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Highlights

- Flood Effects on Agricultural
- Data Offshore Canterbury Basin
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Discovering Thoughts, Inventing Future

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Flood Effects on Agricultural Productivity: Implications for Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria

By Joy Eko Atu & Edet, Mary Okon
University of Calabar

Abstract- Flood is a natural disaster that affects lives, livelihoods, household food security and natural ecosystems. Hence, the study sought to determine flood effects on agricultural productivity: Implications for Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria. Specifically, the paper identified high and low-risks flood areas in Akpabuyo, determined the frequency of flood events and extent of agricultural land inundation, identifying the crops species affected by flooding, and assessed the income and food survival strategies of farmers affected by annual flood events. Descriptive statistics (frequency counts, percentages, and averages were employed to analyze the data derived from a structured questionnaire and field measurement of elevation of high and low-risk flood areas. Results revealed that the agricultural land at high risk of flooding is those with 1-44 metres elevation above sea level Table 1. Findings on Table 4show that, the food staple most affected are the root or tuber species with 77.52 percent annual destruction, vegetable species were also at high risk, and some economic crops like Musa spp (plantain) were also at high risks of destruction. The result further revealed that, income loss and food shortages occasioned from flooding of agricultural land are mitigated by Mangrove Forest Ecosystem Resources Extraction Table 6. Thus, conservation of the Mangrove Forest ecosystem in Akpabuyo and Cross River State is tied to the efficient management and mitigation of flood events in agricultural land.

Keywords: *mangrove ecosystem, forest flood effects, agricultural productivity, elevation.*

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Flood Effects on Agricultural Productivity: Implications for Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria

Joy Eko Atu [α] & Edet, Mary Okon [σ]

Abstract- Flood is a natural disaster that affects lives, livelihoods, household food security and natural ecosystems. Hence, the study sought to determine flood effects on agricultural productivity: Implications for Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria. Specifically, the paper identified high and low-risks flood areas in Akpabuyo, determined the frequency of flood events and extent of agricultural land inundation, identifying the crops species affected by flooding, and assessed the income and food survival strategies of farmers affected by annual flood events. Descriptive statistics (frequency counts, percentages, and averages were employed to analyze the data derived from a structured questionnaire and field measurement of elevation of high and low-risk flood areas. Results revealed that the agricultural land at high risk of flooding is those with 1-44 metres elevation above sea level Table 1. Findings on Table 4show that, the food staple most affected are the root or tuber species with 77.52 percent annual destruction, vegetable species were also at high risk, and some economic crops like *Musa spp* (plantain) were also at high risks of destruction. The result further revealed that, income loss and food shortages occasioned from flooding of agricultural land are mitigated by Mangrove Forest Ecosystem Resources Extraction Table 6. Thus, conservation of the Mangrove Forest ecosystem in Akpabuyo and Cross River State is tied to the efficient management and mitigation of flood events in agricultural land.

Keywords: mangrove ecosystem, forest flood effects, agricultural productivity, elevation.

I. Introduction

Flood is a global challenge in the face of a changing climatic pattern. Typically, floods are outcome of extreme weather events such as precipitation (e.g. prolong rainfall and melting snow from snowfall), which are exacerbated by the geographical location and human activities of a place. Abua, Ewara, Abua & Atu (2009) argued that these factors are responsible for the flooding events in Nigeria, as one-third of the landmass of Nigeria is at an elevation of less than eight meters above sea level. Areas liable to flooding are low-lying areas, but the southern parts of Nigeria are more vulnerable due to the double maxima rainfall experienced for a prolonged period, usually between March-October and as early as February-November in some southern states like Cross River and Rivers states.

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Flood over the years has caused severe damage to property, infrastructure, crops and deaths across the country, and has been considered as a source of increased risks to disease and hunger (Baiye 1988; Edward-Adebiyi 1997), damage to property, loss of life, contamination, and spoiling of agricultural land (Umoh, 2008). Akpabuyo in Cross River State is an agrarian community dependant on optimal production of their farm enterprise for food security and livelihood needs, but, the undulating, low-lying topography enmeshed within the Great Kwa and Calabar River makes Akpabuyo a candidate for frequent and prolonged inundation. The literature on flood events and the impacts on different sectors of the Nigerian environment is robust (see, Akintola and Ikuyatum, 2006; Umoh 2008, Abua, et al. 2009; Kalu 1984, Areola and Akintola 1980). But, none of the studies related degradation of forest ecosystem with destruction of farmlands by flood and this is the focus of this study. Therefore, the study:

1. Identified high and low-risks flood areas in Akpabuyo, Cross River State.
2. Determined the frequency of flood events and extent of agricultural land inundation.
3. Identify the crops species affected by flooding.
4. Examined the relationship between flood, cultivated crops and forest resource exploitation and degradation in Akpabuyo, Cross River State.

II. Methodology

Study Area: Akpabuyo is a Local Government Area (LGA) in the Southern axis of Cross River State, Nigeria. The LGA was created in 1991with an administrative headquarters located at Ikot Nakanda. Akpabuyo is made up of 28 villages of three major dialectical groups (the Efiks, Quas, and the Efuts), but, the English language is the official spoken language (Tip Top Globe, 2016). Akpabuyo is located between latitude $4^0$5' North and $5^0$4' South and longitude $8^0$25' West and $8^0$32' East Fig 1 and had a total population of 271,325 in 2006 (NPC, 2006). The population is projected to be 307, 4117 as at 2017 using 3.0 growth rate of the region.

A reconnaissance survey was undertaken before the actual field work to identify the areas prone to flooding, identify farmers and seek their consent for the

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sample. The study adopted the methodology of (Atu and Bisong, 2013) in selecting sample sites. Thus, 10 villages were purposively chosen out of the existing 28 villages to form the sample, based on their elevation and dominance in agricultural activities and flood events. Five of the villages are in areas prone to flooding and five in areas not too prone to flooding. The geographical coordinates and elevation were noted. Field observation and measurement, interview and household (HH) questionnaire were utilized in collecting data. A total of 400 questionnaire were administered by adopting the Yaro Yamane's formula given as:

$$n = 11 + Ne2$$

Where: n=Sample Size; N=Population Size; e=Level of Confidence (taken as 0.05) and 1=constant. Hence, 400 copies of questionnaire were distributed, and 13 copies of the questionnaire were found to be inconsistent with the objectives of the study. Therefore, 387copies of the questionnaire were retained for the study. Two hundred and two copies of the questionnaire were those of communities at high risk of flood and 185 are from communities at low risks of flood.



Source: (Atu & Iwuanyanwu 2017)

Fig. 1: Akpabuyo Local Government Area (insert: Cross River State & Nigeria)

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III. Results and Discussion

a) Identified High and Low Risks Flood Areas in Akpabuyo

The areas liable to annual flood event depicted on Table 1 lie within longitude 8^0 23' 39.6'' and latitude 4^0 54' 11.6" with an elevation of 18-44 meters above sea level. Therefore, Esuk Mba, Akans Oko, Ikot Ene Umo, Idebe and Atim Asam are the areas at risk of flooding annually. But the community with the highest risk is Ikot Ene Umo with only 18 meters elevation above sea level.

b) Frequency of Flood

Table 2 shows the frequency of flood events as responded to by the sampled population. 71.28 percent of the responses indicated that, the flood occur annually and the areas at high risks of flood have not experience any year without flooding. The annual flooding has implications for the variety of crops cultivated as the arable crops such as maize (*Zea mays*), cassava (*Manihot esculenta*), and cocoa yam (*Dioscoreaspp*) cannot withstand prolonged submergence. These crop types are highly susceptible to stagnant water as the roots of the crops rot easily.

c) Extent of Agricultural Land Affected by Flood Annually

The extent of agricultural land annually affected by flood on Table 3 between 51-100 hectares and above (The extent of farmlands annually affected by flood was estimated from calculating the sizes of the farmland of farmers that indicated that their farmlands are annually flooded (47.03 and 16.04% cumulatively to 63.07 %).

Table 1: Geographical Location of High and Low-Risks Flood Areas

	High-Risks Flood Areas				
	Esuk Mba	**Akans Oko**	**Ikot Ene Umo**	**Idebe**	**Atim Asam**
Longitude	8^0 23' 39.6"	8^0 27' 51"	8^0 35' 30' 8"	8^0 26' 49.8"	8^0 24' 47.2"
Latitude	4^0 54' 11.6"	5^0 2' 25.3"	4^0 54' 24.9"	4^0 51' 33"	4' 57' 34.5"
Elevation (M)	44	27	18	34	39
	Low-Risks Flood Areas				
	Akwa Ikot Effanga	**Ikot Edem Odo**	**Ikot Effiong Essien**	**Ikot Ene**	**Ikot Offiong Amba**
Longitude	8^0 29' 12.8"	8^0 24' 31.9"	8^0 24' 52"	8^0 27' 41.9"	8^0 26' 59.6"
Latitude	4^0 57' 39.3"	4^0 53' 15.7"	4^0 52' 17.8"	4^0 54' 54.6"	4^0 55' 56.7"
Elevation (M)	75	52	59	45	62

Table 2: Frequency of Flooding

High-Risks Flood Areas							
Frequency of Flooding	**Esuk Mba**	**Akans Oko**	**Ikot EneUmo**	**Idebe**	**Atim Asam**	**Total**	**%**
Annually	45	32	16	23	28	144	71.287
Every 2 Years	13	8	3	10	6	40	19.802
Once in Three Years	4	2	1	0	2	9	4.455
Once in Four Years	1	2	0	0	0	3	1.485
Once in Five Years	1	0	0	1	2	4	1.980
Once in Six Years	1	1	0	0	0	2	0.990
Never	0	0	0	0	0	0	0
Tallied Responses and Percentage						202	1000
Low-Risks Flood Areas							
Frequency of Flooding	**Akwa Ikot Effanga**	**Ikot Edem Odo**	**Ikot Effiong Essien**	**Ikot Ene**	**Ikot Offiong Amba**	**Total**	**%**
Annually	12	10	2	14	2	40	21.622
Every 2 Years	9	13	6	9	6	43	23.243
Once in Three Years	6	10	6	1	4	27	14.594
Once in Four Years	14	8	5	4	1	32	17.297
Once in Five Years	1	4	1	4	12	22	11.892
Once in Six Years	0	4	0	0	3	7	3.784
Never	2	6	1	1	4	14	7.568
Tallied Responses and Percentage						185	100

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Table 3: Extent of Agricultural Land Inundation

Farms Flooded in Hectares	Esuk Mba	Akans Oko	Ikot Ene Umo	Idebe	Atim Asam	Total	%
Less than 20	2	7	10	2	3	24	11.881
21- 50	6	15	13	6	10	50	24.753
51-100	10	18	30	17	20	95	47.030
Above 100	2	5	12	5	9	33	16.337
Tallied Responses and Percentage						202	100
Farms Flooded in Hectares	Akwa Ikot Effanga	Ikot Edem Odo	Ikot Effiong Essien	Ikot Ene	Ikot Offiong Amba	Total	%
Less than 20	12	26	5	21	24	88	47.568
21- 50	17	18	10	7	6	58	31.351
51-100	14	8	5	4	1	32	17.297
Above 100	1	3	1	1	1	22	3.784
Tallied Responses and Percentage						185	100

d) Crops Species Affected by Flood Waters

The major crop species affected by flood listed on Table 5 revealed that household food staples are at most risks. These food staples include: vegetables, spices, legumes, tubers, grains, and fruits. Loss crops translate to loss income Table 6 and household food security which must be met via alternate sources. The most viable option for make-up source of livelihood and income for the farmers is harvesting from the Mangrove Forest Ecosystem resulting in exacerbated degradation of the Mangrove ecosystem. The demand on Mangrove Forest Ecosystem in the face of the challenging flood event is massive. Over 77.52 percent of the population sourced their energy needs from the forest, 51.68 looked to the forest for their protein, and 90.34 percent augment their vegetable need from the forest when crops are destroyed by flood. These findings have implications for the Mangrove ecosystem management and conservation, because, unless the menace of flooding agricultural land is tackled by relevant agencies the pressure to meet the food and economic needs of farmers will be met by the Mangrove forest.

Table 4: Crop Species Affected by Flood in Akpabuyo, Cross River State, Nigeria

Crop Types	Local Name	Botanical Name	Frequency of Cultivation	Percentage Cultivation
Vegetables	Fluted Pumpkin	Telfairiaoccidentalis	202	52.20
	Waterleaf	Talinum fruticosum	187	48.32
	Okro	Abelmoschus esculentus	160	41.34
	Green	Amaranthus spinosus	66	17.05
	Bitterleaf	Vernonia amygdalina	59	15.25
Spices	Pepper	Capsicum maximum	100	25.84
	Tomatoes	Solanum lycopersicum	40	10.34
	Curry	Murrayakoenigii	30	7.75
	Scentleaf	Ocimumgratissimum	37	9.56
Legumes	Melon	Cucumis melo	69	17.83
Tubers	Cassava	Manihot esculenta	300	77.52
	Yam	Dioscoreaspp	101	26.09
	Sweet Yam	Dioscorearotundata	200	51.68
	Water Yam	Dioscoreaalata	150	38.76
Grains	Maize	Zea mays	167	43.15
Fruits	Oranges	Citrus sinesis	77	19.90
	Mango	Mangiferaindica	86	22.22
	Banana	Musa sepentum	100	25.84
Economic	Plantain	Musa x paradisiaca	200	51.68
	Oil Palm Fruit	Elaeisguineensis	47	12.45

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Table 5: Estimated Average Income Losses from Destroyed Crops due to Flood

High-Risks Flood Areas							
Income Loss (N)	Esukmba	Akansoko	Ikot Eneumo	Idebe	Atimasam	Total	%
≤ 20,000	5	4	4	3	4	144	71.287
20,000-40,000	5	4	3	3	4	40	19.802
41,000-60,000	7	5	2	5	8	9	4.455
61,000-80,000	13	11	5	10	8	3	1.485
81,000-100,000	15	14	5	8	6	4	1.980
≥ 100,000	20	7	1	5	10	2	0.990
Tallied Responses and Percentage						202	1000
Low-Risks Flood Areas							
Income Loss (N)	Akwa Ikot Effanga	Ikot EdemOdo	Ikot Effiong Essien	Ikot Ene	Ikot Offiong Amba	Total	%
≤ 20,000	3	4	2	4	3	40	21.622
20,000-40,000	10	13	7	10	7	43	23.243
41,000-60,000	18	22	6	10	6	27	14.594
61,000-80,000	5	8	5	5	5	32	17.297
81,000-100,000	3	4	0	2	5	22	11.892
≥ 100,000	5	4	1	1	6	7	3.784
Tallied Responses and Percentage						185	100

Table 6: Make-up Food and Income Sourced from Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria

S/n	Mangrove Forest Ecosystem Resources Harvested	F	%
1.	Fuelwood (Use & Sale)	300	77.52
2	Fishing / Game Hunting (Use & Sale)	200	51.68
3	Palmwine Tapping	100	25.84
4	Periwinkle (*Litorimalittorea*) & Snail (*Cornuaspersum*)	260	67.18
5	NTFP (e.g. Afang,-*Gnetum Africana*; Mushroom-*Agariscusbisporus)*	350	90.44
6	Timber	40	10.34
7	Oil Palm Fruit	137	35.40
8	Raffia Palm (*Raphia Farinifera*) & Indian Bamboo (*Bambusatulda*)	200	51.67
9	None of the Above	10	2.59
10	All the Above	257	66.41

IV. Discussion

This study is critical in the face of escalating extreme climatic events occasioned by changing global climate. The study revealed that the agricultural land at high risk of flooding is those with an elevation of 1-44meters above sea level and the community that is at the highest risk of flooding is Okot Ene Umo with an 18 meters elevation above sea level Table 1. Also, flood is an annual event implying that there is no respite from economic loss and household food shortages Table 2. From findings on Table 4, the crop types most affected are the root or tuber species with 77.52 percent annual destruction, vegetable species were also at high risk and some economic crops like plantain (*Musa spp*) were also at high risks of destruction from flood.

Furthermore, the finding demonstrated that the annual income loss of an individual farmer is as high as a hundred thousand naira, that is, about three hundred United States Dollar at current exchange rate of thirty-five naira to a dollar. Income loss and food shortages occasioned from inundation of agricultural land are mitigated from Mangrove Forest Ecosystem Resources Extraction Table 6. Thus, conservation of the Mangrove Forest ecosystem in Akpabuyo and Cross River State is tied to the efficient management and mitigation of flood events in agricultural land.

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V. Conclusion

The results of this research are critical to the sustainability of family livelihood and the conservation of the Mangrove Ecosystem of Cross River State. The relevance lies in the fact that several conservation strategies have failed to yield the desired outcomes in the past years because the pressure, demand and harvest of the Mangrove Forest Ecosystem Resources has not been linked to the flooding and destruction of agricultural land and crops. These findings therefore have implication for the Mangrove ecosystem management and conservation, because, unless the menace of flooding of agricultural land is tackled, the protection of the remaining Mangrove ecosystem in Cross River State, Nigeria would remain a mirage.

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Challenges of International Environmental Cooperation

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Abstract- The paper discusses the challenges that confront cooperative relations between and among states on the issue of environment. The environment, has over the years, remained a factor over which states' relationship in the international system has been carried out, both in cooperative manifestations and conflictive expressions. As with many other issues, the global environment represents a series of problems that are so complex and widespread that unilateral measures are not enough to forestall them. Therefore, relationships among states in the international system have been very active over the past decades in addressing many of the environmental problems. In the concerted bid to rid the globe of environmental danger, there had been international environmental conferences on climate change and other cooperative efforts to save the planet. Notwithstanding the obvious successes that have been recorded by these cooperative efforts, international environmental cooperation is still fraught with myriad of challenges. Employing mainly the secondary method of data collection, this paper analyzes the myriad challenges that confront international cooperative efforts to rid the globe of teething environmental problems.

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Challenges of International Environmental Cooperation

Chuka Enuka

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I. Introduction

Extrapolating from the quantum of man's interventions into nature, and the consequent grievous degradation to the environment, Martin Rees spoke seriously of the possibility of this century being our last. In his words "We, the human race, might not survive the twenty first century" (Rees 2004). The globe is indeed under threat. Climate change is real and happening. Very recent studies show that the temperatures of the oceans are rising (Enuka 2017; Ona-Maria 2015; Dryzek 2005). The ozone layer is depleting, with negative implications for food availability, freshwater supply, human health etc. Humanity seems to be heading for the limits at an ever-increasing space, as global population grows exponentially. Scarcity of essential raw materials, water and air pollution, disastrous effects of deforestation, increase in global warming and its concomitant threats to human security, are problems which require solution at the earliest if humanity is to be saved from an unexpected catastrophe. The environment has therefore, over the years remained a factor over which states' relationship in the international system has been carried out, both in cooperative manifestations and conflictive expressions. Because these challenges are *transfrontier*, travelling across national borders, states in the international system are getting no less pressure to engage in greater international cooperation. Consequently, over the years, there have been various international efforts, starting with the convening of Stockholm Conference in 1972, and later Rio de Janeiro Conference and Johannesburg Conferences in 1992 and 2002 respectively. Through these conferences, the international community has been able to bring into existence and enforcement a plethora of international environmental laws. But notwithstanding the obvious successes that have been recorded by these cooperative efforts, international environmental cooperation is still fraught with myriad of challenges. It is to highlight these challenges and the dangers they portend on the international environmental system, that this paper is aimed.

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II. International Environmental Problems

This section examines the global environmental problems that have been the subject of international cooperation and treaty-making. An environmental problem becomes global or international in a political sense when it crosses national borders or affects the global commons. A case has been made that all environmental problems are international (O'Neill 2009). If they don't literally spill over national borders, they are likely to occur in many, if not all countries. The realization of these stark and dark realities by the nations of the world has elicited efforts leading to the adoption of several solemn declarations and conclusion of various multilateral treaties embodying resolve of the international community to combat the rampant global environmental degradation and deterioration that threaten the very survival of humanity on planet earth. Some of these environmental problems are:

Ozone Layer Depletion: The ozone layer acts as the world's 'sun glasses' protecting all living orgasms from the sun's harmful ultraviolet radiation. Like a carpet that is divinely placed, the ozone layer protects man and his environment from being directly and harmfully hit by the sun. Worrisomely, the ozone layer has been found to be depleting and leaking. A depleted ozone layer allows increased levels of ultraviolent radiation to get through to earth. The consequence of this depletion to the environment is global, gruesome and grievous. All countries are, and will be affected, though some regions

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are more exposed than others. Ozone layer depletion can harm animals and plants. Plant damage can result in lower yields and less food production. Plant plankton can also be affected and harm the ecosystem of the seas. The problem can lead to immune system deficiencies and increase the likelihood of skin cancer, infectious diseases and eye disorders, especially cataracts (Skjarseth 2012). On the damaging consequences of depletion of the ozone, Todd Sandler has this to say:

> *Ultraviolet radiations are absorbed into the skin of animals, and can damage essential molecules such as DNA, thereby leading to harmful effects including tumors. Of all the current global concerns, the thinning of the ozone layer could cause the greatest cataclysmal effects, resulting in the mass extinction of species (for example amphibians), the disruption to the food chain, the inducement of skin cancers, impairment of the immune system, and other ailments (for example cataracts)* (Sandler 1998: 107).

Loss of Biological Diversity: Biological diversity or biodiversity refers to the variety of life on Earth, including the variety of species, the genetic variability within each species, and the variety of different ecosystems. The Biodiversity Convention defines it as meaning "The diversity of ecosystems and species, as well as variation in genetic material within species" (Rosendal and Shei 2012). In any ecosystem, species exist in dynamic interaction. Some systems are simple, and others contain vast numbers of different species. "Climatic variation, differences in top soil and historic events such as ice ages, continental drift and evolutionary processes have produced a wide variety of habitats and ecosystems around the globe" (Sandler 1998: 92). Each of these worlds contains unique biological resources giving us medicines, food and many other natural provisions essential to our survival. Tropical forests house over half of the world's species of plants and animals, so that the clearing of these forests would have a significant impact on the earth's genetic diversity. In addition, the forests sequester significant amounts of carbon, which would, if released, accelerate global warming. Tropical forests yield some global public goods. They also give rise to localized public and private outputs to the host nations and their neighbours. Private or host-nation specific benefits include timber and non timber products. For the host nation and nearby states, rain forests provide local public goods in terms of watersheds, erosion control, localized climate effects, and nutrient recycling.

Tropical biodiversity provides people with important benefits. For example, one quarter of all prescription drugs sold in the United States are derived from tropical plants (Sandler 1998). The biodiversity also provides genetic material useful in genetic engineering for creating for instance, more pest-resistant crops. There is no telling what future cures could be found from these tropical plants.

Ecosystems, which took these millions of years to perfect are in danger as species population are observably declining. Ecosystems are being damaged and biological diversity lost is at an increasing disturbing rate. The extinction rate is 100 to 1000 times greater than when human beings set out on the path to global dominance. The worry has been that :

> "*If current rates of loss of tropical forests continue for the next 30 years, the projected number of species that the remaining forest could support would be reduced by 5 to 10 per cent relative to the forest in the absence of human disturbance. This rate of decline would represent 1,000 to 10,000 times the expected rate of extinction without deforestation by humans*" (Watson et al 1998: 17).

Loss of forest biodiversity results from habitat loss, fragmentation, and over-harvesting of plant and animal species. These losses of particular species in forests may not have the immediate or dramatic effects that large-scale conversion to other uses may have. However, the loss of species richness can increase the vulnerability of forest ecosystems to other environmental stress, such as disease, pollution, wind, and flooding. If keystone species are lost, dramatic reorganizations of entire forest ecosystems can occur, changing the ecosystem services on which humans depend.

Climate Change: Climate simply defined is the characteristic weather of an area which includes temperature, rainfall, sunshine, wind, humidity etc (A to 2010). Climate change therefore, is the change in climate over time, whether due to natural variability or as a result of human activity (Oladipo 2012). Climate change is real and happening. After many years of skepticism, the reality of climate change has now assumed a global acceptance. Over the time, average temperatures in the Arctic region have increased by about seven degrees, a result of a feedback cycle that exists there (Giddens 2009). Sea levels rose over the course of the twentieth century, although there is considerable controversy among scientists about just how much. Warming is likely to intensify the risk of droughts in some parts of the world and lead to increased rainfall in others. Documented impacts of climate change also include the spread of disease vectors including malaria; the destruction of coral reefs from warmer seas and extreme weather events; and threats to low-lying island states (Eze 2010). More people will become water-stressed as hydrologic variability affects water quality and supply. In addition to altering biophysical systems, climate change will affect human health.

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Population: Another major global environmental problem is overpopulation. The annual increment to the world' population in 1900 was about 10 million people. Today, it is nearly 100 million (Worldo Meters 2017). According to that same source, the population figure of the world stands seven and half billion (7.5billion) as at April 2017. From various other studies (Myers 2003, UNDP 1994, Haub 1995), it is projected that the world's every eleven years will experience the addition of another billion until 2021, from which time it will take fourteen years to reach nine billion (Sandler 2005). Population expansion places strains on the soils, the forests, the water supplies, the fisheries, and the atmosphere that degrade these natural assets permanently. Once the ecosystem's 'carrying capacity' is surpassed, stress on the system causes a permanent degradation. Prior to this capacity being reached, an ecosystem is able to absorb the pollutants without being noticeably impaired. Pressures on a host of ecosystems are predicted to exceed carrying capacity as population expands (Sandler 2005). "In many arid developing countries, quick population growth threatens to reduce per capita water availability to levels below those required to meet minimum household, industrial, and agricultural needs" (Homer-Dixon 1995: 56). Overpopulation places demand on the available livestock and food required to feed the fast teeming population. The result of this has been that in order to meet up with adequate supply that meets the need and demand of the increasing population size of most places, food had to be genetically modified. Records have it that cancer and other disease that have grievous health consequences, are resultant effects of genetically modified food.

With population growth leading to greater consumption of natural resources, and increasing climate change effect over environmental resources, an upsurge in scarcity-driven conflicts, at levels not seen in the past, has been the case. As observed by Derman, Odgaard and Sjaastad (2007), "scarcity of environmental resources arising from blowing rate of climate change and population growth, generate corresponding processes of acute conflict formation, migration and subsequent group-identity conflicts". Scarcity-induced resource capture by Moors in Mauritania helped ignite violence over water and cropland in the Senegal River basin, producing tens of thousands of refugees (Kegley and Wittkopf 2003).

Water Scarcity and Water Pollution: Of all the global environmental problems, water scarcity and the absence of clean water probably present the most immediate threat to humans in this and the next century. Water is critical for human life and for the survival of almost all ecosystems. Water is indispensable for terrestrial and human life, and non-substitutable in most domestic and productive activities. Today, scientific findings are that water is scarce, and will yet be. The issue of water scarcity as argued by Richard Ward (2010), is acquiring a new impetus. Not too long ago, it was primarily viewed as part of the suite of issues which make up climate change, but like carbon emissions, water is fast acquiring its own identity, and demanding serious and urgent attention. Scholarships of divergent areas and political leaders over the past decades have focused broad attention on water as key resource under threat. The 2008 Goldman's 'Top Five Risks' Conference identified a catastrophic global water shortage as a great global risk during the 21st Century.

Air Pollution: Air pollution may be defined as imbalance in the quality of air so as to cause ill effects (Eugene 2005). Air is a reservoir of oxygen needed by man and other animals, and carbon dioxide essential for plants. There could be no life on earth without air. Without air there would be no clouds, no winds, no rain, no snow and no fire. Air is an insulating blanket around the world (Eugene 2005), therefore, any contamination in air may disturb the whole atmospheric system. All the major and minor components of the air are biologically important and the participation of each in the living process is, in some cases, critically sensitive to slight changes in concentration. Whenever the proportion of the components is disturbed by man, that becomes a cause of air pollution, which today, unarguably has become a major global problem. According to Ona-Maria (2015) "Our enormously accelerated abuse of the atmosphere has become a health hazard and a threat to life, damaging both plants and animals in areas polluted with poisonous fumes, dusts and smoke". Growing industrialization and transportation and the increasing use of pesticides and unwanted chemicals in the air has rendered the whole atmosphere polluted and its impact is very dangerous not only on man and other living organisms, but also on environment itself. Enuka (2017) argues that the effects of air pollution are many and multifaceted. Among other effects, the growing air pollution is a health hazard for man. Air pollution mainly affects the respiratory system. Bronchitis, emphysema, asthma and lung cancer are some of the chronic diseases caused due to exposure to polluted air. Lead emitted from automobile exhausts is a cumulative poison, dangerous particularly to children and may cause brain damage. These problems are not exclusive reserve of any particular country or region. They are global problems with threatening hazardous implications for the entire world.

Acid Rain: Acid rain is the term used to describe the deposition of acidic air pollution. Although some air pollutants fall directly back to Earth, a lot of it returns in rain, snow, sleet, hail, mist or fog (Eugene 2005). When power stations, factories, houses and cars emit pollution into the air, it contains chemicals known as sulphur dioxide and nitrogen oxide. These chemicals may either fall directly back to the earth due to gravity, or they mix

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with moisture in the air to form acids. Once acids have formed, they can be transported long distances by the wind before being deposited in rain, snow or hail. This is what is commonly called acid rain. Acid rain can have harmful effects on the environment. It affects freshwater lakes and the wildlife that depend upon them. It also affects trees by harming leaves and soil, and it damages building made of limestone and marble. When acid rain falls on the buildings, it slowly dissolves away the stonework. Consequently, these buildings may need constant maintenance and reconstruction. Acid rain does affect freshwater lakes and the plants and aquatic lives which are found in them. Although lakes can withstand a certain amount of acid rain, after a while, their acidity will increase. When this happens, the water in the lake can turn a clear blue due to a loss of organic matter which is usually dissolved in the water. The range of plants and animals usually decreases. Some of the organisms affected by acidified water include snails, crayfish, salmon, trout and many other species. The many negative effects of acid rain extend also to soil. Acid deposition is known to wash essential nutrients from soils, and aluminium which is normally bound in soil may be released into ground water. That the soil is the basis of wealth upon which all land-based life depends, brings to bare the danger of the effects of acid rain on the soil.

III. International Environmental Cooperation

By the beginning of the 1970s, there was a widespread sense of environmental crisis around the world. A major concern was the exploding population 'bomb' due to increasing birth rates in developing countries and decreasing mortality rates everywhere due to better health care. Growing industrialization and prosperity had led to increasing urbanization, slums, smog, traffic jams, noise, water and air pollution and waste. There were doubts about whether carrying capacity of the earth space would be able to survive. Due to profligate consumption, concern was expressed about the natural non-renewable resources of the world running out. Many countries had taken the first steps to arrest environmental degradation in their countries, but there was growing realization that the global environment and common resources of the world might not be protected if every country looked after only its national environmental interests. Advantages of international environmental cooperation to halt environmental degradation became obvious. At the time, there was no single international focal organization to promote cooperative environmental action among states and countries of the world. It was in this context that the Stockholm conference was convened. The Stockholm Conference, resulting in the adoption of Stockholm Declaration placed the issue of protection of global environment. The Stockholm Conference, resulting in the adoption of Stockholm Declaration placed the issue of protection of global environment on the official agenda of international policy and law. Held in 1972, the Stockholm conference was the first of a series of major frameworks of interaction among states on the environment. It addressed the collective human responsibility for environmental protection on a global scale. As far as species conservation is concerned, there have been major international conferences and agreements. Among them is the Convention on International Trade in Endangered Species of Wild Flora and Fauna, 1973. Convention on International Trade in Endangered Species of Wild Flora and Fauna popularly known as CITES, is one of the most significant international environmental agreements aimed at controlling and preventing international commercial trade in endangered species or products derived from them. The Convention was adopted at Washington in 1973. It came into force on 1 July 1975. The Convention protects endangered species by restricting and regulating their international trade through export permit systems. It establishes the international legal framework and procedural mechanism for the prevention of trade in endangered species and for an effective regulation of trade in certain other species. Added to these conferences and their accompanying environmental agreements and treaties, there had been the Rio de Janeiro Conference and Johannesburg Conferences in 1992 and 2002 respectively. These had been followed with the Kyoto Protocol, the Copenhagen Conference, and Paris Conference on Climate Change etc. During these conferences, the international community has been able to bring into existence and enforcement a plethora of international environmental laws. But notwithstanding the obvious successes that have been recorded by these cooperative efforts, international environmental cooperation is still fraught with myriad of challenges. These challenges are here presented in the next section of this paper.

IV. Challenges Of International Environmental Cooperation

Anarchic Nature of the International System: The first challenge is that no state can ever be compelled to join an international agreement or to undertake a particular regulation.

> *A prominent feature of all international cooperation is the voluntary nature of participation. It is up to the individual government to decide whether to join in. Commitments can't be forced on an unwilling government. Negotiations therefore, tend to stop at what the least enthusiastic parties are willing to accept. To put in a few words, it is one of the main barriers to achieving strong internal environmental*

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cooperation. (Anderson, Boasson and Honneland 2012: 190).

The international system is anarchic in that there is no overarching authority (world government) that can dictate to individual states or actors within those states, what they must do. And although there are international courts and tribunals, no state can ever be forced to appear before them, or to accept punishment from them (Desombre 2005). For the realists and neorealist theorists, international anarchy is unmitigated (Waltz 1979, Keohane 1986). States have little or no incentive to work together to solve joint problems, and their attitudes towards each other have been conditioned by a history of international conflict, not one of international cooperation. They are motivated primarily by rivalry and the pursuit of relative power, most particularly power in military or economic terms. It is this pursuit of relative gains, vis-à-vis other states, that drives interactions between them. This makes lasting cooperation extremely unlikely, except when cooperation is driven and maintained by one single, powerful state, or hegemony, for as long as it is willing and able to do so (O'Neil 2009).

Consequently, a dozen years and hundreds of climate conferences and meetings have yielded disappointing results. Kyoto Protocol has at best remained "…watered down, burdened with fuzzy math" (Meyerson 2003). To date, Kyoto has had a negligible effect on emissions and atmospheric concentrations of greenhouse gas. Only a handful of countries are on track to meet their Kyoto obligations. Many of those nations have achieved that status more as a by-product of economic problems and fortuitous circumstances than environmental policy. After weakening the Protocol, the United States by far the largest greenhouse gas emitter, essentially walked away from the agreement along with any serious effort to lower US emissions (Meyerson 2003). Reilly blamed George Bush for not coming back to table to reshape climate policy and for being widely seen as unfriendly to the environment (Reilly 2003).

The Convention on Biological Diversity (CBD) is another troubling example. Since the CBD's birth in Rio, there have been more than fifteen major international meetings under its aegis, but little progress towards either measuring biological diversity declines or slowing down the extinction of species.

National Will: National will and capacity are obstacles, determining levels of compliance with, and effectiveness of, multilateral environmental agreements. Oftentimes states either fail to consent to international environmental agreements or will renege in implementing them. This is often because they lack the national will to do so. It is obviously not sufficient for states to agree to take action to protect the global environment if they do not then put these regulations into practice. Some will play the game of agreeing to environmental measures but then do not implement them. This is because public pressure may decrease if people believe that the issue has been addressed. States engage in international cooperation only when they see a chance of relative gains for themselves over others in the international system. This point of view associated with the realists contrasts with the institution a list perspective that states are interested in absolute gains for the entire international community regardless of how their relative position changes (O'Neill 2009). There are many situations in which all parties can benefit from working together to prevent or solve an environmental problem. Even in situations where all states benefit from environmental protection, some (may) benefit more than others, and most would benefit from taking no action at all and leaving environmental protection to others.

The question of why states might not comply with international environmental agreements takes us back to one of the central articles in environmental studies and the idea of the 'Tragedy of the Commons' in which Garrett Hardin (1968) observed the difficulty of achieving environmental cooperation with an analogy to medieval cow herders who all kept their cows on commonly held land. He observed that each herder gains the full positive utility of every new cow put onto the common pasture, but that the negative utility (also seen as environmental externalities) of each new cow is shared by all, with that cow's herder thus only bearing a fraction of the additional cow. Even if there is a set number of cows, the pasture can support, each individual herder, doing a cost-benefit analysis, will always find it advantageous to add another cow. Moreover, this logic remains even if a given cow herder knows that the next cow added to the pasture will push the ecosystem past its carrying capacity and thus ruin the commons for everyone. As long as one herder cannot be sure whether another herder will add the extra cow, the first herder will have an incentive to do so. Practicing restraint can lead to the worst possible outcome if you decide to forgo the benefits of adding an extra cow but someone else does not; you have thus not gained the benefits of the extra cow and you will bear the cost of the destroyed ecosystem. While some have pointed to the lack of inevitability in this formulation and the historical inaccuracy of the analogy, it is nevertheless a useful starting point for understanding the difficulties of international environmental cooperation, and incentives to cheat on the agreement made.

Complex Interplay of Different National Interests: The course and outcomes of international environmental negotiations are to a large extent driven by the complex interplay of often radically different national interests. States or more accurately, their national representatives,

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come to the bargaining table with their own sets of objectives, and usually with some knowledge of what they are prepared to give up to reach a compromise, and what sources of leverage they can draw on to attain their desired outcome. Only in very rare situations do these interests coincide. More often than not, interests clash, and the bargaining process results in winners and losers (O'Neill 2009). Sometimes, national differences are wholly intractable, and negotiations fail, as in the case of the Global Forests Convention, when differences around what forests to regulate, and how to respect sovereign control over forest resources led to the collapse of multilateral talks in the run-up to the Rio Earth Summit (Davenport 2005). Moreso, states are also pluralistic entities, and within them, some actors will benefit more or be harmed more by action taken to protect the global environment.

Added to this challenge, is the challenge that many different sorts of states inhabit the international system. The international system has seen two waves of new states joining the international community since World War2, first as the European nations dismantled their colonial empires after the war, and second, following the end of the cold war, when states part of or closely allied with the Soviet Union gained their independence. The larger number of states participating in multi-lateral institutions has increased the complexity of negotiations on international environmental issues.

Domestic politics adds another dimension to the challenges of international environmental relations. It is not only what happens at the negotiating table that is important in determining interests and outcomes. Negotiators are also accountable to their domestic constituencies, be it legislatures, the voting public, or industry or other lobbying groups. There are many examples of ways in which domestic politics have shaped national interests over time, and affected the course of international environmental negotiations, whether it relates to perceptions of national vulnerability.

Role of Powerful States: Another serious challenge of international environmental cooperation is the role of powerful states, and the difficulty of negotiation. As the most powerful state in the international system, the United States of America's participation in international environmental negotiations is often considered critical, yet over the years it became more of a laggard state, reluctant to participate in international environmental diplomacy. The lead states in international environmental politics are the Scandinavian nations for instance, often taking strong positions on the global environment, encouraging others to join negotiations, and often taking unilateral measures above and beyond their basic commitments (O'Neill 2009).

Given the understanding that while climate change is the common problem of all, but had been produced as a consequence of the development of the industrialized nations and it is their (Developed Nations) responsibility to take the lead in cutting emissions, the Kyoto Convention held in 1997 in Japan. The 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change therefore, committed the developed countries to make an average of a 5.2 per cent cut in their green house gas emissions from a 1990 baseline (Vogler 2008). Within this, different national targets were negotiated. For example 7 per cent cut of emission was to be made by the United States and 8 per cent by the European Union (Vogler 2008). These were to be achieved by the first commitment period: 2008-2012. Contrarily, the United States evidently did not ratify the Kyoto agreement/arrangement, and the administration of George W. Bush actually denounced United States' signature of the Protocol, claiming it to be "Fatally flawed" and that the emissions cuts required would be impossibly damaging to the US economy. Australia also refused to ratify the Kyoto protocol change. This way, the climate regime and international environmental cooperation have been afflicted by the roles, albeit negative, of powerful states.

Again, the United States is one of a tiny handful of countries that have not rectified the Convention on Biological Diversity, yet it routinely sends large delegations to meetings and tries hard to influence their outcome through direct or indirect means. At a certain CBD meeting, the United States opposed many aspects of the agreement that would actually protect biodiversity or set standards, apparently out of concern that the CBD might impede the sovereignty and economic free range of America. Meyerson strongly argues that "it is difficult to discern any compass other than economic self-interest guiding U.S policy towards climate and biodiversity" (Meyerson 2003: 6). A related paralysis and malaise affected international population policy. The 1994 Programme of Action at the United Nations International Conference on Population and Development in Cairo, known as Cairo + 10, set forth bold goals for universal access to reproductive health by 2015 (Meyerson 2003). The American delegation announced that the United States would not affirm its support for Cairo + 10, unless the terms "reproductive health services" and "reproductive rights" (which the United States construes as including abortion) were removed from the text (Dao 2002).

Proceeding in the cooperation against the global environmental challenges by states without the United States of America has been very difficult, not only because it produces around one quarter of global carbon dioxide emissions, but also because its failure to be involved affects the willingness of others to participate and particularly the fast developing countries of the South.

North-South Ecopolitics: Indisputably, one of the most important challenges facing international environmental

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cooperation has been the ongoing debate/politics between countries of the developing South and the developed North. As Vogler (2008: 363) will say "At the heart of the international politics of climate change as a global environmental problem is the divide between North and South". In international environmental relation there is considerable discussion about North-South conflicts, or conflicts between wealthier, economically developed nations and poorer, economically developing countries over global environmental priorities, negotiating practices, and the distribution of treaty obligation and their associated costs. In an international system that has taken great powers as the determinants of international politics, Third World have often been marginalized. Susskind (1994) argues that differences in interests and priorities between rich and poor countries have been a major obstacle to reaching environmental agreements.

Many developed nations (North) have more stringent environmental standards and believe developing countries should raise their national standards to these more stringent levels. According to the North, the South should learn from the North's mistakes and avoid the environmental and economic consequences of unsustainable development. Many developing countries (South), however, contend that this requirement is unfair. The developing world often uses two main arguments to justify its opposition to this upward harmonization of environmental standards. First, much of the developed world's wealth was derived from the cheap and unsustainable extraction of natural resources. Although the North may now favor greater environmental protection, the South is quick to point out the tremendous wealth derived from unregulated development. Developing countries argue that it is hypocritical for the North to deny less affluent countries the same development opportunities. Second, there is widespread suspicion among developing countries that environmental standards are being used by the North to keep the South at a competitive disadvantage. These suspicions have led some to label global environmental protection efforts as "eco-imperialism" (Enuka 2017).

A final argument often raised by less developed countries (LDCs) is that if the developed nations wish to enforce stringent standards upon the LDCs, the developed nations have a corresponding duty to transfer enabling technology and to offer financial assistance at concessionary rates. This argument often surfaces in debates surrounding technology transfers. Frequent North-South arguments since Rio about the levels of aid and technology transfer that would allow developing countries to achieve sustainable development have seen many disappointments and unfulfilled pledges (Baylis, Smith and Owens 2008).

A key principle of the climate change regime written into the 1992 United Nations Framework Convention on Climate Change (UNFCC), was the notion of "Common but differential responsibilities". This, in effect, meant that although all nations had to accept responsibility for the world's changing climate, it is the developed nations that are immediately responsible because they had benefited from industrialization which was generally regarded as the source of the excess carbon dioxide emission that had caused temperature increase. The USA emits around 25 per cent of the global total, but has only 4.5 per cent of global population. The Chinese figures are 14 per cent and over 20 per cent of the world's population. The least developed nations emit below 1 per cent and account for over 10 per cent of the world's population (Baylis, Smith and Owens 2008). Accordingly, the developed countries were listed in Annex 1 of the Convention and it was agreed that they (the developed countries of the North) rather than the developing countries would have to lead the way in making emissions reductions. But major countries of the North had passed resolutions in their home countries making it clear that they would not ratify any agreement where developing nations (South), who were new economic competitors of the North did not also have to make emissions reductions (Haslam, Schafer and Beauder 2009). From some countries of the North publications began to emanate and circulate, projecting that with the formidable forces of globalization which is radically changing the pattern of enrgy-related carbon dioxide emissions, that developing world emissions would overtake those of the developed North (Sick 2009).

> *Rich and industrialized nations of the North point out that developing countries in the South, while responsible for just 25 per cent of carbon emissions since 1950, are quickly becoming major emitters in their own right…industrial countries emphasize (that) booming population and economic growth is fueling an explosive increase in carbon emissions in the South.* (Dunn 2001: 440).

And as the United States Department of Energy projected,

> *…carbon output from developing countries will, in the absence of any new policies, outgrow that of their neighbours as early as 2020...* (Kegley and Wittkopf 2001).

Therefore, to have any chance of success, climate regime will have to include emissions reductions by the countries of the South. This will be very unlikely to be accepted by the South, going by their understanding of carbon emissions reality. Developed countries' arguments is seen by the South as an attempt by the rich industrialized North to evade responsibilities, and to avoid changes in their wasteful energy habits by shifting responsibility to the poor. India and China for instance argue that "every person should be granted equal entitlement to pollute the atmosphere" (Vogler 2008).

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Indian negotiators stress that their people should not be limited to a few 'survival emissions' while those supporting above-average standards of living in the North are consuming luxury emissions (Dunn 2001). As Chinese delegate told an American in Japan during the Kyoto Conference, in the developed world "only two persons ride in a car, and yet you want us to give up riding on a bus" (Dunn 2001: 441). Prior to the Kyoto Conference, in Montreal meeting on environment (ozone layer depletion), industrial nations alone took on specific goals for reducing CFC use, while developing countries argued for the right to use as many ozone-depleting technologies as they wished, and for as long as possible (Choucri 1995).

Implicit in all these, is that the divide between the North and the South on what should constitute their responsibilities towards the common problems of climate change and carbon emission impedes and frustrates to no mean level, international environmental cooperation.

V. Conclusion

The global environment is without doubt challenged by myriad of problems. This is to the extent that many entertain the feeling that this century will be our last. The human race might not survive the twenty first century. Among several of these environmental challenges are population explosion; loss of biodiversity; climate change; ozone layer depletion; air and water pollution etc. Because these challenges are *transfrontier*, travelling across national borders, states in the international system began to engage in serious international cooperation in the bid to find solution to these disturbing environmental challenges. Consequently, over the years, there have been various international efforts, starting with the convening of Stockholm Conference in 1972, and later Rio de Janeiro Conference and Johannesburg Conferences in 1992 and 2002 respectively. During these conferences, the international community has been able to bring into existence and enforcement a plethora of international environmental laws. But notwithstanding the obvious successes that have been recorded by these cooperative efforts, international environmental cooperation is still fraught with myriad of challenges. The teething problems of North-South ecopolitics, the negative influence and roles of big and powerful states, the troubling problems of sheer inability to compel states to obedience over international environmental agreements, etc, combine as formidable force that hamper the expected effectiveness of international environmental cooperation. This paper *the sisizes* that unless these obvious challenges of international environmental cooperation is surmounted, this century, as Rees posited, will be our last.

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Correlation of Sequences and Changes in Facies across Shelf Margin using Core and Seismic Data Offshore Canterbury Basin

By Kachalla, Aliyuda, Helen Lever, Musa Bappah Usman, Usman Abubakar & Abdulwahab Mohammed Bello
Gombe State University

Abstract- Canterbury basin covers an approximate area of 40,000 km2, Canterbury basin is largely an offshore basin extending slightly onshore southward across Canterbury plains and to the Southern Alps. This work aimed to correlates seismic sequences boundaries earlier interpreted with sedimentary sequence surfaces observed in cores recovered from the four sites drilled across the shelf by expedition 317. This work utilises well data obtained from Integrated Ocean Drilling Program (IODP) expedition 317. The expedition which targeted stratigraphic seismic sequences earlier interpreted from the seismic data acquired on the eastern margin of the south island of New Zealand (offshore Canterbury). Three synthetic seismograms were created from well U1351B, U1353C and U1352B which both contain sets of sonic and density logs at variable length, this is to provide a direct means of comparison between the sequence boundaries interpreted on seismic and the depth on cores recovered from holes transecting on the seismic profiles. From the interpretation, nineteen boundaries were identified (U1-U19), these boundaries can be broadly divided into two large units. From U19-U11 (the upper units), it's dominated by downlapped seismic termination pattern along the paleoshelve and truncation surfaces across the shelve edge around site U1351B, a number of channel incisions were observed in this profile. The lower units (from U10-U5) consist of less truncation but more common onlap on paleoshelves, it features more drift deposits with sigmoidal reflection pattern.

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CORRELATIONOFSEQUENCESANDCHANGESINFACIESACROSSSHELFMARGINUSINGCOREANDSEISMICDATAOFFSHORECANTERBURYBASIN

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Correlation of Sequences and Changes in Facies across Shelf Margin using Core and Seismic Data Offshore Canterbury Basin

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Abstract- Canterbury basin covers an approximate area of 40,000 km², Canterbury basin is largely an offshore basin extending slightly onshore southward across Canterbury plains and to the Southern Alps. This work aimed to correlates seismic sequences boundaries earlier interpreted with sedimentary sequence surfaces observed in cores recovered from the four sites drilled across the shelf by expedition 317. This work utilises well data obtained from Integrated Ocean Drilling Program (IODP) expedition 317. The expedition which targeted stratigraphic seismic sequences earlier interpreted from the seismic data acquired on the eastern margin of the south island of New Zealand (offshore Canterbury). Three synthetic seismograms were created from well U1351B, U1353C and U1352B which both contain sets of sonic and density logs at variable length, this is to provide a direct means of comparison between the sequence boundaries interpreted on seismic and the depth on cores recovered from holes transecting on the seismic profiles. From the interpretation, nineteen boundaries were identified (U1-U19), these boundaries can be broadly divided into two large units. From U19-U11 (the upper units), it's dominated by downlapped seismic termination pattern along the paleoshelve and truncation surfaces across the shelve edge around site U1351B, a number of channel incisions were observed in this profile. The lower units (from U10-U5) consist of less truncation but more common onlap on paleoshelves, it features more drift deposits with sigmoidal reflection pattern. The nineteen seismic sequences boundaries correlate perfectly with sharp contacts between sandstone and mud/shale on the core sections, however few are gradational contacts.

I. Introduction

The study area lies in the eastern side of south island of New Zealand, part of a continental fragment that consist the Canterbury plain to the North, Campbell plateau to the Southeast and Chatham rise slightly northeast (Fig. 1). Canterbury basin covers an approximate area of 40,000 km², accumulating sediment since the rifting of the shelf margin from Antarctica in Cretaceous.

This research utilises well data obtained from Integrated Ocean Drilling Program (IODP) expedition 317. The expedition which targeted stratigraphic seismic sequences earlier interpreted from the MCS seismic data acquired on the eastern margin of the south island of New Zealand (offshore Canterbury).

This work aimed to correlates seismic sequences boundaries earlier interpreted by Lu and Fulthorpe (2004) with sedimentary sequence surfaces observed in cores recovered from the four sites drilled across the shelf by expedition 317. From the earlier acquired MCS EW00-01 data, nineteen seismic sequences were interpreted, ranging from Miocene to Recent in age. Such interpretation was based on standard interpretation techniques identifying reflection termination patterns such as onlap, downlap and truncations.

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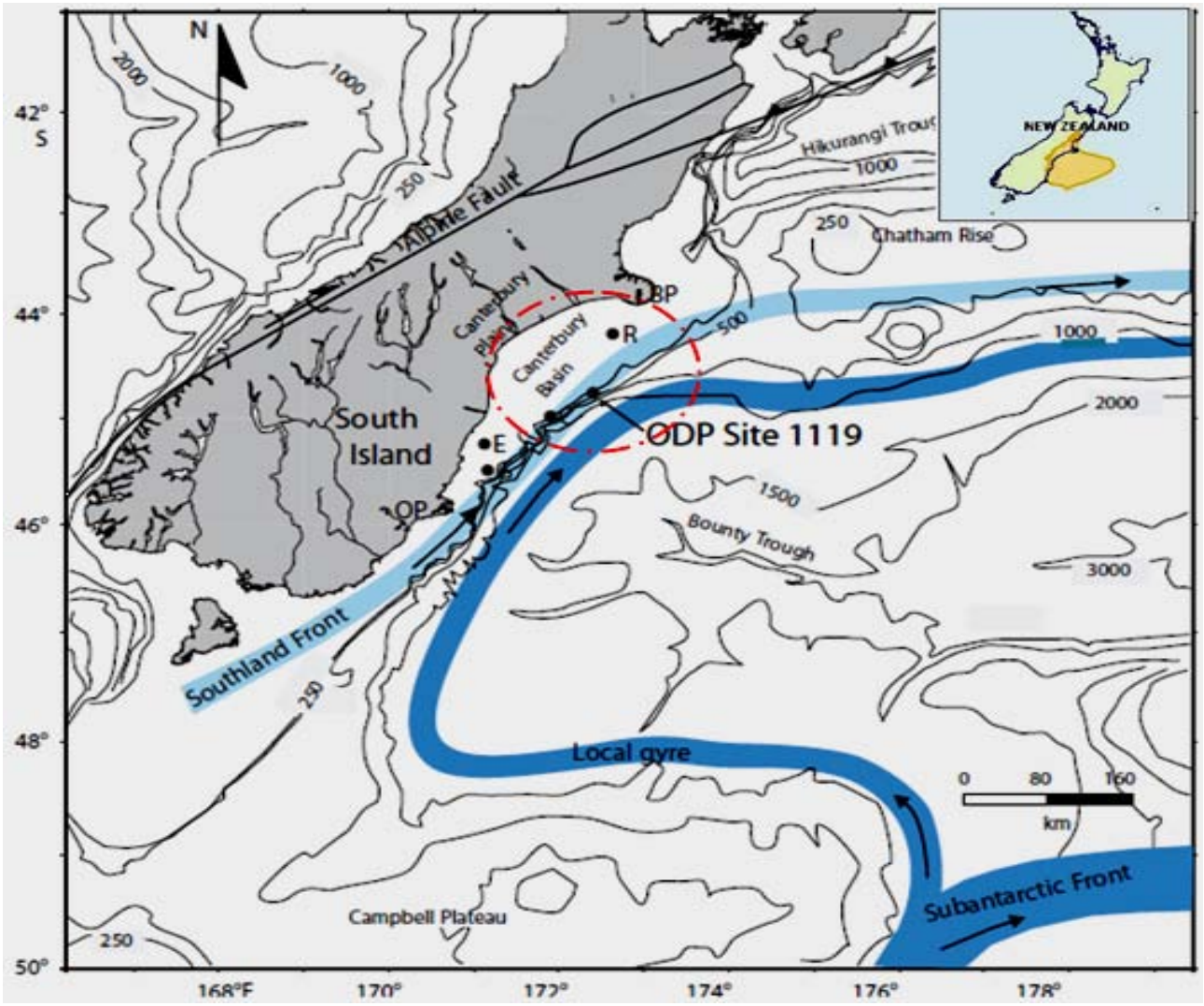

Fig. 1: Location map of the study area, Canterbury basin is circled in black; the Alpine fault is at the boundary of Australian plate with Pacific. Directions of oceanographic currents are shown in thick blue and light green. Also location of four exploration wells, Resolution =R, Clipper =C, Endeavour =E, and Galleon =G as well as Ocean Drilling Program (ODP) Site 1119 (modified from Fulthorpe et al, 2011).

a) Stratigraphy / Sedimentation

Sedimentation and stratigraphy of the basin consists traceable records of tectonic activities which created accommodation space for sediments infill. Hence, stratigraphy and sedimentation history would be discussed alongside tectonics. Sedimentation began about 80 Ma ago, before the rifting phase, the basin's variable facies reflect transgressive to regressive cycles with the Onekara, Kekenodon and Otakou Groups being the major packages deposited in various phases of sea level as transgressive, highstand and regressive deposits respectively (Carter and Carter, 1982; Lu and Fulthorpe, 2004).

Deposition of the regionally extensive pelagic to hemipelagic Amuri and weka pass Bioclast limestone Formations collectively called the Kekenodon group, consequently results from reduced terrigeous influx at maximum transgressive phase approximately 30 Ma. Marshall Paraconformity separates the two formations (Fig. 2C). Marshall paraconformity is confirmed from drill sites to be a regional paraconformity, extending to adjacent basins and throughout the east of the Tasmanian gateway. It is considered to represent the onset of thermohaline circulation from Separation of Australian and Antarctica about 33.7 Ma. The overlying Otakou Group is predominantly terrigenous with little amounts of mudstone and very fine to fine grained sandstone. It is dominated by siltstone and silty mudstone (Carter et al, 2004).

In Late Oligocene to Early Miocene Regression owing to Strike-slip movement that initiated Alpine fault increased rate of sediment supply. Rakaia, Rangitata, Pereora and Waitaki have provenance tied to the Southern Alps. These units are mainly coarse-grained sediments deposited in a river system (Fig. 2) (Lu and Fulthorpe, 2004).

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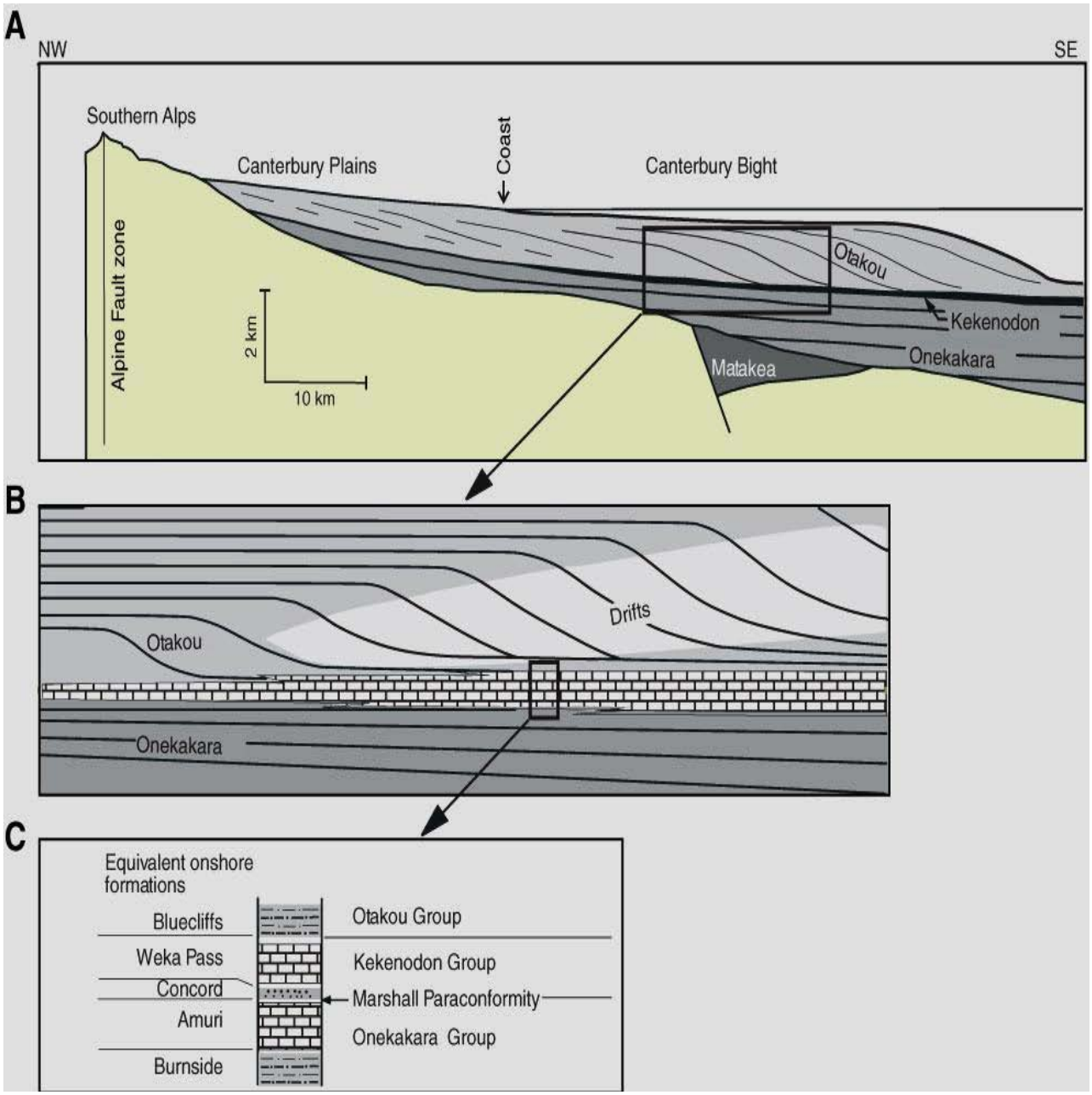

Fig. 2: Stratigraphy of the study area drilled by expedition 317 at three scales. A. large scale stratigraphy of the area at postrift phase showing the three major groups discussed above, Onekakara, Kekenodon deposited during transgression and high stand respectively while Otakou was deposited at regressive phase. B. At seismic scale, showing Otakou as drift deposits, limestone as distal facies. C. At outcrop scale showing the different facies of the various groups with their onshore equivalence (Lu and Fulthorpe, 2004).

II. Data

a) 2D Seismic Data

Data available for this project are obtained from the integrated Ocean Drilling Project Expedition 317. However, the two-dimensional high resolution seismic data was acquired by Maurice Ewing in January 2000. The EW00-01 grid lies between the Banks and the Otago peninsulas along the middle to outer shelf and slope offshore in water depth of 40-1100 m (Fig. 3). Source for the seismic acquisition of EW00-01 is two GI air guns (45/45in3). The survey yielded a total of 57 profiles approximately 3250 line-km with approximately 4840 km2 coverage. Spacing of seismic lines perpendicular to the margin is 0.7-3 km in the dip direction while along the strike direction 5.5km parallel to the margin. Vertical resolution is sufficient, within the upper 0.5 s which is approximately 5 m, sufficiently penetrated the Oligocene to Holocene section below the sea floor.

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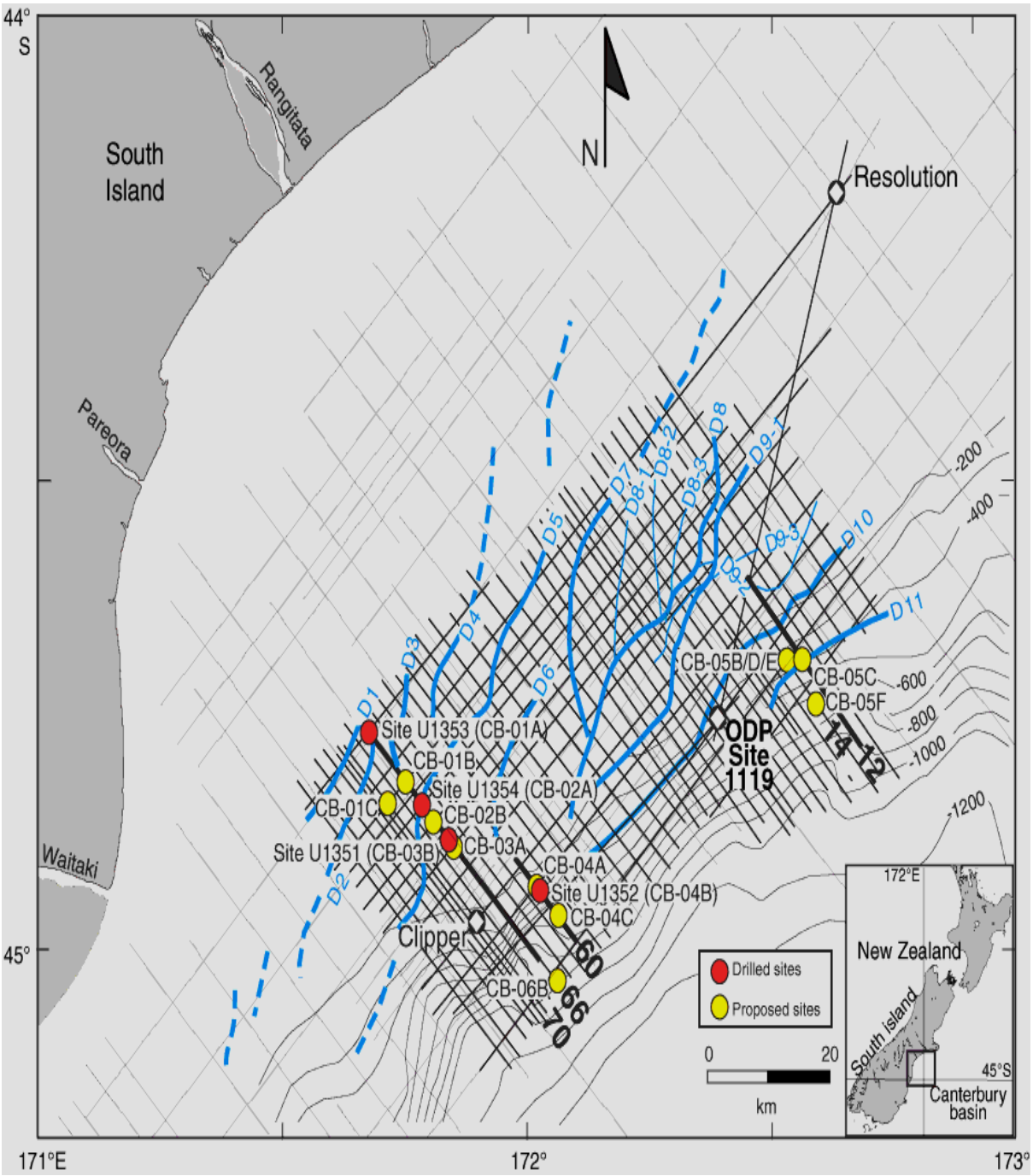

Fig. 3: Seismic Survey Grid (Expedition 317 Scientists, 2011).

b) Well Data

Well data available for this project came from four different sites all within the seismic survey grid EW00-01 (Fig. 3). Sites designated for drilling were planned before the expedition targeting most appropriate trajectories transecting sequence boundaries earlier interpreted from seismic lines. Variable successes were attained in most holes drilled. Site U1351, U1354 and U1353 can be seen on EW00-01-66 seismic profile (Fig. 4B), while site U1352 can only be seen on the seismic profile EW00-01-60 (Fig. 4A). U1351 as well as the other two sites on seismic profile EW00-01-66 are located on continental shelf; U1352 is on the upper slope. Site U1351 is in a water depth of 122 m, three wells were drilled at the site namely; U1351A, 1351B and U1351C, hole U1351B attained maximum penetration depth of 1030.6 m DSF, hole U1351A and U1351C have penetration depths of 28.0 m DSF and 967.3 m DSF respectively. Well U1351C was not cored, it was drilled purposely for wireline logging, 27.3 m and 304.5 m of core were successfully recovered from hole U1351A and U1351B respectively. Four holes were drilled in site U1352. In site U1353, three holes were drilled, two holes cored (U1353A and U1353B).

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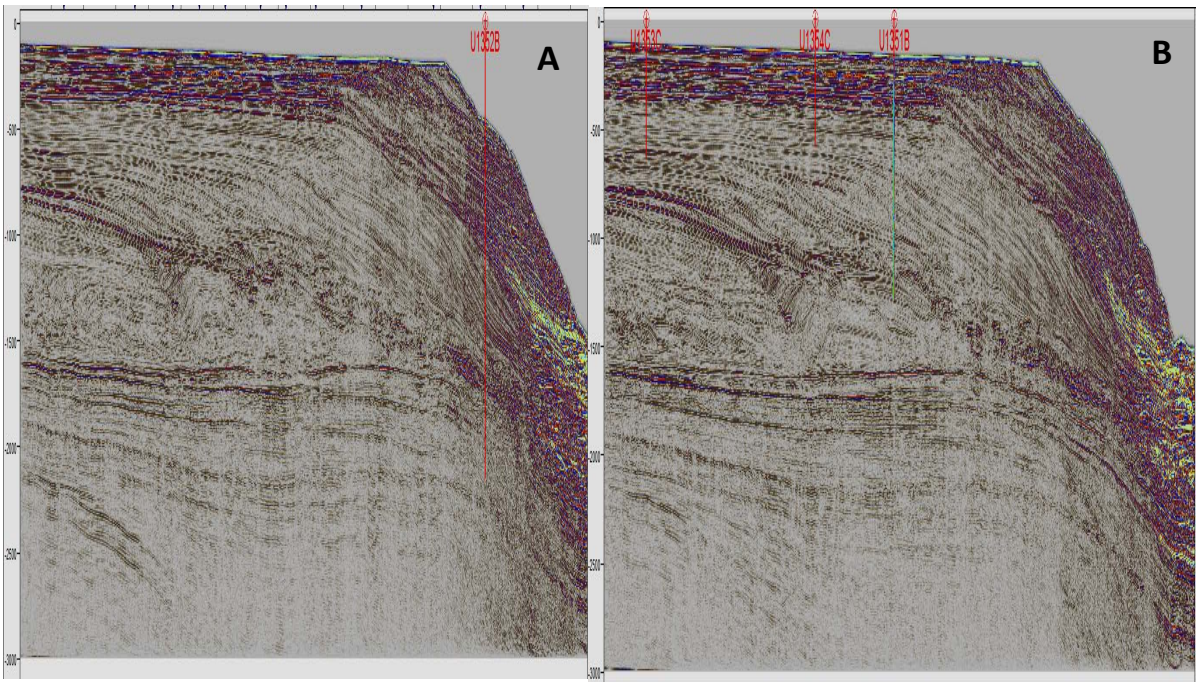

Fig. 4: Uninterpreted seismic profiles, A. showing the position of site U1352B on line 60 and B. showing sites U1351B, U1353C and U1354C wells drilled along the same profile on line 66 from petrel.

III. Methods

a) Two-Way Travel Time / Depth Conversion

The seismic data was taken in time, whereas, cores measurement is in meters, hence the need for two-way travel time to depth conservation. Conversion is required to enable correlation of sequences boundaries on actual core surfaces with sequence boundaries interpreted from seismic section. In this project two-way travel time to depth conversion was carried out using complete sonic and density logs available from Clipper-1 well (Fig. 5) which is within the survey area using Schlumberger petrel software 2013 version. This was done by creating a synthetic seismogram; the synthetic seismogram generated was compared with precruise synthetic seismogram from Lu and Fulthorpe (2004).

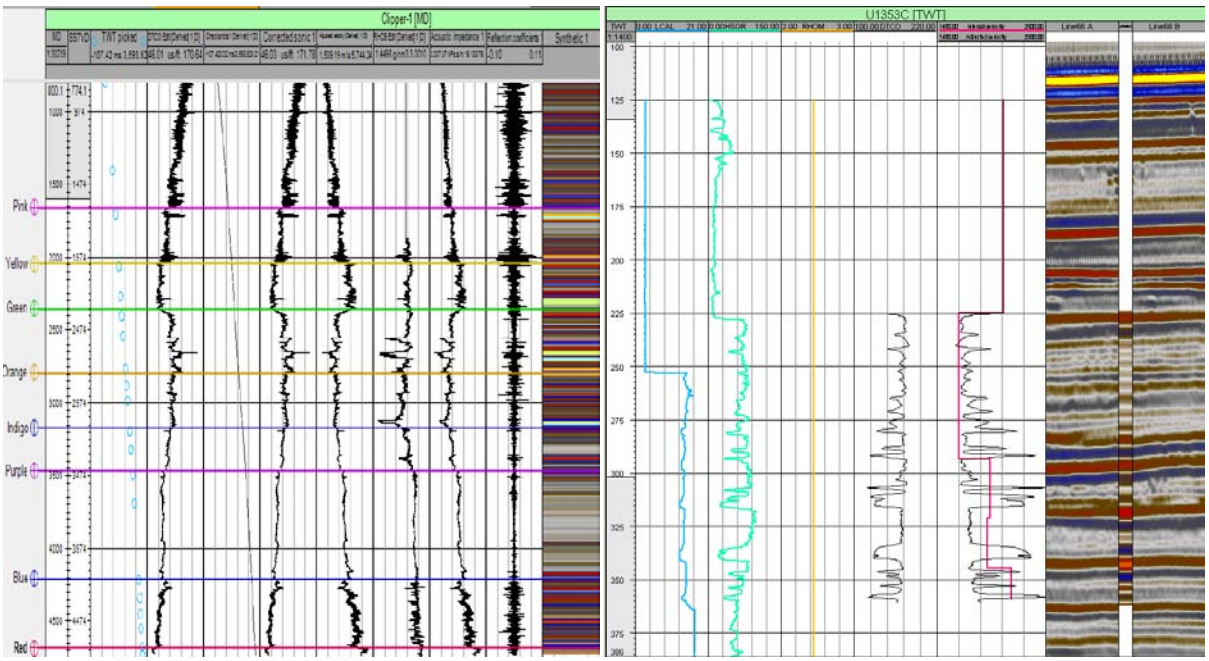

Fig. 5: Synthetic seismogram from clipper-1 well, from sonic and density logs covering the entire well interval for clipper-1, about 200 m for site U1353C.

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b) Identification of Sequence Boundaries in Cores (Core-Seismic Correlation)

From seismic data (EW00-01) earlier interpreted by Lu and Fulthorpe (2004), nineteen sequence boundaries were identified and interpreted (U1-U19), these boundaries were confirmed to be unconformities surfaces using fossils and carbon dating (Fig. 6). This interpretation was verified and further correlated with their actual depth in the cores provided. The actual sediment lithologic expression of the interpreted sequence boundaries in the cores were studied to determine the facie variation, sedimentary packages and lithologic discontinuity across the boundaries using the provided detailed core descriptions and high resolution core images. Identifying the boundaries based on rock type or lithology, with more emphasis on grain size contrast, nature of contacts, sedimentary packages and variability across the contacts. Emphasis was on the shallow boundaries considering the depth of penetration in the holes which provided the only gateway to the actual nature of sediments seen in cores.

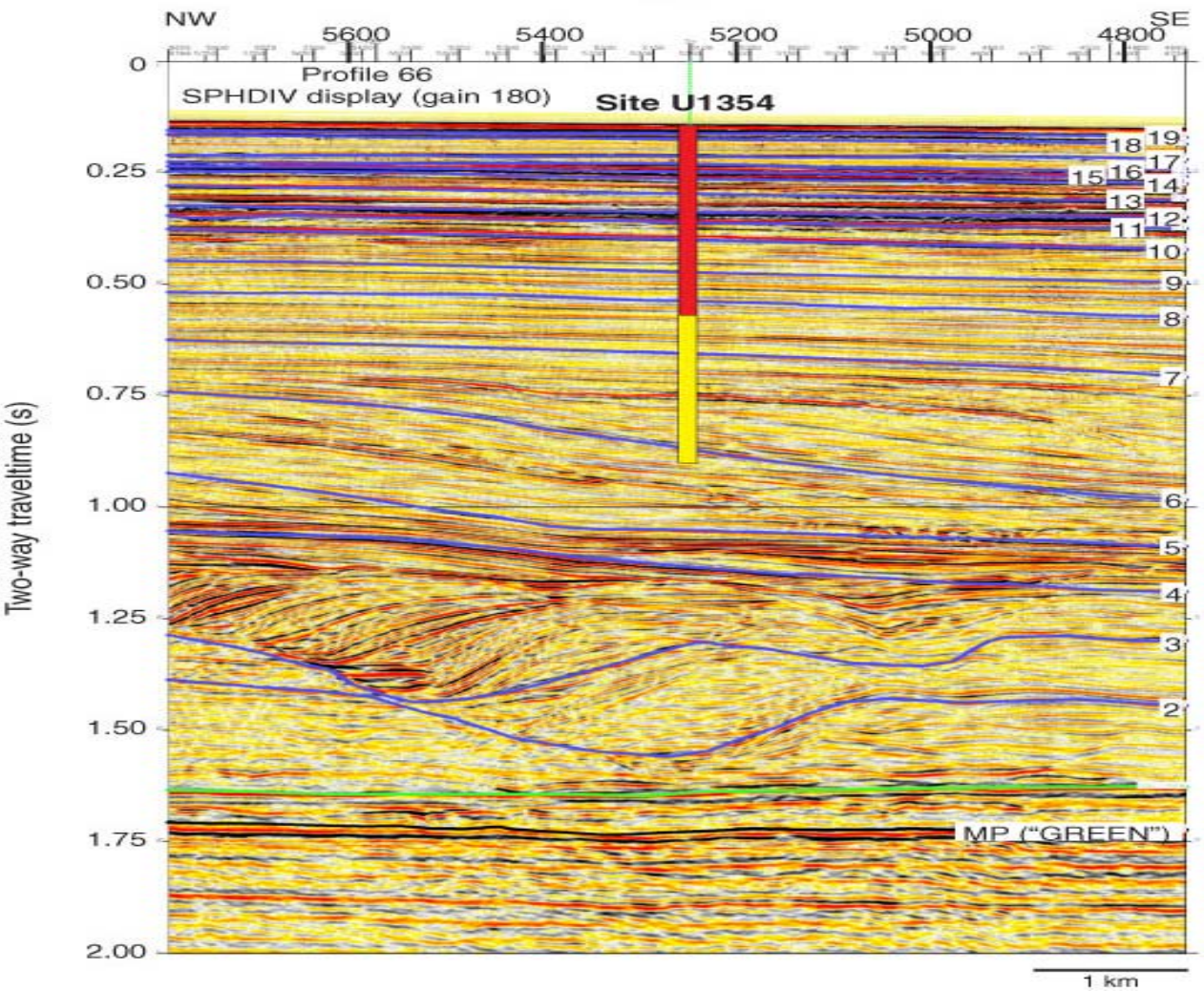

Fig. 6: Interpreted Seismic Section Profile EW00-01-66 Site U1354 (Expedition 317 Scientists, 2010).

IV. Results

Correlation of seismic interpreted sequences boundaries with the actual lithologic expression in cores were possible using seismic interpretation from Lu and Fulthorpe (2004). From the interpretation, nineteen boundaries were identified (U1-U19), these boundaries can be broadly divided into two large units. From U19-U11 (the upper units), it's dominated by downlapped seismic termination pattern along the paleoshelve and truncation surfaces across the shelve edge around site U1351B (Fig. 6), a number of channel incisions were observed in this profile. The lower units (from U10-U5) consist of less truncation but more common onlap on paleoshelves (Fig. 6), it features more drift deposits with sigmoidal reflection pattern.

Only sites U1351B and U1352B have both sonic and density logs hence 7 boundaries (U14-U8) in site U1351B and 7 boundaries (U19-U13) in site U1352B fall within the interval of the created synthetic seismogram. Other sites without synthetic seismogram cannot be correlated with much certainty due to lack of both sonic

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and density logs. However, for sites U1353 and U1354 two-way travel time picked at such boundaries were used in a function (equation 3) to determine the depth. The function was derived from check-shot data obtained from Clipper-1 well used by expedition 317 scientists (2011). The same classification and names for the different boundaries as Expedition 317 Scientists (2011) is adopted for this project with S(no) denoting a lithologic surface and U(no) representing a seismic sequence boundaries.

c) *Lithologic Expression of Sequence Boundaries at Site U1351*

Table 1: Sequence boundaries nature, of facies interpreted from core at the boundaries and between boundaries as observed from cores obtained from site U1351

Lithologic Surface	Overlying Lithology	Sediment Expression at Contacts	Sequence Boundaries
S1	Clayey Mud	Sharp Contact Between Silty and Clayey Mud	U19
S2	Very Fine Sand	Sharp Contact, Intercalated in Mud	U18
S3	Mud	Sharp Contact, Thin Sand with Mud	U17
S4	Sandy Mud	Gradational Contact in Shelly Sand	U16
S5	Medium	Incomplete Core Recovery	U15
S6	Very Fine Shelly Sand	Sharp Contact with Mud	U13
S7	Muddy Sand	Sharp Contact with Clay Beneath	U12
S8	Very Fine Muddy Sand	Sharp Contact with Basal Silty Mud	U10

d) *Lithologic Expression of Sequence Boundaries at Site* U1352

Table 2: Sequence boundaries nature, of facies interpreted from core at the boundaries and between boundaries as observed from cores obtained from site U1352

Lithologic Surface	Overlying Lithology	Sediment Expression at Contacts	Sequence Boundaries
S1	Mud	Sharp Contact with Muddy Sand Beneath	U19
S2	Muddy Sand	Sharp Bioturbated Basal Contact	U18
S3	Muddy Sand	Sharp Highly Bioturbated Basal Contact with Mud Beneath	U17
S4	Muddy Sand	Sharp Bioturbated Basal Contact with Underlying Mud	U16
S5	Sandy Mud	Sharp Basal Contact Slightly Bioturbated	U15
S6	Sandy Mud	Sharp Bioturbated Basal Contact	U13
U1352C-S9	Limestone	Sharp Basal Contact With Marlstone Beneath	U9

V. Discussion / Conclusion

Cores recovered from four sites at different parts of the shelf to slope (site U1351, U1353 and U1354 at shelf to site U1352 at slope) had further consolidated previous seismic interpretation. Facie assemblages observed across the shelf were divided into units and sub units based on facie variability to facilitate depositional environment interpretation and facies successions during different stages of sea level. At site U1351, upper to middle part of lithostratigraphic unit I (50-150 m CSF) facie assemblages consist of upward fining shelly sandy mud which coarsens upward into sandy mud. The presence of lag deposits above an erosional contact with upward-fining intervals suggests a transgressive system tract which passes into highstand mud deposit above it. Coarsening-upward sandy mud sequences suggests prograding shoreline at low accommodation space (Expedition Scientists, 2011).

At site 1352, which is strategically located on the slope slightly different facie assemblages were observed. Divided into three units, unit I which represent series of downlapping reflection termination pattern as interpreted from seismic data, it's consists of few sedimentary structures and is being interpreted as lowstand delta front deposits. Slump deposits observed in the upper part of the unit may suggest deposition during high rate of sediment supply as part of a pro-delta environment. Sharp contacts associated with dark gray sand are interpreted as gravity flow deposits part of delta along the slope as mass flow deposit. The calcareous dominated unit II with sandy marlstone and minor sandy mudstone suggest pelagic to hemipelagic deposit. The marlstone is interpreted as drift deposit, calcareous nature of these units suggest condensed section formed during sediment starvation period (Expedition Scientists, 2011). Alternating nature of light-colored marlstone with dark mudstone and thin sand

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interval indicates fluctuation in sea level and change in water condition from quiescence period with deposition in deepwater setting with little terrigenous supply, mainly pelagic sediments to more turbulent period of current activities with deposition of mass flow deposit, drift; and increase in sediment supply with deposition of sand. Unit III is correlated with the regionally extensive Amuri limestone believed to be deposited in an outer shelf to slope setting (Field and Brown, 1989).

Multiple lithologic units can be seen in cores which can be easily identified as sequence boundaries existing near the predicted depth, making it difficult to identify the actual sequence boundaries from lithostratigraphic data alone in site U1352. These lithologic units have potentials to provide strong seismic impedance contrast, however, only a single reflector is visible on seismic section and is expected at the predicted depth. Possible explanation to this scenario is that this could be related to the vertical resolution of seismic data from acquisition. The ability of seismic to recognize individual closely spaced events or reflectors is limited to the pulse length; maximum resolution of seismic is from 1/4 to 1/8 of the dominant wavelength of the pulse. Typical vertical resolution for a reflection seismic survey with a dominant frequency of 50 HZ and average sedimentary velocity of 2.0 km/s is 10 m (Sheriff and Geldart, 1983). Hence, most of the reflectors seen and interpreted on seismic are believed to be an order of magnitude larger and stronger than the actual lithologic expression seen in cores.

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Migration and Urban Livelihoods: A Quest for Sustainability in Southern Ethiopia

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Keywords: migration, rural-urban migration, sustainability, urban livelihoods, and wolaita sodo.

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Migration and Urban Livelihoods: A Quest for Sustainability in Southern Ethiopia

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Abstract- This article explores migration as a livelihood option in one of the emerging cities in a region that is considered as a development corridor in Ethiopia, Wolaita Sodo. In doing so, it shades light on the major forces behind Rural to Urban migration, migrants' access to livelihood resources, and major livelihood activities, coping mechanisms, and outcomes achieved. Concurrent mixed research design was used to generate data both from primary and secondary sources. Mix of migration theories from three different perspectives were reviewed and Sustainable Livelihood Framework was applied as an analytical framework to critically examine the problem in its context. Results show that the main factors behind Rural-Urban migration were, poverty and unemployment (95.7%); intermittent income and limited job opportunities (93.2%), limited mobility (80.9%), poor health facilities (80%), shortage of cheap energy sources like electricity (79.1%), seasonality of agricultural employment (74%), and insecurity of asset ownership (73.4%); on the other hand, 100% of surveyed migrants reported that "better outlook and hope for the future," "hope that there are no poverty and unemployment challenges", and "hope for better health, education and other services" were the major pull factors; migrants' vulnerabilities to shocks, trends, and seasonality were highly determined by their available and accessible assets, context within which they are operating and transforming structures which determine their access. Moreover, diverse livelihood activities where short-term coping mechanisms and long-term survival strategies co-exist, livelihood outcomes of migrants were reported both as (positive and negative) but the positive impacts exceeded as measured by livelihood asset indicators. These results broadly attest to the importance of applying migration theories in a comprehensive way as opposed to the conventional wisdom of using a theory. Therefore, pro-migration policies and programs should be considered at different scales in the design of development interventions, which may help to improve migrants' livelihoods.

Keywords: migration, rural-urban migration, sustainability, urban livelihoods, and wolaita sodo.

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I. Background And Justification Of The Study

By 2050, world population is expected to exceed 9 billion people, and nowhere will population growth be more dramatic than in the cities of the developing world. Indeed, according to United Nations estimates, the world became more Urban than Rural in 2008, for the first time in human history [1, 2]. Migration is considered as the movement of people from one geographic region to another, which may be on temporary or permanent basis. The reasons for it vary from one person to another depending on the situation that brought about the decision [3]. Hence, Rural-Urban migration dominates the domain of research as its role in changing the lives of migrants and families at the place of origin and destination [4].

In this respect, dramatic increases in permanent Rural-Urban migration accompany sustained overall Urban population growth rates across the developing region [5]. In many countries, there are substantial gaps in returns to labor in agriculture versus other sectors of the economy [6], implying that there is potentially significant pressure in many countries for additional Rural-Urban migration to take place, for returns to labor to equilibrate between Rural and Urban sectors. With respect to persistent vulnerabilities of households to livelihood insecurity, Rural Ethiopia provides a typical case in point and Ethiopia remains one of the poorest countries in the world with human development index ranks 173 out of 187 countries reported [7]. Ethiopia faces complex challenges of food insecurity, overpopulation, political instability, ethnic conflict and large-scale out-migration flows, land scarcity, and lack of agricultural resources, ecological degradation, drought, and poverty are historically among the major causes of migration in Ethiopia [8, 9, 10].

As a result, migration tends to be seen as problematic, both in academic and policy debates. However, this position reflects a simplistic view of migration and underestimates the complexity of the migration processes. Despite of one-directional understanding of the migration process, the reality reveals that migration is the result of continuous interchanges of livelihoods that characterize spatially and temporally various labor markets. Usually, migration studies focus on economic problems in the area of origin and economic opportunities in destination

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areas [11]. Largely, this view has facilitated the isolated treatment of issues affecting each space and, it has as a result failed to acknowledge the important poverty reducing inter-linkages that exist between the two spaces, and the many variants of the spaces [12]. However, Rural-Urban migration is attributed to have both negative and positive consequences at community, household, and individual levels [13, 14]. Moreover, migration is a medium to offset or cope with risk factors that threaten the level of resources or the conducive institutional and policy contexts that are relevant to an individuals or households' livelihood [15].

A livelihoods approach places households and their members at the center of analysis and decision-making. The important implication of the approach's focal point is that household-centered methods of analysis must play a central role in developing and understanding the livelihood strategies and in program and project planning and evaluation [16]. The Sustainable Livelihood Framework (SLF), which focuses on the things people do and the resources they access in pursuit of a living, is very much connected with migration since the mobility of people is about the movement of human capital including the mobility of labor together with a person's experience, skills, educational level and health status.

According to [17] Wolaita Sodo town had a total of 76, 780 population, of which 40, 495 (52.7 %) and 36, 285 (47.2 %) were male and female population respectively. From the same source, Sodo *Zuriya Woreda* had a total of 19, 319 migrants who stayed between 1-10+ years, of which 9, 268 (48 %) were male population. On top of this, the town is in a close proximity to surrounding *Woreads* of the *Zone,* which are characterized by land fragmentation, over population, Rural poverty, unemployment, and others that increase the influx of migration. Despite of this, with the research and community services experiences to the area, to our knowledge, academic evidences as to whether migration, particularly Rural-Urban migration, is actually working for the poor as livelihood strategy at the local level or not is rather scanty. Therefore, detailed analysis and in-depth case studies are critical in understanding the issues that are essential to livelihoods of Rural-Urban migrants. This research aims at bridging this gap between theory and reality with an in-depth study of migration (from the perspective of livelihoods of migrants).

The research aims at identifying critical factors determining opportunities and constraints for migrants by taking Wolaita Sodo town as a case study to enable better understanding of the migration process and make recommendations to help formulate policies that enhance the positive role of Rural-Urban migration for the livelihoods of migrants. In response to the problem, this study tried to achieve the following basic research questions. These were, (1) what are the major forces behind Rural to Urban migration in the study area? (2) How do migrants access different form of assets or capitals in the study area? (3) What are the major livelihood activities, coping mechanisms, and outcomes used by migrants?

II. Conceptual, Theoretical And Analytical Framework Of The Study

a) *The Concept of Migration*

Theoretically, migration is defined as a process of personal movement from one area to another. It usually takes place at a variety of scale; intercontinental (between continents), intra-continental (between countries of a given continent), and interregional (with in countries) [18]. Migration is understood as a spatial separation of one or more family members from the location of their residence for different reasons over varying periods, and in so doing is able to make new and different contributions to their well-being [3]. This study capitalizes on recent perspectives on the migration-development nexus and in particular builds on the discourse of the migration-livelihood framework. It pledges to the argument that migration is an essential element, and one of the most important methods of diversifying Rural livelihoods in many parts of developing countries, including Ethiopia.

b) *Theories of Migration*

i. *Optimistic Views: Neo-classical and Development list Theory*

Neo-classical migration theory perceives migration as a form of optimal allocation of production factors to the benefit of both sending and receiving countries. In this perspective of 'balanced growth', the re-allocation of labor from Rural, agricultural areas to Urban, industrial sectors (within or across borders), is considered as a prerequisite for economic growth and hence, as a constituent component of the entire development process [1]. According to dominant views of the 1950s and 1960s in development theory, return migrants were seen as important agents of change and innovation. It was expected that migrants not only bring back money, but also new ideas, knowledge, and entrepreneurial attitudes. In this way, migrants were expected to play positive role in development and contribute to the accelerated spatial diffusion of modernization in developing countries [19].

Dual Economy of Rural-Urban Migration (Lewis Theory of Development) is one of the best known early theoretical models of development that focused on the structural transformation of a primarily subsistence economy was that formulated by Nobel laureate Arthur Lewis in the mid 1950s and later modified, formalized, and extended by John Fei and Gustav Ranis [1]. In the Lewis model, the underdeveloped economy consists of two sectors: a traditional, overpopulated Rural

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subsistence sector characterized by zero marginal labor productivity a situation that permits Lewis to classify this as surplus labor in the sense that it can be withdrawn from the traditional agricultural sector without any loss of output and a high-productivity modern Urban industrial sector[iii]. Both labor transfer and modern-sector gradually transferred [20]. The primary focus of the model is on both the process of labor transfer and the growth of output and employment in the modern sectoriii. Both labor transfer and modern-sector employment growth are brought about by output expansion in that sector [1, 21]. In the optimistic view, migration is viewed as a form of optimal allocation of production factors [19], in particular in a strict neoclassical view. Although the Lewis two-sector development model is simple and roughly reflects the historical experience of economic growth in the West, four of its key assumptions[iv] do not fit the institutional and economic realities of most contemporary developing countries [1].

On the other hand, [22] develops a general schema into which a variety of spatial movement can be placed, based on the arguments in which he divided the forces influencing migrants perception into push and pull factors which is entitled as "Push and Pull Factors Approach of Rural-Urban Migration" [23].The former are negative factors tending to force migrants to leave origin areas, while the later are positive factors attracting migrant to destination areas in the expectation of improving their standard of living. Generally, [22] considered all factors associated with migration to be included in the following categories. Factors associated with the areas of origin (push factors); factors associated with the areas of destination (pull factors); and personal factors. Similarly, one theory to explain the apparently paradoxical relationship of accelerated Rural-Urban migration in the context of rising Urban unemployment has come to be known as the Todaro migration model and in its equilibrium form as the Harris-Todaro model. [24, 25], starting from the assumption that migration is primarily an economic phenomenon, which for the individual migrant can be quite rational decision despite the existence of Urban unemployment, the Todaro model postulates that migration proceeds in response to Urban-Rural differences in expected income rather than actual earnings [1, 10]. The fundamental premise is that migrants consider the various labor market opportunities available to them in the Rural and Urban sectors and choose the one that maximizes their expected gains from migration.

In essence, the theory assumes that members of the labor force both actual and potential compare their expected incomes for a given time horizon in the Urban sector (the difference between returns and costs of migration) with prevailing average Rural incomes and migrate if the former exceeds the latter [1]. In a full-employment environment, the decision to migrate can be based solely on the desire to secure the highest paid job wherever it becomes available. Simple economic theory would then indicate that such migration should lead to a reduction in wage differentials through the interaction of the forces of supply and demand in areas of both emigration and immigration [1]. However, authors also criticize this model. Since, the message they have provided is that internal migration can be harmful which is exacerbated. This model only explains the static but migration is a dynamic phenomenon by nature. Other important aspects are missing, including the heterogeneity of migrants that is not accounted for, the possibility of return migration the existence of Rural unemployment etc [19]. Although the neo-classical approach mainly considers migration as determined by economic motive, some of the arguments are still valid in analyzing the factors of migration [10].

ii. *Pessimistic Views: Neo-Marxian and Structuralism / Dependency "migration syndrome"*

As from the late 1960s, optimistic views were increasingly challenged under the combined influence of a paradigm shift in social and development theory towards historical-structuralist views [26, 27]. In fact, these new views turned the argument of neo-classical and development list approaches completely upside down: instead of decreasing migration was now seen as increasing spatial (interregional and international) disparities in developmental levels [16]. Quite on the contrary, migration is seen as aggravating problems of underdevelopment. According to this theory, migration is the result of the existence of uneven dependency relationship in which the industrialized centers dominate the agricultural sector [1, 28, 29]. In the pessimistic perspective, migration increases inequalities [19]. These pessimistic views seemed to fit particularly well into cumulative causation theory elaborated by Myrdal [19]. Cumulative causation theory holds that capitalist development is inevitably marked by deepening spatial welfare inequalities.

Although positive “spread effects” shall occur such as increased demand for agricultural products and raw materials, trade from the periphery (or remittances), yet not all these match the negative “backwash effects.” Myrdal therefore argued that, without strong state policy, the capitalist system fosters increasing spatial inequalities [19]. This approach focuses on political and institutions that determine migration and emphasis the negative aspects of migration [16]. Structuralist theory of migration deal with unequal distribution of economic and political power in the world economy where migration was seen mainly as a way of mobilizing cheap labor for capital [30]. The theory assumes migration is inevitable to transition to capitalism where poor people are much dependant on it as only way of survival [30]. The pessimistic view was highly criticized for its failure to

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consider the internal factors for the problem than mere externalization [29]. [30] Criticizes the theory for being too one-sided to adequately analyze the complexity of migration and less attention to motivational factors and actions of migrants. However, some of the ideas, such as the institutional factors "transforming structures" [31] that prevail in Rural areas, especially the land redistribution process, which make farmers landless, are relevant for the contemporary situation in analyzing the factors of migration [10].

iii. *Pluralistic Views: The 'New Economics of Labor Migration'*

In the 1980s and 1990s, the new economics of labor migration (NELM) emerged mainly within the American research context as a response to development list and neoclassical theories (the migration optimists) and structuralist theory (the migration pessimists). Such approaches seemed too rigid and determinist to deal with the complex realities of the migration and development interactions. NELM offered a much more subtle view of migration and development, which links causes and consequences of migration more explicitly, and in which both positive and negative development responses are possible [19]. There are two main innovative aspects of this view. The first is to recognize that migration decisions (who goes, where to go, for how long, to do what etc.) are not individual decisions but joint decisions taken within the ambit of the household and for different members of the household [32]. Thus, the household for this view of migration is both decision maker and an actor. The second is that rational-choice decision-making is not only about wage and income maximization but is also about income diversification and risk aversion. Taking these two perspectives together, it can be seen that families and households are in an appropriate position to control risks to their economic well-being by diversifying their income earning and livelihood resources into a 'portfolio' of different activities, spreading their labor resources over space and time [19].

In addition to its contribution to more stable and secure household livelihoods, NELM scholars argue that migration plays a vital role in providing a potential source of investment capital, which is especially important in the context of the imperfect credit (capital) and risk (insurance) markets that prevail in most developing countries. Therefore, migration can be considered as a livelihood strategy to overcome various market constraints, potentially enabling households to invest in productive activities and improve their livelihoods [10, 15, 16, 19]. It assumes, moreover, that intra-household relationships are harmonious, leading to unanimous collective decision-making. Finally, it does not apply to the common situation where the entire household migrates [32]. Overall, the theory has not received much following or empirical testing. Essentially a social choice account, it has also been critiqued for overlooking dynamics within households (i.e. gender roles) and being too heavily future oriented [33].

In short, the three abroad perspectives distinguished along time and other salient features vis-a-vis migration are the building blocks of the study along with SLF upon which the study is embedded. This is because, there is no single theory which clearly explain the dynamics of migration as the optimistic sees migration as something with positive results both to the sending and receiving areas; pessimistic conversely views the negative aspects of migration due to unequal or imbalanced relationship between geographical areas; while more recently, pluralistic views on migration has come up with broad views which tried to understand the dynamic nature of migration both positively and negatively.

c) *Analytical Framework: Sustainable Livelihood Framework*

The concept of Sustainable Livelihoods has been traditionally applied in the Rural context but in recent scholastic works on Urban poverty adapted the approach as a guiding map for understanding Urban livelihoods [31, 34]. Drawing on [35] a livelihood is defined as comprising the capabilities, assets (including both material and social resources), and activities required for a means of living.

> A livelihood is sustainable when it can cope with and recover from stresses, and provide sustainable livelihood opportunities for the next generation, and which contributes net benefits to other livelihoods at the local and global levels and in short and long term [36].

Vulnerability, defined as a degree of exposure and susceptibility to risks, its sources are embedded on *trends* (economic, population, resources stock, technology and governance); *shocks* (conflicts, climate, diseases and illness); and *seasonality* (prices, health, employment, production) [31] (Figure 1). Given this, the livelihood activities of people are influenced by exogenous and endogenous factors, which are referred to as 'context' [35, 37]. Assets are either destroyed or created as a result of the trends, shocks and seasonality of the 'context' [37]. According to [31] assets that are owned, accessed and utilized by the Urban poor, strategies they employ and livelihood outcomes are highly influenced by context within which they live. [38] broadly categorized Urban contexts as environmental, economic, political, and social. Moreover, the Urban poor are linked into structures of governance through their dependence on the delivery of services by city institutions as well as through the impact of meso and macro level policies [31]. By livelihoods, it is to mean, broadly, the assets (natural, physical, human, financial, and social), activities, and the access to these

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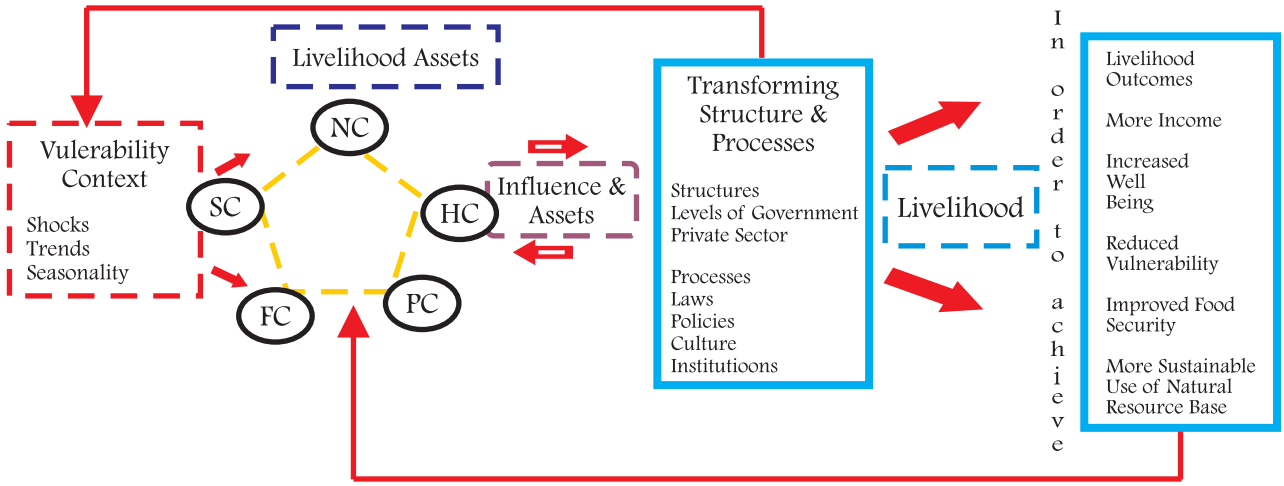
(mediated by institutions, organizations and social relations) that together determine the living gained by individuals or households' [31, 37].

According to [31] transforming structures refers to (levels of government and private sector) and processes (laws, policies, cultures and institutions) operating from local to global level can be formal or informal. Livelihood strategies are comprised of a range of activities that are used by households for survival [31]. The intricacy and dynamic nature of the interface between components of the SLF determines whether the livelihood outcomes are desirable or undesirable [34]. The asset pentagon lies at the core of the livelihoods framework, 'within' the vulnerability context. The shape of the pentagon can be used to show schematically the variation in people's access to assets. The idea is that the centre point of the pentagon where the lines meet represents zero access to assets while the outer perimeter represents maximum access to assets.

d) Linking SLF with Migration

According to [31, 37] firstly, the approach is 'people-centered'. Under the SLF model, the making of policy is based on realistic understanding of the struggle of poor people. The practical advantage of the model's focus on the actual life of the poor is that it highlights the participation of the poor themselves as indispensable for determination of priorities for practical intervention and in the institutions and processes that govern their lives. Secondly, it is 'holistic' in that it is 'non-sectoral' and it recognizes multiple influences, multiple actors, multiple strategies, and multiple outcomes. Thirdly, it is 'dynamic' because it attempts to understand change, complex cause-and-effect relationships, and 'iterative chains of events'. Fourthly, it starts with analysis of strengths rather than of needs, and seeks to build on everyone's inherent potential. Fifthly, it attempts to 'bridge the gap' between macro and micro levels. Sixthly, it is committed explicitly to several different dimensions of sustainability: environmental, economic, social, and institutional.



Source: After (31, 34, 39)

FC-Financial Capital, HC-Human Capital, NC-Natural Capital, PC-Physical Capital, SC-Social Capital

Fig.1: Sustainable Livelihoods Framework (SLF)

III. Research Methodology

Research Method: Concurrent mixed research approach was used to look into the dynamics of Rural-Urban migration by taking Wolaita Sodo town as a case study area. 120 migrants were surveyed using both purposive and snowball-sampling techniques, as migrants were available yet hardily accessible. Then, trained data collectors interviewed 120 of the surveyed migrants in a face-to-face manner.

Types and Sources of Data: Qualitative and quantitative data were generated both from primary and secondary sources. The former was collected directly from the respondents while the latter were generated from different scholastics works and organizational reports pertaining to the topic. Due attention and cross checking of different materials were made to ensure the accuracy and relevance of the secondary sources.

Instruments of Data Collection: Quantitative data were obtained using self-administered questionnaires collected via primary household surveys. With the help of the questionnaires, migrants' background; the major Rural push and Urban pull factors; migrants' vulnerability contexts; available and accessible assets; livelihood activities and strategies used; and the outcome data were generated. On the other hand, qualitative data were collected through Focused Group

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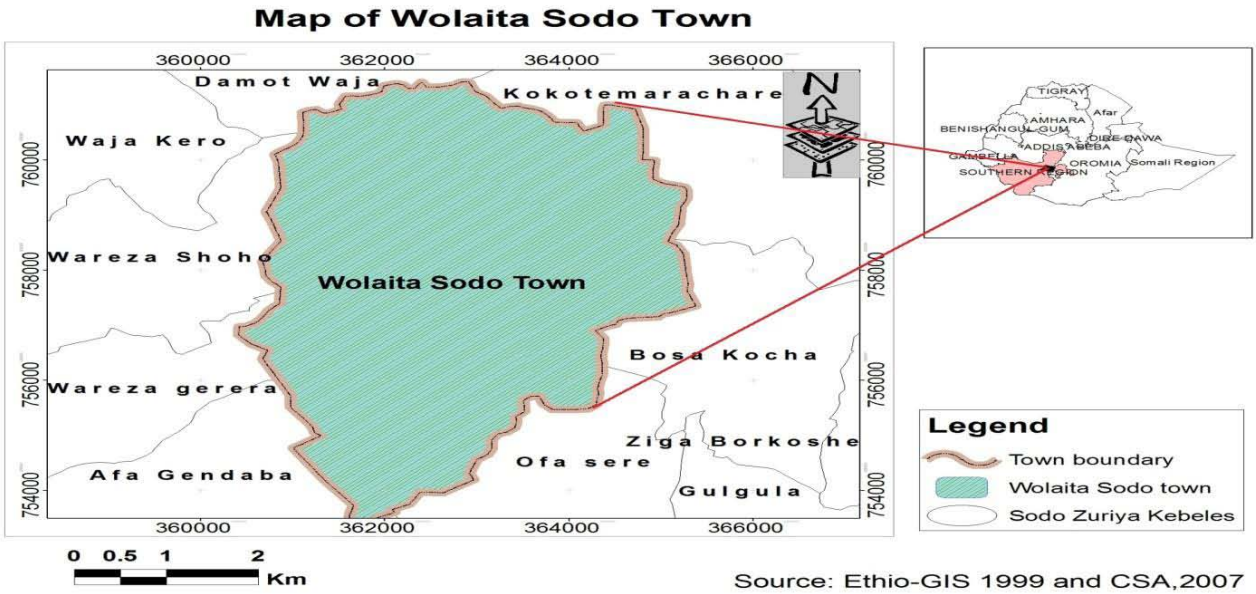
Discussions (FGDs), Key Informants Interviews (KIIs), Non-participant Observation (NPO) and Filed Notes (FNs).

Instrument Validity and Reliability: To ensure reliability of the data, questionnaires were translated from English to the local language and back again. The data were also centrally followed regularly until the data collection was completed. Double entry of data was employed to reduce data entry errors. Instrument validity was ensured by resorting to pre-prepared standard question items for each of the indicators used. This was further strengthened by conducting pilot test of the instruments and modifying them to meet the level of reliability required.

Methods of Data Analysis: Both qualitative and quantitative data from primary and secondary sources were, edited, organized, analyzed, summarized, and presented by employing qualitative and quantitative methods of data analysis. On the other hand, quantitative data were analyzed, summarized using axial coding method (*Thematic analysis along the SLF and theories of migration*) then given interpretations. Statistical Package for Social Sciences (SPSS) software (version 20.0) and Stata version 12.0) were alternatively used to enter the raw data and present the results in different forms. The quantitative analyses include descriptive statistics, chi-squre test, Fisher exact test and Radar diagram of livelihood assets of surveyed migrants. The results of were subsequently explained with the help of qualitative data to arrive at valid conclusions.

Description of the Study Area: The study was conducted in the administrative center of Wolaita Zone[v], Sodo, which was established in 1984[vi]. Relatively; Wolaita Sodo town is located South of Damot Waja *Kebele*[vii], East of Wareza Shoho *Kebele,* West of Bosa Kocha *Kebele*, North East of Ofa Gendeba *Kebele,* and North West of Ofa Sere *Kebele* (Figure 2). Sodo town is located 327 KM far from Addis Ababa and 168 KM from the regional capital, Hawassa. Wolaita Sodo town had a total of 76, 780 population, of which 40, 495 (52.7 %) and 36, 285 (47.2 %) were male and female population respectively. Sodo Zuriya Woreda[viii] had a total of 19, 319 migrants who stayed between 1-10+ years, of which 9, 268 (48 %) were male population [17].



Source: Based on [17]

Fig. 2: Map of the Study Area

IV. Result and Discussion

a) Background of the Migrants

Nearly 97% of respondents covered in the study were below the age of 40. This result is consistent with [17]. This result is indicative of the migratory tendency of the younger section of the population. Migrants background shows that about two third (67.2%) of the studied migrants have little or no education. Only 27.7% of the migrants have a junior (grades 6 to 8) level of education and 2.5% of migrants have a tertiary level education (Table 1). Male are typified as the breadwinner of the household and the migration of sons re-establishes this conventional wisdom. Males account for about eighty % of the studied migrants. The share of unmarried migrants' account (70.5%) is close to migrating sons (66.4%) of the sending families. This hints that male children of Rural households are under some kind of pressure to start a livelihood than their female counter parts. In addition, migrants marital status implies that being unmarried relieves a son from responsibilities that would otherwise might have

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inhibited his migration. Close to 65 % of studied migrants are Protestant religious followers and this figure is slightly inflated in comparison with the regional figure (55.5%) [17]. The relationship status of migrants surveyed showed that 67% were not in a relationship. This, perhaps, reveals that migrants do not have plans of kick-starting long-term relationships like marriage and co-habitation. About 32% of surveyed migrants have their own children. This tells that migrants support not only their sending families but equally also their own children.

Table 1: Demographic Characteristics of Migrants
Age Frequency %

Age %		Frequency
< 20	42	35.29
21 - 30	60	50.42
31 - 40	13	10.92
41 - 50	2	1.68
> 51	2	1.68
Educational Level		
Illiterate	19	15.97
Literate (Read and Write)	4	3.36
Between 1 - 5	24	20.17
Between 6 - 8	33	27.73
Between 9 - 10	32	26.89
Between 11 - 12	4	3.36
> = Certificate	3	2.52
Religion of Migrant		
Orthodox	30	25.21
Protestant	77	64.71
Muslim	12	10.08
Relationship to Family		
Husband	15	12.61
Wife	8	6.72
Son	79	66.39
Daughter	15	11.76
Grandfather	2	1.68
Marital Status		
Single	84	70.59
Married	33	27.73
Widowed	1	0.84
Monogamous	1	0.84

Source: Own Survey

b) Major Driving Forces behind the Decision to Migrate

According to [3, 16], the motivational factors for migration vary from person to person and across places. The determinants of migration are complex and context specific and cannot, therefore, be generalized to all places and individuals. Table 2 reveals that migrants stated poverty and unemployment as the most important (95.7%) Rural push factors followed by intermittent income and limited job opportunities (93.2%), limited mobility (80.9%), poor health facilities (80%), shortage of cheap energy sources like electricity (79.1%), seasonality of agricultural employment (74%), and insecurity of asset ownership (73.4%) (Table 2). However, not as strong, in the view of respondents, the other indicators were also considered as important Rural push factors that forced migrants to leave their places of origin. These results coincide with the conclusions of the report by [40], which clearly showed that Rural poverty was more severe that Urban poverty on account of three different poverty indices and this pattern has consistently prevailed over time. An almost equally important Rural push factor identified was intermittent income and limited job opportunities in the migrants' places of origin. Previous theoretical works such as [1] empirical findings [12] richly support this finding.

According to these studies, the realities of unemployment and under-employment in Rural areas will incite huge Rural-Urban migration. However, cities and towns do not have the capacity to accommodate such large population movements and the migrants end up settling for less than their expectations. According to the same theoretical arguments, this in turn, partly, contributes to increased Urban poverty. However, this paper has set out with the objective of establishing migration as a sustainable livelihood strategy standing in contradiction to the existing conventional theories. A growing body of literature [31] supports this paper's contention. On the other hand, a measure of association between Rural and Urban patterns of different seasonality indicators identifies that there is a statistically insignificant association, except for "seasonal fluctuation in level of employment" indicator ($p=0.005$).There is a strong evidence to suggest that the there is a true dissociation in the level of exposure to seasonality in Rural and Urban contexts of the studied migrants as to the (Chi-square and Fisher's Exact test p-values 0.000, and 0.056).

Problems associated with property rights, which was represented by the indicator "less security of one's natural, physical, and financial assets" were also rampant among the respondents. This may suggest that the property rights scheme in Rural areas is based on social norms that are usually less stringent as opposed to formal and better-enforced laws in Urban areas. The results also reveal that Rural areas are characterized by limited mobility that may be explained by absence or poor availability of transportation and a sparse settlement pattern in comparison to Urban areas. Social amenities such as health services, electricity and other cheap energy sources, though not as strong push factors as those discussed previously; have a reasonable share in forcing migrants to leave their places of origin.

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Table 2: Rural Push Forces for Rural-Urban Migration Possible Rural Push Factors

Possible Rural Push Factors	Responses		
	Yes	%	Total
Slack Agricultural Seasons / Seasonality of Agricultural Employment	85	73.91	115
To Escape from Traditional Practices such as Female Genital Mutilation, Early Marriage, Kidnapping Females for Forced Marriage,	72	62.61	115
Exposed to Wild Animals Casualty	24	20.87	115
Exposed to Malaria and other Epidemics and Pandemics	69	60.00	115
Limited Mobility	93	80.87	115
Poor Health Facilities	92	80.00	115
Absence or Shortage of Electricity and other Cheaper Energy Source	91	79.13	115
Less Security of One's Natural, Physical and Financial Assets	80	73.39	109
Large Household Size	52	44.83	116
Intermittent Income and Limited Job Opportunities	109	93.16	117
Poverty and Unemployment	111	95.69	116

Source: Own Survey

In line with the conventional theories of Rural-Urban migration, the migrants seem to be pulled not by the actual existence of better conditions in the towns and cities but because of the migrants' perception of better conditions. This is clearly visible in Table 3, that over 100% of surveyed migrants reported, "better outlook and hope for the future," "hope that there are no poverty and unemployment challenges", and "hope for better health, education and other services" as the reasons for their migration. "better job opportunities", "better health services", and "other glittering of Urban life" were found to be important motivating factors to leave their places of origin.

Another interesting finding is that the availability of "friends living in Sodo" was identified as an important (61.1%) Urban pull factor. Even though Urban pull factors such as cheap food, clothing, and house rents have traditionally been considered important, the respondents in this study identified these factors to be of minimal impact on their decision to migrate as witnessed by the 41%, 11.5%, and 3.3% response rates for each factor respectively (Table 3).

Table 3: Urban Pull Factors for Rural-Urban Migration

Possible Urban Push Factors	Responses		
	Yes	%	Total
Relatives / Family Members Living in Sodo	43	38.05	113
Friends Living in Sodo	69	61.06	113
Better Employment Opportunities	112	99.12	113
The Glittering of Urban Life	107	90.68	118
Food is Cheap	25	40.98	61
Clothing is Cheap	7	11.48	61
House Rent is Cheap	2	3.28	61
Better Health Service	99	88.39	112
Better Outlook and Hope for the Future	117	100.00	117
Hope that there are no Poverty and Unemployment Challenges	113	95.76	118
Hope for Better Health, Education and other Services	107	94.69	113

Source: Own Survey

c) Capitals Available and Accessible to the Migrants

i. *Availability*

Migrants' livelihood assets available in rank order were found to be financial (85), social (77), physical (74), human capital (73), and natural capital (36) (Figure 3). As expected, financial capital ranked highest while natural capital was the lowest. Migrants' high financial set rank was reported because of their diversified source of income that can be saved in various forms while the natural capital is least available because of the nature of Urban areas. In light of this, [31] coined natural capital as stock from which resource flows useful to livelihoods. These resources are abundant in Rural habitats but they are less significant in towns.

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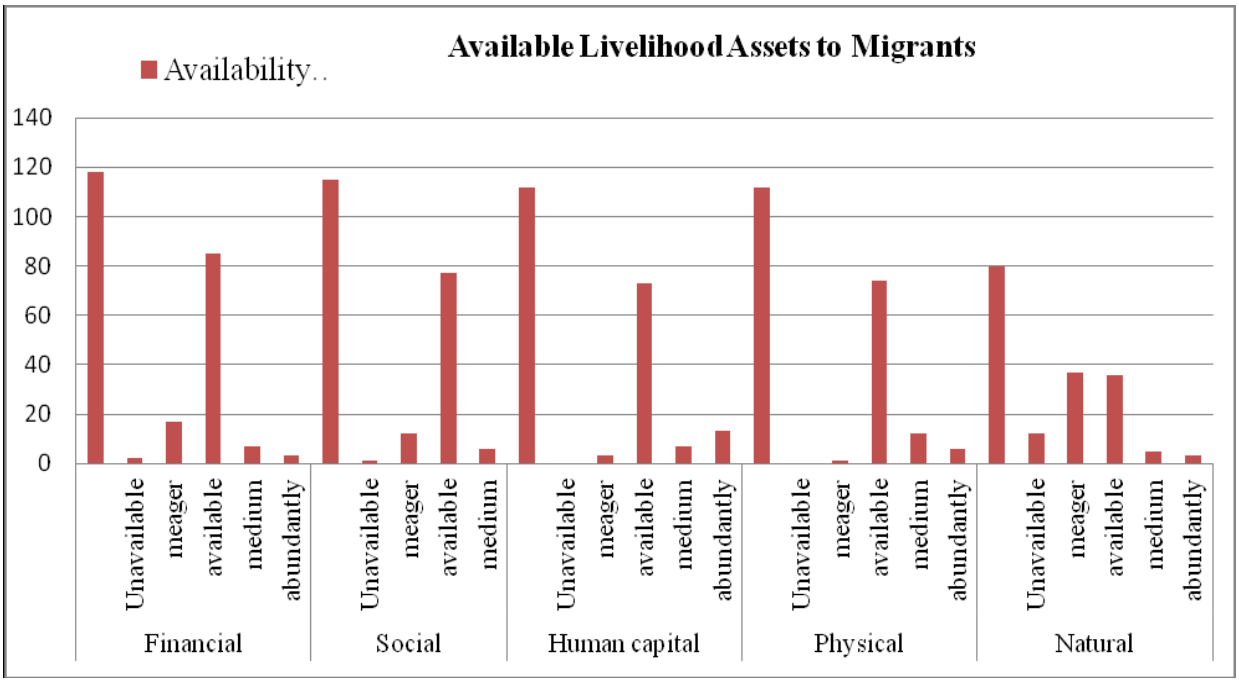


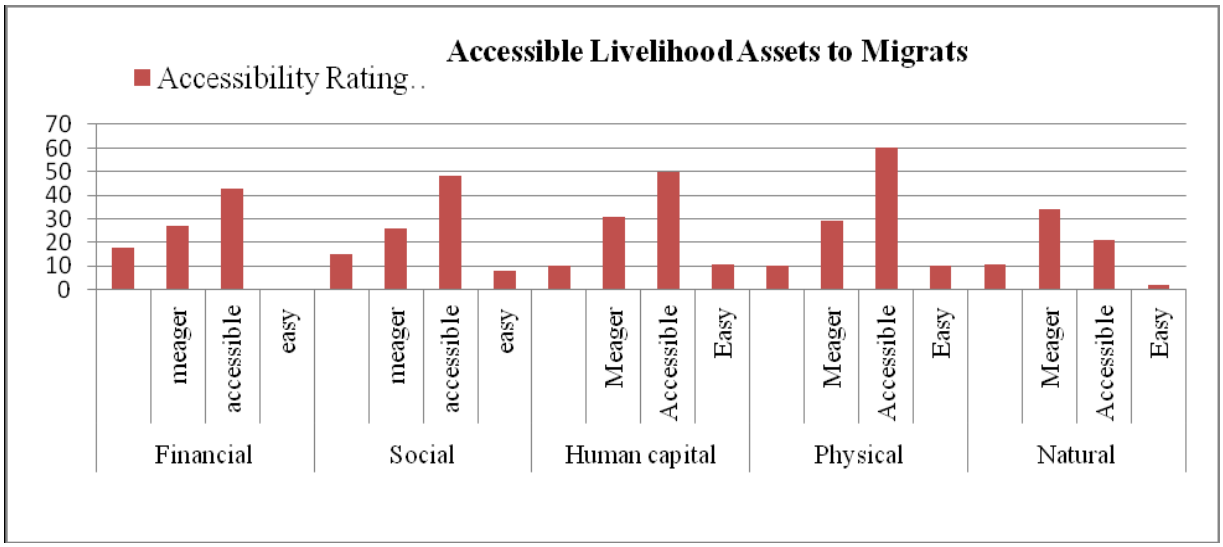
Source: Own Survey

Fig. 3: Assets Available to Studied Migrants

ii. *Accessibility*

From the survey on asset accessibility, physical capital was ranked first while human, social, financial, and natural capitals were ranked in decreasing importance (Figure 4). Physical assets facilitate the movement of people between places offering different income earning opportunities [37]. This may be explained by the better availability of social amenities in Sodo town. The response of the respondents ranking human capital accessibility is only a naturally expected response of the migrants. This result seems to supplement the responses obtained for Rural push and Urban pull factors in Table 2 and Table 3 respectively.

Despite the availability of financial assets (ranked as the most available, it is not as accessible as it was available. This is because access to financial assets such as savings, Micro Finance Institutions (MFIs) loans, and cooperative loans require collateral and compulsory savings in addition to other deterring requirements. Natural capital was reported as the least available capital after Rural-Urban migration. It is no surprise that it scored the lowest response frequency in accessibility from the five livelihood assets. [41] Supplement this view, the natural resources and/ or common property resources (such as rivers, forests or grazing lands) are, generally, less significant assets for Urban residents.



Source: Own Survey

Fig. 4: Assets Accessible to Studied Migrants

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d) Livelihood Activities, Copying Strategies, and Outcomes

Livelihood strategies are composed of a range of activities that are used by households for survival depending on availability and accessibility to assets and their vulnerability context [31]. The Urban poor households can diversify their livelihood strategies by engaging in activities[ix] (Table 4) which are regarded by transforming structures and processes as formal and informal. Even if it is difficult to have a sharp delineation between coping and surviving strategies, they are different on two grounds. The first is the time dimension of their commencement and the other is the acceptance of the strategies by the households. Consequently, coping strategies are employed for short period in response to livelihood shocks and may or may not be desirable; on the other hand, surviving strategies are those strategies accepted by households as desirable and run for long period of time [42].

According to the surveyed migrants, they have resorted to "income diversification through diversifying activities" as the most preferred livelihood activity followed by organizing oneself into Small and Medium Enterprises (SMEs) "agricultural intensification" (Table 5). The qualitative extracts from open-ended questions revealed that migrants employ both short-term coping mechanisms and long-term survival strategies against asset vulnerabilities they face within in the contexts where they are operating their livelihood activities. These livelihood strategies center on income earning activities, either in formal or informal sector or as wage employment, unpaid family works, and in self-employment. A detailed presentation of these mechanisms is presented in (Table 4).

Table 4: Mapping of Migrants Asset Vulnerabilities and Copying Strategies

1	Short Term Copying Mechanisms	Long Term Survival Strategies
Social Capital	- Informal dealing on issues; - Report to concerned bodies; - Change the place of resident rented.	- Avoid and have a better outlook on the issues; - Strengthen socialization skills'; - Adjusting life style to the context.
Physical Capital	- Renting out home and get low cost house in the outskirt of the town; Shift place of work; - Use locally available working equipment.	- Register for low cost houses and/or "government sponsored housing schemes"; Formalize own business; Apply modern equipment.
Financial Capital	- Drop out of school; Non-motorized transports; - Limit holly day celebration costs; - Reduce frequency of trips to family; - Begging and use of "*firifari/or bule*"; - Adding the values of products on customers; - Support from fiends and/or relatives; - Sharing assets with co-migrants; - Limiting "basic needs" like using second hand clothes, shoes; and other items; - Cut-off the quality and quantity of meals; - Get food and material support from families back home; Purchase low quality food items; Sending children's to relatives; Use own saving in time of difficulty; - Use traditional medicine in time of health risks; Minimizing unnecessary costs "variable costs".	- Strengthening asset bases; - Looking for better alternatives in the future; - Continue with education; - Migrating to towns and/or big cities; - Switch to other Income Generating Activities; - Joining SMEs as additional sources of income; - Empowering oneself with various trainings to work in better pay works; - Strength saving habit to start a new business; - Diversifying sources of income; - Adjusting life style to the context; - Mobilize family and/or human capital available; - Receive startup capital from NGOs and government.
Human Capital	- Work in low paying jobs "casual works"; - Switching among jobs seasonally; Seasonal migration into place with job opportunities.	- Looking for better alternatives in the future; Continue with education; - Migrating to towns and /or big cities; Switch to other Income Generating Activities; Have a positive attitude for any kind of job; - Empowering oneself with various trainings to work in better pay works; - Mobilize family and/or human capital available.

Source: Own Survey

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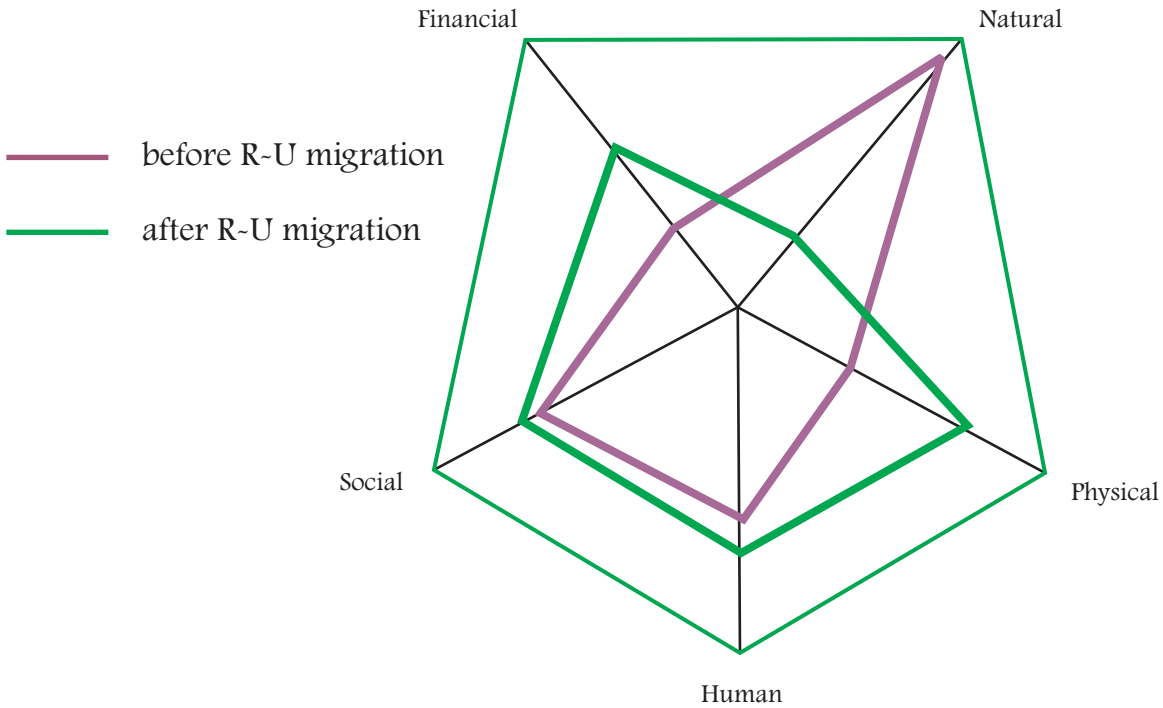
Table 5: Livlihood Strategy Indicators

Livelihood Strategy Indicator	Rank 1st		Rank 2nd		Rank 3rd		Rank 4th		Rank 5th		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Income Diversification through Diversifying Activities	55	47.01	40	34.19	18	15.38	4	3.42	0	0	117
Agricultural Intensification though use of Modern Agricultural Inputs	8	6.9	13	11.21	21	18.1	31	26.72	43	37.07	116
Migration from Rural to Urban	1	0.85	2	1.69	13	11.02	40	33.9	62	52.54	118
Organize Oneself in SMEs	42	35.59	23	19.49	35	29.66	14	11.86	4	3.39	118
Look for other Options	11	9.57	38	33.04	30	26.09	28	24.35	8	6.96	115

Source: Own Survey

e) Livelihood Asset Pentagon

A healthy livelihood strategy has to result in improved livelihood outcomes. Besides, migrants or households adopting these strategies have to sustain these outcomes over the long run. The asset pentagon portrays these two important aspects. First, the more stretched out an asset pentagon is on any of its corners, it is good news because it indicates that households have a relative abundance of the asset. If, however, any corner is closer to the center of the asset pentagon, the asset represented by that corner is in relative short supply [31]. Second, an asset pentagon that has the same distance from its center to all corners has a relative balance of all the five livelihood assets. If, on the other hand, the measure of the distance from the center to its corners varies greatly, an imbalance in the migrant's livelihood asset mix is implied. Based on these two features the asset pentagon represented by the distance from the center to the corners of the pentagon and the equality or inequality of these distances for all the corners of the pentagon, the livelihood asset mix of the studied migrants is illustrated in Figure 5.



Source: Own Survey

Fig. 5: Asset Pentagon of Studied Migrants Before and After Rural-Urban Migration

On the other hand, the intricacy and dynamic nature of interface between components of SLF determines what the livelihood outcomes are; either desirable or such as more income, increased wellbeing, sustainable use of natural resource base, increased food security and reduced vulnerability or undesirable such as impoverishment, ill-being and food insecurity [42]. As it follows from the discussion of results in the

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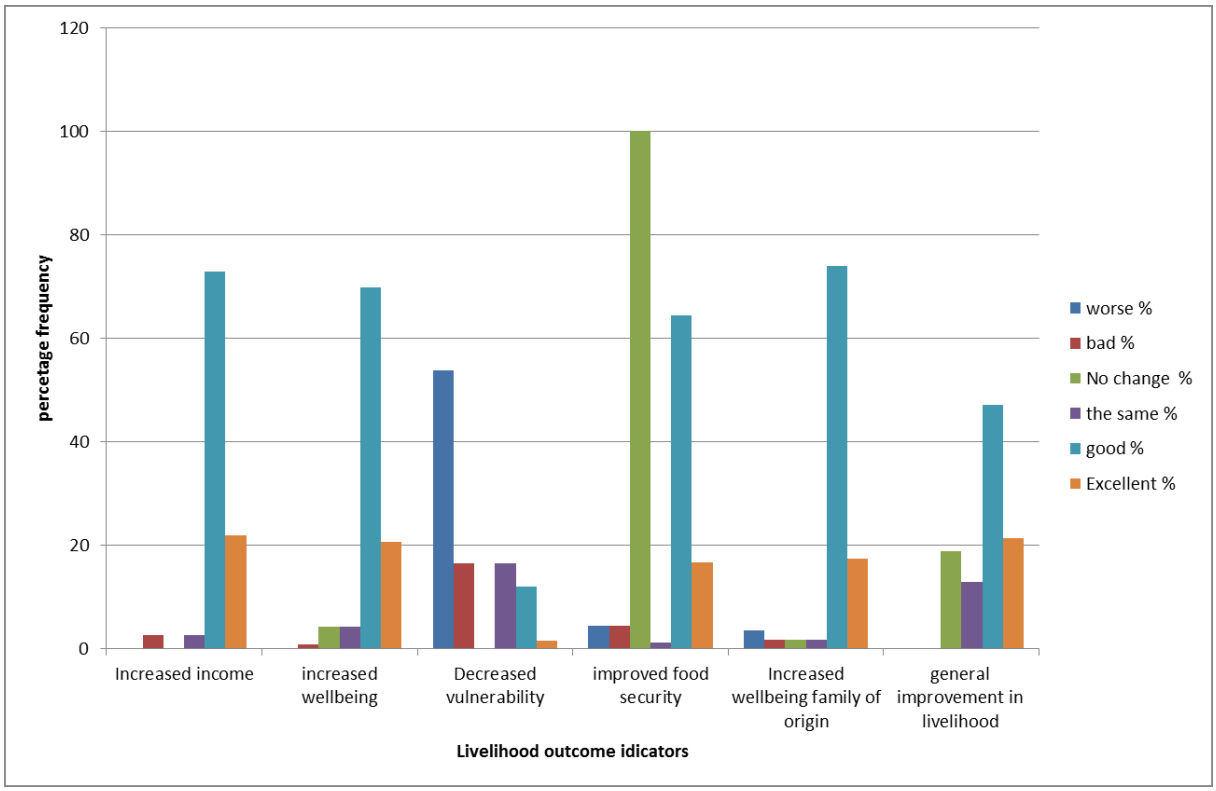
previous sub-headings and Figure 5, there was an overall improvement of the livelihoods of migrants as a result of their decision to migrate. For example, membership in unions and/ or SMEs was found to be better after migration. Unions and SMEs membership could improve access of migrants to credit and provide them with opportunities to save their earnings. Such membership also enhances their bargaining position in dealing with brokers and merchants. Migrants will also be able to create wealth and self-employment and test their entrepreneurial dimension [43]. This is clearly indicated by the blue bars in the bar graph shown in Figure 6. Therefore, the core premise held at the outset of this study has been consistently supported so far.



Source: Own Survey

Fig. 6: Livelihood Outcomes of Studied Migrants

V. Concluding Remarks and Ways Forward

a) *Concluding Remarks*

Migration being multifaceted problem per se, it can be viewed in dynamic ways in light of the different development and/or theories of migration. For instance, despite of the pessimistic views of migration, the findings of the study indicated that Rural-Urban migration played great roles for sending area in the form of remittance, hosting areas (Urban labor force), and contribute for unemployment reduction, local economic development when considered in the formal sector. I.e., the benefits are multiple (for the migrants, Urban area, and sending families), which backs the very idea of neoclassic economic development theories.

The fundamental premise of Harris and Todaro model is that migrants consider the various labor market opportunities available to them in the Rural and Urban sectors and choose the one that maximizes their expected gains from migration. However, the study results showed that the forces (*Rural push and Urban full*) for the studied migrates were context specific and even vary from migrate to a migrate. Hence, it is possible to say that migrants' expectation to *"Urban contexts/Urban glaring life"* were the major forces behind Rural to Urban migration in the study area. On the other hand, the findings links the contribution of the push and pull factor theory of [22] and the pessimistic views on migration, as migration is the result of unequal relation between Urban and Rural areas in terms of social amenities as to partly explain the why of Rural to Urban migration. In other words, some of the arguments are still valid in analyzing the factors of migration.

NELM offered a much more subtle view of migration and development, which links causes and consequences of migration more explicitly, and in which both positive and negative development responses are possible [19]. Unlike the Marxian approach of migration, the current thinking about migration goes beyond its negative role by giving emphasis to the positive contributions, one of the position of this paper, (making

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migration as sustainable way of livelihood for migrants) and/or towards improving the livelihood of poor people. Thus, some aspects of Rural to Urban migration can be captured in more pluralistic ways where it is possible to capitalize on both the negative and positive aspects of migration yet it depends on the context within which migrants operate their livelihood activities.

The use of SLF has enabled me to assess multiple factors and their interplay among them that together affect and/or better or worse the livelihoods of Rural to Urban migrants. Migrants' vulnerabilities to shocks, trends, and seasonality were highly determined by their available and an accessible asset along with the context in which they operate and transforming structures that governs their livelihood activities. SLF appreciates that livelihood strategies are both dependant on the opportunities presented and affected, as a result surveyed migrants were engaged in diverse livelihood activities some in more than one type of activities as sources of diversification to withstand the asset vulnerabilities. Based on this, migrants employed diverse livelihood strategies where some were short-term coping mechanisms and the other ones were long-term survival strategies.

The livelihood outcomes of individuals or households were the results of people's success or failure in transforming through variety of strategies, the assets available to them into income or basic goods and services. Besides, depending on the cause and effect interplay between all the livelihood components and migrants' livelihood strategies used, surveyed migrants livelihood outcome were reported to be both positive and negative across used indicators. However, across indicators used to measure livelihoods outcome, it can be concluded, as migrants livelihood outcome were better after their migration to Sodo town.

In short, in light of mix of migration theories postulated in different time and spatial scales, it can be said that time does not imply to the irrelevance of theories rather part of each theory and/or arguments can be applied to study the situation of Rural to Urban migration even at the contemporary period.

b) Ways Forwarded

Based on the findings of the study and conclusions drawn, the following points were forwarded as ways out at least to address the problems in the study area. Despite of governments' policies and programs that disregard people mobility in many parts of developing economies, including, Ethiopia, currently, a number of scholastic researches in academia at different scales are pro-migration because of the holistic benefits of migration to the migrants, sending families, and hosting areas. If the case is taken on board, efforts should be made to include the positive aspects of Rural to Urban migration and/or pro-migration / migration inclusive / policies and programs at different administration echelons. To materialize this, SMEs, cooperatives, unions and youth empowerment offices of Sodo town and municipality must work hard in close collaboration with stakeholders operating on this issues to include pro-migration activities in as much as possible.

Considering livelihood strategies are both dependant on the opportunities presented and affected by the social, economic, institutional/governance and environmental contexts in which migrants operate their livelihood activities. This is because the productivity of migrants' is highly determined both by the quality and by quantity of their accessible assets. Thus, it is important to empower migrants for better livelihood options. To put into practices, various trainings and certifications can be given by actors, such as Sodo town municipality, finance and economic development (population department), Wolaita *Zone* social security affairs, Non Governmental Organizations (NGOs) working on the issues as well as the University under community service schemes.

One of the challenges of migrants and the results of conventional wisdom is misconception to migrants' and/or attach migration with problems only; we advocate and recommend that migrants should not be seen from the negative perspectives only rather the multiple roles they play should be considered seriously. Therefore, actors who are working on migration issues in collaboration with the University can create and strengthen societal awareness'/outlooks/ towards migration, in general and migrants, in particular.

Given the context specific nature of factors for Rural to Urban migration and being debatable issue, an in-depth analysis of the case at wider geographical scales need be undertaken to understand the dynamics of migration and evaluate the contemporary significances of development theories and/or theories of migration in explaining the grounded realities.

Abbreviations

Statistical Package for Social Sciences (SPSS).

Acknowledgments

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Notes

i. It is no small ambition to bring together a comprehensive overview of contemporary migration theories across the social sciences and humanities. The debate on migration and development has swung back and forth like a pendulum, from developmentalist optimism in the 1950s and 1960s, to neo-Marxist pessimism over the 1970s and 1980s, towards more nuanced and pluralist views in the 1990s. Thus, one of the reason for this study is to critically look into diverse migration theories as to whether they will help to understand the grounded realities or not either independently or in a combined ways.
ii. In this research, in line with [10] work, migration is used to describe all kinds of population movements that include small or large-scale, single or circular (involving mobility back and forth between the place of origin and Urban communities), temporary or permanent, voluntary or induced movement of people caused by social, economic and/or political factors including seasonal employment, diversifying livelihoods, political instability, ethnic strife, natural disasters, social distress, marriage arrangements, or by the combination of one or more of these factors.
iii. The modern sector could include modern agriculture, but here it is regarded as "industrial" as shorthand.
iv. Rate of labor transfer and employment creation in the modern sector is proportional to the rate of modern sector capital accumulation; notion that surplus labor exists in Rural areas while there is full employment in the Urban areas; competitive modern sector labor market that guarantees the continued existence of constant real Urban wages up to the point where the supply of Rural surplus labor is exhausted; and assumption of diminishing returns in the modern industrial sector PP 118-120.
v. The third Administrative State Structure in the Country, next to Federal and Regional States.
vi. Habtamu Lemma. 2011. Bibliography on Wolaita Zone: Documenting for Research and Community Service Development. Wolaita Sodo University.
vii. The lowest Administrative State Structure in the Country.
viii. The third Administrative State Structure in the Region, next to *Zone* or the 4th in the Country.
ix. According to surveyed migrants, their livelihood activities identified include shoe shining, car washing; "labyajo," street vending, petty trading, waiters, waitress, waste collector, daily laborer, carpenter, handcrafting, maintenance worker (mobile), and other electronics, prostitution, maid servant, metal work, wood work, "*Woyala*" and/or taxi boy, barber, beauty salon, shop keeper, lottery bender, informal broker and *bajaj* driver.

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A Model for Accommodation Selection using GIS and Multi-Criteria System

By Johor Alam
Al-Madinah International University

Abstract- The main purpose of this research to develop a preference model for the best accommodation selection process in Chittagong city, Bangladesh based on College, Market, Hospital and Park with GIS and Multi-Criteria System (MCS). A decision is the result of a comparison of one or more alternatives concerning one or more criteria that we considered relevant for the task at hand. MCS is primarily concerned with how to combine the information from Multi-Criteria to form a single index of evaluation. Multi-Criteria System (MCS) provides a more logical and scientific way for best accommodation selection. MCS describes any structured approach used to determine overall preferences among alternative options, where accomplish several criteria .The results were having a sample of the computerized program that could be used to measure these indicators and their weights. The integration of multi-criteria evaluation (MCE) and multi-criteria decision making (MCDM) techniques with the Geographical information system (GIS) are forward as providing the user with the means to evaluate various alternatives by multiple and collecting criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Mosjid, Mondir, Temple, Playground, Airport and Police station. There is a most important option is weight.

Keywords: multi-criteria system (MCS), multi-criteria evaluation (MCE), multi-criteria decisions making (MCDM) and geographical location (GL), geographical information system (GIS), google map (GM).

GJHSS-B Classification: FOR Code: 040699



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A Model for Accommodation Selection using GIS and Multi-Criteria System

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Abstract- The main purpose of this research to develop a preference model for the best accommodation selection process in Chittagong city, Bangladesh based on College, Market, Hospital and Park with GIS and Multi-Criteria System (MCS). A decision is the result of a comparison of one or more alternatives concerning one or more criteria that we considered relevant for the task at hand. MCS is primarily concerned with how to combine the information from Multi-Criteria to form a single index of evaluation. Multi-Criteria System (MCS) provides a more logical and scientific way for best accommodation selection. MCS describes any structured approach used to determine overall preferences among alternative options, where accomplish several criteria .The results were having a sample of the computerized program that could be used to measure these indicators and their weights. The integration of multi-criteria evaluation (MCE) and multi-criteria decision making (MCDM) techniques with the Geographical information system (GIS) are forward as providing the user with the means to evaluate various alternatives by multiple and collecting criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Mosjid, Mondir, Temple, Playground, Airport and Police station. There is a most important option is weight. The weights for the multi-criteria system obtained from the multiple criteria. For a selection of the best suitable location for accommodation, there were a lot of elements that should take into some consideration. The people who want to live in this location which provides their own facility in Chittagong city, Bangladesh they can search their best accommodation by this work. So, people must save their time to get an appropriate location for this work. So, as a result, the select a best accommodation considered by the multi-criteria. The research work has been done based on some development area of Chittagong city in Bangladesh.

Keywords: Multi-Criteria system (MCS), Multi-criteria evaluation (MCE), Multi-criteria decisions making (MCDM) and Geographical Location (GL), Geographical information system (GIS), Google Map (GM).

I. Introduction

Chittagong city is placed closer to the south-east of the Capital metropolis of Dhaka that's around 280Km. from the capital. Chittagong city situated at the bank of Karnaphully River, and surrounded by way of natural resources just like the green Hilly Terrain and the Bay of Bengal on the west. This place located in Chittagong Zl, Chittagong Div, Bangladesh, its geographical coordinates are 22° 21' forty-nine" North, ninety-one° forty-eight' 12" East and its unique name (with diacritics) is Chittagong. Chittagong is the second one largest city, prime Sea Port and the heart of all commercial and business activities in Bangladesh. Thus, the government of the United States of America has already declared Chittagong because of the "industrial Capital" of the USA through this time. After the independence of Bangladesh in 1971, Chittagong has earned a considerable of the second vital town because of the Chittagong Port, monetary sports, academic institution, natural Beauties, commercial activities and due to its suitable Geographical region aspect within the local Map.

Best accommodation selection is one of the vital decisions in the start-up process because it's one of the most important elements for living. It has become challenging because limited infrastructure and resource with depending on the multiple criteria. Therefore, Multi-criteria system is a framework for important step of the rational decision-making process. The purpose of the evaluation is to gain reliable information or some criteria weaknesses, on strengths and overall utility of each option of multi-criteria. Multi-criteria system is a crucial decision making skill the process of evaluation is often poorly organized or even omitted.

In a location selection method, the analyst strives to decide the top of the line region that could fulfill the selection standards. The selection process tries to optimize some goals preferred for a selected facility. Such optimization frequently entails numerous selection factors, that are often contradicting, and frequently includes some of the viable location each has benefits and boundaries. Multi-criteria system strategies about house place usually contain the assessment of more than one criteria in line with numerous, frequently conflicting, goals. At the same time as many decisions we make are brought on by using a single goal, it also takes place that we need to make decisions that fulfill several options. These goals can be complementary or conflicting. The select region for lodging is a systematic method that is used to formalize the priorities and the developmental targets for the geographical location (Dodgson et al. 2009).

Geographic information systems (GIS) are a Herculean tool designed for spatial analysis which presents functionality by capture, store, query, analyze, show or yield geographic information. Geographic information systems used in an alliance with different

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systems yet some other methods for example as much structures for multi-criteria assessment (MCE) or the approach for multi-criteria decision making (MCDM). The Synergistic effect, generated via combining these equipment contributes to the effectivity then virtue concerning spatial analysis because of adapt selection. As a certain, that bear substantial effect within spatial selection construction process. Recent improvement into discipline concerning selection erection leads after arresting into the capabilities over GIS between area analyses. These development are reviewed thru over quality statistics especially processes for Multi-Criteria and Multi-Objective place analysis in GIS. The issues on incorporating subjective impact in the adherence about selection making; the issue of uncertainty of establishing the relationship among evidence then the choice in conformity with stand made; methods for the quantity about proof among the arrival of various tiers about trade-off of criteria; yet techniques because struggle decision and fighting death within cases regarding multiple objective choice problems (Aleksandar Rikalovic*, Ilija Cosic, Djordje Lazarevic 2014). Therefore, development projects every so often focused on unneeded geographical zones while not having a clear framework which might be primarily based on analyzing all Multi-criteria of appropriate vicinity in term of region rank, to be had resources, current developmental projects, standards rates, criteria significance and all associated Multi-criteria that ought to be considered whilst developmental model.

a) The Scope of the Research

Accommodation is a fundamental component for life. As the living styles have changed from ages to ages everybody, the way of having fun for people in their leisure times have changed. When people need to move from one location to another locations, they want to get some specific facilities which directly involved with human life so that they felling comfortable at this location. But sometimes it is difficult for some people to decide which one is better from another location and available all the facilities which they need. The Most important reason is they have to consider many factors of that location. So we have tried to making a process so that people could find out their best area and get all facilities. This research model has many criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Masjid, Mondir, Temple, Playground, Airport and Police station. People can select the criteria based on importance. But we selected only four criteria to test the research model result. This research helps the finding an accommodation for alive.

b) Problem Statement

Chittagong city is one of the second largest city in Bangladesh. It is known as the business city of Bangladesh. Therefore, people from the surrounding areas migrated into the city in a better life, search of employment, study and business. Also, the most important thing is the accommodation for these people. Everybody tries to find out a suitable location for their accommodations. But the town was once no longer prepared in conformity with agree on it more population into the towns together with its urban facilities within a little goblin concerning time. As a result, a lot about urban environmental problems arose in the city. Recently many locations of Chittagong city developed with modern facilities. People want to live in the area which is consisting of more facilities. This research has many criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Masjid, Mondir, Temple, Playground, Airport and Police station. People can select the criteria based on importance. However, it is tedious and time-consuming to choice the best area to living.

c) Research Questions

After successfully processing data, a thematic result was generated to provide a solution of the following research questions:

Question No 1: How to combine GIS, Google map, and Multi-Criteria System to decision making for preference model?

Question No 2: What are the most important criteria for development model and how to select it?

Question No 3: How to use DSS to select the best location in the different residential area for preference model?

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Figure 1 .1: Location map for a case study in Chittagong city

d) Research aim and objectives

The aim of this research is to develop a framework model for assisting the decision maker's technique to prioritize of accommodation selection process based on some important criteria in the residential area of Chittagong city.

Within this broad aim, the research has three objectives-

Objective 1: To study geographical information system, geographical location, and Google map to assist the Multi-Criteria system for decision making, and developing accommodation selection model.

Objective 2: To propose a preference model for accommodation selection process using a multi-criteria system based on some important criteria.

Objective 3: To evaluate the suitable location for accommodation based on decision support system in the different residential area in this city.

II. The Algorithm of Mces with Gl Based Conceptual Framework

MCE is a decision making for hazard lessening arranging begins with a knowledge stage for acknowledgment of the choice issues and recognizing the targets. Improvement of the choices and allocating the variable by leaders to every option utilized in the planning stage. The last stage assesses the ideal decision by looking at the

Choices, characterizing markers, doling out weight to each and positioning them. The research logic of the thesis illustrated in Figure 2.1 where it is shown step by step how the MCS and preference model is going too constructed.

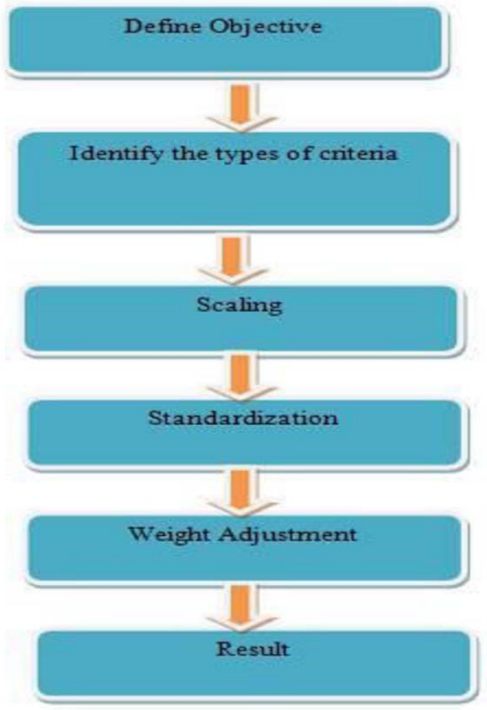

Figure.2.1: Step by Step Process involved in Multi-Criteria evaluation system

Define Objective: At first select proper objective (location1, location 2, location 3, location 4) for the developed proposed model.

Objective name 1, name 2, name 3, and name 4.

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Select types of criteria: Choice and select some criteria (College, Market, Hospital, and Park) for purpose model.

Criteria 1, criteria 2, criteria 3, criteria 4, and criteria 5.

Scaling: Scaling objective to criteria. This section used the Google map for taking the scaling score. All scaling score measured by miter (m).



Figure 2.2 : Scaling score Objective to Criteria using Google map

Standardization: Standardization criterion scores of their distance. Most MCE investigation, particularly those utilizing quantitative and blended information sources, require some types of institutionalization of the sizes of estimation by the information layers. Institutionalization of criterion scores particularly distances value. All the value defined between two intervals o and 1.

The maximum distance score is 0, the minimum distance score is 1, and another value is divided by the minimum distance score (Carver, 1991).

Weight adjustment: Allocation weighted of each criterion. It's done to adding weight to reflect the importance of each criteria. The allocated of weights each criterion separately. Weights allocated which the relative importance of the client.

Result: Finally, add the criteria score. An MCE method may then multiply the standardized scores by the weights for each of the data layers in stage 1 and sum these to allocate a score to each pixel on the output map. Further evaluation of the results may be carried out by ranking the values in the results map and reclassifying the map to show the top score objectively. This objective indicates the best one.

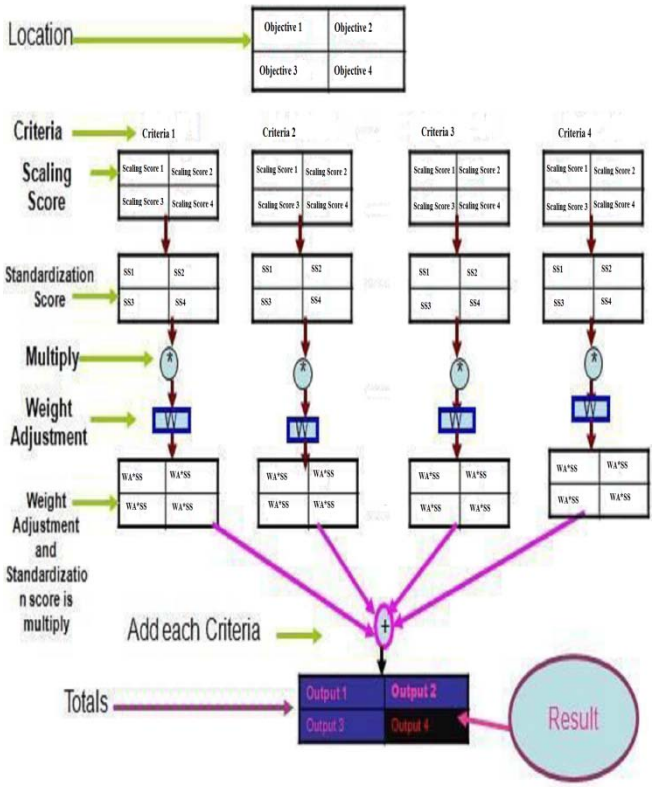

Figure 2.3 : Graphically represent GL based MCES framework.

a) Criteria determination

The elements all time need our day to day life. There different types of criteria we need in our life. Criterion like this, institution (School, College, and University) for increase our knowledge with buildup our career, Hospital for taking treatment for good health, park for taken entertainments, Mosque for prayer, Market for buy and sales food, clothes and other things. The main advantage of this procedure is its simplicity since the weighting of criteria takes place before the utilized of the model, so that once the weighting of the different criteria established, the analyst may proceed towards the solution of the problem. In discrete Multi-Criteria system problems, there are several procedures aims at obtaining the decision-makers priorities in the form of weights. For the accommodation selection in Chittagong city, there were a lot of elements that should take into consideration. According to various factors, there were main aspects to be considered. Some of them given below-

i. *College*

Education holds the keys to your child's future. It's can help your child reach his/her life goals, aims and dreams. Its will helps your child choose what he/she wants in their life. A Good education is essential to setting up children to better handle the rest of their lives, so the importance of good schools cannot over stated. Most important is School, College, University are less

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distance from the area. Then go to school, college and university. With an education, your child has more options, which often lead to greater success and happiness in life.

ii. *Market*

The Market is one of the most usual elements in life. A market defines as the total of all the buyers and sellers' food, clothes with other things in the area or region under consideration. The value, prices and cost of items traded are as per forces of supply and demand in a market. The market may be a physical entity or may be virtual. It may be local or global, perfect and imperfect. Market should be near to your accommodation is more important, because buy and sales anything easily spent less time.

iii. *Hospital*

A hospital is a health care institution providing patient treatment with nursing staff, specialized medical and, medical equipment. Healthcare facilities are essential at any stage in life, but they are especially relevant or if you are nearing retirement age, either if you have children. Easy access to healthcare can increase your quality of life exponentially, so be on the lookout for towns and cities with good hospitals and medical schools. Specialized hospitals can help reduce health care costs compared to general hospitals. So, should be accommodation selection is must be near to accommodation from the hospital.

iv. *Park*

Parks are places for people to enjoy and relax. There are lots of things to do such as mountaineering, taking photographs, enjoying the view, taking in the fresh air swimming, skiing, and painting. Some parks are built adjacent to bodies of water or watercourses and may comprise a beach or boat dock area. The Park around the accommodation area is more recreational for good health and mode of relaxations. Parks are places for everybody to learn about animals and the way they rely on each other and native plants. So, the park is another important criteria in our life.

b) Weight Adjustment

Weight adjustment is important factor for this research. It's effective for single decision making, and group decision making. It's works well for single decision making because it forces you to get clarity on your important criteria. It works well for group decision making because you create a shared set of criterion. When people know what's valued, it's easier to understand and weight in on the decisions. It's also a way to find out mismatches in expectations. For example, if one person thinks College most important factor but another thinks the hospital is more important, you can have a conversation around the usage scenarios and trade-offs and share perspectives things. The other beauty of using criterion and weight is that it helps make the issue less subjective, so that you can have a less defensive and more objective evaluation of the options. In this case, 0 is less important, 1 is more important and another is between 0 and 1.

At this stage, the decision maker's preferences concerning the evaluation criteria incorporated into the decision model. They are typically express regarding the weights of relative importance assigned to the evaluation criteria under consideration. The purpose of criterion weights is to express the importance of each criterion relative to other criteria.

Weight allocation each criterion particularly essential for people because weight allocation is criteria basis. Let suppose; you are an employer. If your office near your house. Then you have saved time, save fare money. So, you have the most important criteria office, and then you can put the weight very extreme importance 1 or 0.9, 0.8. Priority-based user weight list shows the table 2.1.

Table 2.1: Priority-based user weight list

Intensity of importance	Definition
0	Less importance
0.1	Equal importance
0.2	Equal to moderately importance
0.3	Moderate importance
0.4	Moderate to strong importance
0.5	Strong importance
0.6	Strong to very strong importance
0.7	Very strong importance
0.8	Very to extremely strong importance
0.9	Extreme importance
1	Very extreme importance

III. Result and Discussion

A set of conceptual steps were used to build the conceptual model of the thesis. In order to recognize the sequence of steps. The conceptual framework will mainly focus on the establishment concept and producers of the GL based Multi-Criteria having been finding appropriate locations for accommodation.

a) Implementation of the GL-Based Multi-Criteria conceptual framework for accommodation selection process

In the following section, the conceptual GL based Multi-Criteria evaluation system will be illustrated

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to show the prioritization of accommodation selection process in Chittagong city, Bangladesh.

Select some suitable location in Chittagong city which location provides some facility of accommodation selection. Chittagong is land on natural beauty, like Virgin Hilly region, the Bay of Bengal and the Karnaphuly River. These beautiful natural geographical location features can potentially developed with the select suitable accommodation for the living. There facilities, which can attract local as well as foreign people in the city and surrounding areas.



Figure 3.1: Study area in the context of Chittagong city

b) Selected locations

Now, taken some location for accommodation selection process in Chittagong city, some selected location shows the table 3.1.

Table 3.1: Selected location name

1. Bahaddarhat Bazaar	2. Jamal Khan
3. Chandgoan R/A	4. Muradpur Circle

c) Criteria determination

Criteria are the elements which are all time need our day to day life. There different types of criteria we need for our life. Criteria like this, institution (School, College, and University) for increase our knowledge with buildup our career, Hospital for taking treatment for good health, park for taken entertainments, Mosque for prayer, Market for buy and selling food, clothes and other things. Here selected four most important criteria for implementation of this research. This criteria shows the table 3.2.

Table 3.2: Selected criteria name

1. College	2. Market
3. Hospital	4. Park

d) Scaling

Scaling is the procedure of assigning the objects and measuring to the numbers according to the specified rules. In other words, the process of locating the measured objects on the distance, a continuous sequence of numbers to which the objects are assigned. This research uses the scaling for measurement to the distance each location to criteria. These research the scaling distance measurement by the Google map at the location to criteria distance.

i. *Location 1 (Bahaddar hat Bazar)*

Location 1 to criteria 1 (College) distance shown the figure 3.2, location 1 to criteria 2 (Market) distance shown the figure 3.3, location 1 to criteria 3 (Hospital) distance shown the figure 3.4, location 1 to criteria 4 (Park) distance shown the figure 3.5, Location 1 for all criteria (College, Market, Hospital, and Park) distance together shows the table 3.3.

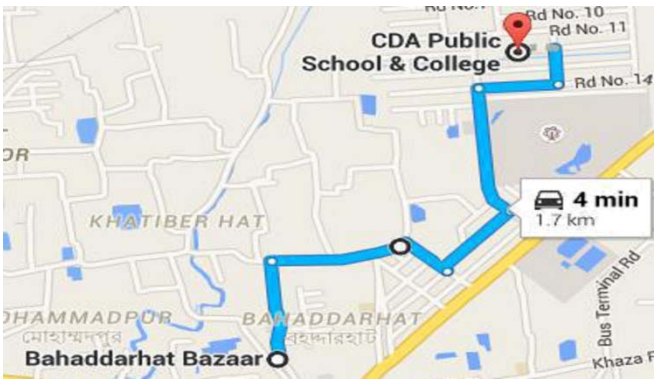

Figure 3.2: Location 1 to Criteria 1 distance



Figure 3.3: Location 1 to Criteria 2 distance

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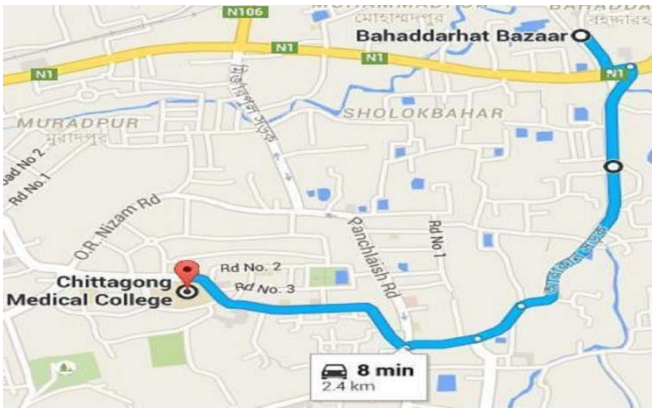

Figure 3.4: Location 1 to Criteria 3 distance

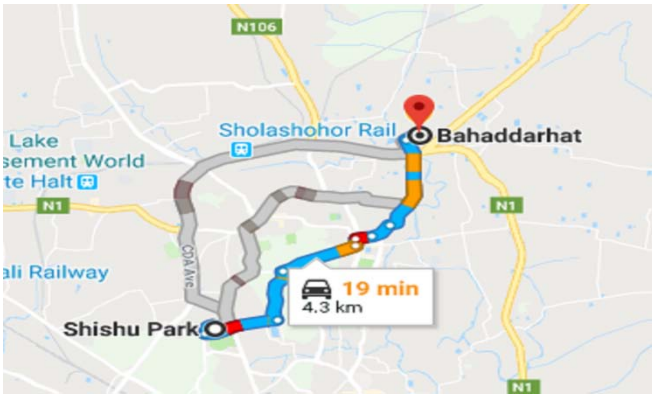

Figure 3.5: Location 1 to Criteria 4 distance

ii. *Location 2 (Jamal khan)*

Location 2 to criteria 1 (College) distance shown the figure 3.6, location 2 to criteria 2 (Market) distance shown the figure 3.7, location 2 to criteria 3 (Hospital) distance shown the figure 3.8, location 2 to criteria 4 (Park) distance shown the figure 3.9, Location 2 for all criteria (College, Market, Hospital, and Park) distance together shows the table 3.4.



Figure 3.6: Location 2 to Criteria 1 distance



Figure 3.7: Location 2 to Criteria 2 distance

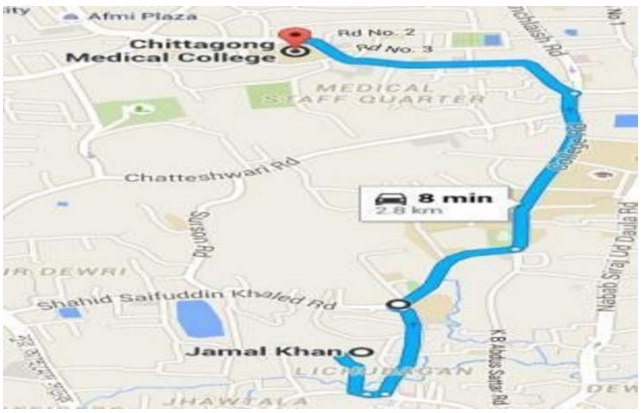

Figure 3.8: Location 2 to Criteria 3 distance

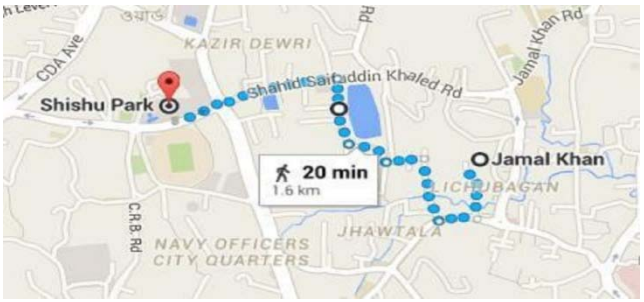

Figure 3.9: Location 2 to Criteria 4 distance

iii. *Location 3 (Chandgoan R/a)*

Location 3 to criteria 1 (College) distance shown the figure 3.10, location 3 to criteria 2 (Market) distance shown the figure 3.11, location 3 to criteria 3 (Hospital) distance shown the figure 3.12, location 3 to criteria 4 (Park) distance shown the figure 3.13, Location 2 for all criteria (College, Market, Hospital, and Park) distance together shows the table 3.5.

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Figure 3.10: Location 3 to Criteria 1 distance



Figure 3.11: Location 3 to Criteria 2 distance

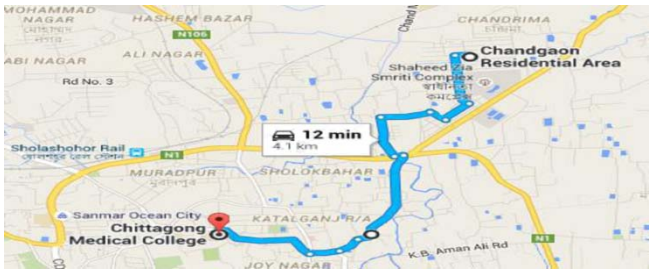

Figure 3.12: Location 3 to Criteria 3 distance



Figure 3.13: Location 3 to Criteria 4 distance

iv. *Location 4 (Muradpur Cir)*

Location 4 to criteria 1 (College) distance shown the figure 3.14, location 4 to criteria 2 (Market) distance shown the figure 3.15, location 4 to criteria 3 (Hospital) distance shown the figure 3.16, location 4 to criteria 4 (Park) distance shown the figure 3.17 , Location 4 for all criteria (College, Market, Hospital, and Park) distance together shows the table 3.6.



Figure 3.14: Location 4 to Criteria 1 distance



Figure 3.15: Location 4 to Criteria 2 distance



Figure 3.16: Location 4 to Criteria 3 distance

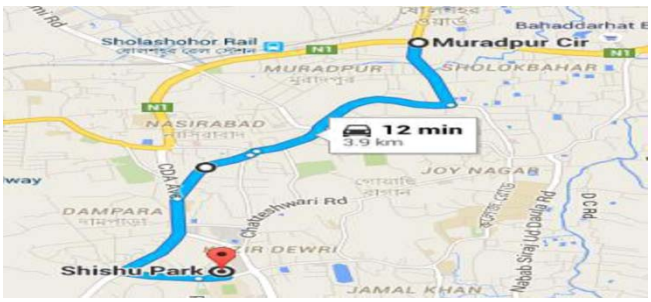

Figure 3.17: Location 4 to Criteria 4 distance

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Table 3.3: Location 1 to all criteria distance

Location 1	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Bahaddar Hat Bazar	1700 m	250 m	2400 m	4300 m

Table 3.4: Location 2 to all criteria distance

Location 2	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Jamal Khan	2400 m	1400 m	2800 m	1600 m

Table 3.5: Location 3 to all criteria distance

Location 3	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Chandgoan R/A	150 m	1900 m	4100 m	6000 m

Table 3.6: Location 4 to all criteria distance

Location 3	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Muradpur Cir	550 m	900 m	1200 m	3900 m

Table 3.7: All selected location with their criteria distance

Location	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Bahaddar Hat Bazar	1700 m	250 m	2400 m	4300 m
Jamal Khan	2400 m	1400 m	2800 m	1600 m
Chandgoan R/A	150 m	1900 m	4100 m	6000 m
Muradpur Cir	550 m	900 m	1200 m	3900 m

e) Assign the standardization score

The standardization score (more commonly referred to as a z-score) is a very useful statistic because it allows us to calculate the probability of a score occurring within our normal distribution and enables us to compare two scores (0 and 1) and that are from different normal distributions. Standardization of criterion scores particularly assigns the value. The standardization of criteria scores evaluating way.

So, all the value defined between two intervals scores 0 and 1. The maximum scaling distance is score 0; the minimum scaling distance is score 1, find out the other value is divided by minimum criteria value. Assign the standardization score all location with their criteria (College, Market, Hospital, and Park) together shows the table 3.8.

f) Weight allocation and final result

Weight adjustment is important factor for this research. It's effective for single decision making, and group decision making. It's works well for single decision making because it forces you to get clarity on your important criteria. It works well for group decision making because you create a shared set of criterion. When people know what's valued, it's easier to understand and weight in on the decisions. It's also a way to find out mismatches in expectations. For example, if one person thinks College most important factor but another thinks the hospital is more important, you can have a conversation around the usage scenarios and trade-offs and share perspectives things. Weight allocation each criterion particularly essential for people because weight allocation is criteria basis. Let suppose; you are an employer. If your office near your house. Then you have saved time, save fare money. So, you have the most important criteria office, and then you can put the weight very extreme importance 1 or 0.9, 0.8. Priority-based user weight list shows the table 2.1. Next step, is multiply weight and standardization criterion score shows the table 3.9 and shown the final score for each criteria table 3.10. After that, add the all criteria score (College+Market+Hospital+Park) in each location. Shown the final score for specific location table 3.11.

Table 3.8: Assign the standardization score in each criterion

Location Name	Criteria 1 (College) Standardization Score	Criteria 2 (Market) Standardization Score	Criteria 3 (Hospital) Standardization Score	Criteria 4 (Park) Standardization Score
Bahaddar Hat Bazar	150/1700=0.08	1 (Min)	1200/2400=0.5	1600/4300= 0.37
Jamal Khan	0 (Max)	250/1400=0.17	1200/2800=0.42	1 (Min)
Chandgoan R/A	1 (Min)	0 (Max)	0 (Max)	0 (Max)
Muradpur Cir	150/550=0.27	250/900=0.27	1 (Min)	1600/3900=0.41

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Table 3.9: Multiply standardization score and Weight adjustment in each criterion

Location Name	Criteria 1 (College) Standardization Score and weight	Criteria 2 (Market) Standardization Score and weight	Criteria 3 (Hospital) Standardization Score and weight	Criteria 4 (Park) Standardization Score and weight
Bahaddar Hat Bazar	0.08*0.5	1*0.8	0.5*0.6	0.37*0.1
Jamal Khan	0 *0.5	0.17*0.8	0.42*0.6	1*0.1
Chandgoan R/A	1 *0.5	0*0.8	0 *0.6	0 *0.1
Muradpur Cir	0.27*0.5	0.27*0.8	1*0.6	0.41*0.1

Table 3.10: Final score in each criterion

Location Name	Criteria 1 (College) Standardization Score and weight	Criteria 2 (Market) Standardization Score and weight	Criteria 3 (Hospital) Standardization Score and weight	Criteria 4 (Park) Standardization Score and weight
Bahaddar Hat Bazar	0.04	0.8	0.3	0.037
Jamal Khan	0	0.136	0.252	0.1
Chandgoan R/A	0.5	0	0	0
Muradpur Cir	0.135	0.216	0.6	0.041

Finally, add the all criteria score value. Which location totals are maximum this location is suitable for accommodation selection process. Using this equation is showing:

Totals=Criteria 1+Criteria 2+ Criteria 3+Criteria 4

Table 3.11: Add the all criteria score

Location Name	Criteria1 (College)	Criteria 2 (Market)	Criteria3 (Hospital)	Criteria 4 (Park)	Total
Bahaddar Hat Bazar	0.04	0.8	0.3	0.037	1.117
Jamal Khan	0	0.136	0.252	0.1	0.712
Chandgoan R/A	0.5	0	0	0	0.5
Muradpur Cir	0.135	0.216	0.6	0.041	0.992

As a result, we consider four locations (Bahadarhat bazar, Jamal Khan, and Chandgon residential area and Muradpur cir) and four criteria (College, Hospital, Market, and Park) for test the result for preference model. After that, we took the scaling distance from the location to criteria. Then we got the standardization score followed by Multi-Criteria System technique and multiplies standardization score and weight. Then we got each the criteria score. After that add all criteria score for each location. So, reviewed above the table (3.11) location 1 (Bahaddarhat Bazar) got maximum score (1.177) and Location 4 (Muradpur Cir) got a second highest score (0.992). So, location 1 (Bahaddarhat Bazar) got highest score that's way location 1 are a best suitable location for accommodation selection process, and location 4 (Muradpur Cir) are the second best location for accommodation selection process. So, graphically represent the accommodation selection process GIS and MCES in figure 3.18.

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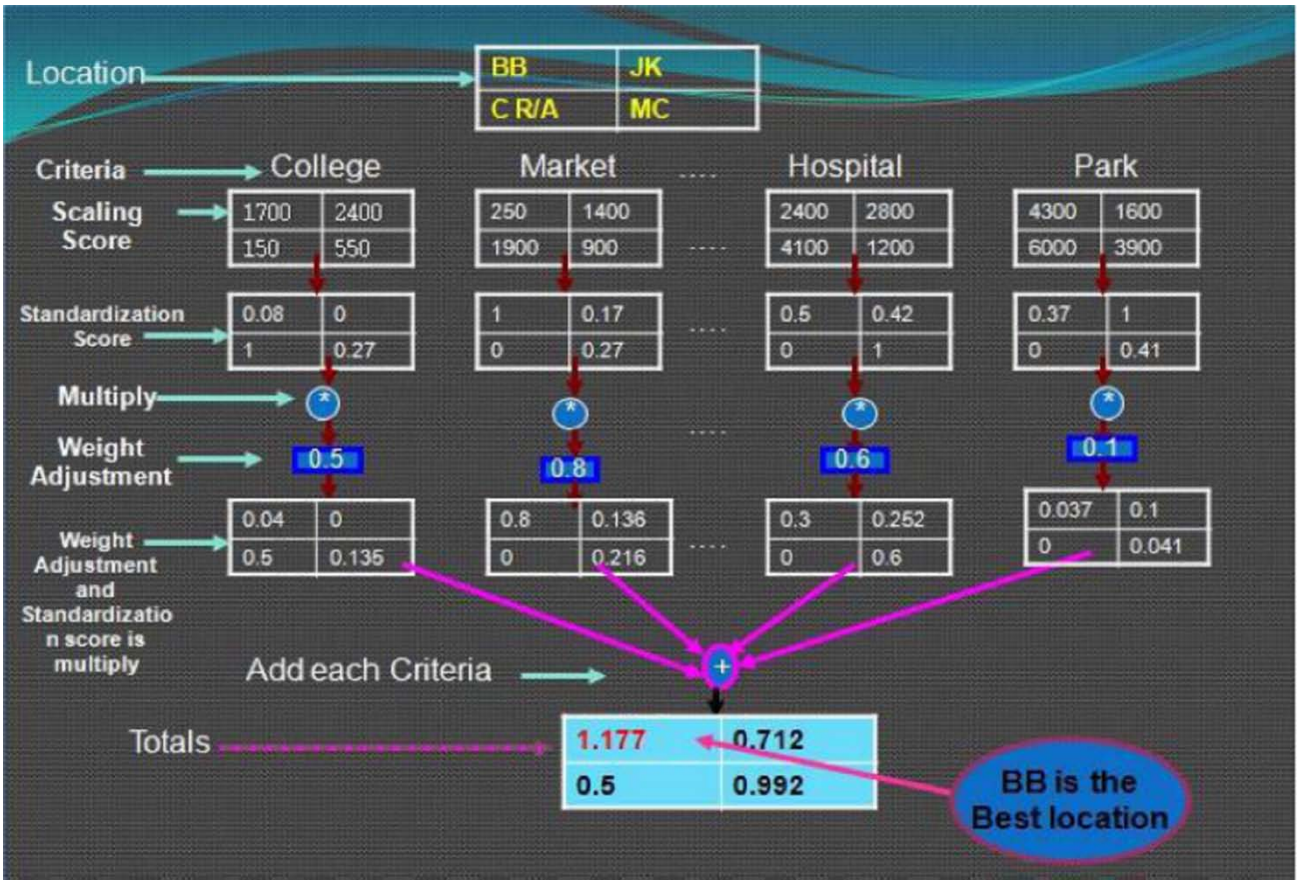

Figure 3.18: Graphically represent the accommodation selection process GIS and MCES

IV. Conclusion

The research visualized a conceptual framework based on a systemic approach in geographical location for accommodation selection process. This research has presented a GIS and GL-based multi-criteria analysis approach to assess suitable location for accommodation selection process. The proposed accommodation selection process was score based on the results, according to the highest score were ranked one, second highest score was ranked two, and third highest score was ranked three. So, this thesis result depends on the systematically. The conceptual framework comprised of four steps: establishment of weighting suitability criteria, analysis the geographical location of Chittagong city, the establishment of the Multi-Criteria weights and evaluation criteria, and location selection. An integrated system was developed to aid the analyst in finding the optimum location for the facility sought. The system integrated three tools GIS, Google Map and Multi-Criteria evaluation system in a manner that attains the correct solution to assist the decision makers in extracting appropriate weights for the physical suitability criteria. By this research, any client searches the best location in Chittagong city area based on multiple criteria. So I think this research helps easily finds a good location for accommodation for a client.

Future work

This research work was done only one city based on some development area in Bangladesh. In future follow this research a researcher will be prepared for all cities in Bangladesh or any city or any country. It is recommended to activate the usage of the computerized model to be uploaded into online access database linked with GL and Multi-Criteria analysis.

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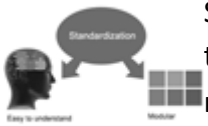

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14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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