

1 **An Analysis of Human Survival Strategies in Difficult Environments. A Case**  
2 **Study of the Kom Highlands in Cameroon**

3

4 **Abstract**

5 Mountainous regions and other difficult terrains, the world over, present significant challenges to  
6 communities as they strive to carry out their daily activities. In spite of these difficulties,  
7 strategies have been employed by communities to cope with such difficulties, yielding diverse  
8 outcomes. The extent and outcomes of survival strategies employed by communities, still beg for  
9 scientific and policy edification, in the context of the Western Highlands of Cameroon. This  
10 paper contributes to bridge the knowledge gap, by examining the survival strategies employed by  
11 locals in the Kom Highlands to affront the challenges presented by the harsh physical  
12 environment. 10 key informant interviews were conducted accompanied by a representative  
13 survey of 60 farming household heads, drawn from 5 villages in Fundong. The data were  
14 analyzed using both descriptive and inferential statistical tools, including the Chi-square  
15 analysis. The results reveal that Kom displays a plethora of harsh physical environmental  
16 characteristics, prominent among them are the hilly and difficult terrain, the poor soil quality and  
17 the generally cold weather conditions witnessed here. Faced with these challenges, the  
18 population has employed a number of survival strategies in the agricultural sector, housing and  
19 transport. These strategies are unfortunately inadequate and such inadequacy is accounted for by  
20 their low level of technology, poverty, ignorance and other cultural factors, among others. The  
21 study therefore recommends the need to improve and modernize agriculture through the  
22 provision of fertilizers at subsidized rates to the farming population, the encouragement of  
23 effective slope stabilization and terracing and also for rigorous government intervention in terms  
24 of road and fly over constructions.

25 **Key words:** Difficult environments, Farmers, Livelihood, Kom, Survival,

26 **Introduction**

27 The complex aggregation of land, water, air and all other natural elements comprises the physical  
28 environment which is the home of man. Its composition is so complex and varied that scholars  
29 sometimes argue about the non-existence of an ideal environment for the uttermost thriving of

Comment [VNO1]: Wouldn't 'confront' be a better word here? Think of that!

30 man (Seymour, 2016). A harsh physical environment refers to the difficult aspects/attributes of  
31 the environment that threaten human survival. Better still, it refers to those aspects of climate,  
32 relief, vegetation as well as soils which make life very uncomfortable, miserable and/or  
33 challenging to human beings. It is important to mention that the nature of the challenge imposed  
34 by the physical environment differs from community to community. In the same vein, the level  
35 of adaptation to such harsh environments is dictated among other things, by culture, history and  
36 the level of technological advancement of societies (Slocombe, 1980; Mulihill, 2009).

37  
38 Generally in the world today, many areas portray aspects of harsh physical conditions like  
39 droughts, floods, earthquakes, hurricanes, coastal erosion, landslides and the presence of chains  
40 of highlands and mountains which give the area a difficult nature (Mulihill, 2009). In fact, an  
41 estimated 12% of the world's population lives in mountainous areas which are essentially areas  
42 of difficult topography (Price, 2008). Despite the difficult nature of mountainous landscapes,  
43 they still have something to offer as half of humanity depend on mountain resources especially  
44 water for energy, irrigation and for consumption (Meybeck, M. et al., 2001).

45  
46 Two major themes come to the forefront in the man-land and development discussions. The first  
47 emphasizes the role of the physical environment in structuring human activities. The second  
48 emphasizes the role of culture in structuring the physical environment. Under these headings,  
49 there are literatures of varying degrees of methodological sophistication and theoretical  
50 penetration (Slocombe, 1980; Mulihill, 2009). Both themes, however, rely on a rather stark, and  
51 in some ways, indefensible separation of the natural from the human, of the physical  
52 environment from culture.

53  
54 Laos for example, is a landlocked country dominated by a dense jungle and rugged mountains,  
55 with a vast drainage basin at the center and alluvial plains in the West along the Mekong River.  
56 The inhabitants of Laos have devised survival strategies which they use to cope with these harsh  
57 conditions, ([www.mountainpeople.org](http://www.mountainpeople.org)). In addition, there are other inhabited areas of the world  
58 which are physically very harsh such as the permafrost zones which is inhabited by eskimos;  
59 who live in the permanently frozen areas. These people have devised heat trapping strategies to  
60 keep their body cells functioning in the midst of the very chilly weather conditions. Desert

**Comment [VNO2]:** Use the VANCOUVER STYLE OF IN-TEXT CITATION all through the manuscript (numbering system in which case this citation should be [1]). Also the references should be presented using the Vancouver style as approved for the journal, JGEESI.

61 settlers (such as in the Sahara which is the largest in the world) have also devised survival  
62 strategies in their dressing, feeding and other human activities. Many states in the Middle East  
63 are aware of their very dry conditions and they rely on irrigation for their agricultural activities to  
64 flourish. People also live in very mountainous regions of the world like the Alps and the Jura  
65 Mountains found mostly in Switzerland which serves as a constrain to human activities and  
66 hinders development. Despite the mountainous nature of these regions, people continue to live  
67 there because they have derived methods of adapting themselves to the situation like organizing  
68 mountain races, snow skiing races, setting touristic sites that attract lots of tourists into the area,  
69 thereby making their economy viable.

70

71 In Cameroon, there are certain parts of the country where the physical characteristics restrain the  
72 population and narrows down their range of human activities. Examples of some of such areas  
73 include some parts of the Northern Region of Cameroon which is not only mountainous but  
74 possesses a rocky landscape, poor skeletal soils and aspects of desertification or drought, owing  
75 to the fact that it is located close to the world's largest desert. **The effects of such physical  
76 constraints are further enhanced by rising poverty in Cameroon, where an estimated 24% of the  
77 population live below the poverty line of 1.9 US dollars per day<sup>1</sup>. This deepening poverty is  
78 significant in rural Cameroon where the head-count ratio of the poor is 54%, which is above the  
79 average of sub-Saharan Africa (Boateng *et al.*, 1990; Achiri-Okyere *et al.*, 1997; World Bank,  
80 2005).**

81

82 The Kom highlands in the North West Region of Cameroon, exhibits a good example of harsh  
83 physical and environmental conditions, which is evident in its poor soils, cold and harsh climate  
84 and a difficult relief and topographic landscape. Again, this region is witnessing significant  
85 population growth in. Geometrically, it almost entirely lies straddled along the precipitously  
86 steep slopes of the high lands that rise from the Menchum Valley at about 900m above sea level  
87 in the South, to the Oku Uplands at about 1500m above sea level. Human settlements colonize  
88 every bit of hill top and spur and perch along the steep slopes as many stream banks here are  
89 steep, narrow and rocky.

90

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<sup>1</sup> Based on estimates between 2014 and 2016 by the UNDP. For details, see: <http://hdr.undp.org/en/countries/profiles/CMR>

91 All these harsh physical conditions that dominate the area, culminate in making life in Boyo  
92 Division difficult, particularly in the domain of; construction of houses, farming to raise  
93 sufficient food crop to satisfy the basic local needs and surpluses for sale, the construction of  
94 motorable roads, the frequent or rampant illnesses like cold and fever which result in high death  
95 rates, an adaptive particular dressing style, are typical of the Kom people.

Comment [VNO3]: Where is this division, Is it the only location that showcases the itemized challenges or the entire Kom highland?

Comment [VNO4]: I suggest author should consider "peculiar"

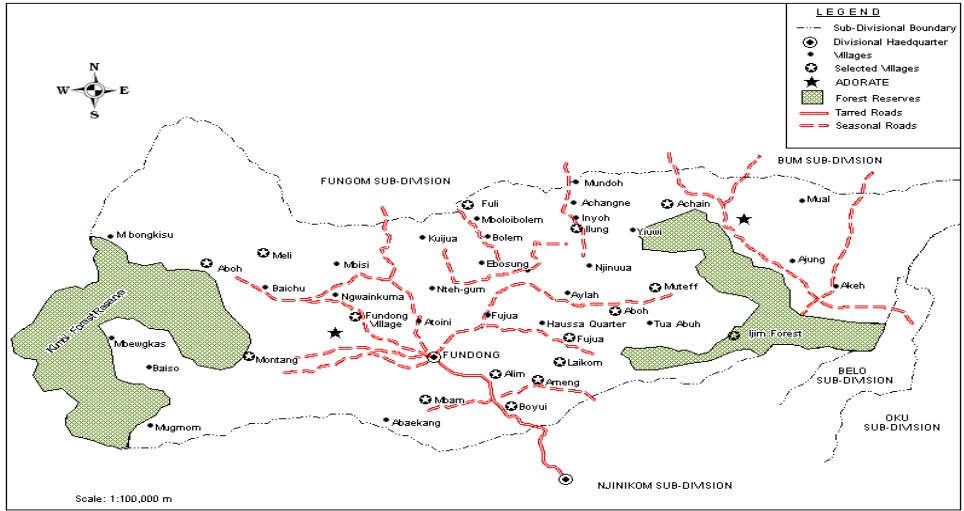
96  
97 Since the extent and outcomes of survival strategies employed by communities in harsh physical  
98 environments, still seek scientific and policy edification, there is a need to contribute to  
99 illuminate this aspect using the case of the Kom Highlands of Cameroon. The objectives of this  
100 paper therefore are to (i) identify and categorize the survival strategies employed by farmers in  
101 the Kom highlands of Cameroon, and (ii) analyse the extent and outcomes of these survival  
102 strategies employed by Kom farming communities. Addressing these objectives is relevant in the  
103 field of Mountain Geography, and provides an opportunity to further revisit existing theoretical  
104 debates on human adaptation in mountainous environments. The results equally demonstrate  
105 potentials to contribute to update theoretical frameworks on environmental determinism and  
106 possibilism.

## 108 Research Methodology

### 109 Study area

110 Fundong is the head quarter of Boyo Division. It occupies the central portion of the North West  
111 Region of Cameroon and it is located some 65km away from Bamenda, with a total surface area  
112 of about 37000km<sup>2</sup> (Community Development, Fundong). It is bounded to the west by Wum  
113 Sub-division and Bafut Sub-divisions, to the east by Noni and Belo Sub-divisions, Fungom and  
114 Bum Sub-divisions share its boundary at the north and to the south, it shares boundaries with  
115 Belo and Njinikom Sub-divisions. I would suggest the latitude and longitude be indicated here  
116 and on the map as well. However, it is proper to make reference to the map in-text. What is the  
117 height of the study area at the highest peak above sea level? Information on the temperature of  
118 the study area will help improve appreciation of this work especially Tmax and Tmin

Comment [VNO5]: ?? year



119

120 **Figure 1:** The Layout of Fundong Sub-division

Source; Fundong Council, 2013

## 121 **Data Collection and Analysis**

122 | The study made use of primary and secondary sources of data. Primary sources **consulted**  
123 | include field observation, accompanied by interviews and the administration of questionnaires.  
124 | 10 key informants were interviewed and a total of 100 **copies of questionnaires** were used to  
125 | sample the population of Fundong using a random sampling technique and 59 were successfully  
126 | collected. **Interviews were conducted to some traditional and council authorities, as well as to**  
127 | some elites of the population on their suggestions for improving their coping strategies. In  
128 | addition, some photographs were used to portray certain aspects of the harsh or difficult physical  
129 | environment.

130 | Secondary data was obtained through the consultation of reports from the Fundong Council, the  
131 | Delegations of Agriculture and Rural Development, Tourism and Environment and Nature  
132 | Protection. Also, population data and reports from other related institutions were consulted. **The**  
133 | **study also made use of literature which was obtained from published and unpublished sources**  
134 | **including articles, textbooks, theses and dissertations as well as internet sources.**

135 | The data obtained has been presented in the form of tables, maps and charts which involve some  
136 | qualitative representation. Quantitative data analysis was done using the chi-square analysis in  
137 | which the **stated hypothesis was verified. The chi square test ( $X^2$ ) in statistics, tests whether the**  
138 | **observed frequencies of a given phenomenon differ from the frequencies which might be**  
139 | **expected according to some assumed hypothesis. The general formula for the chi square test is**  
140 | **given as thus:**

141 | 
$$X^2 = \sum \frac{d^2}{e} = \sum \frac{(O-E)^2}{E},$$

142 | where;

143 | X = chi square symbol

144 | D = the difference between the **observed** and **expected** frequency for each category.

145 | E = expected frequency for each category.

146 | The degree of freedom (df), is given thus;

147 |  $df = (\text{number of columns} - 1)(\text{number of rows} - 1)$

148 | The formula was used to analyse the (in) adequacy of survival strategies to the harsh physical  
149 | conditions in Kom.

**Comment [VNO6]:** The study is silent on the population of farmers or target audience from where the samples were drawn. How did the author(s) arrive at administering 100 copies of questionnaire?

**Comment [VNO7]:** As long as no data was collected from these sources, I think it is not part of data collected and should be deleted since the citation and references takes care of it in any study.

**Comment [VNO8]:** There is need to state the hypothesis; it is not there yet

**Comment [VNO9]:** Would be better if you use equation editor

**Comment [VNO10]:** What are your variables that would be substituted into the equation

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## Results and Discussion

### Socio-demographic characteristics of respondents

Table 1 presents the socio-demographic characteristics of respondents. Based on age, a majority of the respondents (60%) fall within the age group of 31-49. On the whole, more than 80% of the respondents are above 31 years. Regarding gender, 68% of the respondents were men, as against women who constitute 32%. The household size of most of the respondents (61%) ranges from 4 to 6 members, while a majority of the respondents (44%) are primary school leavers. Seventy-two percent of the respondents have average monthly incomes of less than or equal to 50,000FCFA.

Table 1: Socio-demographic characteristics of respondents

Variables	Variable definition	Percentage of sample
Age of respondents	1 = 16 - 30	18
	2 = 31-49	60
	3 = 50+ years	22
Gender	Male	68
	Female	32
Family size	1 = 1-3 members	27
	2 = 4-6 members	61
	3 = 6+ members	12
Level of education	1 = Primary	44
	2 = Secondary	16
	3 = University	3
	4 = non formal education	17
	No formal education	20
Average monthly income (FCFA)	1 = less than 30,000	40
	2 = 31,000- 50, 000	32
	3 = 51,000 – 75,000	18
	4 = 75,000+	10

Source: Own data. Note: N=59

**Comment [VNO11]:** For the purpose of international readership and comparison, what is the value of this in USD?

**Comment [VNO12]:** I think the number of respondents (N) should be part of the table and this column for the sake of clarity instead of merely indicating N on the bottom of table.

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### Survival Strategies

165 | Over the years, other studies[include a few] have shown that although environmental conditions  
166 | have an influence on human and cultural development, people have varied possibilities in their  
167 | decision to live and survive within a given environment. This idea gained grounds with the  
168 | advent of technological advancements which seemed to have “tamed” the harsh physical  
169 | environment and made it conducive for human habitation and survival. Until recently, it has been  
170 | observed that there are limits to which man can control his physical environment and the  
171 | environment at one point in time will frustrate human efforts and present harsh environmental  
172 | repercussions (Kimengsi, 2009).

173

174 | The above harsh physical conditions in Fundong Sub-division have led to the derivation of some  
175 | survival strategies. The strategies that have been derived so far are both at individual and general  
176 | levels. This means that in as much as the individuals are seeking or deriving strategies to  
177 | facilitate their daily activities, the local authorities and the government as well, is also trying  
178 | their best to make life comfortable for inhabitants of Fundong. This is viewed in the agricultural,  
179 | settlement and road construction sectors, among others.

180

### 181 | **Survival Strategies in the Agricultural Sector**

182 | The presence of poor soils in this region has led to the utilization of very harsh and crude  
183 | farming practices like burning or the “Ankara” system, a system of farming where the soil is  
184 | being burnt to enrich it. By so doing, burrowing animals and organisms which help in softening  
185 | or loosening the soil compactness are destroyed. After burning, the soil actually gains some  
186 | considerable degree of fertility, but this does not last for years. This farming method has also led  
187 | to rampant and common bush fires especially during the dry season and this has led to the loss of  
188 | habitat of some organisms as well as species extinction.

189

190 | Bush fallowing is also a very common practice here as a result of poor soils. This is a farming  
191 | practice where by a piece of cultivated land is allowed for some years to fallow or regain its  
192 | fertility. Hence, poor soils have led to the use of traditional methods of farming or agriculture.

193 | The use of farming practices like bush fallowing and shifting cultivation is facilitated by the  
194 | presence of vast and unoccupied land. Also, terraces are being made to ease agriculture and



195 reduce the rate of soil erosion. Though terracing is not very common for agricultural practices,  
196 there are some evidences of it in Fundong Sub-division.

197

198 As another method to deal with soil erosion, farming is being done across the slopes rather than  
199 along the slopes as was the case in the yesteryears. This method of farming (across the slope),  
200 has greatly helped in remedying the problem of soil erosion. This method is still not 100%  
201 successful because on very steep slopes, running water forces its way, cutting across the already  
202 constructed ridges, carrying away or eroding the soil and damaging crops as well. Figure 2  
203 shows a situation of anti-slope-wise farming in Fundong Sub-division.

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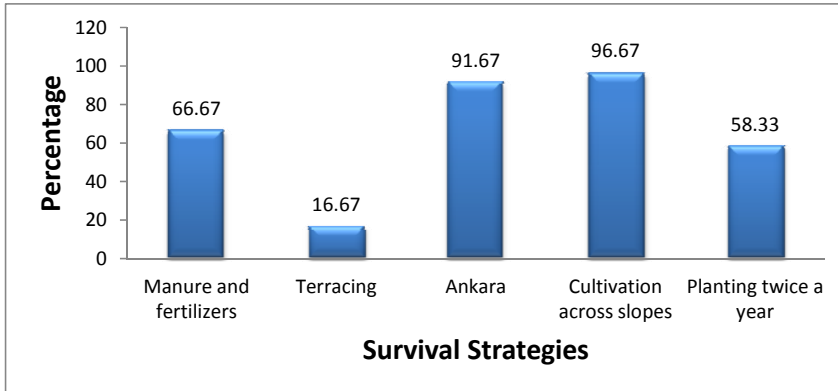
205 The problem of soil infertility is being dealt with in so many ways by different people;  
206 depending on their various perceptions on what method is the best. Some people prefer to use the  
207 “Ankara” system. The method is highly discouraged by agriculturalists but the population is still  
208 very adamant to change.

209

210 Other farmers make use of fertilizers, both artificial and natural as well as domestic waste. Most  
211 schools and institutions make use of compost manure. When all these fertilizers and manure are  
212 applied in their correct proportions, it improves on soil fertility and agricultural yields. Though  
213 the use of fertilizers and manure is highly encouraged by agricultural technicians, it is not a  
214 100% effective method because some farmers complain that these fertilizers burn and destroy  
215 their crops. But this is due to poor methods of application. Another survival strategy in the  
216 agricultural sector that is adopted is the fact that most farmers cultivate their farmlands twice in a  
217 year to meet up with the increase in demand for food crops by the growing population. Figure 23  
218 shows the frequency of survival strategies in the agricultural sector.

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**Comment [VNO13]:** This figure should be included. Not in the manuscript yet



**Figure 23: Percentage of survival strategies in the agricultural sector**

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 223 | As shown on Figure 23, most cost free methods are the widely used methods. For example,  
 224 almost all of the respondents indicated that they adopt the anti-slope wise cultivation method  
 225 because they are aware of the fact that it reduces the effect of erosion since some soil nutrients  
 226 are not eroded.

227  
 228 The Ankara system is also widely used because it is less costly and its short term effects are very  
 229 promising, unlike the use of fertilizers and manure which is rather costly because farmers have to  
 230 purchase fertilizers. Poverty is a the number one constrain to this method though most people  
 231 acknowledge the fact that it is a good method.

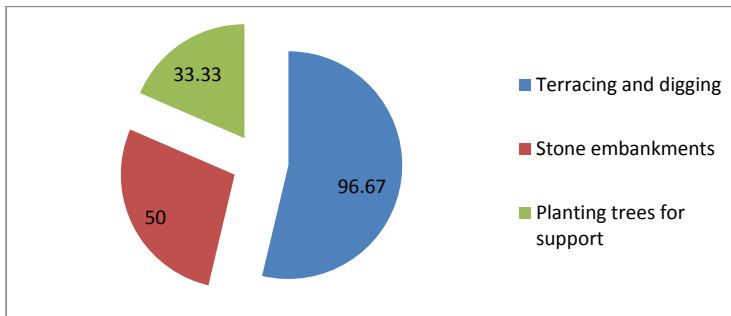
232  
 233 **Survival Strategies in Housing Construction**

234 For the construction of houses, the population makes attempts to terrace or level hill spots to  
 235 create flat surfaces for houses to be constructed. The foundations for these houses are dug deep  
 236 into the ground to ensure that the house is well established. This is the most common method of  
 237 adaptation and it is a very effective survival strategy, though it has its own constraints. Also, the  
 238 population locally builds up embankments along path ways and houses by pilling up stones to  
 239 stabilize slopes. This action is too short-lived.

240  
 241 Some other people prefer to plant trees as a source of support to these houses, to prevent them  
 242 from eventually falling or breaking off. This method is not the best because some of these trees  
 243 grow too big so much so that their roots end up instead helping to destroy the foundation of the

244 | house. Figure 3 4 shows the frequencies and percentages of responses on survival strategies in  
245 | the housing sector.

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249 | **Figure 43: Percentage of Survival Strategies in the Housing Sector**

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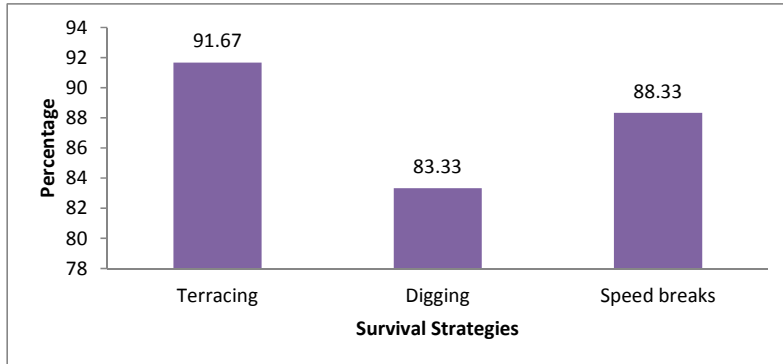
251 | Most inhabitants of Fundong recognize the fact that these above listed survival strategies are  
252 | important but due to the fact that they are constrained by poverty, they make a scale of  
253 | preference, choosing that which is most necessary to them. According to the analysis above,  
254 | terracing and the digging of a hill is the most important and preferred strategy. Besides this  
255 | strategy, the implementation of other strategies would reflect ones financial backings.

256

### 257 | **Survival Strategies in Road Construction**

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259 | Just as in the case of housing, hills are dug or scabbed to ensure or enable the passage of roads.  
260 | These roads are dug in such a manner that will minimize cost, the reason why the roads wind and  
261 | bend. However, due to the absence of heavy machinery, effective terracing is not done and so  
262 | these areas in the long run still suffer from slope failure problems. Given the nature of roads,  
263 | accidents are very liable or likely to occur and rampantly too. As a means of trying to reduce  
264 | these frequent rates of accidents, several speed breaks have been built on the roads to control the  
265 | movement and speed of cars. This method has so far met with some success in these winding  
266 | roads because the rate of occurrence of accidents has greatly reduced. Figure 4 5 shows the  
267 | frequency of responses on survival strategies in road construction.

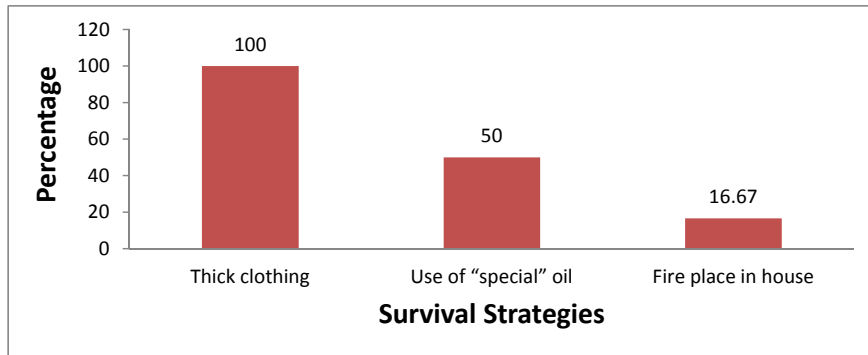


**Figure 45: Survival Strategies in Road Construction**

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 272 The above table shows that the three mentioned survival strategies are highly competitive, with  
 273 frequencies ranging from 50 to 55. Given the nature of the terrain, in creating or constructing  
 274 roads, these three strategies are very necessary to reduce cost. Speed breaks are also necessary as  
 275 they help to reduce the incidents of road accidents along slopes.

276  
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 278 **Survival Strategies to Harsh Climate**

279 The inhabitants of Fundong have adopted an adaptive mode of dressing to protect themselves  
 280 from the very cold climatic conditions. They cover most parts of their body with thick clothing  
 281 so as to reduce exposure to cold during the rainy season and in the evening and morning periods  
 282 of the dry season. These dresses cover the body, preventing it from heat and moisture loss. Some  
 283 people usually wear special body oils and/or increase the glycerin content of their rubbing oil, all  
 284 in a way to fight against heat loss and body dryness. Most kids are usually found having Vaseline  
 285 oilmen, rubbed around their lips to prevent cracks and in their nostrils to prevent them from  
 286 catching a cold. In most of the interior parts of Fundong Sub-division, make use of fire sides lit  
 287 | in their houses to constantly keep warm conditions. refer to the figure below in-text



**Figure 56: Survival Strategies to Harsh Climatic Conditions**

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292 Indications above show that during cold climatic conditions, most people in Fundong Sub-  
293 division wear thick and warm clothing to keep them warm and free from many cold related  
294 diseases. Others go as far as using some heat producing body oils like Vaseline. Those who lite  
295 fire in their houses for heat production are very few in the town but in the suburbs, it is the most  
296 commonly practiced strategy.

297

298 In a nut shell, all the above survival strategies are employed, depending on individuals and their  
299 levels of perception. Most people choose the survival option that is most suitable for them,  
300 considering the cost, technology and level of education. Hence, the effectiveness of these  
301 strategies also depends greatly on each individual's level of satisfaction.

302

### 303 **Constrains to Human Survival Strategies**

304 As mentioned above, the effectiveness or the extent to which these survival strategies are  
305 effective depends on the individuals themselves. This means that, given the various perceptions  
306 people have about a strategy, it leads to varied levels of effectiveness. For example, as concerns  
307 poor soils, many people believe in the use of fertilizers and manure to enrich the soil, while  
308 others strongly believe that fertilizers destroy their crops. Hence, a strategy may be effective to  
309 one person and ineffective to another.

310 Out of the 60 people who were interviewed, the following strategies can be drawn for those who  
311 consider their strategies as effective as well as those whose strategies are ineffective (Figure 67).

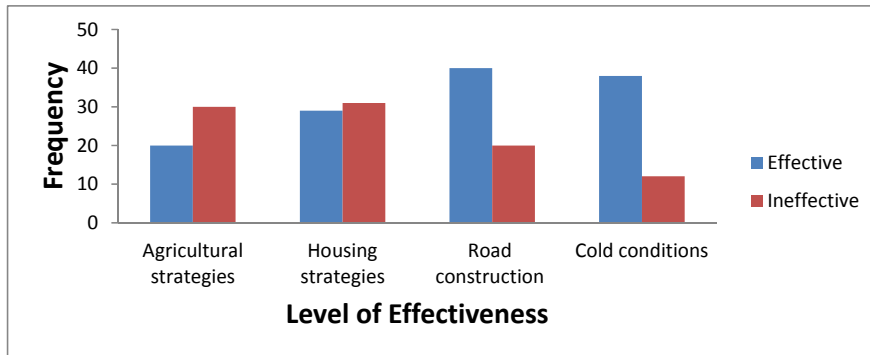


Figure 6 7: Effectiveness of survival strategies

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316 It can be seen that a considerable number of people still consider these their strategies as  
317 ineffective, generally, the effectiveness of these strategies are constrained by a number of factors,  
318 some of which include poverty, ignorance, perception, culture, limited resources and level of  
319 technology. Hence, there is a need for more effective survival strategies.

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#### Poverty

322 Poverty in this area is a common phenomenon. This means that there are very few high income  
323 earners in this region. Most people have just enough to take care of their basic needs and so there  
324 is hardly an extra means to help them strategize. This is mostly the case with the interior villages  
325 where people for example do not have money to buy fertilizers or very thick cloths. Hence, they  
326 instead have to lit fire places in the middle of their houses to keep them warm and instead of  
327 fertilizers, they get to practice the Ankara system or even bush fallowing – because they have  
328 abundant land for such a practice. Thus, the strategies are varied because some are affordable  
329 and others are not.

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#### Ignorance and Perception

332 This is equally another constrain to the effectiveness of these strategies. Most people are not well  
333 informed about the havoc that poor soils, hilly conditions and cold climatic conditions cause in  
334 the region. They are equally unable to identify these harsh physical conditions and consider them  
335 so seriously, since they believe it is an irreversible situation. Because of this, they are hindered  
336 from thinking about the possible methods, strategies or solutions to combat the situation. So they

337 do things just because they see others doing them and seem indifferent about their effectiveness.  
338 Also, even those who are enlightened, educated or aware of such problems ravaging their region  
339 and the various ways which they can use to overcome the situation, have their different  
340 perception about the various strategies employed. For example, some people prefer natural  
341 manure to fertilizers because they think that fertilizers destroy the soil in a long run. That is,  
342 when one starts using fertilizers, it is difficult to stop because the soil situation will grow even  
343 worse than when the application of fertilizer was not yet effected. So they want to avoid a  
344 situation where when they are unable to afford these fertilizers in the future, their yields would  
345 be very poor.

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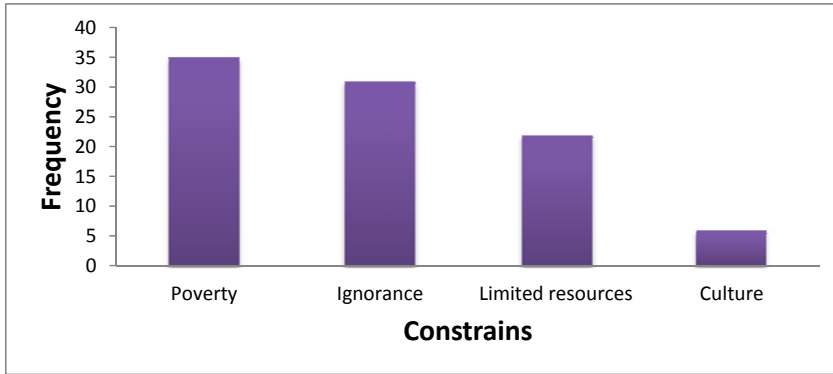
#### 347 **Limited Resources and Technology**

348 The fact that this region is not fortunate to be amongst the others that are blessed with enough  
349 **resources and technology** stands as a hindrance or a limitation to effective implementation of  
350 survival strategies in this region. This is so because some people may have the idea on an  
351 effective survival strategy, but they lack the resources or the techniques to carry out or  
352 implement the strategy. For example, creating fly overs is one of the best options for road  
353 construction in a hilly environment but the lack of financial resources and probably, the  
354 necessary equipment remains a major constrain.

355

#### 356 **Culture**

357 Another factor that constrains human survival strategies is culture. This group of people has  
358 certain norms and believes beliefs that seriously prevent them from carrying out or implementing  
359 certain strategies to aid them cope with their difficult environment. For example, it was  
360 seemingly difficult to sensitize the population on the need to adopt an anti –slope wise farming  
361 method since they initially had slope wise cultivation rooted in the history and, by extension,  
362 their culture. Figure 7 8 shows the frequency of responses on the observed constrains to  
363 effectively adopt survival strategies in the different sectors.



**Figure 78: Constrains to the Effectiveness of Survival Strategies**

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It can be seen that the highest constrain to these survival strategies is that of poverty, followed by ignorance and limited resources in that order and lastly culture.

To test the effectiveness of survival strategies, the chi square analysis was conducted. With a degree of freedom of 2, at a 0.01% level of significance, the table chi square value is 9.21. Since the calculated value for  $X^2$  (0.623) is greater than the table value of 9.12, then the null hypothesis ( $H_0$ ), cannot be rejected. Hence, the alternative hypotheses which states that the survival strategies for the harsh physical conditions in Fundong Sub-division are adequate, is rejected in favor of the null hypothesis. This therefore prove that there are inadequate survival strategies in this region and thus, there is the need to suggest other survival and coping methods.

### Discussion of Findings

Fundong Sub-division is characterized by a harsh physical environment with aspects such as poor soils, cold climatic condition and a very hilly and undulating terrain. All these mentioned conditions hinder them from enjoying nature's gift to them. These physical attributes operate in different magnitudes, with the hilly terrain and its poor soil conditions being very harsh.

It was realized that this difficult environment has constrained development activities in the domain of agriculture, settlement and road construction. For example, it is very difficult to farm on hills but the population has no other option rather than to do so and so they are faced with

**Comment [VNO14]:** Is 0.623 greater than 9.12?. No, it is incorrect so check if a type 1 or type 2 error has not been committed and reversed. I think a table showing the analysis result and remarks should be included here



389 high rates of soil erosion, limiting their production output. The hilly slopes are exposed to  
390 massive soil erosion and nutrient loss, which reduces agricultural productivity despite the  
391 lengthy time devoted for the practice. Also, the construction of roads and houses is very difficult  
392 and expensive as a lot of digging and terracing has to be done.

393 Apart from the cold climatic conditions witnessed in the area, there is also the presence of strong  
394 winds that destroy houses and crops are often attributed to a particular witchcraft group “*muso*”.  
395 It is believed that this group manifests through strong winds, destroying houses and farmlands.  
396 This finding agrees with the earlier works of Gwan (1988) who noted that every geographical  
397 environment is to some degree, harsh; the harshness being a factor of some of its physical or  
398 biotic attributes or both. It is also similar to the findings of Gwan (1988) in Ekon-Lelu where he  
399 concluded that this environment contains many harsh elements that are enemicalinimical to the  
400 survival of inhabitants of this area.

401 The population of this area, despite all odds is still on an increase. The increase is due to the fact  
402 that some coping strategies have been implemented to help the population deal with the harsh  
403 conditions. These strategies have been adopted in the agricultural, housing, road construction  
404 among others.

406 For agriculture, the most adopted coping strategies are the adoption of anti-slope wise cultivation  
407 and the use of the “Ankara” system. The latter is widely used because it is less costly and its  
408 short term effects are very promising, unlike the use of fertilizers and manure which is rather  
409 costly because farmers have to purchase fertilizers. However, the long term effect of the  
410 adoption of the Ankara system is bad. An increase in population also means an increase in the  
411 demand for food and the use of agricultural land for the construction of infrastructure.

413 Another importance coping measure is the adoption of the strategy of planting twice in a year.  
414 While the population acknowledged the importance of using manure, they however indicated  
415 that poverty remains a problem since they lack the finances to purchase fertilizers.

417 For housing construction, a majority of the population have resorted to terracing which,  
418 unfortunately is not properly done. This accounts for the incidence of slope failures and the  
419 consequent destruction of houses. In addition to the use of terracing for road construction, the  
420 population also adopts the use of speed brakes to reduce the incidence of accidents. This finding

421 is similar to the earlier findings of Lambi (2001) on the coping strategy employed by the Kirdis  
422 in their hostile environment. His study noted that as part of their coping mechanisms, they  
423 embark on the terracing of slopes to ease farming and construction. The findings of this study  
424 also show some similarity with the earlier works of Bristol (2009) who noted that the physical  
425 conditions and ecological diversity of mountain lands are associated with an extra ordinary  
426 variety of human cultures. Consequently, many surviving indigenous people are found in the  
427 mountains. Their adaptation to these habitats, their cultures and environmental knowledge, are of  
428 singular interest and value for sustainable practices.

429  
430 The major constrains to the effective adoption of coping strategies in Fundong Sub-division  
431 include, among others, poverty, ignorance, limited resources and culture.

#### 432 **Conclusion and Recommendations**

433  
434 Based on the results, this paper concludes that; (1) Kom displays a plethora of harsh physical  
435 aspects of her environment, (2) the survival strategies employed by the population of kom are not  
436 adequate. Thus there is a need for more technologically advanced strategies to facilitate  
437 adaptation not only for indigenes but also the nonindigenous.

438 Faced with the identified constraints, the following recommendations have been put forward  
439 which if carefully implemented, can redress the problems.

440 The government may consider as a major objective, the need to improve the road situation in this  
441 area, including fly-overs. For instance, the government may consider tarring the Fundong,  
442 Bafmen and Wum road. This will help to open or expose the region to many aspects of  
443 development (awareness, education, commercial activities and a general increase in income).  
444 Because the roads are very narrow, the **government may give consideration** to widening them or  
445 better still, creating a double lane road. This will boost development in this region and also  
446 reduce the rampant road accidents.

447  
448 Specialists on environmental issues may also be trained as experts in the field, who be charged  
449 with the tasks of looking into the environmental issues of Kom, write reports on any changes and  
450 recommend possible solutions that could be implemented given the situation. By this method,  
451 proper management of the environment will be ensured and the inhabitants will keep abreast or  
452 will be kept posted on the changes and challenges faced in their region and also consider

453 solutions to these challenges. It will also save people the stress or burden of thinking that they  
454 have a responsibility to care for their environment.

455

456 The local council on her part need to take the responsibility of properly checking the  
457 construction sites and compare them with housing plans pertaining to each site seriously. This  
458 will help to reduce the consequences of poor construction, given that it is a very delicate event,  
459 constructing on a hilly area. More specific attention should be given to the foundation and  
460 digging of the area.

461

462 There is also the need to train more agricultural practitioners who will be responsible for  
463 educating farmers on agricultural issues like when and where to, and the right methods and  
464 proportions of fertilizers to apply. The issue of fertilizers should really be taken into  
465 consideration because most farmers hardly apply them in their required quantities and so are  
466 always very disappointed with their output.

467

468 Since poverty remains a major problem in terms of the purchase of fertilizers, it is necessary to  
469 subsidize the purchase of fertilizers in this area so as to encourage farmers to increasingly adopt  
470 this method.

471 There is also a need for slope stabilization and terracing. This will help to gain enough  
472 construction space and the process of constructing would be made easier. The physical  
473 environment will also get to change.

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**Comment [VNO15]:** As earlier mentioned use the Vancouver style of referencing.

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