence is to be guaranteed. The extent of influence has been suggested to depend on the extent of effectiveness of the communication algorithm in driven attention, interest, desire and action.

In appraising mass media influence, it is important to establish that the mass media do have important consequences for individuals, for institutions and for society and culture; but that we cannot trace precisely the causal connections and make reliable predictions does not nullify this conclusion (McQuial, 1979), rather the focus should be to compare media reality and social reality in certain situations since the diatribe of influences stream from source of media content, consumers of media contents to shape of media contents (Shoemaker and Reese, 1996). Therefore, issues that will define the influence of the media could arise from the source, the consumer predisposition and the nature of the message itself. How does the Nigerian situation spell out?

In an analysis of influence of media coverage on awareness of climate issues in Japan which has been decimated by climate concerns, Sampei and Aoyagi-Usui (2009) found that during the period from January 1998 to July 2007 there was a dramatic increase in newspaper coverage of global warming which correlated with an increase in public concern for the issue. The extent of concern was immediate but had short-term influence on public concern. However, with transitory high levels of media coverage, the contention is that for the campaigns to have long term influence, it has to be weaved around effective communication to cater for other connections that McQuial (1979) contended could be decisive for media influence. For the EVD in Nigeria, the extent of media attention could be attributable to the palpable risk it creates for the larger public of the media stakeholders are not immune from than for public-concerned-driven reasons.

The issue of influence is so decisive that scholars have even contended that exposure to the various facet of media could influence eating disorder among girls 12-21 years (Martínez-González, Gual, Lahortiga, Alonso, Irala-Estévez and Cervera, 2003); influences citizens' interest with regard to community, producing effects on public policy (Baba, Cherecheş and Moşteanu, 2007); limited in terms of political conditionality and suaveness of the political parties as media influence has been identified in

the process of shaping attitude towards party ideologies according to the agenda setting model (Green-Pedersen and Stubager, 2010); as well as serve as a positive force in young women's sexual health and development through the information and models they provide and the opportunities they offer for validation and self-expression (Ward, Day and Epstein, 2006). This, it is argued, is possible through the media important role in setting people daily agenda, maintain and create trends merely through recurrent messages, frequency of conveyance and persistency because the more persistent media are, the more relevant for community the issues they will be.

On another platform, Wright (2011) highlighted three indicators to defining the influence of mass media on sexual behaviour. These indicators regarded as multi-components are acquisition, activation and application of the media content. However, exposure to the mediated content on sex was seen as negative suggesting that influence could be positive and negative when certain issues are trusted forth in the media-sphere. He contends that effect and influence are real from consumption of media content, but the preoccupation of researchers should revolve around explanation for such influences. In line with this, the study explains the influence of surveillance campaigns on disease prevention to ascertain the directions of effectiveness.

To get a better grip on the work, the agenda setting, diffusion of innovation and Lasswell communication model provide the needed theoretical framework. From Lasswell, the functional paradigm of communication at the macro level (Dominick, 2012) is instructive in providing understanding that one of the threshold of the media is in its ability to survey the environment through her news functions and information provision for the good of the society. However, this can be well performed with some level of intensity, persistency, fluidity and attention to the point of making it issues in the front burner for daily discourse (Baran and Davies, 2009). This is where the agenda setting theory slides in. The strength of the agenda setting model is amplified by Roger's diffusion of innovation model, where the media, as first line of change agent and other religious organs, institutions, opinion leaders as the next line of change agent follow the diffusion pathways of knowledge, persuasion, decision, implementation and confirmation (Anaeto, Onabanjo and Osifeso, 2008)

## **Methodology**

The study relied on the survey design because it concentrated on eliciting responses using a 32-item structured questionnaire administered to 600 respondents drawn using a multi stage design of cluster and simple random techniques from a population of the south-south and south-eastern part of Nigeria (37,439,636, 2006 Census). The size was arrived at using the sample size calculator ([www.surveysystem.com](http://www.surveysystem.com)) at a confidence interval of  $\pm 4$  and confidence level of 95%. The items were structured using the Likert scale, while the variables of age, religion, sex and education were correlated to see how they affect the extent of influence. The items expounded the stated alternate hypotheses which were first presented and analyzed using the weighted mean and then the hypotheses were tested in the null form using the Pearson Product moment correlation coefficient statistics. The scores and interpretation for the weighted average are 4.50-5.00 [strongly agree]; 3.50-4.49 [agree]; 2.50-3.49 [undecided]; 1.50-2.49 [disagree] and 0.50-1.49 [strongly disagree]. The condition for decision making for the hypotheses is if the calculated value is greater than the critical value of 0.754 (df=5; 0.05 level of significance) reject the null hypothesis and accept the alternate hypothesis and vice versa.

## **Findings and Discussions**

All the 600 copies of the questionnaire administered were returned and valid for analysis. The first distribution x-rayed opinion on media surveillance campaign.

## Media surveillance

s/no	Item	SA	A	U	D	SD	NC	WM
1	EVD messages are strong enough in scope to attract me and the public	198	307	49	25	20	0	4.06
2	EVD outbreak messages are on TV, Radio	157	326	69	38	8	2	3.97
3	EVD outbreak messages are well publicized on Facebook, twitter, WhatsApp, internet	161	293	79	41	20	6	3.86
4	EVD outbreak messages were frequent on newspaper/ magazines	142	217	154	68	14	5	3.65
5	EVD messages are well spread through telephony – SMS, calls	121	203	187	57	25	6	3.53
6	EVD messages are well spread in schools, offices and religious organizations	121	238	154	63	19	5	3.61
7	EVD messages are available through interaction with peers, families, associates	162	258	115	49	14	2	3.83
GWM = 3.79								

(SA = strongly agree; A = agree; U = undecided; D = disagree; SD = strongly disagree; NC = no comments; WM = weighted mean; GWM = group weighted mean)

The distribution on media surveillance campaign indicates that the respondents agreed that the media perform her surveillance function in helping mitigate the EVD scourge with a group weighted mean of 3.79. They noted that EVD messages in the various media are strong enough in scope to instill the needed change and engage the public and the individual. However, EVD messages on radio and television are stronger (3.97) as compared to messages in the social media (3.86); interaction with peers, families and associates (3.83); the print media (3.65); from institutions like churches, mosques, schools, offices (3.61) and from telephony (3.53). This position is explainable when the demographics of the respondents are cross tabulated. For instance the study found positive relationship between the sex of the respondents and the opinion they gave. Females which accounted for about 43.3% of the respondents have a stronger opinion as 94.3% of them agreed to the issues above as compared to males where only 87.2% agreed. Religion equally played a dominant role as 93.1% of the Christians and 91.2% of Muslims respondents felt the media are performing their surveillance role effectively. For the pagan, atheist and African traditional religion worshippers, their concerns were different. It could be apt to conclude that the mass media performs its surveillance campaign on disease prevention and control effectively if the campaigns on the EVD were to be used as an index of her performances and that in line with Wright (2011), people are willing to acquire, activate and apply messages when the issues at stake are of grave concern to them.

## Negative consequences of surveillance

s/no	Items on negative consequences	SA	A	U	D	SD	NC	WM
1	Messages on EVD make people to avoid sick people	142	283	101	57	16	2	3.79
2	Messages on EVD influenced my movement to infected cities and areas	118	214	175	65	27	2	3.55
3	Messages on EVD helped minimized my contact with people whether infected or not	113	309	109	58	5	6	3.75
4	Messages on EVD created panic in the society especially with the salt solution	142	323	77	49	8	2	3.90

5	Messages on EVD were not friendly	123	294	124	49	8	2	3.78
6	Messages on EVD made me to be afraid of the world around me	101	241	145	101	11	2	3.52
7	Messages on EVD were harmful to human health	159	217	139	60	14	11	3.69
GWM = 3.71								

(SA = strongly agree; A = agree; U = undecided; D = disagree; SD = strongly disagree; NC = no comments; WM = weighted mean; GWM = group weighted mean)

Here, the respondents agreed (3.71) that media surveillance campaign in controlling and preventing diseases has attendant negative consequences for the people. Specific on this was the panic created by the message on usage on salt solution as an antidote that went viral (3.90) which the respondents identified as catastrophic since the panic of media earlier portrayal of the stealthily nature of the EVD made most people not to weigh the outcome of a concentrated salt solution on their health as well as never bothered in most cases to seek medical attention before applying the solution. Media reports indicate there were casualties from the use of this magical antidote. Other negative consequences appraised included that people began to avoid other sick people (3.79); people did no longer displayed that warm African greeting pattern for fear of contact (3.78) and a drastic minimization of contact with other people through avoiding church services, parties, gathering and crowded places (3.75). Other issues were that the messages were harmful to human health (3.65) and skepticism in terms of visiting cities with record of infected persons. Religion and age were key demographic index that influence the responses from the respondents in this regards. Christians (41.6%) panicked more than the other religious sect (Muslim, 17.4%; pagans, 15.3%; atheist, 13.4% and traditional worshippers, 12.3%). For age, the younger generation less than 45 years of age (87.5%) said they panicked as compared to 12.5% for those 45 years and above. Therefore, it could be said that messages on disease control and prevention must align with the WHO health strategic approach if the extent of negativity is to be minimized. There is doubt that in line with Martı́nez-Gonza´lez, Gual, Lahortiga, Alonso, Irala-Este´vez and Cervera (2003), media surveillance campaigns on health related issues can result more in dysfunction.

The level of intensity, persistency, fluidity and attention that define the agenda setting model (Baran and Davies, 2009) as well as effective usage of the media as the first line of change agent in activating the diffusion pathways of knowledge, persuasion, decision, implementation and confirmation (Anaeto, Onabanjo and Osifeso, 2008) impacted the responses to 'agree' level (3.62) that the media support for disease management is sufficient.

#### **Sufficient support for disease management**

s/no	Items on negative consequences	SA	A	U	D	SD	NC	WM
1	The messages on EVD disease control came right on time	172	211	150	50	9	8	3.77
2	The message on EVD disease control and prevention provided adequate information	117	250	154	55	22	2	3.63
3	I trust the message carried on EVD disease control to want to rely on and apply it	117	227	126	93	28	9	3.47
4	The messages were appropriate in curbing EVD diseases	104	183	175	85	52	2	3.33
5	The messages should have been spread before the outbreak of EVD	154	244	106	72	24	0	3.72

6	The message source is credible enough in managing EVD disease control	154	235	101	93	17	0	3.69
7	Media was quick enough in spreading information about EVD	139	263	131	50	14	3	3.75
GWM = 3.62								

(SA = strongly agree; A = agree; U = undecided; D = disagree; SD = strongly disagree; NC = no comments; WM = weighted mean; GWM = group weighted mean)

Significant in the distribution above is the indecision in opinion that that the campaigns were appropriate enough to deal with the EVD scourge as in other disease outbreak situation (3.33) and extent of trust for the message to want to apply it wholeheartedly (3.47). A casual interview with some of the respondents in areas where there were no recorded cases revealed that they think that the whole activities about the EVD were to enrich some people. The messages on EVD were seen to be right on time (3.77); quick enough to help society (3.75); and that adequate information was provided to help EVD control and prevention (3.63). However, some of the respondents (3.72) felt that since the disease broke out in other neighbouring countries, the campaigns should have been started before the outbreak in Nigeria rather than the casual statement that EVD is not in Nigeria and therefore there should be no panic. One other issue that defined sufficiency and helped in diffusion of innovation was source credibility which the respondents agreed was strong enough to help the diffusion pathways for disease control and prevention (3.69).

Do the messages anchored in the surveillance campaigns correlate positively with the efforts at disease control and prevention? The respondents were undecided (3.46); but at +5 margin, could be said to agree. This could be seen in the last two items in this category where there was agreement that EVD messages were successfully positive in helping to deal with diseases (3.56) and that it positively helped towards community participation in EVD control and prevention (3.58). Every other responses stream along the undecided continuum such as the EVD messages alone could not have made them to behave hygienically (3.30); that EVD message alone during the current campaign could not have clearly instructed on what to do to prevent disease outbreak if there were no prior approaches (3.46) and that understanding of disease control and prevention could not have been solely entrenched from the EVD messages. Equally, EVD messages alone did not provide the needed directions towards disease control and prevention (3.42). The distribution below presents this data.

#### **Correlate positively with disease management**

s/no	Items on negative consequences	SA	A	U	D	SD	NC	WM
1	The EVD messages make me want to behave hygienically	94	186	173	102	41	3	3.30
2	The EVD messages clearly direct me on what to do to prevent diseases	110	216	156	80	36	2	3.46
3	I understand the EVD message and what to do to prevent disease	91	238	153	93	22	3	3.46
4	The messages on EVD disease control were effective	101	213	173	87	27	0	3.46
5	The messages provided needed directions to deal with EVD diseases	106	209	162	77	46	0	3.42
6	The message were successful in helping me deal with EVD diseases	93	279	121	87	19	2	3.56
7	The messages moved people towards community	93	285	118	88	14	2	3.58

	participation in EVD disease control							
GWM = 3.46								

(SA = strongly agree; A = agree; U = undecided; D = disagree; SD = strongly disagree; NC = no comments; WM = weighted mean; GWM = group weighted mean)

On the strength of these distributions the three hypotheses were tested in the null form using the Pearson to establish a correlate between media surveillance campaigns on disease control and prevention and negative consequences; on sufficiency in providing support and on positive correlation with disease management using experiences borne out of the EVD campaign as the threshold. In all three hypotheses, extent of responses on agreement (strongly agree and agree) on media surveillance was tabulated as the ‘x’ variable, while the others were interchanged for the ‘y’ to ascertain the extent of relationship.

**1. Mass media surveillance campaigns on disease prevention and control do not lead more to negative influences such as panic, phobia than to managing the Ebola disease.**

From the data tabulated and presented in the test of hypothesis, the calculated Pearson ‘r’ returned a value of -0.176. Therefore, the null hypothesis is rejected because the calculated value is greater than the critical value of 0.754. The position upheld in the statistical test is that mass media surveillance campaigns on disease control and prevention have the potential to not only lead to panic but also to heighten it among the populace. With the attendant effects occasioned by deploying the agenda setting model as well as diffusing innovation through the media as change agent, this cannot but be expected. The relationship is negative indicating that as one variable increases in value, the other experiences a corresponding decrease. Consequently, as the intensity of media surveillance campaigns on disease control and prevention increases, there is a likely tendency for an increase in the level of panic in the society. Looking at from the WHO (2012) manual for communication for inducing behavioural change perspective, one can say that panic can only be heightened when the communication for disease control and prevention is not properly articulated to suit the mindset of the consumer. Therefore, the better articulated and tested the communications on disease control and prevention, the less likely it will create panic among the people. Panic can occur in the avoiding sick and sickly looking people because of reinforced stimuli in the consciousness of the people and interpreting it in the form involuntary reflexes. It can occur at the point of withdrawal from society, thereby damaging the communication chain for transference of information within the interpersonal level of meaning sharing. Messages for disease control, it is recommended, must be strategic and attentive to the needs of the people. If the message is properly articulated the people will benefit more as the incidence of diseases will be mitigated.

**2. Mass media information processes have not provided sufficient support towards health education, health promotion and health literacy in the management of the Ebola Virus Disease (EVD).**

This hypothesis is rejected on the same premise and the position that mass media information processes have done well in providing ample support towards health education, health promotion and health literacy. The returned value of 0.066 which depicts a large range with the critical value helps buttress the position that the mass media processes are actually providing the needed support through adequate information as at when due; credible information and promptness in the delivery of information in all the available media – print, broadcast, interactive, telephony, institutional and interpersonal – and trust to the point of applying the content of the message because it is deemed as credible. This diameter amplifies the algorithm that information is critical to health management and that proper attention to the change agent is crucial to the extent of sufficiency of support needed. The relationship, from the wide range, shows that it is weak and fragile and as such if the information is not properly managed, it could dovetail into panic. It should not be toyed with as health education is critical

in promoting the health of the people so that they can effectively acquire, activate and apply such knowledge. This is pathfinder towards development.

Equally, the positive strength of the relationship meant that as the quantum of media information increases, the extent of health education, health promotion and health literacy will experience corresponding increase in support and better the lives of the people. Health they say is wealth and the healthier the citizens are, the wealthier the nation is likely to be.

**3. *Extent of mass media surveillance campaign on the EVD does not correlate positively with the extent of health education, health promotion and health literacy in the management of EVD gained by the public.***

The analysis of data produced a result of -0.322 which is less than the critical value of 0.754 and therefore the null hypothesis is rejected in favour of the alternate hypothesis. The extent of mass media surveillance campaign on EVD correlates positively with the extent of health education, health promotion and health literacy gained by the public. It correlates with the extent of health management processes because it helped the public to behave hygienically, gives direction on how to manage disease and provides direction in disease management. The negative index in the value is occasioned by the spate of indecisions to the responses on the items in the group.

Nevertheless, the line graph for this distribution shows a situation where a reduction in the extent of media surveillance campaigns will result in a corresponding reduction in the ability of the people to appropriately manage their health situation. Therefore, the extent of inputs media into the media surveillance approach must always be on the increase with stakeholders deploying newer strategies if there must be a corresponding increase in the extent of education, promotion and literacy on health matters. This becomes necessary to safeguard challenges thrown up by apathy towards the message, redundancy in meaning since the message would have lost interest occasioned by constant representation to the public and a host of others.

## **Conclusion**

Having journeyed through the discourse of media surveillance functions in campaigning for efficiency in disease control and prevention, this study contends that the media in Nigeria is alive to its responsibility in this regards and identified three planks of influences. It noted that unguarded and absence of strategic information management in line with WHO (2012) manual will greatly hamper whatever gains recorded and negative consequences will surface in the area of panic and phobia to reach out, contact others and even diffuse the information of health management.

It asserts that media surveillance function could provide great support for the processes of health education, health promotion and health literacy with the people acquiring same information, applying it and activating such information to better their health and engender national development. Such information too, the study maintain, correlates positively with health management, that is the more available we make strategic health information for the media to set agenda, the greater the propensity for the media to use her surveillance function to better the process of disease management, prevention and control. The study concludes that the influence of surveillance function of the media on disease prevention and control using the EVD campaign is strong, effective, adequate, timely provided the needed direction towards health management.

## Recommendations

The following recommendations are advanced:

- i. Information on disease control and prevention must be strategically designed and not left at the mercy of citizen journalists or purveyor of user generated content else the result will be cacophony of information that will result in panic for society.
- ii. To adequately cater for the needs of the people in the hinterlands, information on disease prevention and control should be disseminated with the slightest notification of such diseases in other land or likely occurrence of such outbreaks within the polity.
- iii. Information on disease prevention and control should direct specific actions at a time that the citizens should adapt with and subsequent message to evaluate the level of compliance.
- iv. Religious and other opinion leaders should be integrated into the process of message design for surveillance campaigns as a means to mitigate the extent of distrust for the message content as well as increase the extent of acquisition, application and action.
- v. The surveillance campaigns should not be targeted at creating other pecuniary reasons but at ensuring strict adherence to WHO-tri-based objectives of health education, health promotion and health literacy.

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## Appendixes

### Sample research instrument

#### Questionnaire to appraise the influence of influence surveillance on control and prevention of Ebola Disease Virus

Tick the appropriate options (SA = strongly agree; A = agree; U = undecided; D = disagree; SD = strongly disagree)

#### Media surveillance

s/no	Item	SA	A	U	D	SD
1	EVD messages are strong enough in scope to attract me and the public					
2	EVD outbreak messages are on TV, Radio					
3	EVD outbreak messages are well publicized on Facebook, twitter, WhatsApp, internet					
4	EVD outbreak messages were frequent on newspaper/ magazines					
5	EVD messages are well spread through telephony – SMS, calls					
6	EVD messages are well spread in schools, offices and religious organizations					
7	EVD messages are available through interaction with peers, families, associates					

#### Negative consequences of surveillance

s/no	Items on negative consequences of surveillance	SA	A	U	D	SD
1	Messages on EVD make people to avoid sick people					
2	Messages on EVD influenced my movement to infected cities and areas					
3	Messages on EVD helped minimized my contact with people whether infected or not					
4	Messages on EVD created panic in the society especially with the salt solution					
5	Messages on EVD were not friendly					
6	Messages on EVD made me to be afraid of the world around me					
7	Messages on EVD were harmful to human health					

### Sufficient support for disease management

s/no	Items on sufficient support for disease management	SA	A	U	D	SD
1	The messages on EVD disease control came right on time					
2	The message on EVD disease control and prevention provided adequate information					
3	I trust the message carried on EVD disease control to want to rely on and apply it					
4	The messages were appropriate in curbing EVD diseases					
5	The messages should have been spread before the outbreak of EVD					
6	The message source is credible enough in managing EVD disease control					
7	Media was quick enough in spreading information about EVD					

### Correlate positively with disease management

s/no	Items on positive correlate of surveillance with EVD management	SA	A	U	D	SD
1	The EVD messages make me want to behave hygienically					
2	The EVD messages clearly direct me on what to do to prevent diseases					
3	I understand the EVD message and what to do to prevent disease					
4	The messages on EVD disease control were effective					
5	The messages provided needed directions to deal with EVD diseases					
6	The message were successful in helping me deal with EVD diseases					
7	The messages moved people towards community participation in EVD disease control					

### *Please just circle the options that applied to you*

Sex:            Male            Female  
 Education:    Formal           Informal           None  
 Religion:      Christian       Muslim           Pagan            Atheist            African  
 Age:            13 - 20           21 – 28           29 – 36           37 – 44           > 45

## Data for hypotheses testing

### Hypothesis 1

<i>N</i>	<i>x</i>	<i>y</i>	<i>xy</i>	<i>x</i> <sup>2</sup>	<i>y</i> <sup>2</sup>
1	506	425	214942	255542	180792
2	483	332	160647	233738	110412
3	454	422	191417	205702	178124
4	359	465	166805	128921	215822
5	324	417	135383	105241	174158
6	359	342	122701	128921	116781
7	420	376	158257	176797	141660
<b>Σ =</b>	<b>2906</b>	<b>2780</b>	<b>1E+06</b>	<b>1E+06</b>	<b>1E+06</b>
Calculated Pearson = -0.176					

### Hypothesis 2

<i>N</i>	<i>x</i>	<i>y</i>	<i>xy</i>	<i>x</i> <sup>2</sup>	<i>y</i> <sup>2</sup>
1	506	383	193448	255542	146442
2	483	367	177397	233738	134637
3	454	343	155705	205702	117860
4	359	287	102910	128921	82148
5	324	398	129253	105241	158743
6	359	389	139664	128921	151303
7	420	402	168851	176797	161262
<b>Σ =</b>	<b>2906</b>	<b>2569</b>	<b>1E+06</b>	<b>1E+06</b>	<b>952394</b>
Calculated Pearson = 0.066					

### Hypothesis 3

<i>N</i>	<i>x</i>	<i>y</i>	<i>xy</i>	<i>x</i> <sup>2</sup>	<i>y</i> <sup>2</sup>
1	506	280	141703	255542	78576
2	483	326	157602	233738	106266
3	454	329	149276	205702	108329
4	359	313	112523	128921	98211
5	324	315	102176	105241	99200
6	359	372	133444	128921	138126
7	420	378	158919	176797	142848
<b>Σ =</b>	<b>2906</b>	<b>2313</b>	<b>955643</b>	<b>1E+06</b>	<b>771557</b>
Calculated Pearson = -0.322					

# The Disciplinary Identity of International Relations: an Analysis on Cross Disciplinary Enterprise

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## Introduction

The disciplinary identity of International Relations has become one of contested resonances among academics in International Relations as a branch of Social Sciences. Concurrently the disciplinary identity of International Relations is subject to a wider array of ambiguities as the discipline is not embedded with a clear node for its disciplinary demarcation. Although International Relations has become a widely accepted academic discipline among numerous students, academic associations and institutions, the question of its disciplinary identity is yet to be addressed adequately. “IR has generated dozens of quality journals, and its debates are lively and diverse. Although it has not settled the question of whether it is a discipline or a field, it nonetheless serves as a clear node of identity”.<sup>1</sup>

Thus the above statement induces to conduct a critical inquiry into the disciplinary identity of IR by raising the question of what are the mainstream ambivalences that convince to problematize the disciplinary identity. The International Relations as a growing discipline, has been sensitive to numerous socio-economic and political clusters that have been constantly changing over the time. Conceivably, except such reasonable disciplinary adaptation into an outward conglomeration, IR could have become a more self-contained discipline. Unless such a voluntary reworking, its affiliation to the field of Social Sciences can be further questioned. Therefore it is worth to discuss the main stream ambivalences that impact on the disciplinary identity of IR by appealing to a milieu of “inter-disciplinary interactions”.

“All disciplines beg, borrow or steal from each other, and in this respect IR is no exception”.<sup>2</sup> It seems that inter-disciplinary enterprises are common phenomena and no way for IR to be exempted from such multidisciplinary association. “The academic study of IR should, conceivably have something unique to offer, something that scholars from outside the field who are interested in global political questions can turn to”.<sup>3</sup> As suggested by this idea, the discipline of International Relations requires a certain degree of “multidisciplinary socialization” in order to serve its growing subject matters by moving beyond the traditional disciplinary confines. Yet, it is questionable to which proportion the discipline of IR should engage in a such disciplinary sharing or what repercussions can be expected through such an inter-disciplinary connections. More explicitly, the outside disciplinary intervention should be judged to which degree it makes impact on the existing theoretical paradigms and conceptual framework of the discipline of IR. Similarly to which extent it provides innovative analytical power to understand the disciplinary matters should be also a concern.

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<sup>1</sup> Barry Buzan and Richard Little “Why International Relations has Failed as an Intellectual Project and What to do About it”, *Millennium – Journal of International Studies* 30 (1) (2001) : 19-39

<sup>2</sup> Ibid., p.19

<sup>3</sup> Ilan Zvi Baron “The Continuing Failure of International Relations and the Challenges of Disciplinary Boundaries” *Millennium – Journal of International Studies* 43(1) (2014) :224-244

In this context, this paper intends to examine how the inter –disciplinary connections impact on the disciplinary identity of IR, considering the cross disciplinary enterprise as one of mainstream ambiguities towards the disciplinary identity of IR. While insisting, the paper provides critical insights from both non-social sciences and other social sciences where the discipline of International Relations has to be interactively engaged. Together the study would explore the possible consequences of such inter-disciplinary engagement of IR, as a discipline which has to serve the “plurality” of the contemporary world.

In what flows in this paper, the first section of this paper will briefly examine the prevailing academic discourses related to the cross disciplinary impact on the discipline of International Relations, including their protuberant ambiguities and core arguments. In the second section, the paper will closely look at two different case studies that come from social and non – social science disciplines in order to examine the impact of interdisciplinary enterprise on the IR disciplinary identity of IR. To serve the purpose, disciplinary interactions between IR and Biology, Theater and Performance from the field of Aesthetic Studies will be incorporated into the study appealing to some of relevant scholarly works in the above two selected fields.

### **Disciplinary Identity Dilemma: Autonomy versus Dependency**

The disciplinary identity dilemma of International Relations can be identified as a result of different ambivalences and diverse of intellectual inquiries into the discipline. Particularly, the debates on the central reference point of the subject matter and the interdisciplinary sharing tend of the IR, which come as the main concern of the paper; can be considered as the most contested contexts among the aforesaid ambivalences and intellectual projects. Considering the debates on the main focus of the subject matter of IR, the ideas donated by Buzan and Little can be firstly discussed in the light of the idea of “self- contained quality” of IR. As argued by them, the idea of the state as the main reference point to the discipline of International Relations has become obsolete and it convinces the perception that IR is a self- contained discipline that subject to mainly about the relations among states<sup>4</sup>. Indeed such a description offers an idea that the scope of International Relations is parochial and confined to a tightly rigid subject matter. Countering the argument, Buzan and Little provide a systematic analysis to explicit how the subject matter of IR has been broadened over the time by addressing numerous peculiarities. Significantly, the scope of globalization persuades that international system has to be understood not merely in terms of relations among states but also in terms of a network of people.<sup>5</sup> Certainly, this argument claims a need for the discipline of IR to be conceived from broader perspectives which are not blindly confined to a tightly rigid model deriving from conventional nomenclatures in the discipline.

Owing to the fact that, Buzan and Little further forward their argument, by emphasizing a need of broader historical perspectives can open up new insights into the origin and the future of the contemporary global international system.<sup>6</sup> In this context, to which they are skeptical is, not for a historical exploration towards the discipline, but to a rigid model that has been used commonly or perhaps dominantly to explain the subject matters, irrespective of their time and places. Broadly speaking, Buzan and Little’s idea on “IR’s Westphalian Straitjacket” indicates that “the strong tendency to assume that the model established in seventeenth century Europe should define what international system is for all times or all places”<sup>7</sup>. Certainly such tendency can be jeopardized the

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<sup>4</sup>Buzan and Little ,op.cit., p.21

<sup>5</sup> Ibid.,p.21

<sup>6</sup> Ibid.,p.27

<sup>7</sup> Ibid., p.25

ability of IR to adopt itself into growing and pluralistic world at the same time, limiting its interdisciplinary socialization. By contrast, Neumann in his recent seminal work has provided a skeptical analysis towards the argument on International Relations as an 'In and Out' discipline which is laid by Buzan and Little and further his criticism has been directed to their view on IR is insulated from other Social Sciences.<sup>8</sup> Moreover Neumann rationalizes his counter argument through a trilateral analysis, by choosing three characteristics from social sciences.

"Therefore, IR would be lost without history. A second thing that must be in place for a social science to be worthy of the name, is a gamut of tools: data collection, methodology, theory, Meta –theory. The third and final characteristic that I want to discuss, concerns the relationship to the non-academic world and the need for some degree of autonomy".<sup>9</sup>

In deed Neumann in his first element, history has been placed in an indispensable position with IR while Buzan and Little suggesting a mutual beneficial synergies with history. "There is nothing idiosyncratic about a synthesis of IR with world history nor need the argument to be confined to the study of international relations"<sup>10</sup>. But Neumann's perception on history is slightly different from them, as he has stated, "in the larger picture, however, the main threat to IR's standing as a social science is probably not the misuse of history, but the increasing amnesia that seems to be taking hold."<sup>11</sup> What is more, he explains the reason for why history should be a consideration for any form of social science by claiming that history is instrumental for making a universal coverage of cases which are pertinent to the discipline<sup>12</sup>. Therefore, IR as a social science has no exceptions from such universal coverage facilitated by history. More specifically the Neumann's analysis reveals three different spheres where the subject matter of IR to be dealt, namely extant relations, historical and imagined relations.<sup>13</sup> Responding to this rendering, Chris Brown in his critical writing has argued that, the Neumann's emphasis on importance of history to IR is compatible with the ideas of Fred Halliday. Thus Brown explains Fred Halliday would have also appreciated Neumann's desire to extend the universe of historical cases considered by IR theory. Concurrently, challenging Halliday, Brown point out that enlarging universe of cases is different from engaging with a "full" universe of cases. Many possible cases aren't actually that interesting because they result in dead ends<sup>14</sup>. Apart from sustaining his argument in this intellectual debate, Chris Brown offers a notion that some events and some actors are not world historical and therefore limited in significance. As noted by him further, world history is made by world powers and world historical forces and Euro centrism has become a generalized terms of abuse nowadays.<sup>15</sup> Indeed this idea has created an important point of view regarding the potential pitfalls that has to be carefully handled by the discipline of IR in its engagement with history. On the other hand, Lucian Ashworth has explicitly discussed how historical narratives are influential on the discipline of International Relations. "Like all academic subjects, International Relations (IR) is heavily influenced by the historical narratives that make up the myths about the discipline's foundation and

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<sup>8</sup>Iver B. Neumann "International Relations as a Social Science", *Millennium: Journal of International Studies* 43(1) (2014): 330-350

<sup>9</sup>*Ibid.*, p.333

<sup>10</sup>Buzan and Little, *op.cit.*, p.33

<sup>11</sup>Neumann *op.cit.*, p.334

<sup>12</sup>*Ibid.*, p. 334

<sup>13</sup>*Ibid.*, p.334

<sup>14</sup>Chris Brown "IR as a Social Science: A Response", *Millennium: Journal of International Studies* 43(1) (2014): 351–354

<sup>15</sup>*Ibid.*, p.353

course.”<sup>16</sup> Certainly, this kind of historical myths are even potential in making negative impacts on the disciplinary identity of IR. In other words this idea can be aligned with the notion of IR’s Westerphalian Straightjacket that convince to consider the subject matter of IR based on a single dominant historical narrative or a model.

Considering different insights from the contemporary thinking, Elizabeth Dauphinee’s ideas offer a different perception on use of narratives in international politics which is also relevant to the discipline of IR. It seems that, with these innovative approaches, the disciplinary identity of IR has become an opened space for more complicated discourses. Moreover, Elizabeth Dauphinee reveals, “for me, narrative approaches allows us to think about the worlds we encounter differently. They allow us to encounter worlds that we normally do not see. They give us different languages and different angles of vision”<sup>17</sup>. Further she questions the adequacy of the standing writing approaches and conventional empirical endeavors that are not able to reach the ground realities of the scenarios concerned. Apparently, Dauphinee’s suggestion to incorporate such innovative approach into the field may challenge the conventional linear fashion of writing in history of international Relations. Further, in order to sustain her argument, she points out a scenario of “trauma” a situation which cannot be adequately addressed through the conventional fashion of research. For an instance she adds “the war lies in every gesture, in every movement of musculature, in every silence in which the imperative to witness is too exhausting to contemplate and too urgent to ignore”.<sup>18</sup> More importantly, this innovative approach convince the scholars in International Relations to rethink about how should write and about what, along with deep insights into the scenario. Apart from this, Vigneswaran and Quirk explore some other challenges related to historiography of IR focusing on three elements, content, context and criteria. In addition, they emphasize the need of addressing numerous interpretative challenges, translation issues, historical silences along with the issues such as idiosyncratic intellectual trends and self-censorship.<sup>19</sup>

The given discussion portrays how the core disciplinary matter of International Relations has been transformed from a single focal point of phenomena to a diffusion of matters that has more potential of challenging the disciplinary identity of IR. Whether IR is confined to relations among states or debates on Eurocentric influences on IR is not much relevant to today context of International Relations. Similarly great debates, issues related to definition formulation are also outdated factors to be considered in the contemporary world. Given this complicity to the picture, it is ostensible that today International Relations as a discipline is subject to a wider array of alternative sites that require new theoretical synergies and innovative methodologies. The disciplinary matters of IR today are complicated and needed to be addressed in the premises of inter-disciplinary association. To serve this plurality in the present day more effectively, the discipline of International Relations tend to look for more inter-disciplinary association. Therefore, it is more validate to examine the disciplinary identity of IR appealing to its interactions with other disciplines coming from both social and non-social sciences.

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<sup>16</sup> Lucian M. Ashworth “Did the Realist Great Debate Really Happen? A Revisionist History of International Relations”, *International Relations* 16(1) (2002) : 33-51

<sup>17</sup> Elizabeth Dauphinee “ Writing as hope : Reflections on The Politics of Exile , *Security Dialogue* 44 (4) (2013):347-361

<sup>18</sup> Ibid., p.350

<sup>19</sup> Dharshan Vigneswaran and Joel Quirk “ Past Masters and Modern Inventions : Intellectual History as a Critical Theory ”, *International Relations* 24 (2) 2010 : 107-131

## International Relations at Theater and Performance

Owing to the fact that, that International Relations as a discipline has become much more complicated than traditionally portrayed and by looking at where constant replacements are occurring with numerous uncertainties and precedencies in the contemporary world, it is important to see how IR response to these new challenges by drawing insights from the outside disciplines. As an entry point, Steve Smith by explaining the ideas of Enloe who has introduced different “maneuvers” in her seminal work on *“Bananas, Beaches and Bases: Making Feminist Sense of International Politics”*, has created a space to rethink how the subject matters of IR has become transformed. Admittedly, Steve aligned with Enloe argues how private sphere has become more important to today’s subject matters of International Relations.<sup>20</sup> Consequently, the idea reveals how even individuals’ acts and performances in their day today life have become an important course of International Relations. Taking the question of “where are the women” raised by Enloe, Steve portrays the different roles played by women in international politics, in particular, woman as a diplomatic wife, as a prostitute around military bases, as a western tourist and as a marketing symbol for bananas.<sup>21</sup> Indeed, this provides some useful insights into the transformation taken place in the subject matters of International Relations in the contemporary world. As argued by Enloe, the personal is international and governments depend on certain kinds of allegedly private realms in order to conduct their foreign affairs.<sup>22</sup> Therefore how individuals perform their roles has become an important subject concern of IR. In this context, the challenge before the discipline of IR is how to serve this diffusion of subject matters that have been diffused to multiple clusters that cannot be adequately analyzed by the conventional systematic approaches.

Since the individuals’ performances have become more significant in the present context of International Relations, it is worth to consider how the discipline of International Relations can be aligned with the Theater and Performance studies. Looking at the Naoko Shimazu’s writing on Diplomacy as Theater which has been focused on the Bandung Conference of 1955, presents a novel writing approach to the discipline of International Relations. Remarkably this approach provides some possible ways to capture some of the subject clusters in detail, and to make the scenario more descriptive and more palpable. Equally, Shimazu brings out the significance of the symbolic dimension that has to be taken into consideration in IR writings. Thus, adherent to the three main principle components of the theatre: stage, performers, audience, Shimazu has referred the Bandung city where that historical conference was held as the stage, and leaders and diplomats who attended the conference as the performers while people of Bandung are referred to the audience.<sup>23</sup> Going beyond a mere description to the episode, he assures how the approach is successful in producing powerful imaginaries from a such diplomatic event concerned, even with an account of iconologies and symbolic meanings coming through a careful and close examination. Further as noted by Shimazu, “these physical movements speak out to the people as non-verbal forms of communication, and create a spontaneous shared space between the leaders and the people. Indeed, charismatic leaders like Nasser understood well the value of communicating and reaching to the public in this manner”.<sup>24</sup> More significantly, such counting provides a wider-ranging visualization of the event along with a comprehensive calculation of symbolic politics

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<sup>20</sup>Steve Smith “The discipline of international relations: still an American social science?”, *British Journal of Politics and International Relations* 2(3) (2000): 374-402

<sup>21</sup> Ibid., p.384

<sup>22</sup> Ibid., p.384

<sup>23</sup>Noko Shimazu “Diplomacy As Theatre : Staging the Bandung Conference of 1955”, *Modern Asian Studies* 48(1) (2014) :225-252

<sup>24</sup> Ibid., p.247-248



in terms of power. Similarly, it has proven that such improvisational form of writing can be well adopted into IR by addressing the issue of “least explicitly” exposed by some of conventional theories.

In order to have another vantage point to the discussion, Rustom Bharucha’s analysis coming from the field of theatre and performance, provide a more comprehensive picture of how the theater and performance can be synergized with the discipline of International Relations in order to address some peculiarities which are really beyond the expounding capacity of existing approaches. Hence Bharucha questions, “What work does “performance” do? What does it reveal about terror that other analyses – such as the psychological, social, political and economic cannot do?”<sup>25</sup> Answering to the question, he enunciates that performance has the capacity to synthesize the different domains of inquiry and has the ability of incorporating ideas and realities with its synaesthetic capacities.<sup>26</sup> Further he authenticates performances as capacities of “embodiment”, “affect”, and “corporeality”, “kinesthetics” and “reflexivity” that are more palpable than what is found in other social sciences.

At the same time, it enables to have a new form of analysis that can be distinguished from what is available in political and or economic theory.<sup>27</sup> With respect to the idea of ‘reflectivity’ what is expected to come as a outcome through the language of performance can offer a framework that makes the manifold subject matters of IR more expressive and profound with the ground realities, which cannot be concealed by other form of analysis. From the Bharucha’s point of view, the terror which has become a recurrent subject matter of IR, has different languages, complexities and distinct visual culture, even embedded with bodily sacrifice, requires new analytical insights that derive from the outside disciplines like Theater and Performance.

On the other hand, there is an ongoing debate about the relevance of “social body” and “physical body” to International Relations. For instance, Lauren Wilcox is critical on the idea forwarded by Neumann, “an exclusively social discussion about is doomed to remain exactly disembodied. The physical body must be back in. The question is how”<sup>28</sup> Although Neumann has suggested the “physical body” is to be incorporated into analytical endeavors of social sciences, Wilcox is still doubtful regarding the “dehumanizing effect” coming from such physical bodily analysis deeply embedded with natural science principles. “There is a deep skepticism of the uses of scientific justify claims about the social and political world, with reasons based precisely in considering the history (and the present) of discourses and their use in legitimizing various forms of oppression, violence and inequalities around the world.”<sup>29</sup>

It seems that, from the Wilcox’s point of view, those scientific justifications are not adequate to realize the claims coming from the real socio – political world; similarly their capacity to legitimize such claims is questioned. Thus Wilcox point outs, “broadly speaking, this is not a matter of “abuses” of science but an effect of the dehumanizing practices of the discourse of “science” itself”<sup>30</sup>. As Wilcox has placed the project of scientific justification to social science subject matters in an intrinsically failed position, Neumann shows the possibility of how these two different insights can be incorporated together. “The physical body and the performing body are not identical phenomena, they are both relevant for our social existence, and we cannot go on putting physical body –and, by extension, biology and psychology

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<sup>25</sup> Rustom Bharucha, *Terror and Performance* (New Delhi: Tulika Book, 2014 ),29

<sup>26</sup> Ibid., p.29

<sup>27</sup> Ibid., p.29-30

<sup>28</sup> Neumann, op.cit.,p. 346

<sup>29</sup> Lauren Wilcox “ Making Bodies Matter in IR” *Millennium - Journal of International Studies* 43(1) ( 2014 ) : 359–364

<sup>30</sup> Ibid., p.362

– under erasure forever<sup>31</sup>. Therefore, it would be more beneficial to IR, if the discipline looks for situational adaptation of both disciplinary insights to realize its subject matters more precisely rather creating dilemma on disciplinary identity. Moreover the following section explicates how insights coming from a non-social science; Biology has been incorporated into one of prominent subject matters in International Relations along with a critical analysis towards the project.

## Biological Discernments into IR

To initiate the discussion, Gerard has made a vantage point of view regarding scientific representation in International Relations. As noted by him, “the scientific representation is part of the set of discursive practices that make up the sociology of scholarly work. It does not simply fulfill representative purposes, but plays out political functions in the habitus of the field. In case of IR, this implies it is ruled by the most dominant discourse of the discipline: “the science question”.<sup>32</sup> What generally this statement convinces is that scientific representation is potential in contributing some useful insights to International Relations from its discursive practices. Providing more elaborative picture, Gerard explains that “scientific representation has largely been considered noncontroversial and of relatively little relevance. The tacit assumption is that representation ‘re-presents’ both finding and methodology of the research in question”.<sup>33</sup> Since the scientific representation is less controversial in terms of illustration of social science research outcomes and research designs, primarily one can argue that insights coming from non-social sciences have been already successfully incorporated into social science practices wherever it is required.

For him, so far IR has adopted several models of scientific representations in order to formalize the social world while adding a more logical sense to it. For an instance, numerical and graphical illustrations are the most common scientific presentation models visible in the discipline of IR, precisely being an element of making research endeavors of IR more expressive. Apart from that, Gerard has revealed three functional effects called “distorting” of scientific representation which are found in research practices in International Relations. “However, there also exist three distorting effects that are usually not considered or planned: *simulacrum*, the *reinforcing categorical perception* and *homogenization*”.<sup>34</sup> On the ground of these distorting effects, one may argue on the capability of these models to bring out the reality of the social world as they tend to provide more tacit understanding about the world. But on the other hand, it can be argued that, these scientific representative models provide alternative conceptual lenses to the discipline of International Relations and able to produce deferent insights through processes of examination and demonstrations directed to the matter concerned.

Moving beyond the discourse of scientific representation, Ann Florini draws an analogy between international norms and genes which is much more relevant to this discourse. In order to provide new insights, she has adopted the evolutionary model associated with the discipline of Biology. In her seminal work, primarily she has answered the question, how international norms have been fluctuating over the time and also how they have been evolved through different circumstances by incorporating a metaphor of genes into the inquiry. It is significant to discuss that how such metaphor coming from non-social sciences has been successfully incorporated in order to discuss international norms which can be considered as one of important subject components of International Relations without any exception to contemporary sense. As viewed by her, “it is well known that genes strongly condition the behavior of

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<sup>31</sup>Neumann, op.cit., p.346

<sup>32</sup>Gerard van der Ree “The Politics of Scientific Representation in International Relations”, *Millennium - Journal of International Studies* 42(1) (2013): 24–44

<sup>33</sup> Ibid., p.26

<sup>34</sup> Ibid., p.36

most individual animals, in International Relations, norms govern much state behavior”.<sup>35</sup> Owing to the fact that, she has pointed out another two major characteristics of genes that can be utilized to explain how international norms are changed. “The genes and norms are both transmitted from one individual to another through similar process of *inheritance* and norms like genes are “contested”.<sup>36</sup>

It is important to see how this metaphorical analysis is pertinent for the subject of international norms. Take, for an instance, international norms conditions the behavior of states on a ground of shared normative agenda as genes directing the behavior of the organisms. Concurrently international norms are subjected to transfer from one state to another state. Florini in her explicit account, further has explained how norms can be horizontally spread among states through the process of “*emulation*”<sup>37</sup>. On the other hand, genes are subjected to the process of “*natural selectivity*”, similar to that, international norms producing is also subjected to a certain selectivity procedures which is determined by the prevailing norm pool and other domestic factors of the states. Using the term, “*phenotype*”, Florini has extensively shown the applicability of the metaphor of genes to have comprehensive inward –looking into the international norms behavior. “Variations in traits among members of a population occur at the level of gene, and are expressed in (the physical form, functioning, and behavior of an organism). Genes are pieces of chromosomes, DNA stands, that convey information about how to construct all the bits and pieces that make up an organism”<sup>38</sup>. Indeed in the similar manner, genes are directions or a set of guiding principles which are determined by several factors. Similarly International norms are also a set of directional values that are subject to external and domestic factors in the international system. Therefore, this metaphorical analysis coming from non-social sciences offer a basis to think of a successful project of interdisciplinary enterprise in International Relations.

## Conclusion and Discussion

In this paper, by examining the transformations taken place in the subject matter in the discipline of International Relations over the time, has shown that subjects matters of IR in the contemporary world have been horizontally expanded into numerous sectors being more complicated. Apparently the idea of “horizontal blockade” related to the subject matter of IR is no longer pertinent as IR tend to serve the “plurality” in the contemporary world by considering these new developments. Therefore the paper has argued that today International Relations as a discipline is subjected to “diffusion of subject matters” which characterized by a large number of divers of socio economic, political and environmental clusters. In order to serve these transformations, it has observed that there is a visible tendency in IR to be interactively engaged in the other disciplines. Adherent to this, the paper has examined how this kind of cross disciplinary enterprise impact on the disciplinary identity of IR by exploring some of contemporary academic debates on the concern.

Most of the literature incorporated into the study has revealed that conventional historical base lines or dominant historical models that have been used to understand the subject matters of IR have provided more tactic understandings to the discipline while the subject matters are horizontally blocked. On the other hand, it has been prated the importance of systematically refined historical trajectories, specifically refined from the historical myths and persona to the discipline of International Relations. On the contrary, Neumann has shown why history is important to the discipline of IR while Darshan and Joel has provided an account of pit falls to be considered in historiography of International Relations.

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<sup>35</sup> Ann Florini “ The Evolution of International Norms” *International Studies Quarterly* 40(3) (1996): 363-389

<sup>36</sup> Ibid., p.367

<sup>37</sup> Ibid., p.379

<sup>38</sup> Ibid., p.367-368

Mostly the perceptions coming from literature convince that IR should be associated with history without confining itself to history.

Moreover, ideas of Elizabeth Dauphinees discussed in this paper have broadly elaborated how new writing approaches can be incorporated to provide more palpable account for subject matters of International Relations. Besides, in order to capture the ground realities of the world, she has revealed the significance of such new fashion of researching by moving beyond the conventional linear fashions of writing. It convinces that today world won't be easily conceived by the conventional research framework available in the discipline of IR and it requires new approaches that can realize and conceptualize the today world adequately. Apart from that, incorporating Enloe's insights, the study has further revealed how individuals' performances matter the course of International Relations. The performances of private realms have become more important to the subject matters of International Relations. In fact, claims coming from these individual realms cannot be conceived appropriately by the traditional fashions of writing and researching. Therefore, the discipline of IR has to be more interactive with other disciplines.

Taking successful insights from the theater and performances Nako Shimazu has portrayed how imaginary power of explaining can be enhanced by producing symbolic meanings. Similarly, this approach provides comprehensive analysis which cannot be found in conventional IR approaches to realize the symbolic politics in International Relations. Thus Rustom Bharucha's account explicitly outlines how the insights coming from theater and performances can be successfully incorporated into an attempt of understanding complicated realities of the world. Consecutively, Bharucha has pointed out that, a theme like terror which is characterized by numerous complicities, uncertainties and different languages should be realized by producing closer insights into the scenario, even by countering minor iconologies.

Although, there is an inheriting fear of adopting insights from natural sciences into social sciences in terms of dehumanizing effect and producing more formalized and tactic understanding to the social world, the case of scientific representation reveals a successful incorporation between science and International Relations. At the same time, these scientific representative models are playing significant roles in increasing the analytical power and the discursive power of the research outcomes and frameworks of IR. Moving beyond this point, Florini has provided a successful case of metaphorical analysis on international norms taking insights from Biology while revealing the possibility of producing more inclusive account of the subject concerned.

Finally owing to this discussion, the paper concludes that the discipline of IR has been engaging in a successful cross disciplinary enterprise with interacting both social and non-social sciences to serve the plurality of its subject matter. Adherent to the general perception among academia, no discipline either from social sciences or natural sciences maintains a "full disciplinary autonomy". International Relations has no exception regarding this, as its subject matter is growing faster than the speed of new conceptual and theatrical producing, therefore it has to look for more interdisciplinary association to bring new insights to the subject matters. With this interaction, IR has made its some of subject matters more palpable, discursive and legitimized. Likewise, IR has gained the ability to capture some ground realities to which conventional IR theories and approaches are not sensitive.

Moreover, by interacting with other disciplines IR has found new mechanisms to eradicate some of academic ambiguities prevailing in the discipline. What is more, this enterprise has benefited IR by providing effective communicational strategies into its research culture while providing new teaching methodologies to the discipline of International Relations. Therefore the paper concludes that, this

“situational interdisciplinary association” has created less impact on the disciplinary identity of IR and that is a constructive engagement which can be considered as a requirement of the “diffusion of subject matter” of IR.

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# Teaching and Learning Swedish Online

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## Abstract

This paper aims to give an overview on a cooperation project launched four years ago, under which students who study Swedish at two universities across the Baltic Sea have a chance to complete a part of relevant courses in their study programmes together in an online course. The primary goals of joint studying are: to encourage students from different nationalities to actively communicate with one another, using Swedish as the lingua franca (communicative and social competence); to motivate students to use a range of sources in Swedish to get information; to give the participants a chance to gain new knowledge about their neighbouring country and the student life there (internationalisation competence). The common difficulties in carrying out joint studies at two different universities (Guth, Helm & O'Dowd, 2012), e.g. timetabling and technical problems, are overcome by focusing on asynchronous dialogue and by choosing a technically workable platform with good technical support from one of the partner universities. The misalignment of academic calendars does not complicate the carrying out of the joint unit as the exchange takes place during a period of six weeks and the partner teachers draw up a detailed calendar on a week-by-week basis for each joint task. The authors consider the cooperation a very positive experience, easy and inexpensive to implement, and highly recommend it to their colleagues. Our experience confirms what previous studies (Guth, Helm & O'Dowd, 2012) have already outlined: despite the belief that foreign languages should be learned face-to-face and preferably with native speakers, students seem to appreciate using ICT for connecting with other people using the target language as their lingua franca. We also feel that these exchanges are particularly suitable for the teaching of less commonly taught languages and offer all parties both change and satisfaction.

Keywords: collaborative language learning; e-learning, language teaching online

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## 1. Introduction

Comparing language learning today with language learning 20 years ago, it is evident that changes are significant. The difference is particularly noteworthy in the use of online technologies and not only in the language teaching methodology. Paper textbooks and exercise books have been replaced by electronic ones, and a fast Internet connection gives the language learner an easy access to global resources. Online projects also bring language learners all over the world into contact with one another and create opportunities for authentic communication. The authors, who work as Swedish language lecturers at Turku University of Applied Sciences and Tallinn University, wished to give their students a possibility to complete a part of their Swedish language course in virtual collaboration with the partner university. Hereby, we present an overview of the cooperation that has by now been ongoing for four years.

## 2. Method

### 2.1 Students/Language level

The prerequisite for successful cooperation in language learning is a more or less equal level in language proficiency; differences in language proficiency can be a challenge to successful collaboration (Guth, Helm & O'Dowd, 2012). The Finnish business students who participated in the

project had studied Swedish both at comprehensive school and upper secondary school, and were on B1+/B2 language level. The students studying Swedish at Tallinn University start from zero and by the time of the joint study reach the same language level (B1+/B2). Similar prerequisite skills make the formulation of tasks and communication between the students considerably easier. The number of students participating was in the year 2011 (Turku) 12, (Tallinn) 9, in 2012 (Turku) 20, (Tallinn) 7, in 2013 (Turku) 18, (Tallinn) 10 and in 2014 (Turku) 17, (Tallinn) 9. The number of students is relevant if teachers also aim to give individual feedback during the course and it should not therefore be too high.

## **2.2 Duration**

Because of the misalignment of academic calendars at Finnish and Estonian universities it was rather difficult to create a joint study unit which would cover the whole academic semester. To give our students a chance to a continuous on-line study session without any longer breaks we ended up with a shorter, six-week joint study period that later turned out to be quite optimal. By integrating this joint study unit in an already existing courses we could avoid difficulties and expenses which probably would arise from modifying the curriculum.

## **2.3 Web platform**

As Finnish and Estonian higher education institutions use different study environments, a decision on the best platform had to be made first. As Turku University of Applied Sciences has been offering different online courses for students for a long time, and as the used platform Optima has also a Swedish language version, it seemed to be the best choice for the implementation of the joint study. Choosing a technically workable platform with good technical support from one of the partner universities also contributed to the decision. The students of Tallinn University received a temporary user name and password for Optima.

## **2.4 Tasks**

The primary goal of the joint online course was to encourage students to use Swedish as a *lingua franca* when communicating with the students of the partner university. Therefore, group work formed a large part of the joint study. The first task consisted of presentations of the students' personal and academic backgrounds followed by a peer discussion on the virtual forum. The photos/illustrations the students attached to their presentations were a perfect way to "break the ice" and create a cohesive group of students, willing to learn more about their fellow students on the other side of the Baltic Sea. The students were divided into Estonian-Finnish pairs and could comment each other's presentations on the forum and ask questions.

The next task was listening comprehension by following television and radio programmes in Swedish and commenting them in a diary. The students wrote down a brief summary of the programme and complemented it with a small glossary of new vocabulary that was used in the programme. In addition, students evaluated their listening skills with reference to the Common European Framework of Reference for Languages.

The main purpose of the first two tasks was to help students to get familiar with each other and the web platform. They were followed by a third, more difficult task.

The third task was to discuss in groups the current social topics the students had given in their individual essays. Argumentation was carried out on the virtual discussion forum the following week. Some exemplary themes were given for the students, for instance:

- Should Turkey become/not become a member of the EU?
- Smoking in public places must be/should not be forbidden.
- Higher education should be/should not be free of charge.
- Nature needs our help.
- Present-day society – a consumption society?

Some examples of the topics proposed by students:

- Marriage or living together?
- The dangers of wind energy.
- Children have a right to home care.

The task of writing an argumentative essay on a current social topic was chosen by us teachers to offer our students a chance to produce a different type of text than they are used to writing at school. Ulrika Tornberg (2009:164), who has studied the writing of students at school, has come to the conclusion that most of the texts students have to write during their studies are about themselves and argumentative texts are practically missing.

Thereafter, the students were divided into groups of 4–5 members and the communication continued on the virtual forum. All students had to read through their group members' essays and give argumentations for or against the opinions presented there.

### **3. Discussion**

An online course requires a lot of preparatory work. When working out the tasks the teacher should think about the learning process, create optimal learning conditions, decide on the way of giving instructions during the course, finalise the schedule and of course gather and organise the learning material into a logical whole. (Koli, 2008) Content production is a vital part of an online teacher's professionalism (Suominen, Nurmela 2011).

As our wish was to offer an online course with active feedback, the students received feedback from the fellow students and from the teachers. In terms of the first task we also exchanged roles between ourselves, so that students would receive feedback not only from their own teacher but also from the so-called guest teacher. When working out the tasks, both lecturers again took part, thanks to which the joint course consisted of varied types of tasks.

In case of such joint study, in which group work comprises a large part of the study, it is of special importance that all the participants follow the given deadlines. When the deadline of a particular task was coming closer, we therefore sent a reminder by email. In the authors' opinion, the students were very committed to completing the tasks, and there were only a few cases when a student forgot about the deadline. We believe that students tend to consider their studies of value if they are credit-bearing and part of the study programme (O'Dowd, 2013).

In joint teaching, it is also important that the partner teachers have common visions, approaches and practices in their teaching (O'Dowd, 2013). We believe that a reliable teacher partnership is vital to long-term collaboration and successful co-teaching. An online course can definitely be prepared online as well, but we presupposed that a physical meeting makes planning considerably easier – and this was also confirmed by our own experience.



### 3.1 Feedback from students

After the period of joint study all students were asked to fill in a feedback questionnaire, in which they answered the following questions:

- 1) How would you evaluate your language development during the course? Which sub-skills (reading, writing, online communication, listening, cultural competence) developed the most/least during the course?
- 2) What did you like the most about the joint study? What kind of tasks suit an online course best?
- 3) Did you encounter any difficulties in using Optima? Was the timetable suitable for the course? Did you get acquainted with the feedback provided by the teacher?
- 4) How would you evaluate the cooperation with the partner university on a scale from 10 (very good) to 1 (very bad)? Please explain your answer.
- 5) Would you be interested in similar joint study also with other higher education institutions and not only in the framework of language training? Why?
- 6) Do you have any remarks or suggestions as for modification?

All of the respondents noted that their language skills developed during the course. As the answer to the most developed sub-skill they mentioned listening, writing, and online communication. Interesting was the fact that students evaluated the development of cultural competence very differently. In the opinion of approximately half of the students, this developed the most of the sub-skills, and in the opinion of approximately the other half, the least.

When answering question no 2, it was mentioned that the tasks were varied and interesting and the reading and commenting of fellow students' texts exciting.

None of the students experienced problems with understanding the use of Optima or the instructions. The timetable was considered suitable and the majority also looked at the feedback provided by the teacher.

The feedback indicated clearly that students liked to study "internationally". The evaluation of the participants in 2013/2014 was on the average 7.1 in Estonia and 8.4 in Finland. Among other issues, it was mentioned that the joint study was

"a new way to study language",

"a good way to learn to know Finnish/Estonian students"

"thanks to online communication, language use seemed natural"

"I learned a lot, also from other participants in the course"

"exciting, good variation in study routine"

None of the students had anything negative to say about the joint study. It is evident that in the students' opinion the internationality gave the course extra value and the form of study was

motivating. Let us use the formulation of one of the students' feedback: "More similar sort of studies". Or as G. Gillberg (2004) expresses it: "You can work seriously but still have fun".

### 3.2 Recommendations

Online studies are well-suited for several different types of tasks: reading comprehension, writing (analysis, report, summary), listening comprehension, translating, vocabulary and grammar exercises and different assignments for group and pair work on a communication forum. In our opinion, the best solution is to integrate a joint online course into an already existing course. In the present case, Estonian students "visited" the course *Svenska på nätet* (Swedish on the Net) during six weeks, after which both groups continued their respective Swedish language courses in Finland and Estonia.

In comparison to "ordinary studies", online studies require a more detailed planning and precise instructions (Koli 2008), but this one-time amount of time spent is in the authors' opinion rewarding. Relying on our experience, we can say that the course is easily manageable if the task for each coming week opens only after having completed the previous one. The teacher(s), on their side, have to strive for good learning atmosphere and make the game rules clear for the students.

In high-quality online education the teacher should embrace the attitude of being merely a co-instructor for the student who is supposed to take responsibility for his/her own learning. The teacher should encourage the students to independent study. The importance of giving precise instructions is however emphasised in online teaching where the teacher's role is to ensure that every student understands what he/she is supposed to do and that the given timetable is followed. It is also very important as a teacher to give individual feedback in such a way that the teacher's personal work load does not get too heavy in big groups. Online teaching does not reduce the work load, on the contrary, frequent communication with the students and individual feedback usually increase it. Individual feedback tends to improve the quality of feedback but it demands more time and effort from the teacher. (Suominen & Nurmela, 2011)

Different cultural backgrounds in teaching (teaching methods, ideologies and personalities) can cause misunderstandings between teachers. The significance of these cultural factors decreases if the students are given wider opportunities to influence the contents and implementation of the online course. In online teaching it is easy to make the students more active participants in learning by giving them free hands to search information in the Internet, choose their own topics for argumentation, participate in interactive tasks in groups and pairs etc. There are lots of possibilities to adapt the contents of learning material to new situations and new learners and through this adaptation reach out to various types of learners – motivate and stimulate them. The most important role of the teacher is to be a supervisor.

The students' attitudes towards online studies can vary and the students should also understand the challenges of this working method. Cooperation and the student's genuine attempt to learn something should be emphasised in all relations between the teacher and the student (Suominen & Nurmela 2011). A right attitude from the student's side reduces the temptation to underachieve and 'jump over where the fence is lowest'.

### 4. Conclusions

The project has turned out to be viable, key factors being students at approximately the same language level, partner teachers with similar aims and practices, good adaptation to existing study programmes and a workable platform. In all four years, students have evaluated the joint study project as successful and they have noted that it has been exciting and motivating.

It has been successful also in the opinion of the authors. As we had counted with the fact that we do not meet our students face to face, we were ready to interrupt at any moment if anybody would have problems with the platform or the instructions. The students, however, managed everything. Virtual communication is that natural and usual to present-day youth that it should be used by teachers in creating virtual classrooms.

Successful online teaching presupposes very thorough planning and preliminary work. In the authors' opinion, online cooperation is also great variation for the teacher, creating besides the physical classroom a virtual one, which is different from the former but certainly not worse. Considering the more and more complex economic situation at higher education institutions, we believe that such joint study also has good future prospects.

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# ON EXCEPTIONS TO AKAN VOWEL HARMONY

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## ABSTRACT

*The vowel harmony in Akan is described as a phonological process of regressive assimilation (i.e. advanced vowels assimilate unadvanced ones that precede them (Owusu 2002). Dolphyne (1988) devotes a section of her book to Akan vowel harmony. She identifies six groups of words that deviate from the Akan vowel harmony rule. Some of the words discussed in Dolphyne (1988) as exceptions to the Akan vowel harmony rule do not break the vowel harmony rule in the language. This is because unadvanced vowels cannot assimilate advanced vowels that precede them. Rather, it is the advanced vowels that assimilate unadvanced ones that precede them. In effect, there are virtually no exceptions to the vowel harmony rule in Akan.*

## INTRODUCTION

Unlike many Ghanaian languages which stand endangered, Akan is the most studied Ghanaian language. It is spoken by about sixty percent of the population of Ghana (Owusu, 2002). Its dialects include Fante, Akuapem, Asante, Akyem, Bono, Wasa, Agona, Kwahu, Assin, Gomoa, etc. According to the 2010 population and housing census, the Akans are the predominant ethnic group in Ghana. They constitute 47.5% of Ghana's population. Three of the dialects (Asante, Akuapem and Fante) have achieved literary status, (Dolphyne 1988). The examples used in this paper are therefore based on these three dialects of Akan.

Like stress and intonation in English, tone is also considered as a non-segmental feature of speech which can be used to bring about differences in the meaning of words which are otherwise identical. Tone is the use of pitch in language to distinguish lexical or grammatical meaning. Akan is described as a tone language, because tone is important for meaning in the language as shown in 1 and 2 below:

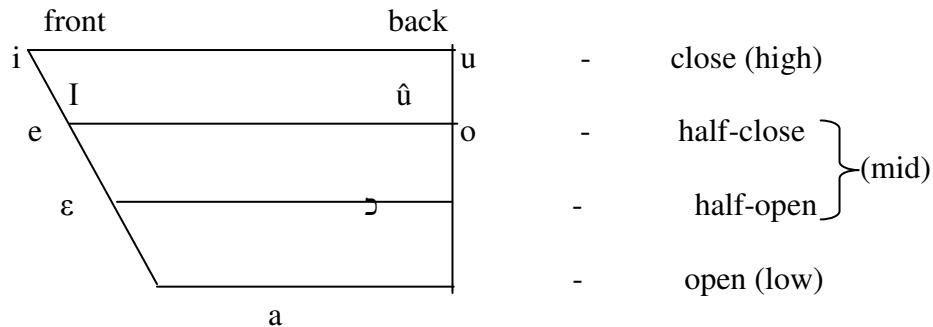
- |     |     |           |                 |
|-----|-----|-----------|-----------------|
| (1) | (a) | [ kȳráá ] | ‘never’         |
|     | (b) | [ küràá ] | ‘calabash’      |
| (2) | (a) | [ á!sö ]  | ‘a girl’s name’ |
|     | (b) | [ àsö ]   | ‘hoe’           |

This paper examines exceptions to the Akan vowel harmony within the framework of autosegmental phonology as formulated and expounded by Goldsmith (1976) and (1990) respectively.

## VOWEL HARMONY IN AKAN

According to Dolphyne (1988), Akan has nine distinct vowels as shown in Fig 1.

**Fig 1**



The vowel symbolised as [a] by Clements (1981) and Dolphyne (1988) is a variant of the low vowel, [a]. This vowel is symbolised as [æ] in this paper. It occurs mainly before syllables with the vowels [i] and [u] in the Twi dialects as in 3 and 4 below.

3. [æni] ‘eye’

4. [æduro] ‘medicine’

In the Fante dialect, it is realised as [e] in the environment of the above advanced vowels as in 5 and 6 below.

5. [eɲiwa]

6. [edur]

The vowel harmony in Akan is governed by the [ATR] parameter as shown in Fig 2.

**Fig 2**

[ +ATR ]: i e o u (æ)

[ -ATR ]: I ε ô û a

The Akan vowel harmony rule allows advanced vowels to assimilate unadvanced ones that precede them, as exemplified in 7 and 8 below.

7. /bô/ ‘mention’ + /din/ ‘name’ → [bodin] ‘Mention its name.’

8. /din/ ‘name’ + /bô/ ‘mention’ → [dinbô] ‘mentioning of name’

The vowel harmony rule operates in (7) because the unadvanced vowel /ô/ occurs before the advanced vowel /i/. In (8) the advanced vowel /i/ fails to assimilate unadvanced vowel /ô/ because the unadvanced vowel occurs after the advanced vowel. Because of this phonological phenomenon in Akan, vowels in verbal affixes are assimilated by the vowels in the verb stem with which they occur. This type of assimilation, according to Lass (1984), is called distant assimilation since the segments involved are separated by other segments. The following examples in Table 1 from Dolphyne (1988) illustrate this point:

**Table 1**

Pronoun prefix	Verb stem	
[ mI ] 'I'		[midi] 'I eat'
[ wû ] 'you (singular)'		[wudi ] 'You eat'
[ ô(nû) ] 'he/she'	[di] 'to eat'	[ odi ] 'He eats'
[ yân ] 'we'		[yedi ] 'We eat'
[ mû ] 'you (plural)'		[mudi ] 'You eat'
[ wô(n) ] 'they'		[wodi] 'They eat'

The Akan vowel harmony rule can be represented linearly as in Fig 3 below:

**Fig 3**

$$\left[ \begin{array}{c} \text{V} \\ -\text{ATR} \end{array} \right] \rightarrow \left[ \begin{array}{c} +\text{ATR} \end{array} \right] / \text{---} +\text{C} \left[ \begin{array}{c} \text{V} \\ +\text{ATR} \end{array} \right]$$

On the other hand, if the vowel in the verb stem is [-ATR], the vowel in the prefix will remain [-ATR] as in Table 2 below:

**Table 2**

Pronoun prefix	Verb stem	
[mI]		[mIdI] 'I am called .....
[wû]		[wûdI] 'You are called .....
[ô(nû)]	[dI] 'to be called'	[ôdI] 'He is called .....
[yân]		[ yâdI] 'We are called.....'
[mû]		[mûdI] 'You are called.....'
[wô(n)]		[ wôdI] 'They are called ....'

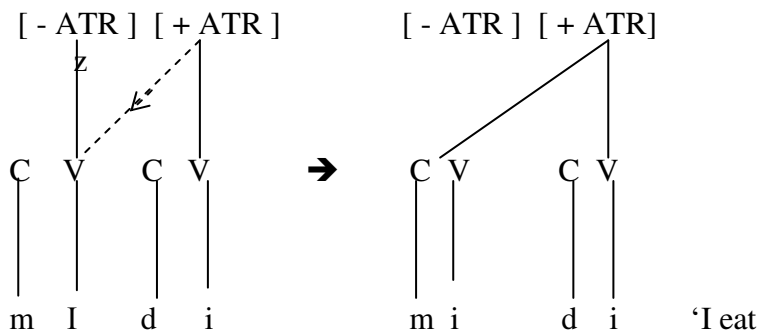
Fig 3 states that a vowel that is [-ATR] becomes [+ATR] in the environment of a following vowel that is [+ATR]. The following autosegmental representations in Fig 4 illustrate Vowel Harmony in Akan:

**Fig. 4**

ATR Tier:

Skeletal Tier:

Segmental Tier:



Vowel harmony is an assimilatory process, (Essien 1990, Hyman 1975, Aoki 1968, Katamba 1993, Lass 1984) and not just a co-occurrence restriction on the distribution of vowels in words, as construed by Ofori (2004), Dolphyne (1988) and Kenstowicz (1994). Vowel harmony should be considered as a phonological process and not a phonological state. The Akan vowel harmony can be described as a phonological process of regressive assimilation. This is similar to vowel harmony in Larteh by Ofori (2004). In this phonological process, advanced vowels assimilate unadvanced vowels that precede them.

Almost all the Akan words discussed in Dolphyne (1988) as exceptions to the Akan vowel harmony rule have unadvanced vowels preceded by advanced ones. Dolphyne (1988) therefore tends to have more exceptions to the Akan vowel harmony than rules. She discusses two types of vowel harmony (i.e. tongue root position and lip rounding). She however discusses six types or groups of words as exceptions to the Akan vowel harmony rule. It is little wonder that O’Keele (2003) describes the Akan vowel harmony as full of seeming exceptions.

Although words like 9 to 18 have both advanced and unadvanced vowels, they do not break the vowel harmony rule in Akan.

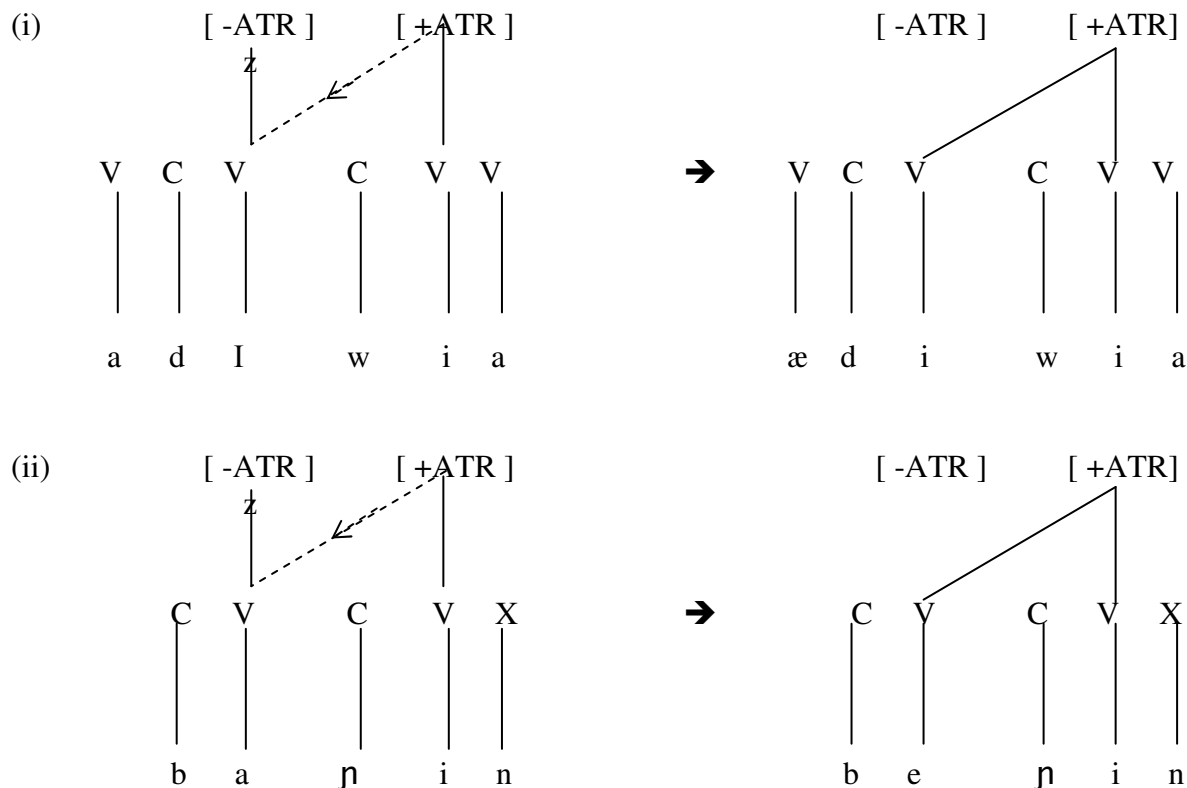
9. [ɲinsân] ‘be pregnant’
10. [pinɲtɛâ] ‘come close’
11. [ædidibla] ‘pasture’
12. [kununûm] ‘husbands’
13. [æsieyâ] ‘cemetery’
14. [æmumuyô] ‘evil doing’
15. [æsusô] ‘rainy season’
16. [onipa] ‘a person’
17. [supô] ‘island’
18. [æhina] ‘pot’

The above words (and those listed in the appendix) cannot be considered as exceptions because in each of the words, advanced vowels are followed by unadvanced ones. The vowel harmony in Akan is an assimilatory process which occurs when unadvanced vowels are followed by advanced ones. Something is considered an exception if it does not follow any rule. The Akan vowel harmony rule allows [+ATR] vowels to assimilate [-ATR] vowels that precede them in words, as in 19 to 25.

19. /ba/ ‘child’ + /ɲin/ ‘male’ → [beɲin] ‘man’ (Fante)
20. /wia/ ‘to steal’ + /adɪ/ ‘something’ → [ædiwia] ‘stealing’
21. /kô/ ‘go’ + /fie/ ‘house’ → [kofie] ‘go home’
22. /wû / ‘you’ + /di/ ‘eat’ → [wudi] ‘you eat’
23. /bô/ ‘mention’ + /din/ ‘name’ → [bodin] ‘mention its name’
24. /mɪ / ‘me’ + /tuɔ/ ‘gun’ → [mituɔ] ‘my gun’
25. /mâ/ ‘I will’ + /tu/ ‘fly’ → [metu] ‘I will fly’

Fig 5 illustrates this phonological process.

**Fig 5.**



It seems to me that the low vowel, [a] does not undergo the process of ATR assimilation. It is only raised to [æ] and [e] in Twi and Fante respectively before syllables with the vowels [i] and [u]. It does not undergo any ATR assimilation before the other [+ATR] vowels, [o] and [e] as in 26 to 30 below. Because it does not take part in the ATR assimilatory process, it tends to block the spreading process as in examples 32 to 36. The examples 37 and 38, from Boadi (2009) further exemplify the fact that the chain of spreading is broken by the presence of [æ].

26. [abotire] 'crown'
27. [ago] 'velvet'
28. [atemuda] 'judgement day'
29. [atentrehuo] 'kapok'
30. [lateni] 'someone from Larteh'
31. [ôpatæku] 'wolf'
32. [kankæbi] 'millipede'
33. [ôbærimá] 'man'
34. [ôpætui] 'he pretended'
35. [ôkæri] 'he weighs it.'
36. [ôtæni] 'someone from northern Ghana'
37. [okura bætire] 'he holds a shoulder'
38. [okura pætuo] 'he holds an owl'

Apart from the Akan low vowel, another form which poses a threat to the Akan vowel harmony rule is the progressive affix in the Akuapem dialect. In the Akuapem dialect, the progressive affix, [rɪ] is not



subject to the vowel harmony rule in Akan. This affix does not change even if it occurs before [+ATR] vowels, as in 31 to 33. Because [rɪ] does not take part in the process of ATR assimilation, it tends to block the spreading process of [+ATR] vowels, hence the pronominal prefix, [ô] remains [-ATR], although it occurs before [+ATR] vowels.

31. [ôrɪdidi] ‘he is eating’

32. [ôrɪkodidi] ‘he is going to eat’

33. [ôrɪtu] he is digging it up.

## Conclusion

An attempt has been made in this paper to reduce the number of words which are considered exceptions to the Akan vowel harmony rule. We have seen from the foregoing discussion that the exceptions to the Akan vowel harmony rule are brought about by the Akan low vowel, [a] and the Akuapem progressive affix, [rɪ]. Both the low vowel and the progressive affix in the Akuapem dialect do not undergo the process of ATR assimilation. At this point, no reasons have been assigned for their failure to undergo the process of ATR assimilation. The Akan vowel harmony rule is a spreading process which takes place when [-ATR] vowels are followed by [+ATR] vowels. Generally, [+ATR] vowels have the tendency to assimilate [-ATR] vowels on the left; [-ATR] vowels on the right are not affected by this spreading process.

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## APPENDIX

### SOME AKAN WORDS WITH BOTH ADVANCED AND UNADVANCED VOWELS

- [æfisâm] ‘family matters’
- [ætiefûô] ‘listeners’
- [ænimtia] ‘disrespect’
- [ænimuoꞑam] ‘glory’
- [ænimka] ‘rebuke’
- [æniha] ‘laziness’
- [ænibIrÎâ] ‘seriousness’
- [æɖimisâm] ‘foolishness’
- [ætɔiwadÎâ] ‘abomination’
- [ækuma] ‘axe’
- [ænisô] ‘gratitude’
- [æhuhudÎâ] ‘vain things’
- [æɖɔɔuma] ‘work’
- [æwudifûô] ‘murderers’
- [æbua] ‘pipe’
- [æfutusâm] ‘exhortation’
- [æɔia] ‘sun’
- [ædutûô] ‘using evil spirits to harm someone’
- [ædufudIpâ] ‘greed’
- [æsikafûô] ‘rich people’
- [æhiafûô] ‘poor people’
- [æhufûô] ‘cowards’
- [æniɖÎâ] ‘happiness’
- [æniwudÎâ] ‘a shameful thing’
- [æyitûma] ‘mourning cloth’
- [ænidasûô] ‘hope’
- [æwufûô] ‘the dead’
- [æfiasI] ‘prison’

[ænidahô] ‘vigilance’  
 [æniâd□n] ‘aggressiveness’  
 [ænifira] ‘blindness’  
 [æbufufa] ‘anger’  
 [æsubô] ‘baptism’  
 [æhuntasâm] ‘secret things’  
 [æ□idifûô] ‘believers’  
 [æbura] ‘well’  
 [ætikô] ‘back of the head’  
 [boniayâ] ‘ingratitude’  
 [bu□ia] ‘stove’  
 [ebinûm] ‘some people’  
 [eΐiasI] ‘the world’  
 [eΐira] ‘weeds’  
 [efiada] ‘Friday’  
 [kuruwa] ‘cup’  
 [t̥idôm] ‘rear security forces’  
 [kuayâ] ‘farming’  
 [mfitiasIâ] ‘beginning’  
 [mpunam] ‘roasted meat’  
 [ŋɛira] ‘blessing’  
 [nimdIâ] ‘knowledge’  
 [nitan] ‘hatred’  
 [nsuoɛIâ] ‘hot water’  
 [nsekubô] ‘gossiping’  
 [nifa] ‘the right hand’  
 [oŋiŋɛ â] ‘long life’  
 [oΐifûô] ‘a thief’  
 [odidifûô] ‘a glutton’  
 [okunafûô] ‘a widow’  
 [odupôn] ‘mighty tree’  
 [owura] ‘master’  
 [osebô] ‘jubilation’  
 [osukôm] ‘thirst’  
 [tirimpô] ‘thought’  
 [wukuada] ‘Wednesday’

# **Minimization of Heat Transfer losses at the Shell Bitumen Plant, Takoradi, Ghana**

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## **Author Note**

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## **Abstract**

*This is an extension of Heat Transfer Effectiveness-Application to Shell Bitumen Plant, Takoradi, Ghana. In this work, a thorough review was done on the lagging materials of the pipelines in the plant. Consequently, all asbestos lagging materials were replaced with industrial fiberglass. Simulations were carried out on three different lagging materials: asbestos, fiberglass and composite of asbestos and fiberglass. It was observed that of the three lagging materials the one which gives the best insulation is the fiberglass. Also, comparison analysis were made on copper and zirconium heat exchangers to ascertain which of them best suits the operation at the Takoradi Shell Bitumen Plant.*

**Keywords:** Asbestos, fiberglass, thermia B, bitumen, zirconium heat exchanger, copper heat exchanger.

## Minimization of Heat Transfer losses at the Shell Bitumen Plant, Takoradi, Ghana

At Shell Bitumen Plant, Takoradi, Beverley Thermal Fluid Heater (BTFH) generates heat energy to heat thermal fluid (Thermia B) which flows through heat exchanger and then heats the bitumen which is to be maintained at a temperature range of 140 °C to 160 °C before it is discharged. Industrial fuel oil is used to fuel the BTFH.

The recent hikes and instability in fuel prices, coupled with the high rate of fuel consumption in the burner at Shell Bitumen Plant, Takoradi, has shot up the cost of production. Therefore, the management of the plant is compelled to look at how to minimize heat losses in the system and cut down on operation cost.

In an earlier work, Simons and Nunoo (2008) replaced the asbestos lagging material with a composite of asbestos and fiberglass and were able to reduce heat losses by 78%.

The chimney was redesigned to utilise heat from the exhaust gas which would have otherwise, gone wasted, and this yielded 0.868 kW of heat energy to aid the heating of the bitumen.

However, in modern industrial practices, asbestos are no longer used. This could be as a result of the hazardous nature of the material. In fact, there are four main diseases that are caused by asbestos: mesothelioma (which is always fatal), lung cancer (almost always fatal), and asbestosis (not always fatal, but it can be very debilitating) and diffuse pleural thickening (not fatal), Health and Safety Executive (2014).

This work sought to review and find a suitable lagging material for the plant and also to determine whether or not to maintain the usage of the zirconium heat exchanger currently in use at the plant.

### **Simulation of Rate of Heat Transfer**

Simulation of the rate of heat transfer for asbestos, fiberglass and composite of asbestos and fiberglass lagging materials was done to determine which of them would give a better insulation for the plant.

A cross section of the various lagging materials on the pipe which transports Thermia B to and from the Beverley Thermal Fluid Heater (BTFH) or transports bitumen from the supply tank to the serving tank are shown in Figures 1.

Simulation were done based on two different scenarios; a) comparison of rate of heat transfer for the three lagging materials of diameters of cross sections ranging from 0 to 0.9 meters. b) Comparison of rate of heat transfer for two lagging materials; fiberglass and a composite of asbestos and fiberglass of diameters of cross sections ranging from 0 to 0.6 meters. Scenario b was paramount so as to clearly distinguish between the rates of heat transfer of the two materials, which hitherto, seemed to overlap.

It could be seen from Figure 2 that, for the set diameter range of the pipe (0 to 0.05), the rate of heat loss in the asbestos lagging to the surrounds was the highest. The rate of heat loss in the composite of asbestos and fiberglass is the lowest for the same diameter range. It was, however, observed that from diameter of 0.05 meters upwards, the fiberglass has the lowest heat loss rate.

The results of the simulations are depicted in Figures 2 and 3.

### **Calculation of Heat Losses at the Plant**

It could be seen from Figure 3 that fiberglass gives a low rate of heat transfer to the surroundings than a composite of asbestos and fiberglass, consequently, fiberglass is proposed for the Shell Bitumen Plant.

However, it should be noted that fiberglass could also be hazardous. In fact, Fassa (2012) stated in his article, “Fiberglass fibers cause lung diseases and cancer” that “the case against asbestos in building materials was finalized after decades of research traced several severe lung cancer incidents to asbestos poisoning. Now fiberglass, the replacement for asbestos, is under similar scrutiny for the same reasons.”

Figure 4 shows proposed schematic diagram of the plant designed by Simons and Nunoo (2008). The diagram clearly shows the flow lines of Thermia b, hot and cold bitumen.

### Heat flow calculations

The heat flow through pipe insulation with outer diameter  $d_o$  and inner diameter (of the insulation equal to outer diameter of the pipe)  $d_i$  is l

$$Q = \frac{2\pi kl\Delta T}{\ln(d_o/d_i)} \quad (1)$$

Where  $l$  is the length of the pipe,  $k$  is the thermal conductivity of the insulation material, and  $\Delta T$  is the temperature difference between the inner and outer walls of the insulation ( $\Delta T$  may be approximated as the temperature difference between the temperature of the fluid in the pipe and the ambient temperature).

In the case of a composite pipe (e.g. a metal pipe with several layers of lagging) the most convenient approach of calculating for the heat flow is to express the relationship between heat loss (transfer) and temperature difference in terms of a thermal resistance  $R_{th}$ .

Therefore,

$$Q = \Delta T / R_{th} \quad (2)$$

For each insulation layer the thermal resistance  $R_{th}$  is defined as

$$R_{th} = \frac{1}{2\pi kl} \ln \left( \frac{d_o}{d_i} \right) \quad (3)$$

Thermal resistance of a fluid film on the inside and outside surfaces can be treated by using the equation

$$R_{outside} = \frac{1}{K_{ho}A_o} \quad (4)$$

Where  $A_o$  is the outside surface area, given by  $2\pi r_o$ , referring to Fig. 2, and  $K_{ho}$  is the heat coefficient for the outside surface.

$$R_{inside} = \frac{1}{K_{hi}A_i} \quad (5)$$

Where  $A_i$  is the inside surface area, given by  $2\pi r_i$ , referring to Fig. 2, and  $K_{hi}$  is the heat coefficient for the outside surface.

The total resistance to heat flow is then expressed as

$$R_{Tth} = \frac{1}{K_{hi}A_i} + \sum \frac{1}{2\pi kl} \ln \left( \frac{d_o}{d_i} \right) + \frac{1}{K_{ho}A_o} \quad (6)$$

and heat flow becomes

$$Q = \frac{\Delta T}{R_{Tth}} \quad (7)$$

### Calculation of rate of heat losses at Thermia B

Internal diameter of Thermia b mild steel pipe = 0.1 m

External diameter of mild steel pipe = 0.14 m

External diameter of fiberglass = 0.21 m

External diameter of masonry = 0.23 m

Thermal conductivity of mild steel = 48.2 W/mK

Thermal conductivity of fiberglass = 0.04 W/mK

Thermal conductivity of masonry = 0.3 W/mK

Length of pipe = 11 m

Thermal resistance for mild steel was computed to be  $1.00377 \times 10^{-4} \text{ K/W}$  and that for fiberglass was 0.14666 K/W

Thermal resistance for masonry was calculated to be 0.04387K/w

Thermal resistance for the Pipes and lags

$$= 0.04387 + 0.14666 + 1.00377 \times 10^{-4} = 0.19063 \text{ K/W}$$

Total resistance to heat flow

$$R_{Tth} = \frac{1}{\pi \times 226.163 \times 0.1 \times 11} + 0.19063 + \frac{1}{\pi \times 50 \times 0.23 \times 11} = 0.19443 \text{ K/W}$$

The rate of heat loss by Thermia B as it is pumped from the BTFH to the storage tank is computed as

$$Q = \frac{(488 - 300)}{0.19443} = 0.96693 \text{ kW}$$

The rate of heat lost as Thermia B returns to the BTFH

$$Q = \frac{(443 - 300)}{0.19443} = 0.73548 \text{ kW}$$

The rate of heat loss by Thermia B is  $0.96693 + 0.73548 = 1.70241 \text{ kW}$

### Calculation of rate of heat losses at Bitumen

Internal diameter of Thermia b mild steel pipe = 0.4 m

External diameter of mild steel pipe = 0.45m

External diameter of fiberglass = 0.605 m

External diameter of masonry = 0.655 m

Length of pipe = 18 m

Heat transfer coefficient of Bitumen =  $649525.9 \text{ W/m}^2\text{K}$

Thermal resistances for mild steel, fiberglass and masonry were computed to be  $2.1473 \times 10^{-5} \text{ K/w}$ , 0.06543 K/w and  $2.3404 \times 10^{-3} \text{ K/w}$  respectively.

Thermal resistance for the Pipes and lags

$$= 2.1473 \times 10^{-5} + 0.06543 + 2.3404 \times 10^{-3} = 0.067792 \text{ K/W}$$

Total resistance to heat flow

$$R_{Tth} = \frac{1}{\pi \times 649525.9 \times 0.4 \times 18} + 0.067792 + \frac{1}{\pi \times 50 \times 0.655 \times 18} = 0.068332 \text{ K/W}$$

The rate of heat loss by bitumen is given by

$$Q = \frac{(418 - 300)}{0.068332} = 1.72686 \text{ kW}$$

### Calculation of heat losses at Chimney

Since the proposed design of the chimney remains unchanged, the heat loss remains the same as in the earlier work. Thus the rate of heat transfer from the exhaust gas to the Thermia b is 0.868 kW [1].

### Energy Savings

The amount of heat that could be saved = (total heat losses from the asbestos and fiberglass composite insulation minus total heat losses from the proposed fiberglass lagging) plus heat gained from the exhaust.

$$\text{Heat saved} = (4.258 - 3.42927) + 0.868 = 1.69673 \text{ kW}$$

According to the Public Utility and Regulatory Commission (PURC) approved tariff, effective 1<sup>st</sup> October, 2014, the rates for Special Load Tariff for Low Voltage (SLT- LV) are shown in table 1;

From Table 1 it is possible to translate the heat energy saved into monetary terms.

Conferring with the Electricity Corporation of Ghana, energy charges (savings) for SLT-LV is calculated as follows;

$$\text{Energy tariff} = \text{EC} + \text{MDC} + \text{SC} + \text{PFSC} + \text{SLL} + \text{NHIL} \quad (8)$$

Where,

$$\text{EC} - \text{Energy} = 0.6175 \text{ kWh}$$

$$\text{MDC} - \text{Maximum Demand Charge} = 36.1694 \text{ kVA}$$

$$\text{SC} - \text{Service Charge} = 25.84$$

$$\text{PFSC} - \text{Power Factor Surcharge} = \left( 1 - \frac{\text{pf}_{\text{actual}}}{0.9} \right) 36.1694 \text{ kVA}$$

$$\text{SLL} - \text{Street Light Levy} = 0.000001 \text{ kWh}$$

$$\text{EL} - \text{Electrification Levy} = 0.000002 \text{ kWh}$$

$$\text{VAT} + \text{NHIL} = 0.175(\text{EC} + \text{MDC} + \text{SC})$$

Substituting the above expressions into equation 8, the energy tariff is finally expressed as;

$$\begin{aligned} \text{Energy tariff} = & 0.6175\text{kWh} + 36.1694\text{kVA} + 25.84 + \left( 1 - \frac{\text{pf}_{\text{actual}}}{0.9} \right) 36.1694\text{kVA} + 0.000003 + \\ & 0.175(0.6175\text{kWh} + 36.1694\text{kVA} + 25.84) \end{aligned} \quad (9)$$

Shell Bitumen Plant has actual power factor of 0.8 and a maximum power demand of 150 kVA/Month.

$$\begin{aligned} \text{kWh per month} &= 1.69673\text{kW} \times 30\text{days} \times 12 \text{ hours} \\ &= 610.8228 \text{ kWh} \end{aligned}$$

Therefore, applying equation 9 energy saving per month would be GH¢ 9,300.74

Annual savings then becomes GH¢ 9,300.74 × 12

$$= \text{GH¢ } 111,608.93 = \$34,987.13 \quad [4]$$

### **Evaluation of Zirconium and Copper Heat Exchangers**

The bitumen plant currently employs the usage of zirconium heat exchanger to transfer heat from the Thermia b to the bitumen.

Simons and Nunoo (2008) in an earlier assessment of the plant, recommended that the zirconium heat exchanger should be replaced by a copper heat exchanger for more effective heat transfer. This recommendation was based on the conductance of the two metals.

However, there are other important parameters that should also be considered in the selection of the heat exchangers and the key ones are rate of heat transfer, cost, size and weight, pumping power and environmental friendliness of the material.

In this work the general assumptions made for this appraisal were that;

- Heat transfer is in steady state
- Thermal conductivity is constant
- Heat transfer is one-dimensional
- Heat transfer by radiation is negligible

Some properties of the two metals were used for evaluation purposes and these are depicted in Table 2.



A decision matrix was then developed to help assess the best heat exchanger for the plant. The optimum weight, weighted score and the total score for zirconium and copper are depicted in Table 3.

It could be seen from Table 3 that weighted score for copper and zirconium are 95 and 78 respectively

## **Conclusions and Recommendations**

### **Conclusions**

From the fiberglass insulation and its analysis, and the decision matrix made, the following conclusions were made:

- 1.69673kW which is about 39.85 % of the heat losses could be saved and this could be translated to annual savings of GH¢ 111,608.93 = \$ 34,987.13
- Zirconium scored 78.0 from the decision matrix and it is a very expensive material \$ 160,513 per ton.
- Copper scored 95 from the decision matrix and it costs \$ 7,800 per ton.

### **Recommendations**

It is recommended that the heater should be fuelled by either natural gas or liquefied petroleum gas from Ghana Gas Company, since these fuels are cheaper.

Although copper heat exchanger of the same capacity is better and would cost 20 times less, the zirconium heat exchanger currently in use at the plant should be maintained until replacement time.

We reiterate the recommendation that copper heat exchanger should be used for the chimney.

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Table 1

*The PURC A approved Tariff Effective October 1, 2014*

Tariff Category	Rates (GHP)
Capacity Charge(kVA/Month)	3,616.9367
Energy Charge (/kWh)	61.7463
Service charge (/Month)	2,583.5262

(Modified after PURC)

Table 2

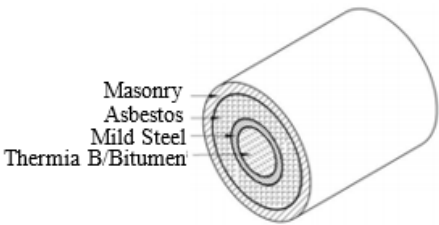
*Comparison of Some Properties of Zirconium and Copper*

EVALUATIONCRITERIA	ZIRCONIUM	COPPER
Thermal Conductivity, $k@500K(W/mK)$	21.37	386
Conductance ( $W/m^2K$ )	138.2374	159.9727
Cost/ton (\$)	160,513	7,800
Density ( $kg/m^3$ )	6570	8933
Diffusivity ( $10^{-6} m^2/s$ )	10.35	112
Melting Point (K)	2125	1358
Tensile Strength (mPa)	570	255
Environmental Impact	Can cause skin irritation	Human friendly

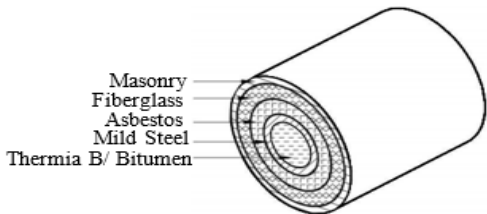
*Note.* These Properties were compiled from Aalco (2013) with the exception of the cost of the materials which were gotten courtesy Baoji Baoye Titanium-Nickel Industry Co. Ltd and Qingdoa ZeRui Metal Co. Ltd for zirconium and copper respectively.

Table 3  
*Decision Matrix for Zirconium and Copper*

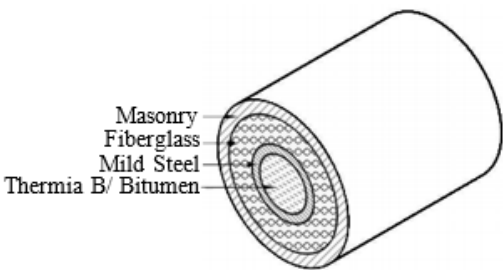
EVALUATION CRITERIA	OPTIMA MUM WEIGH T	<u>ZIRCONIUM (Zr)</u>		<u>COPPER (Cu)</u>	
		WEIGH T	WEIGHTED SCORE	WEI GHT	WEIGHT ED SCORE
HEAT TRANSFER	4	4	16.0	5	20.0
COST	4	2	8.0	4	16.0
PUMPING POWER	3	3	9.0	3	9.0
SIZE AND WEIGHT	3	4	12.0	3	9.0
TYPE	3	3	9.0	3	9.0
MATERIAL	4	4	16.0	4	16.0
ENVIRONMENTA L FRIENDLINESS	4	2	8.0	4	16.0
TOTAL SCORE			78.0		95.0



a) Asbestos lagging



b) Fiberglass and Asbestos lagging



c) Fiberglass lagging

*Figure 1. Cross Section of the Various Lagging Materials on a Pipe*

# SKY CONDITIONS AT NSUKKA AS CHARACTERIZED BY CLEARNESS INDEX AND CLOUDINESS INDEX

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## Abstract

*The correct assessment of cloud conditions in any location is important in determining the characteristic solar resource availability. The sky condition in Nsukka Nigeria (latitude: 6:86°N, longitude: 7:39°E and elevation: 456m above sea level), a tropical location was characterized by clearness index  $K_T$  and cloudiness index  $K_d$ . Daily analysis shows that the majority of the days are cloudy with hardly any very clear days. Based on monthly averaged  $K_T$ , the monthly variation of cumulative frequency of  $K_T$ ,  $f$ , and prevalent climatic conditions, the yearly sky conditions have been classified into six broad patterns: three for the rainy season and the rest for the dry season. Also determined cumulative frequency curve compared for Nsukka, Ibadan, Ilorin and Kumasi further confirm the assertion that Liu and Jordan's generalized cumulative distribution curve (CDC) are not applicable to tropical locations hence should not be used for designs in Nsukka. An expression relating monthly maximum clearness index  $K_{max}$  and monthly average clearness index  $K_T$  is presented and recommended for use in tropical locations and compared with those of Saunier et al. (1987) and Hollands and Suleman (1983). Furthermore the minimum clearness index (0.055) for Nsukka is noticed to be a little above the generally accepted value of 0.05 for overcast sky conditions.*

**Keywords:** solar radiation; clearness index and cloudiness index ; sky conditions

## 1.0 INTRODUCTION

One of the ways of easily estimating the incident solar radiation incident on a horizontal or inclined surface, which is a requirement for design purposes, is by establishing the sky conditions at the locality. These conditions can be quantified by the following parameters: (i) the clearness index,  $K_T (= H/H_o)$  (ii) the relative sunshine,  $S (= N/N_o)$  (iii) the diffuse ratio or cloudiness index,  $K_d (= H_d/H)$  and (iv) the diffuse coefficient,  $K_{dd} (= H_d/H_o)$  (Ideriah and Suleman, 1989). Here,  $H$  represents the daily global solar radiation,  $H_o$  the daily extraterrestrial radiation,  $H_d$  the daily diffuse radiation,  $N$  the daily sunshine duration and  $N_o$  the maximum possible sunshine duration or day length.

$K_T$  gives the percentage depletion by the sky of incoming global radiation and therefore indicates both the level of availability of solar radiation and changes in atmospheric conditions in a given locality while  $S$  is a measure of cloud cover.  $K_d$  is the cloudiness index and  $K_{dd}$  is the factor which mirrors the effectiveness of the sky in scattering the incoming radiation. These parameters have been used to establish sky conditions at various places (Liu and Jordan, 1960; Chouhbury, 1963; Barbaro et al., 1981; Al-Riahi et al., 1990; Akuffo and Brew-Hammond, 1993). In Nigeria, similar studies were carried out by Ideriah and Suleman (1989) for Ibadan and Udo (2000) for Ilorin.

In 1960, Liu and Jordan in particular, studied the sky conditions at various locations in terms of  $K_T$ ,  $K_d$  and  $K_{dd}$  and observed among others that the long term distribution of daily global irradiation over a month corresponding to a given values of monthly average clearness index  $K_T$  is almost independent of location and of the month. This assertion was based on statistical analysis of daily global irradiation on a horizontal surface for 27 locations, each with approximately five years of data. As a result, they proposed a set of generalized  $K_T$  cumulative distribution curve (*CDC*) which has been used, since then by many researchers.

One outright consequence of Liu and Jordan statement is that the underlying corresponding generalized probability density function (*PDF*) must also be of general validity and therefore applicable to any location and month. Bendt et al. (1981) using a more extensive data from 90 stations, each with approximately 20 years of observations essentially confirmed Liu and Jordan's observation that the frequency of daily global solar irradiation on a horizontal, for a monthly period, corresponding to a specified value of  $K_T$ , is almost independent of location and time of the year. Moreover, Bendt et al. (1981) showed that the generalized *CDC* may be obtained from *PDF* which assumes among others, random daily insolation sequences.

The other consequence of the generalized *CDC* is that maximum and minimum value of the clearness index for a particular month, as specified by  $K_T$ , are also independent of location and season. Bendt et al. (1981) suggested a constant value for the minimum ( $K_{min} = 0.05$ ) which corresponds, of course, to overcast sky conditions. Hollands and Suleman (1983) proposed an expression for the maximum value ( $K_{max}$ ) that depends on only  $\bar{K}_T$  as:

$$K_{max} = 0.6313 + 0.267\bar{K}_T - 11.9(\bar{K}_T - 0.75)^8 \quad (1)$$

However, classical results obtained by Hawas and Muneer (1984), Saunier et al. (1987), Ideriah and Suleman (1989) and Udo (2000) for four tropical locations, India, Bangkok in Thailand, Ibadan in Nigeria and Ilorin in Nigeria, respectively threw into question the universal validity of Liu and Jordan generalized *CDC*. Saunier et al. (1987), in particular, showed that the results disagreed with the generalized *CDC* mainly because of the differences in the values of  $K_{max}$  as well as the underlying *PDF*. Consequently, they proposed an expression for  $K_{max}$ , based on observations in Thailand, to be used with the Bendt et al. *CDC*:

$$K_{max} = 0.362 + 0.59\bar{K}_T \quad (2)$$

Additionally, they opined that  $K_{max}$  defined by equation 1 might be suitable for other tropical locations. Akuffo and Brew-Hammond (1993) have shown that equation 2 gave a more satisfactory agreement to observed  $K_{max}$  than equation 1, for the location, Kumasi (a tropical location), that they studied. The applicability of these two equations is investigated in this study.

Analysis of data from other tropical locations by Ideriah and Suleman (1989), Feuillard et al. (1989) and Akuffo and Brew-Hammond (1993) have corroborated the Saunier et al. (1987) conclusion that the generalized *CDC* is not valid universally. Feuillard et al. (1989) specifically noted that the *CDC* for tropical locations exhibit a more pronounced 'S-shape' than for temperate climates, as a consequence of more pronounced peaks in the corresponding *PDFs*.

The invalidity of the generalized *CDC* is not peculiar to the tropics but elsewhere as shown by the work of Olseth and Skartveit (1984) in a temperate climate. They observed that the universal values of  $K_{max}$ , as suggested by the generalized *CDC* are invalid, rather, they opined that  $K_{max}$  is climatologically dependent.

The aims of this work are to quantify the sky conditions at Nsukka as characterized by  $K_T$  and  $K_d$  and to ascertain the validity of the generalized *CDC* curves for a typical Nigerian, location. Moreover, this work will be compared with observations of especially Ideriah and Suleman in Ibadan, Udo in Ilorin and Akuffo and Brew-Hammond in Kumasi. These three towns and Nsukka are located in the west African sub-region, although Ibadan and Kumasi have different agro-climatic conditions from Ilorin. Ibadan and Kumasi are in the rain forest vegetation and tropical rain forest climate (Akuffo and Brew-Hammond, 1993) and Ilorin is in the transition zone between the rain forest of the south and savannah of the north. Nsukka is in the tropical rain forest zone.

## 2 Equations used and data base

In this study,  $K_T$  and  $K_d$  are used to quantify the sky condition mainly due to availability of solar radiation data.  $H_o$  is evaluated from the equation 3 :

$$H_o = \frac{24}{\pi} I_{sc} E_o [(\pi/180) \omega_s (\sin \delta \sin \phi) + (\cos \delta \cos \phi \sin \omega_s)] \quad (3)$$

where  $I_{sc}$  = solar constant in energy unit =  $1367 \text{ Wm}^{-2}$ ,  $E_o$  is the eccentricity correction factor of the earth's orbit,  $\delta$  is the solar declination,  $\omega_s$  is the sunrise hour angle and  $\phi$  is the geographical latitude.  $E_o$  is evaluated from (Spencer, 1971):

$$E_o = 1.000110 + 0.034221 \cos \Gamma + 0.0001280 \sin \Gamma + 0.000719 \cos 2\Gamma + 0.000077 \sin 2\Gamma \quad (4)$$

where  $\Gamma$ , in radians, is called the day angle and defined by:

$$\Gamma = \frac{2\pi(d_n - 1)}{365} \quad (5)$$

where  $d_n$  is the day number of the year.

Solar declination,  $\delta$ , is evaluated according to Spencer (1971) by

$$\delta = (0.006918 - 0.399912 \cos \Gamma + 0.070257 \sin \Gamma - 0.006758 \cos 2\Gamma + 0.000907 \sin 2\Gamma - 0.0002697 \cos 3\Gamma + 0.00148 \sin 3\Gamma)(180/\pi) \quad (6)$$

The sunrise hour angle,  $\omega_s$ , is evaluated using:

$$\omega_s = \cos^{-1}(-\tan \phi \tan \delta) \quad (7)$$

The diffuse ratio or cloudiness index is given by the equations below:

For  $\omega_s \leq 81.4^\circ$

$$\frac{H_d}{H} = \begin{cases} 1.0 - 0.2727K_T + 2.4495K_T^2 - 11.9514K_T^3 + 9.3879K_T^4 & \text{for } K_T < 0.715 \\ 0.143 & \text{for } K_T \geq 0.715 \end{cases} \quad (8)$$

For  $\omega_s > 81.4^\circ$

$$\frac{H_d}{H} = \begin{cases} 1.0 + 0.2832K_T - 2.555K_T^2 + 0.8448K_T^3 + 9.3879K_T^4 & \text{for } K_T < 0.722 \\ 0.715 & \text{for } K_T \geq 0.722 \end{cases} \quad (9)$$

The data for this analysis was collected from the Centre for Basic Space Science, University of Nigeria, Nsukka. It comprises four-year (2008-2011) solar radiation data measured at the interval of five minutes. Nsukka which is a town in Enugu State, Nigeria, is located on latitude of  $6.86^\circ$  N, longitude of  $7.39^\circ$  E and elevation of 456 m above sea level.

### 3 Results and Discussion

Figures (1a-1d) represent the daily clearness index for the four-year period. The minimum daily clearness indices for the four year period are 0.055 (August, 2008), 0.069 (January, 2009), 0.11 (August, 2010) and 0.066 (August, 2011) while the maximum values are 0.612 (May, 2008), 0.5876 (May, 2009), 0.5787 (April, 2010) and 0.5148 (May, 2011).

The monthly average clearness index and cloudiness index are shown in figures (2a-2e). The minimum monthly average clearness index for the four year period are: 0.2812 (August, 2008), 0.2823 (August, 2009), 0.2731 (August, 2010) and 0.2617 (October, 2011). The maximum monthly average clearness index are: 0.4303 (February, 2008), 0.3933 (April, 2009), 0.4175 (April, 2010) and 0.3993 (March, 2011).

The minimum monthly average cloudiness index values are: 0.5001 (February, 2008), 0.5284 (May, 2009), 0.5142 (April, 2010) and 0.5348 (March, 2011). The maximum monthly average cloudiness index values are: 0.6917 (August, 2008), 0.6901 (August, 2009), 0.7042 (August, 2010) and 0.7223 (October, 2011).

One distinct feature of the daily clearness index is that relative clear days mainly exist in the dry season months of January, February, March, November and December and to some extent early and late rainy months of April and October respectively. However, one also notices that during the cloudy period, typical clear days could have  $K_T$  values higher or comparable to the values for the relative clear dry season months. This can be attributable to the clearing off of even dust particle by rain the previous day or days, so that the sky becomes very clear the subsequent day or days.

Furthermore, from the figures (1a-1d), the occurrence of very clear skies ( $K_T \geq 0.65$ ) is very rare in Nsukka. Throughout the four-year duration under study, there is no day with  $K_T \geq 0.65$ . On the other

hand, the occurrence of cloudy skies ( $0.12 < K_T \leq 0.34$ ) is very common especially in the rainy season months (from approximately day number 170 to 270)

The literature is rather silent on the values of minimum clearness index for tropical locations. We realised that the values for Nsukka (0.055 - 0.11) are a little higher than the generally accepted value (0.05) for overcast sky conditions. The quoted minima only occurred for a total 49 days in the four-year period under study (15 in 2008, 12 in 2009, 10 in 2010 and 12 in 2011). This indicates that Nsukka is a cloudy location and sometimes the skies are overcast the whole day.

#### **4 Classification of Monthly Mean Clearness Index and Cloudiness Index**

Figures (2a-2d) show the monthly mean clearness index and cloudiness index for the four year period under study. In 2008, the maxima (major and minor) for the clearness index were in February and November respectively (see figure 2a). The minima (major and minor) for the clearness index were in August and December respectively (see figure 2a). The average  $\bar{K}_T$  value for 2008 was 0.36. The maxima (major and minor) for the cloudiness index were in August and December while the minima (major and minor) were in February and November (see figure 2a). The average  $\bar{K}_d$  value for the year 2008 was 0.59

In 2009, the maxima (major and minor) for the clearness index were in May and September while the minima (major and minor) were in August and January (see figure 2b). The average  $\bar{K}_T$  value for 2009 was 0.34. For the cloudiness index, the maxima (major and minor) occurred in August and January while the minima (major and minor) were in May and September (see figure 2b). The average  $\bar{K}_d$  value for the year 2009 was 0.61.

In 2010, the maxima (major and minor) for the clearness index were in April and December while the minima (major and minor) were in August and January (see figure 2c). The average  $\bar{K}_T$  value for 2010 was 0.35. The maxima (major and minor) for the cloudiness index were in August and January while the minima (major and minor) were in April and December (see figure 2c). The average  $\bar{K}_d$  value for the year 2010 was 0.62.

In 2011, the maxima (major and minor) for the clearness index were in March and January while the minima (major and minor) were in October and February (see figure 2d). The average  $\bar{K}_T$  value for 2011 was 0.33. For the cloudiness index, the maxima (major and minor) were in October and February while the minima (major and minor) were in March and January. The average  $\bar{K}_d$  value for the year 2011 was 0.63.

For the four year monthly averages, the maxima (major and minor) were in April and December while the minima (major and minor) were in August and January for the clearness index (see figure 2e). For the cloudiness index, the maxima (major and minor) were in August and January while the minima (major and minor) were in April and December (see figure 2e). The grand yearly average  $K_T$  and  $K_d$  were 0.34 and 0.61 respectively. As reported by Akuffo and Brew-Hammond (1993), the seasonal variation of  $\bar{K}_T$  for Kumasi and Ibadan follow the same trend with peaks in February/March and November and troughs in December/January and August. There is consistency in the reported results with respects to the troughs.

Also the average  $\bar{K}_T$  values of 0.43, 0.47 and 0.48 were reported for Kumasi, Ibadan and Ilorin respectively (Akuffo and Brew-Hammond, 1993; Udo, 2000) as against 0.34 for Nsukka. This means



that the sky at Nsukka is more cloudy than those of Ibadan, Kumasi and Ilorin. This is expected considering the differences in agro-climatic conditions of this locations.

A  $\bar{K}_T$  value of 0.60 is reported by Bashahu and Nkundabakura (1994) for Dakar (latitude: 14°43' ), a town in West African sub-region but farther north than Nsukka.

From visual inspection of figures (2a-2d), it is observed that months with least  $\bar{K}_T$  values have the highest  $\bar{K}_d$  values and vice versa. This trend is consistent over the four year-period under study hence the clearness index will be used to classify the seasonal pattern in Nsukka. It should be noted that a similar result will be obtained if cloudiness index is used.

Based on monthly average clearness index,  $\bar{K}_T$  , monthly variation of cumulative frequency,  $f$ , and the prevalent climatic conditions, the following seasonal patterns can be identified.

- Dry season:  
November, December, January :  $K_T \approx 0.34$   
March, February :  $K_T \approx 0.40$   
April :  $K_T \approx 0.35$
- Rainy season:  
September, October :  $K_T \approx 0.30$   
July, August :  $K_T \approx 0.28$   
May, June :  $K_T \approx 0.35$

It is observed that there are two broad seasonal patterns namely, 'the dry season' (November to April) and 'the rainy season' (May to October). The dry season in Nsukka has three distinct periods. These include (i) The Harmattan Period (November to January) when cold and dust-laden north-easterly trade winds from Sahara desert keep the atmosphere over Nsukka and its environs heavily overcast for many days, with characteristic hazy and cloud free weather conditions. (ii) the cloud and dust free period (February, March) of mainly high irradiation and clear weather condition and (iii) April, which forms a transition between the clear weather condition of February-March and the rainy season. At times it rains during this month and could as well be classified as rainy season.

During the rainy season, July and August stand out clearly as months of least average monthly clearness index. The two months immediately before July-August (i.e. May and June) have about the same average clearness index and also the two month after July-August (i.e September and October) have similar average monthly clearness index. It should be noted that the months of April and May almost have the same  $K_T$  even though April is classified under dry season months and May is in the rainy season months. This implies that in Nsukka, May and June could at times be regarded as dry season months and at times as rainy season months. From the analysis, six monthly patterns have been identified for Nsukka as outlined above.

Ideriah and Suleman (1989) reported a similar pattern of classification for Ibadan (latitude: 7°26'N, longitude: 3°54'E). The general pattern of classification is almost the same with only minor changes as to which bin does each month specifically belong. For example, in their classification, the months of February to April belong together as against April being on its own in this classification. August, the month with the least  $\bar{K}_T$  value of 0.35 stands alone and so is the month of May as against July-August being the month with least  $\bar{K}_T$  value of approximately 0.28. May and October belong together in this classification. In Ideriah and Suleman's study, two subdivisions were obtained for dry and four subdivisions for rainy season

as against three sub-divisions each, in this study. The values of  $\bar{K}_T$  in each category are different. The discrepancies may probably be due to the fact that the two locations Ibadan and Nsukka are not near each other and belong to different agro-climatic conditions. The classification of February and March together as dry season months with highest  $\bar{K}_T$  values is supported by Akuffo and Brew-Hammond (1993) classification of weather pattern in Kumasi, Ghana (latitude: 6.72°N, longitude: 1.6°W) and Udo (2000) Characterization of sky conditions in Ilorin, Nigeria (latitude: 8°32'N, longitude: 4°34'E). Udo (2000) reported six monthly patterns for Ilorin which is similar to the patterns identified for Nsukka in this study. However, the  $\bar{K}_T$  values for Ilorin are higher than  $\bar{K}_T$  for Nsukka. These differences can be attributed to the differences in agro-climatic conditions.

Finally, one major characteristics of seasonal variation of clearness index analysis is that on the average it ranges from 0.28 to 0.40 implying that the atmosphere at Nsukka is always cloudy throughout the year. It is therefore expected that a large fraction of the global solar radiation reaching the horizontal surface in Nsukka is diffuse (as indicated by high Cloudiness Index for Nsukka). The implication of this is that concentrating devices such as parabolic mirrors whose operation is based on incident beam radiation will not be as effective at Nsukka as at locations where  $\bar{K}_T$  values are higher.

### 5 Cumulative Frequency Distribution

Cumulative frequency is defined here as:

$$f = \frac{\text{number of days with } K_T \leq K_T(\text{fixed})}{\text{number of days in a month}} * 100\% \quad (10)$$

The monthly percentage cumulative frequency  $f$ , of  $K_T$  is presented in Table 1 and the plots corresponding to each of the five seasonal monthly clearness index patterns are shown in Figure 3a. It is observed that each of the six monthly groups, as observed by Ideriah and Suleman (1989), has distinct pattern of frequency distribution with the curves orderly from  $K_T = 0.28$  to 0.40.

Following Akuffo and Brew-Hammond (1993), cumulative frequency curves for clearness index of 0.4 for Nsukka, Ilorin, Ibadan and Kumasi are plotted in Figure 3b. This was done so as to observe the similarities and possible differences existing at these locations since according to Akuffo and Brew-Hammond, climatic factors have strong influence on  $K_{max}$ ,  $K_{min}$  and cumulative distribution curves (CDCs). The CDC for the four locations disagree to an extent (see Figure 3b). Akuffo and Brew-Hammond (1993) also obtained a similar result while comparing Ibadan data with that of Kumasi and attributed the level of discrepancy to the variation in values of  $K_{max}$  and  $K_{min}$ . This results further supports the fact that the four-year data are representative of Nsukka climate.

By these results, which confirms the findings of earlier investigators (Hawas and Muneer, 1984; Saunier et al., 1987; Feuillard et al., 1989; Ideriah and Suleman, 1989; Akuffo and Brew-Hammond, 1993) as regards the tropics, it means CDCs should not be universal but climate dependent hence Liu and Jordan's CDC should not be used in the tropics.

### 6 Maximum and Minimum Clearness Index

As earlier mentioned, Saunier et al. (1987) showed that their results disagreed with the generalized CDC mainly because of the differences in the values of  $K_{max}$  as well as the underlying PDF. As a result, they proposed equation 2 for the Thailand environment they worked on. Akuffo and Brew-Hammond (1993) showed that equation 2 was more applicable to their environment than equation 1.

In this research work, linear regression equations between  $K_{max}$  and  $\bar{K}_T$  and the corresponding regression coefficient,  $r$  were determined thus:

$$\text{For 2008 data set (11)} \quad K_{max} = 0.1250 + 1.0532\bar{\bar{K}}_T \quad r = 0.6957$$

$$\text{For 2009 data set (12)} \quad K_{max} = 0.1495 + 0.9391\bar{\bar{K}}_T \quad r = 0.7095$$

$$\text{For 2010 data set (13)} \quad K_{max} = 0.1484 + 1.3187\bar{\bar{K}}_T \quad r = 0.7732$$

$$\text{For 2011 data set (14)} \quad K_{max} = 0.0196 + 1.3187\bar{\bar{K}}_T \quad r = 0.6530$$

With overall average giving

$$\text{(15)} \quad K_{max} = 0.0745 + 1.1605\bar{\bar{K}}_T \quad r = 0.7786$$

The values of  $K_{max}$  for 2008 data set and the corresponding values calculated from equations (1, 2 and 15) are given in table 2. To compare the predictive efficiencies of the three predictive equations, the following parameters were determined for each equation: mean bias error (MBE) and root mean square error (RMSE) and are defined as follows:

$$MBE = \frac{1}{n} \sum (H_p - H_m) \quad (16)$$

$$MBE = \left\{ \frac{1}{n} \sum (H_p - H_m)^2 \right\}^{0.5} \quad (17)$$

where  $H_p$  and  $H_m$  are the predicted and measured values respectively and n is the total number of observations. Positive and negative  $MBE$  show overestimation and underestimation respectively. The sum enlightens us concerning the long term predictive values of the correlation.

In all cases the  $MBE$  and  $RMSE$  were highest for equation 1 followed by equation 2 while equation 15 has the least  $MBE$  and  $RMSE$  values. The  $MBE$  of equation 15 is negative which show overall underestimation of  $K_{max}$  (underestimated in all months except January, February, October, November and December). For equation 2, there is overestimation of  $K_{max}$  values except for the months of May and September. There is overestimation for all the months by equation 1.

The coefficients of equation 15 are remarkably different from the coefficients of equation 2 thus emphasizing the locality dependent nature of the equations. However, it is suggested that equation 14 should be used at Nsukka and any other tropical location with similar climate to Nsukka.

Also as observed by Akuffo and Brew-Hammond (1993) and Udo (2000), the  $K_{min}$  values observed at Nsukka do not show any definite seasonal trend except that they show relatively high values on October, November, February and March (See table 2). Also a very low  $K_{min}$  close the recommended value for the tropics was observed in August.

## 7 Summary and Conclusion

The sky condition in Nsukka for a four-year period (2008-2011) as characterized by clearness index represented on both daily and monthly bases and cloudiness index represented on monthly bases only is presented.

In addition to classifying the sky conditions, this work was aimed at deriving the frequency distribution of daily global irradiation in Nsukka and compare the results with the work done at Ibadan, Ilorin, and Kumasi. Also a survey of the literature showed that the generalized curves ( $CDC$ ) are not applicable in the tropics primarily due to lower values of maximum clearness index,  $K_{max}$  at locations where they are

determined. Sequel to the effect of  $K_{max}$  on  $CDC$ , an empirical expressions for  $K_{max}$  proposed by Hollands and Suleman (1983) and Saunier et al. (1987) that depends on monthly clearness index were verified to ascertain their applicability to Nsukka. Having compared the results for the following locations (Ibadan, Ilorin and Kumasi) in the West African sub-region with slightly different agro-climatic conditions, the following conclusions were reached.

First, the sky conditions at Nsukka have been classified in six patterns as defined by the monthly averages of daily clearness index and climatic conditions. This is also supported by the distribution of the monthly averages of the cloudiness index. The classification is similar to that of Udo (2000), Ideriah and Suleman (1989) and Akuffo and Brew-Hammond (1993) for Ilorin, Ibadan and Kumasi respectively taking cognizance of the slight difference in agro-climatic conditions between Nsukka and these other locations.

Second, on daily basis, the clearness index,  $K_T$ , in Nsukka ranges from 0.055 to 0.61. On a monthly basis, the clearness index  $K_T$  ranges from 0.28 to 0.40 with an average value of 0.34 while the cloudiness index ranges from 0.53 to 0.69 with an average value of 0.61. Both clearness index  $K_T$  and cloudiness index  $K_d$  are affected by climatic conditions and movement of the sun. However, the higher values of monthly cloudiness index signifies that most of the radiation in Nsukka is diffuse radiation.

Third, literature review showed that not much has been said about values of  $K_{min}$  for the tropics. For Nsukka, the  $K_{min}$  value of 0.055 was recorded which is within the generally accepted value for overcast sky conditions. This implies that due to generally cloudy conditions in Nsukka, skies sometimes are overcast the whole day.

Fourth, most of the days in Nsukka are mainly cloudy and there are hardly days with very clear skies. It should be noted that clear day can occur at any time of the year although the chances are higher for such occurrence during clear months.

Finally, an empirical equation relating  $K_{max}$  and  $\bar{K}_T$  is established by equation 15. The results show that the empirical equation proposed by Saunier et al. (1987) (i.e. equation 2) for  $K_{max}$  may be satisfactory for conditions at Nsukka although it has slight tendency to overestimate. The equation of Hollands and Huget (1983) (i.e. equation 1) is however not appropriate for Nsukka as it predicts much higher values than the observed. Also the  $CDC$ s comparison showed that  $CDC$  curves are location/climate dependent hence the generalized  $CDC$  proposed by Liu and Jordan are not applicable to the tropics, including Nsukka.

## 8 Acknowledgement

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# Effectiveness of Seatbelt Law in Ghana; A Case Study on its Implementation in Tarkwa Nsuaem Municipality

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## Abstract

*The use of seatbelt as a passive safety measure has the tendency to reduce accident injury severity during collision; as such several countries including Ghana have laws governing the use of seatbelt. In this work the effectiveness of seatbelt law in Ghana as a whole and Tarkwa Nsueam Municipality in particular was used as a case study. A survey was carried on 3676 vehicles. It was observed that seatbelt wearing rate in the Tarkwa Nsueam Municipality is approximately 46%. In conclusion it was noted that bus drivers and their front seat passengers are the categories of vehicles that have higher seatbelt rate in the municipality, this was because of the in-service training provided by the employers of these drivers and the strict seatbelt use law on the premises of the mining companies. Finally this research recommends that any measure to encourage seatbelt use in the country should be based on Engineering, Enforcement and Education.*

**Keywords:** road traffic accident, injury severity, seatbelt, injury, municipal and collision.

## Effectiveness of Seatbelt Law in Ghana; A Case Study on its Implementation in Tarkwa Nsuaem Municipality

The introduction of seat belts in cars and car derivations (light commercial vehicles) are part of passive safety measures aimed to reduce occupancy injuries during road traffic accident (Marphetia, 2006). Also seatbelts are used to prevent the body from being hurled forward when the vehicle is stopped suddenly. The force involved in hurling a body when a vehicle is stop suddenly may be as high as 10000 Newton at impact speed of 30 mph (49.5 km/h) [6].

In most advance countries the use of seatbelt has been proven to reduce between about 80-90% of occupancy injuries (Abdulla, 2013). According the National Highway Traffic Safety Administration NHTSA, USA,(Anon. 2001), in 2001 alone, 13,274 lives were saved in crashed through the use of seat belts and an estimated 7,334 lives could have been saved during the same time period, had all occupants used seatbelt.

In the United Kingdom, the Department of Transport (DoT) estimates that since the wearing of seat belt in front seats became a legal requirement in 1983, about 200 deaths and 7000 serious injuries have been avoided each year [4]. According to the UK Department of Transport figures, in a collision at 30 mph (49.5 km/h), an adult back seat passenger is thrown forward with a force of three and half tons-equal to the weight of an elephant.

According to Alaa, Ashraf, and Fikri, (2011), there are three types of ‘‘collision’’ that occur during a road traffic accident where occupants are not restrained, and these have been categories as; type 1, type 2 and type 3 collusion.

Type 1: this type of collision occurs when a vehicle and other object collide, example vehicle colliding with another vehicle, or stationary object like tree, signpost, human being or animal.

Type 2: the collusion under this category occurs when unbelted occupant collide with the interior of the vehicle. Example, a driver hitting his chest with the steering wheel or his uppertorso with a window.

Type 3: this occurs when the impact of the accident affect the internal organs of the occupants.

In Ghana, the road traffic act was enacted in 2004 and article 683 section 13 a and b of this law states “that a person of age 18 years or above who drives a motor vehicle on road or sit on the front or rear seat of a motor vehicle being driven on a road without wearing seatbelt commit an offence liable on a summary conviction to a fine not exceeding 100 penalty points or imprisonment for a term not exceeding 6 month or both” [7]. The law also makes it a mandatory for all persons between the ages of five and eighteen who sit on the front seat of a vehicle to wear a seatbelt. This work therefore seeks to evaluate the effectiveness of the seat belt law in Tarkwa Nsuaem municipality ten years after the enactment of the law in Ghana.

A survey was carried out in the Tarkwa Nsueam to ascertain the effective use of seatbelt.

Methods adopted for data collection were; roadside count, questionnaires and interviews. Two research assistants were positioned at vantage points for the road side count.

In all 3675 vehicle were counted along the road, about 150 questionnaires were sent out and one hundred and fifty (150) people including law enforcement agencies interviewed.

### **Data Collection and Analysis of Result**

A total of about 3675 vehicles were counted during the roadside counting, majority of the vehicles were counted during the morning and evening rush hours. Most of the cars counted were, taxis, pickups/private, mini-buses, buses, cargos and articulator trucks. Table 1, shows the categories of cars counted during the exercise and the corresponding number of people wearing seatbelt in each category.

It could be seen from figure 1, that the worst offenders of the law are the occupants of articulator trucks, follow by cargo, taxi drivers and pickup/private drivers. 73 and 67 % of this drivers are bus and minibus drivers. This is as a result of the fact that most of these buses counted belong to third party Transport Company working for some of the mining companies in the municipality, these companies have strict policy governing the use seatbelt on their premises and this could reflect in the increase wearing rate in bus drivers and their front seat passengers, also the mini-buses (trotro) that ply long distances put on their seatbelt for the fear of the police on the road.

### **Analysis from the Questionnaire.**

One hundred and fifty questionnaires were administered and the figure 2. Gives clear presentation of the usage of seatbelt from the survey.

### **Analysis from the Interview**

About 150 people were interviewed at random and these include drivers, passengers and other road users, the following were the reasons given for not wearing seatbelt. Discomfort, intermittent stoppage, irrelevant of seatbelts, dirty seatbelts, restriction of movement by the belt, unavailability of seatbelt, pain and forgetfulness and lack of education on usage. Figure 3, gives the percentage of the interviewees and their responses to the reasons for not wearing seatbelt.

Furthermore, respondents were asked of their opinion on the importance of wearing seatbelt and their views are depicted in table 2.

It could be seen from Table 2 that whilst only 3.33% of the respondents disagreed to the importance of wearing of seatbelt, 73.33% and 83.33% agreed to injury severity reduction and compulsory usage of seatbelts respectively.

### **Discussion**

The results from this study reveal that seatbelts wearing rate in Tarkwa Nsuaem Metropolitan is 46 percent. It was observed that most of the bus drivers in the metropolitan are employees of third party transport companies working for some of the mining companies in the catchment area. These mining companies have stringent rules governing the use of seatbelts on their premises for all their workers including those on contract, and that failure of any driver to wear seatbelt could result in the transport company losing its contract with the mining company.

Also the mining companies provide in-service training for all drivers including the third party drivers, all these factors motivate the drivers of buses to the use of their seatbelt. It was also detected that the drivers of mini-buses (trotro) who ply their trade outside the metropolitan and their front seat passengers are challenged to use the seatbelts because of the presence of the police on the road.

## **CONCLUSIONS AND RECOMMENDATION**

### **Conclusions**

This study shows that overall seatbelt usage in the Tarkwa Nsueam municipality was 46%.

The belt usage rate is in the descending order; buses 73%, mini-buses 67%, pick-up /private cars 45%, taxis 44%, cargo 29% and articulators 17%.

The research also revealed that 96% of all the reasons given for non-usage of seatbelt were human related which could be tackled by a behavioral change.

### **Recommendations**

The authorities responsible for testing all vehicles in the country, the Driver Vehicle and Licensing Authority (DVLA) should ensure that before vehicle pass its road worthiness



examination, especially all vehicles that had undergone a body works, should have all the seatbelt fixed, to merit the issuance of road worthiness certificate.

The police and also the street warders should be empowered to enforce the road traffic law 2004 as enshrine in the constitution concerning the penalty point system, (GHs: 12.00 per penalty) by allowing them to give on the spot fine to all drivers and passengers found not wearing their seatbelt.

Finally, any measure to encourage seatbelt use in the country should be based on Engineering, Enforcement and Education.

### **Limitation**

The study did not take rear seat passengers into consideration in the sense that most cars in the country did not have rear seatbelt installed in them. There are so many reasons why some cars in the country do not have seatbelt in them. It was also difficult to have any statistic in the country that shows the correlation between non seatbelt usage and injury severity. It is recommended that another research could look into this phenomenon

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<http://www.medicalnewstoday.com/articles/41499.php>

Table 1

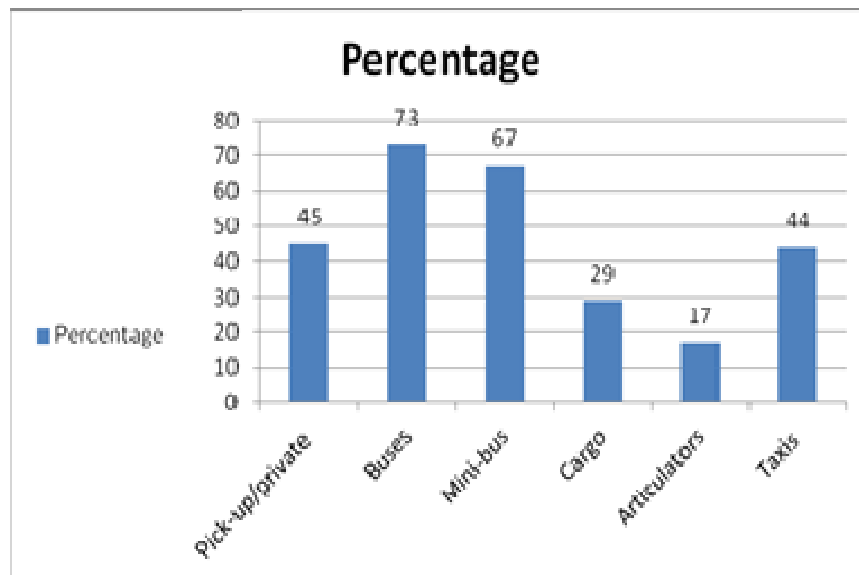
*Category/ type of vehicle and the usage rate of seatbelt by front occupants*

Vehicle type	Number counted	Seatbelt worn
Taxis	1650	715
Pick-up/private	720	325
Buses	550	400
Mini-bus	210	140
Cargo	225	65
Articulators	320	52
Total	3675	1670

Table 2

*Respondents Views on Importance of Wearing Seatbelt*

ViewQuestion	Agree	Indifferent	Disagree	Total Frequency
wearing of seatbelt is important	65	10	5	150
seatbelt can reduce injury severity	30	22	18	150
use of seatbelt should be made compulsory	15	10	15	150



*Figure1. Percentage of Seatbelt Usage in the Various Vehicles*

# **A PROPOSED REASERCH FRAMEWORK:**

## **EFFECTIVENESS OF INTERNAL CONTROL SYSTEM IN STATE COMMERCIAL BANKS IN SRI LANKA**

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### **BACKGROUND**

The internal control system is the major part in any organization. “Internal control is the process designed and affected by those charged with governance, management and other personnel to provide reasonable assurance about achievement of entity’s objectives with regard to reliability of financial reporting, effectiveness and efficiency of operations and compliance with applicable laws and regulations. It follows that internal control is designed and implemented to address identified business risks that threaten the achievement of any of these objectives.” (Sri Lanka Auditing Standard 315, ICASL)

According to Basu (2006), Millichamp, (1987, 1996), The Institute of Chartered Accountants of England and Wales (ICAEW), “internal Control system is the whole system of controls, financial or otherwise, established by the management in order to carry on the business of the enterprise in orderly and efficient manner, ensure adherence to management policies, safe guard assets and secure as far as possible the completeness and accuracy of records”. It comprises of following components (COSO 2002):

- The control environment
- The entity’s risk assessment process
- The information and communication system,
- Control activities
- Monitoring

Banking sector is unique sector in the economy. It provides different kind of services to the customers and handles massive volume of funds daily. All activities in the economy depend on the strength and stability of the banking sector. Due to these facts the necessity of internal control system in the banks cannot undermine. The basis of safe and sound banking system the effective internal controls are so important. A system of tough internal controls can support to ensure that the goals and objectives of banks will be met, that the bank will help to attain long-term profitability targets, and maintain reliable financial and managerial reporting. Such a system can also help to ensure that the bank will comply with laws and regulations as well as policies, plans, internal rules and procedures and decrease the risk of unexpected losses or damage to the bank’s reputation. This help bank’s Board of directors and management to safeguard the bank’s resources, produce reliable financial reports and comply with laws and regulations. Meantime it supports to reduce possibilities of substantial errors and irregularities and assists in their timely detection when they do occur. Also this control system may discover mistakes

caused by personal distraction, carelessness, error in judgment or unclear instructions in addition to frauds or deliberate noncompliance with policies.

<http://www.medwelljournals.com/fulltext/?doi=pjssci.2009.181.189> accessed on 28.02.2012

Therefore the bank staff must have proper knowledge on its internal control and be consistently applied too. As emphasized by Tandon, Sudharsanam, Sundharabahu 2007, these controls include division of work, job rotation, authority levels, separation custody and recording and accounting controls. Bank's size and the complexity of its operations and its risks profile will be affected for the formality of any control system.

In the past decade, internal control failures were the reason for the most explosive accounting scandals of the world.( Kratz, 2008 ) The Enron is the best example in the United States. Before Enron collapse in 2001, the company stated earnings of \$200 million and according to the stock market was worth billions of dollars. Conversely, the stock price of Enron was driven up by fraudulent accounting practices and earnings management.( Kratz, 2008) End of the similar year, it declared that it had overstated its earnings over the last four years and owed about \$6 billion to its lenders. Many of investors lost their money, employees lost their jobs and even employee's pensions evaporated after the collapse because the company's pension scheme had invested in its own shares. ( Kratz, 2008)

WorldCom, America's previous telecommunications giant confirmed accounting fraud in 2002. Hiding bad debt, understating costs, and backdating contracts were only certain offences on its list of frauds.

The communications service company, Global Crossing was also guilty with respect to earnings inflation. As the Enron circumstances, the Global Crossing fiasco finished up in big losses for investors and in missing retirement savings on the part of company employees.

Earthwit, 2010 highlights that top ten frauds of the world as Enron (America), WorldCom (America), Bank of Credit and Commerce International (United Kingdom) , Suprime Mortgage ( America), Bernie Madoff (America), American International Group ( America), Barlow Clowes ( United Kingdom), Fannie Mae & Freddie Mac ( America), Daewoo Group (South Korea) and Satyam Computers (India) respectively. (<http://toptaps.com/> top 10 frauds of corporate world, accessed on 19.07.2013)

Though, those companies encountered of the frauds indeed they might have, internal audit and external audit and other relevant controlling systems. Unfortunately, no one able to disclosure the real situation in those firms till their bankrupt. So there is a problem with existing controlling systems or using them in the organizations.

In Sri Lankan economy there is well established banking system and it includes more than thirty local and foreign banks. [http://www.apbsrilanka.org/general/05\\_banks\\_in\\_sri\\_lanka.html](http://www.apbsrilanka.org/general/05_banks_in_sri_lanka.html). So over thousands bank branches function all over the country. But time to time there are some incidences relates to the frauds, mismanagement and corruptions in this banking sector too.

Daily mirror, E paper, on 6<sup>th</sup> February 2013 released that in connection with the foreign credit cards withdrawals Rs. 263 million frauds has found in a state bank in Sri Lanka and 14 suspects were charged.

Also Peoples bank annual report 2011 highlights their operational losses for the year. Out of them, 10% are internal frauds and 90% are external frauds which have been beyond the bank's control. The report further states that they able to reduce their internal frauds up to 10% because of their rigid internal control and monitoring system.

KPMG audit firm has conducted the fraud survey analysis in 2011/2012 in Sri Lanka and they have revealed that 89 percent of respondents representing public sector institutions encountered fraud while respondents from the private sector reported an incidence of 64 percent. Further they highlighted that overall five out of six incidents of frauds were perpetrated by internal parties and Rs. 122 mn fraud

committed in the financial services sector. They reported subdivisions of frauds in financial services sector as bribery and corruption, information technology related frauds, regulatory noncompliance, theft of funds and goods, and financial statement frauds and they provided those as 26 percent, 7 percent, 19 percent, 39 percent, and 9 percent respectively.(kpmg.com/lk accessed on 25.11.2012)

It is indubitable that without having proper internal control system and practicing the same, the organizations face numerous problems and risks. If the situation continues it will lead to disputes for company's growth, image, employees and customers' dissatisfaction and employees' welfare, loss of investors, insolvency and finally it leads the problems to the government.

The studies on evaluating the effectiveness of internal control systems in Sri Lankan context are limited. Thus, doing a study is timely important for finding the smooth practice of the internal control system in the state commercial banks which play the major role in Sri Lankan economy with the purpose of avoiding the similar situation as mentioned earlier.

### **1. PROBLEM STATEMENT**

In the context of above background, the presence of effective internal control system and their use is very vital to state commercial banks which engaged in broader financial, economic and social roles. No any argument that every bank must have the strong internal control system in practice. Accordingly, it is required to examine that **“Whether or not the established internal control systems are effective and are they being effectively practiced in State Commercial Banks?”**

### **2. RESEARCH OBJECTIVES**

The main objective of this study is to evaluate the effectiveness of internal control system in Sri Lankan State Commercial Banks.

Therefore the study intends to:

1. To examine the nature and structure of internal control systems in the State Commercial Banks.
2. To determine the relationship between the internal control components and the effectiveness of internal control system in State Commercial Banks.
3. To investigate the types of frauds in the State Commercial Banks.
4. To identify the factors those contribute to the incidences of frauds in State Commercial Banks.
5. To identify the strategies can take to eliminate frauds in State Commercial Banks.

**Therefore, the following research questions are intended to be raised;**

1. What are the factors affecting to the internal control system in use in state commercial banks in Sri Lanka?
2. What is the relationship between the internal control components and the effectiveness of internal control system in state commercial banks?
3. What types of frauds occur in the State Commercial Banks?
4. Which factors contribute to the incidences of frauds in State Commercial Banks?
5. What kinds of strategies can take to eliminate frauds in State Commercial Banks?

### **3. SIGNIFICANCE OF THE STUDY**

The motivation of the research work is to evaluate the effectiveness of the internal control systems. The outcomes of the study will support the state commercial banks to put in place activities for their day to

day management of safeguarding assets, prevention and detection of frauds, errors and irregularities. Also, it is hoped that findings from this study will confirm or refute the present perception about the effectiveness of internal control in state commercial banks. This will provide the company to redefine approaches that would facilitate the success of state commercial banks objectives. So the findings of the study will support identify gaps in the systems of internal control in the state commercial banks. . The study will also enhance the existing knowledge bank concerning internal controls and its effectiveness.

Also research studies and text books on internal controls are not comprehensive. So this study will be a valuable reading material for students and researchers and also help as a manual to managers of banks as well as other business organizations.

#### **4. SCOPE OF THE STUDY**

This research will emphasis on the effectiveness internal control systems in state commercial banks. The two state commercial banks namely Bank of Ceylon and Peoples Bank are considered in the study and the research however focused on North Central Provinces and North Western Province particularly 64 branches due to the enormous size of the banking sector

#### **5. LITERATURE REVIEW**

##### **6.1 INTERNAL CONTROL COMPONENTS**

Those internal control components can be described as follows:

###### **5.1.1 Control Environment**

Ofori (2011), Douglas (2011), Millichamp (2002), Amudo & Inanga (2009, <http://www.newpaltz.edu/internalcontrols/> accessed on 10.12.2012, Whittington & Pany (2001), Messier (1997), Sri Lanka Auditing Standards (2013, 315) have mentioned that Control environment is the attitude toward internal control and control consciousness established and maintained by the management and the employees of an organization. It may be viewed as the foundation for other components of internal control providing discipline and structure. Millichamp (2002) describes control environment as the overall attitude, awareness and actions of directors and management regarding internal controls and their importance in the entity. Seven factors affecting the control environment include management's philosophy and operating style, integrity and ethical values, a commitment to the competence, board of directors or audit committee, organizational structure, assignment of authority and responsibility and human resource policies and practices respectively.

###### **5.1.2 Risk Assessment**

The second major component of internal control is risk assessment. Risks are the happenings that threaten the achievement of objectives. They finally affect an organization's ability to achieve its mission. Risk assessment is the process of detecting, assessing and determining how to succeed these things. There are both internal and external risks that could prevent the achievement of established objectives at the every level in an organization. Therefore, management should take necessary actions to prevent these risks. But, sometimes management cannot avoid the risk from occurring. In these situations, management should determine whether to accept the risk, reduce it up to the acceptable levels, or avoid. So management should ensure each risk is assessed and handled properly to achieve its objectives.

(Douglas (2011), <http://www.newpaltz.edu/internalcontrols/> accessed on 10.12.2012, Ofori (2011), Messier (1997), Whittington & Pany (2001),)

### **5.1.3 Information and Communication System**

Information and Communication focuses on the nature and quality of information needed for effective control that the systems use to develop such information, and reports necessary to communicate it effectively. Information is needed at all levels of organization to assist management in meeting the organization's objectives. The information is used by inside parties as well as outside parties. This information should be communicated from top to bottom level that needs it in a form and within a time frame that helps them to carry out their responsibilities. Communication also use by outside parties such as customers, suppliers and regulators. Information about an organization's plans, control environment, risks, control activities, and performance must be communicated up, down, and across an organization. Reliable and relevant information from both internal and external sources must be identified, captured, processed, and communicated to the people who need it in a form and timeframe that are useful.

The literature highlighted those benefits of relevant, timely and effective internal and external communication.

- ❖ Improved communication about expectation, responsibilities and objectives of an organization.
- ❖ Enhanced decision making
- ❖ Reduced dependence on individual employees who assist in the prevention and detection of frauds.

(Douglas (2011), <http://www.newpaltz.edu/internalcontrols/> accessed on 10.12.2012, Ofori 2011, Messier (1997), Whittington & Pany (2001))

### **5.1.4 Control Activities**

Control activities are tools - both manual and automated - that help prevent or reduce the risks that can impede accomplishment of the organization's objectives and mission. Management should establish control activities to effectively and efficiently accomplish the organization's objectives and mission. Messier (1997) noted that control activities are the policies and procedures that help ensure that necessary actions are taken to address the risks involved in the achievement of the entity's objectives. Accordingly the control activities that are relevant to the audit include:

- ❖ Performance review
- ❖ Information processing
- ❖ Physical control
- ❖ Segregation of duties.

Amudo & Inanga (2009) viewed that authorization, segregation of duties, verification before making the payments, control over access to resources, reconciliation, review operations and supervision as the control activities in any organization.

Management should establish control activities that are effective and efficient. According to Walker (1999) control activities occur at all levels and functions of the entity. He provided the following as example of control activities:

1. Top level reviews of actual performance,
2. Reviews by management at the functional or activity level,
3. Management of human capital,
4. Controls over information processing,
5. Physical control over vulnerable assets,
6. Establishment and review of performance measures and indicators,
7. Segregation of duties,
8. Proper execution of transaction and events,
9. Accurate and timely recording of transactions and events,
10. Access restrictions to and accountability for resources and records, and
11. Appropriate documentation of transactions

(Douglas (2011), <http://www.newpaltz.edu/internalcontrols/> accessed on 10.12.2012, Ofori (2011), Messier (1997), Whittington & Pany (2001))

### **5.1.5 Monitoring**

Internal control system and application of controls change overtime. This can be due to the arrival of new personnel, varying effectiveness of implementing the procedures or supervision, time and resource constraints or changes in the circumstances for which the internal control system originally was designed. Thus the management needs to determine and observe whether the internal control system continues to be relevant and effective in the entity as intended.

The purpose of monitoring is to determine whether internal control is adequately designed, properly executed, and effective. Internal control is adequately designed and properly executed if all five internal control components (Control Environment, Risk Assessment, Control Activities, Information and Communication, and Monitoring) are present and functioning as designed.(Ofori 2011)

Monitoring, the last component of internal control, is a process that assess the quality of internal control over time. Also monitoring is the evaluation of an organization's events and transactions to gauge the quality of performance throughout the period and to decide whether controls are effective. Management should emphasis monitoring efforts on internal control and accomplishes the organization objectives. It is important to monitor internal control to determine whether it is operating as intended and whether any modifications are necessary. All employees need to understand the organization's mission, objectives, and responsibilities and risk tolerance levels for monitoring to be most effective. Simmons (1995) Monitoring can be done through on going activities or separate evaluations.



Ongoing monitoring activities include regularly performed supervisory and management activities such as continuous monitoring of customer complaints or reviewing the reasonableness of management reports. Separate evaluations are monitoring activities that are performed on non-routing basis such as periodic audits by internal auditors.

In evaluating the extent to which the effectiveness of internal control is monitored, the following criteria in ongoing monitoring activities, separate evaluations and reporting deficiencies should be considered. (COSO 1994)

- ❖ Ongoing monitoring
  - Extent to which personnel, in carrying out their regular activities, obtain evidence as to whether the system of internal control continues to function;
  - Corroboration of the communication from external parties with internally generated information;
  - Periodic comparison of amounts recorded by the accounting system with existing assets and liabilities;
  - Feedback to management whether controls operate effectively;
  - Effectiveness of internal audit activities
- ❖ Separate evaluation
  - Scope and frequency of separate evaluation of internal control
  - Appropriateness and logicity of evaluation process and methodology
  - Appropriateness of the level of documentation
- ❖ Reporting deficiency
  - Existing of the mechanism for capturing and reporting identified internal control deficiencies;
  - Appropriateness of reporting protocols and follow up actions

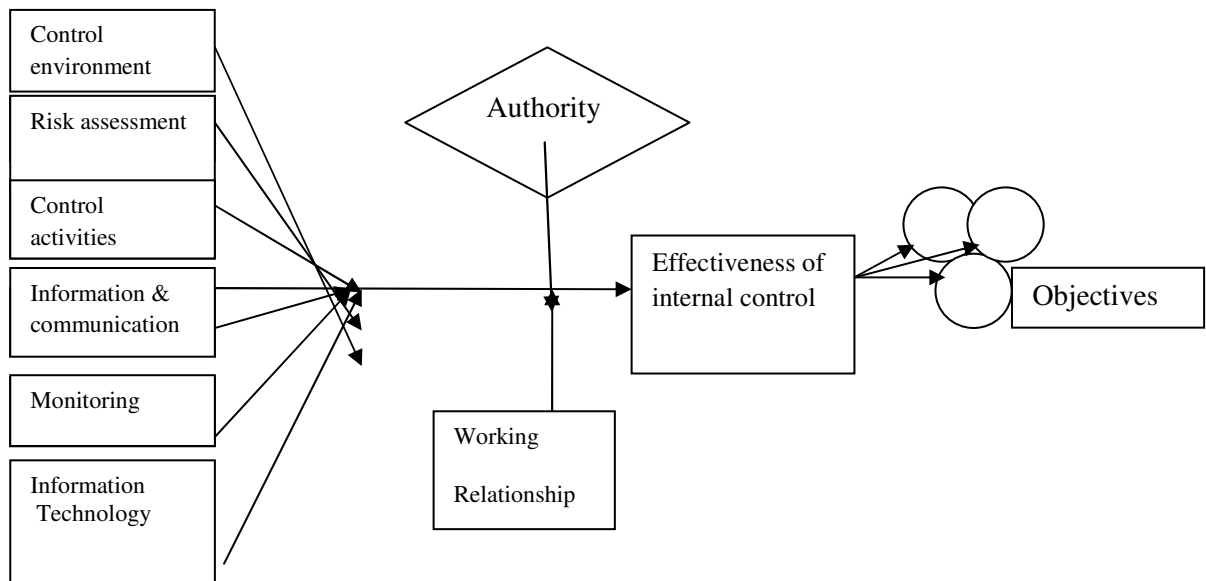
Monitoring includes management's methods for following up and checking on performance to ensure that controls are complied with. With monitoring component the internal control has made a circle and monitoring activity help to improve control activities, information systems as well as overall control environment.

(<http://www.newpaltz.edu/internalcontrols/> on 03.07.2012, Messier (1997), Whittington & Pany (2001), Douglas (2011), Simmon (1995), Ofori (2011))

## 6. Empirical Studies

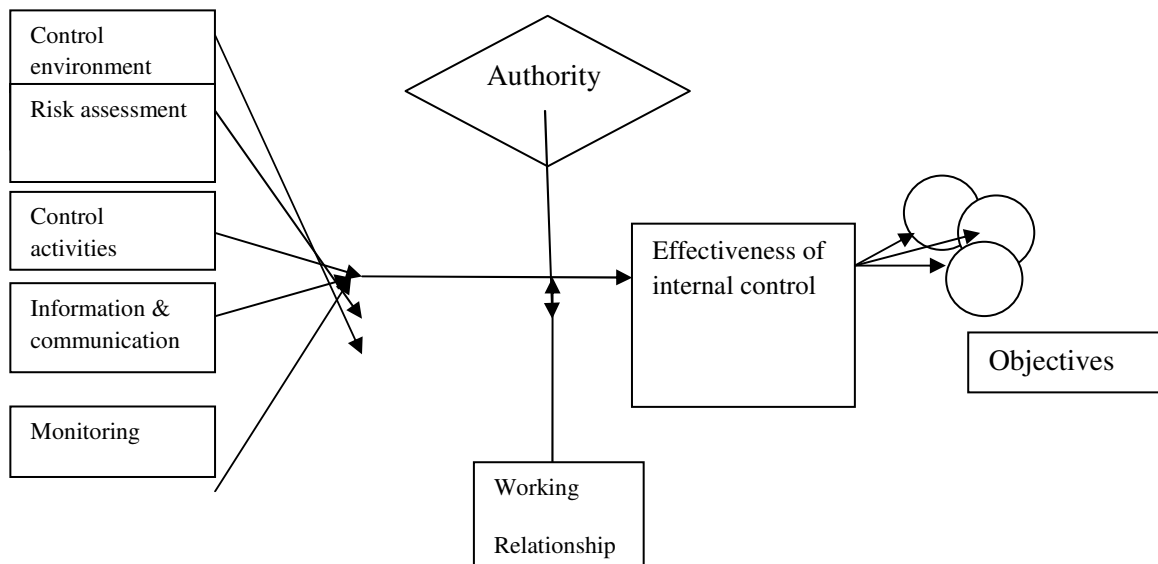
Angella Amudo & Eno L. Inanga has done a study on Evaluation of Internal Control Systems: A Case Study from Uganda in 2009, this study is based on the Regional Member Countries (RMCs) of the African Development Bank Group (AFDB) focusing on Uganda in East Africa and developed a conceptual model used in evaluating the internal control systems in Public Sector Projects in Uganda financed by the African Development Bank. The results found that some control components of effective internal control systems are lacking in these projects. These reason out that the current control structures ineffective. The study identified internal control components as independent variables, internal control as dependent variable, authority and working relationship as moderating variables. The independent variables determine the effectiveness of an internal control system. The presence and proper functioning of all the components of the independent variables ensures effectiveness of internal control system. The model shows as figure 1.

Figure 1  
Model 1



In 2011, the same model as mentioned above, used by Sultana and Haque for their research on Evaluation of Internal Control Structure: Evidence from Six Listed Banks in Bangladesh. They have evaluated effectiveness of the established internal control systems in listed banks in Bangladesh. But in this research they have omitted one independent component used by previous study, it is information technology. The result indicates that almost all the banks in the sample achieved most of components of internal control. But some of banks have lacking about some of the control components. This shows that more or less the current internal control structure is effective for all the sample banks used in the study. The model used by Sultana and Haque presents in figure 2.

Figure 2  
Model 2



**Fadzil , Haron & Jantan (nd)** has done a study to achieve two objectives to determine whether the internal audit department of the companies listed in the Bursa Malaysia complies with the Standards for the Professional Practice of Internal Auditors IIA (2000); and, to determine whether compliance to SPPIA will affect the quality of the internal control system of the company.

The study evaluated the Internal Auditing Practices as independent variables and Quality of Internal Control System as dependent variable. As the quality of internal control system they focused on control environment, risk assessment, information & communication system, control activities and monitoring. It was found that management of internal audit department, professional proficiency, objectivity and review significantly influence the monitoring aspect of the internal control system. Scope of work and performance of audit work significantly influences the information and communication aspect of the internal control system while performance of audit work, professional proficiency and objectivity significantly influence the control environment aspect of the internal control system. The study also shows that management of internal audit department, performance of audit work, audit program and audit reporting significantly influences the risk assessment aspect of the internal control system. Lastly, performance of audit work and audit reporting significantly influences the control activities aspect of the internal control system. This highlights in figure 3

Figure 3  
Model 3



William & Kwasi in 2013 have done research on the significance of internal control in the rural banking sector, they wanted to examine whether effective internal control system is adopted by the bank in the Eastern Region of Ghana. The population for this study includes internal auditors, management, account personnel, and other staff in the bank. The employees at senior level, middle levels and lower levels were included in the study too. The study concluded that the internal control systems assist management and auditors in executing their duties, The internal controls are established by management by adopting policies and procedures with each system of control having specific functions to perform, The computers should be provided with passwords to provide security for the in formations of the bank to prevent fraudulent acts, Auditors should employ professional judgment to asses and design audit risk procedures in other in other to minimize audit risks, Substantive test should be used by auditors to appraise the performance of internal accounting controls and identified weaknesses communicated. The figure 4 shows the model developed for the study.

Figure 4

Model 4

**Internal control System** —————→ **Achievement of company objectives**

- |                              |   |
|------------------------------|---|
| *Management Control          | *Conduct business an orderly and efficient manner   |
| *Internal Accounting Control | *Safeguarding of asserts  |
| *Internal audit              | * Prevention and detection of fraud and error   |
|                              | * Accuracy and completeness of accounting records and timely preparation of reliable financial information. |

Karagiogos, Drogalas, Dimou have studies the Effectiveness of Internal Control System in the Greek Bank Sector. The objective of the study is to highlight the interaction between components of internal control and effectiveness of internal auditing. They have considered control environment, risk assessment, information and communication system, control activities and monitoring as internal control components and independent variables. The effectiveness of internal auditing used as the dependent variable. The results indicated that all components of internal control is vital in the effectiveness of internal audit and consequently in the business survival and success. The figure 5 elaborates the link between internal control and internal audit.

Figure 5

Model 5

**Internal control** —————→ **Effectiveness of internal audit**

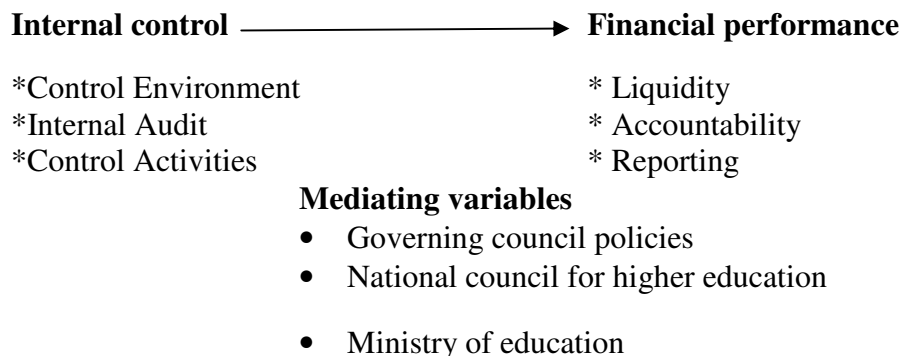
- \* Control environment
- \* Risk assessment
- \* Information and communication system
- \* Control activities
- \* Monitoring

In 2008 Mawanda examined the Effects of Internal control on financial performance in an institution of higher learning in Uganda. The objective was to establish the relationship between internal control system and financial performance in an institution of higher learning in Uganda. Internal controls

focused from the viewpoint of Control Environment, Internal Audit and Control Activities while Financial performance looked at Liquidity, Accountability and Reporting.

The study found that management of the higher learning institution is committed to the internal control systems, actively participates in monitoring and supervision. All the activities of the Institution are initiated by the top level management. However the internal audit department is not efficient, is understaffed, doesn't conduct regular audit activities and doesn't produce regular audit reports. The study also found that there is lack of information sharing and inadequate security measures to safeguard the assets of the University. The study established a significant relationship between internal control system and financial performance. The conceptual model developed can be presented in the figure 6.

Figure 6  
Model 6



The research is done by Olatunji in 2009, the objective of the study is to determine the impact of internal control on the overall management of Nigerian banks. Fifty branches of Wema bank PLC selected as sample of the study and descriptive and inferential statistical methods used to analyze the gathered data. Two hypotheses were tested to determine the correlation between frauds and internal control system and it concluded that the management of bank should establish and practice the sound internal control system to avoid the frauds. It also recommended to function adequate internal control system, effective internal audit department, proper attention for cash, attractive pay packagers, good management and formulation of good personnel and recruitment policies.

The study on evaluation of internal control system of banks in Nigeria is done by Charles, in 2011. The study expected to find out that whether the established internal control systems in the bank are sound enough to detect and prevent frauds. Five banks in Nigeria focused for the study. The study concluded that the banks have sound internal control systems as there is positive relation between the presence of internal control system and the effectiveness in the management, the efficiency in the operations, the reliability of the financial and management reporting system ,the compliance by banks in Nigeria with applicable laws and regulations. But most of the internal control staff had complained of lack of promotion, poor welfare and training , function of good corporate governance by these banks is not yet at its best, they can still do better.

Onumah, Kuipo, Obeng, investigated the effectiveness of internal control of listed firms in Ghana. Due to the recent financial reporting scandals the regulations push to concern about the internal control

system to improve the quality of financial reporting. 33 listed companies considered as the sample. They also have considered the five components of internal control system. The found that control environment showed a higher level of effectiveness rather than other components.

Salehi, Shiri, 2013 done a study to examine the effectiveness of internal control in Iranian banking sector. The study found that the internal control is highly efficient in banking sector to prevent and detect incidents of frauds and errors.

The study done by Douglas, 2011 is to assess the extent of failures caused by humans to internal control system and effectiveness of internal control system in risk management in bank. The study considered the control environment, risk assessment, information and communication system, control activities and monitoring to evaluate the internal control effectiveness in the bank. The population was banks in the Ashanti Region. The research used Ecobank Ghana Limited Ashanti Region as the case study. The study found that there are internal control system in Eco bank in Ghana but there monitoring is less effective. So, recommended to establish internal audit unit in each branch.

The objective of this study done by Noorvee, 2006 is to make suggestions for Estonian companies for improving the effectiveness of their internal control over financial reporting. A questionnaire and interviews used to gather the data and control environment, risk assessment, information and communication system, control activities and monitoring considered as internal control components. The study found that though the companies follow internal control systems, a number of internal control criteria are missing. Therefore the management should consider improving those in near future.

Ofori in 2011 conducted a study to determine the effectiveness of the internal control systems in Ghana Post Company. It is case study type research. Staff of the Ghana Post Company was the population. He also considered control environment, risk assessment, information and communication system, control activities and monitoring considered as internal control components. Finally, it is concluded that all five components in internal control system are not very strong but rather satisfactory. Further, revealed that there was no internal audit unit to monitor the activities independently.

## **7. Conceptual Framework**

The following figure 7 shows the conceptual framework which presenting the relationship between independent and dependent variables for the present study. The effectiveness of internal control system is the dependent variable. Control environment, risk assessment, information and communication system, control activities and monitoring as independent variables. The dependent variable is achieved by the presence and proper functioning of all the prescribed independent variables in relation to each category of the organization's objectives.

The same dependent and independent variables used by Amudo & Inanga (2009) to examine the internal control practice in African Development Bank Group. Also Sultana and Haque (2011) have used same dependent variable and independent variables for their study on evaluating the internal control structure of six listed bank in Bangladesh. Meantime, though, both of above mentioned studies have used authority and working relationship as moderating variables, the study do not consider them as the study will become more complex.

Fadzil , Haron & Jantan (ND) have considered five components of internal control system such as control environment, risk assessment, information and communication system, control activities and

monitoring as dependent variables to evaluate the relationship between internal auditing practices and the quality of internal control system.

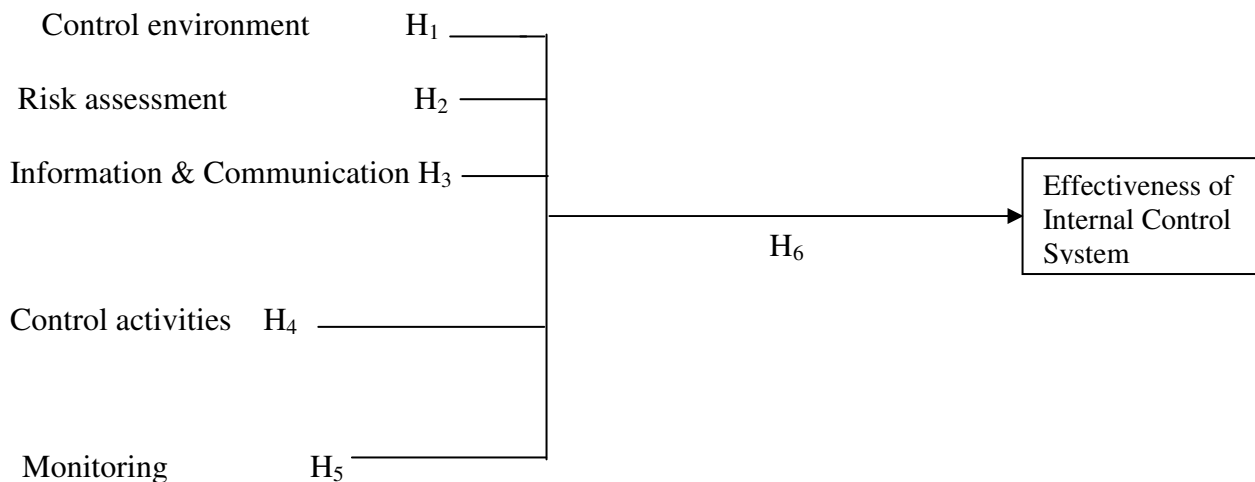
A study on effectiveness of internal control system in the Greek Bank sector done by Karagiogos, Drogalas, Dimou (ND), to assess the link between internal control and internal audit, they also have taken account internal control components; control environment, risk assessment, information and communication system, control activities and monitoring as independent variables and effectiveness of internal audit as dependent variable.

In 2008, Mawanda's study considered control environment, control activities and internal audit as independent variables too.

Therefore, when evaluating the effectiveness of internal control system of the organization the five components must be present.

Based on the above literature, a conceptual framework for this study has developed to achieve the objectives that given in the chapter one as follow;

**Figure 7**  
**Conceptual framework**



The study involves investigation of whether internal control systems are effective in the State banks in Sri Lanka. Two state commercial banks will fall under the population of the study.

## **8. Hypotheses**

Six hypotheses derived as follows:

H<sub>1</sub> – The control environment enhances Effectiveness of internal control system in the State commercial banks

H<sub>2</sub> –The entity's risk assessment process enhances Effectiveness of internal control system in the State commercial banks.

H<sub>3</sub> - The communication system enhances Effectiveness of internal control system in the State commercial banks.

H<sub>4</sub> – The control activities enhances Effectiveness of internal control system in the State commercial banks

H<sub>5</sub> - The monitoring controls enhances Effectiveness of internal control system in the State commercial banks

H<sub>6</sub> – There is positive relationship between internal control components and effectiveness of internal control system

## 9. Operationalization

The table 1 presents the details of variables, definitions and measurements.

Table 1 Details of variables

Variables	Working Definitions	Measurements
<b>The Control Environment</b> <b>Independent variable</b> ( Ofori (2011), Douglas (2011), Millichamp (2002), Amudo & Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington & Pany (2001), Messier (1997), SLAuS 315)	The control environment includes the attitudes, awareness, and actions of management and those charged with governance concerning the entity's internal control and its importance in the entity.	Management philosophy & operational style, Integrity & ethical values, A commitment to competence, Participation of board of directors or audit committee, Organizational structure, Assignment of authority & responsibilities, Human resource policies and practices.
<b>The entity's risk assessment process</b> <b>Independent variable</b> (Ofori (2011), Douglas (2011), Millichamp (2002), Amudo & Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington & Pany (2001), Messier (1997), SLAuS 315)	An entity's risk assessment process is its process for identifying and responding to business risks and the results thereof.	Changes in operating environment, New personnel, Rapid growth, New lines, product & activities, Corporate restructuring, Foreign operation, Accounting pronouncements.
<b>The Information &amp; communication systems</b> <b>Independent variable</b>	An information system consists of infrastructure (physical and hardware components), software, people,	Information needs, information control, management communication, upstream communication,



<p>Amudo &amp; Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington &amp; Pany (2001), Messier (1997), SLAuS 315)</p>	<p>procedures, and data. Infrastructure and software will be absent, or have less significance, in systems that are exclusively or primarily manual. Many information systems make extensive use of information technology (IT).</p>	<p>communication with outside parties, data base contents, introducing new systems, data input process and output, storage and backup.</p>
<p><b>Control activities</b> <b>Independent variable</b></p> <p>(Ofori (2011), Douglas (2011), Millichamp (2002), Amudo &amp; Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington &amp; Pany (2001), Messier (1997), SLAuS 315)</p>	<p>Control activities are the policies and procedures that help ensure that management directives are carried out, for example, that necessary actions are taken to address risks that threaten the achievement of the entity's objectives.</p>	<p>Performance review, Information processing, Physical control, Segregation of duties, Authorization procedures, Independent check, Adequate documentation, Job rotation, compulsory leave.</p>
<p><b>Monitoring</b> <b>Independent variable</b></p> <p>(Ofori (2011), Douglas (2011), Millichamp (2002), Amudo &amp; Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington &amp; Pany (2001), Messier (1997), SLAuS 315)</p>	<p>An important management responsibility is to establish and maintain internal control on an ongoing basis.</p>	<p>On- going supervision, internal audit</p>
<p><b>Effectiveness of Internal Control system</b> <b>Dependent variable</b></p> <p>(Ofori (2011), Douglas (2011), Millichamp (2002), Amudo &amp; Inanga (2009, <a href="http://www.newpaltz.edu/internalcontrols/">http://www.newpaltz.edu/internalcontrols/</a> accessed on 10.12.2012, Whittington &amp; Pany (2001), Messier (1997) SLAuS 315)</p>		<p>Efficient and effective operations, reliability of financial reporting, compliance with rules and regulations</p>

## 10. METHODOLOGY IN BRIEF

### 10.1 Population

According to Mason et al. (1997), the population of a study is the collection of all possible individuals, objects or measurements of interest.

For this study, there are two state commercial banks namely Bank of Ceylon (BOC) and Peoples Bank (PB) which have established 303 and 343 branches respectively (total 646) throughout the country.

Based on BOC bank's circulars it has classified its branches in to five categories according to the branches' business volume. The below table 2 presents details of classification, number of branches and selection criteria.

Table 2  
Details of BOC branches

Classification	Number of branches	Business volume (RS. Millions)
Super Grade I	17	3000 above
Super Grade II	28	2000<3000
Grade A	79	1500<2000
Grade B	73	1000<1500
Grade C	106	700>
Total	303	

(Source: Author compiled)

Whereas, PB has classified its branches based on the bank's circular on deposits, loan and advances and profitability etc. The table 3 shows details of classification and number of branches. (Bank Circular 2013)

Table 3  
Details PB branches

Classification	Number of branches
Grade A	49
Grade B	65
Grade C	154
Grade D	43
Grade E	22
Total	343

(Source : Author compiled)

But due to the time and other resource factors, the study will consider only North Central Province (NCP) and North Western Province (NWP). The number of the branches of BOC and PB banks located in NCP and NWP shows in table 4.

**Table 4**  
**Number of branches in NCP and NWP**

	BOC	PB	Total
<b>North Central Province (NCP)</b>	29	27	56
<b>North Western Province (NWP)</b>	35	32	67
<b>Total</b>	64	59	<b>123</b>

Therefore, this study considers State commercial bank branches of BOC and PB located in NCP and NWP, 64 BOC branches and 59 PB branches as the population. Totaling 123 branches. (Source: PB-web branch net- work, BOC – Diary 2013)

## **11.2 Sample**

The study will select grade A & B branches of BOC and grade C & D branches of PB, because other categories of branches line up in either higher or lower extremes in relation to internal control mechanism. Therefore the selected branches can be identified as medium level functioning branches as well as the branches which have moderate operations of internal control system . Meantime, those branches are located more than 150km far away from the Head offices in Colombo and this can lead to pay less attention by head office for the branches’ internal control operations.

So the study will consider the bank branches spread over NCP and NWP as well as grade A and B branches of BOC and grade C and D branches of PB. Then, the sample comprises 36 branches of BOC and 28 branches of PB totaling 64 branches. The sample comprises 52% of the population. ( $64/123 \times 100 = 52\%$ )

## **11.3 Time frame of data :**

The data will be obtained for the year 2015

## **11.4 Data gathering**

In this particular study both primary and secondary data will be used.

### **11.4.1 Primary Data**

The researcher will use several tools to collect the primary data. Basically they are questionnaire and structured interview. The survey mainly will conduct using questionnaire. The questionnaires will be administered on managers and secondary officer of the each bank branches. Approximately 128 ( $64 \times 2 = 128$ ) respondents will be included the study. Interview also will conduct in collecting some of the data.

#### **11.4.2 Secondary Data**

Review of the relevant literature includes newspapers, professional accounting and auditing journals, magazines, internet reports and relevant text books etc.

#### **11.5 Reliability and Validity**

Cronbach's Alpha formula will be used to measure the reliability of the questionnaire.

#### **11.6 Analysis of Data**

Collected data will be analyzed through descriptive and inferential statistical techniques using Statistical Package for Social Sciences (SPSS) software package and interpretative explanations.

(a) Descriptive statistics: Mean, Median, Mode, Percentages etc.

(b) Inferential statistics: Correlation & Regression

#### **12. Limitations of the study**

Although there are a lot of bank branches in operation in Sri Lanka at present, it will be very hard to attempt cover all these bank branches. Time and financial limitations tended to narrow down the extent and depth of this study. Therefore, the study focused only two state commercial banks and 64 branches mainly locate in two provinces out of nine provinces in Sri Lanka.

It is expected however, that the results on the sample will offer approximate conclusions on the State commercial banks in Sri Lanka and will therefore, apply and be generalized.

#### **13. Organization of the study**

The study is structured in to five chapters. Chapter one, introduction contains background of the study, the problem statement, research question, objectives of the research, the significant of the study, the profile of state commercial banks, scope, methodology in brief and the limitation of the study. Chapter two is the literature review which includes the definitions of internal control, internal controls objectives, types of internal controls, components of internal control, types of internal controls, internal control limitations and empirical studies relevant to the research. Chapter three dealt with the conceptual framework, variables, hypothesis, operationalization, research design, population under study, sampling techniques, sources of data, research instruments and method of data analysis. Chapter four focuses on data presentation and data analysis. Chapter five the last is about the summary of findings, conclusion and recommendations.

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