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Stimulation Modelling of the Effect of Internal Migration on Urbanization in Rivers State, Nigeria

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Abstract

Internal migration is defined as "a movement of people from one area of a country (especially one local government area) to another area of the same country for the purpose or with the effect of establishing a new residence" either temporarily or permanently, is a complex and multidimensional process. In this study we are expected to determine the impact of internal migration in Port Harcourt city and Bori town respectively and to show the effect of the variation of some parameters that affect the growth of Port Harcourt city, through Simplified Assumptions and Mathematical Formulations. The internal migration of effective working population from Port Harcourt city to Bori town is lesser than that of Bori town to Port Harcourt city due to lesser jobs and social infrastructural facilities in Bori than Port Harcourt. Method of Analysis used is a non-linear ordinary differential equation of order 45 which otherwise is called O.D.E 45(Matlab ODE 45). It is evident from the results of the study that the variation of the rate of internal migration can produce either a positive or a negative effect on the population growth patterns of the two interacting population predictions.

Keywords

simulation modelling, internal migration, population growth, urbanization

1. Introduction

Internal migration is defined as "a movement of people from one area of a country (especially one local government area) to another area of the same country for the purpose or with the effect of establishing a new residence" (IOM, 2011 as recommended in ACP Observatory Research Guide, 2011a) either temporarily or permanently, is a complex and multidimensional process.

Growth in population requires corresponding growth in urbanization and industrialization for economic and social development, which will in turn result to the viability of the people. The growth of a city is influenced by the infrastructures on ground such as: modern facilities, industries/companies, hospitals, schools and good polices that will make for a business friendly environment. These infrastructures attract people who lack them in their cities or rural areas to look for greener pasture and modern lifestyle elsewhere that is where they are available. This brings to the front burner the issue of migration to bear and in turn increase or decrease in population, which if not checked has its negative impact on the living and entering countries/communities. Migration of human population is a common phenomenon in Africa especially in the presence of political, environmental and economic crises (Myers, 2002; Hunter, 2005; Raleight, 2011). In the developing world, significant population continue to move within and between rural and frontier areas (Henry et al., 2004; Lopezicarr, 2012), as well as to cities. It is therefore necessary to put in check the rate of migration in order to avoid shortage of food, housing or high cost of commodities, high rate of unemployment due to shortage of jobs and unpleasant social and environmental situations.

Internal migration and its impact on regional development in Macedonia was investigated by Temova (2017) with the aim to analyse the causes of imbalanced growth among the region and in Macedonia and to identify the conditions for their future growth. Statistical data were used to determine the trend of internal migration and the causes. It was discovered that with implementation of decentralization policy, less developed areas can be further developed according to their geographical climate and natural characteristic.

Internal migration and its impact in the growth of Port Harcourt city of Nigeria is an interesting and challenging sustainable development problem that seeks solution. Internal migration has been an issue in the city of Port Harcourt, following the fact that it is the only well developed and industrialized city in Rivers state. This has brought about continuous movement of people to the city to seek for better jobs, schools and modern social amenities that are not available in their localities. This movement can enhance the growth of the city if the rate of migration is very low. But being the only developed and industrialized city, the rate might not be known. It is therefore important to determine the impact of this migration on the city and the way forward to resolving the issue of internal migration in order to reduce its effect in Port Harcourt and Bori town.

The earlier analysis of population growth and how demand for housing has affected land use in the city of Port Harcourt has involved the development of a mathematical model that defines the extent of the

population growth and its implication. It is important to further determine the effect of this growth due to internal migration in Port Harcourt city of Nigeria.

Port Harcourt is an industrialized city in Rivers state compared to other urban cities in the state. This industrialization attracts people from the urban and rural areas to Port Harcourt to seek for jobs, education and medical care. The issue of internal migration comes to bear as people migrate to Port Harcourt for greener pastures. Migration has its impact on the population of the city, infrastructures, social facilities, the economy and the environment.

Ayotamuno and Ekaka-a (2017) investigated the extend on how the variation of population growth and demand for housing can affect land use in Port Harcourt and urban areas in Nigeria. Two main methods were utilized to answer the research questions. These methods are called Geographic Information System (GIS), remote sensing, mathematical modelling and numerical simulation. One of the key results of this important study is stated as follows: development of built up areas need to be controlled so that all the vegetation is not used up because the city needs some vegetation to allow the city breath. Similarly, the proposed mathematical model has compliment the relationship of population growth, housing demand and land use in the city of Port Harcourt in Nigeria.

Port Harcourt city is growing faster in population due to migrants in search for urbanization and industrialization which is on the increase. When there is increase in the rate of migration, the demand for land increases to meet the increasing demand for food production, housing and modern infrastructures. Also there is increasing demand for jobs and social amenities, thus overstretching available facilities.

It is this impacting factors that have prompted this research work, but for this work we are considering the impact of internal migration on the growth of Port Harcourt city and how sensitive the population is to the parameter values of population that changes over time.

In this study, we are expected to determine the impact of internal migration in Port Harcourt city and Bori town respectively and to show the effect of the variation of some parameters that affect the growth of Port Harcourt city. It is against this background we have considered the following expected outcome.

1) To determine how internal migration affects the growth of Port Harcourt city and Bori town.

2) To determine how the rate of internal migration can be minimized to enhance the growth of Port Harcourt City and Bori town.

For better understanding of this research, Figure 1 below shows the geographical area of the study area.

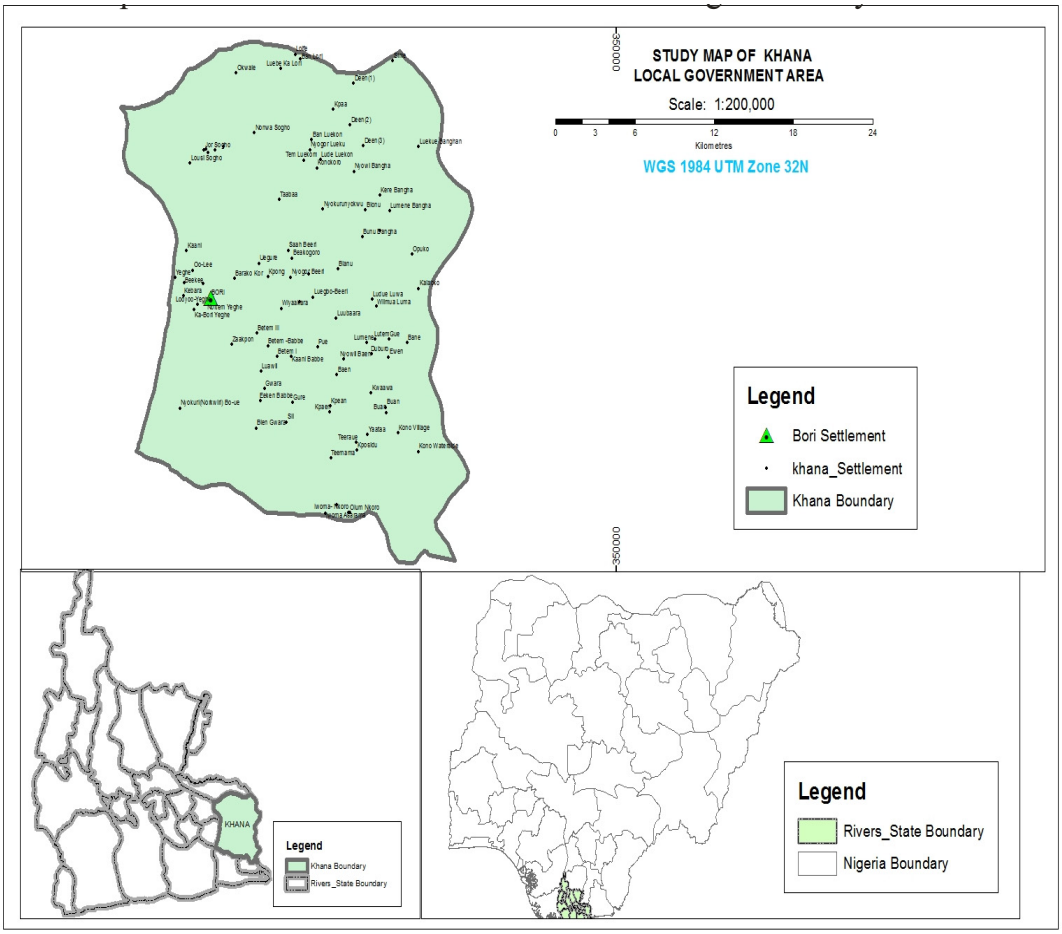

Figure 1. Maps of Nigeria, Rivers State and Khana LGA

Source: Rivers State Ministry of Housing and Urban Development Survey Department.

2. Method

The purpose of this chapter is to define the core method with which the proposed research problem is solved. The research aims at determining the impact of internal migration on the growth of Port Harcourt city in Nigeria. For the purpose of this work, the following are considered:

i. The internal migrants are effective working population.

ii. The migration is from Bori town to Port Harcourt city.

iii. The migration will enhance the population of Port Harcourt city.

2.1 Simplifying Assumptions

The mutualistic interaction between a bigger city called Port Harcourt city council and a relatively smaller city called Bori town can be understood by considering the following simplifying assumptions:

i The internal migration of the effective working population of Bori town tends to enhance the growth of Port Harcourt city, where as the internal migration of the Port Harcourt city working population also tends to enhance the growth of Bori town.

ii The interaction between effective working population within the Port Harcourt city tends to inhibit the growth of Port Harcourt city.

iii The growth of Port Harcourt city is enhanced proportionately which is mathematically tractable based on the method of separation of variables in differential equation modelling but do not offer meaning in the study of human population growth because, the population of Port Harcourt city cannot continue to grow indefinitely due to constraints of job facilities and social infrastructural facilities.

iv The internal migration of effective working population from Port Harcourt city to Bori town is lesser than that of Bori town to Port Harcourt city due to lesser jobs and social infrastructural facilities in Bori than Port Harcourt.

v The initial population sizes of both Port Harcourt and Bori are assumed using the available data.

We will apply these assumptions to formulate the mathematical model next.

2.2 Mathematical Formulations

In this study a first order differential equation will be utilized to determine the effect of internal migration on the growth of Port Harcourt city and Bori town. The first order differential equations are having the following mathematical structure:

$$\frac{dP(t)}{dt} = \alpha_1 P(t) - (t)\ \beta_1 P^2(t) + r_1 P(t) B(t) \quad (1)$$

$$\frac{dB(t)}{dt} = \alpha_2 B(t) - \beta_2 B^2(t) + r_2 B(t) P(t) \quad (2)$$

$P(0) = P0 > 0$, $B(0) = B0 > 0$

These model equations describe the interaction between Port Harcourt city and Bori town population at time t. The parameters in the models are defined as follows:

- P(t) represent the population size of Port Harcourt city at time t.
- B(t) represent the population size of Bori town at time t.
- α_1 denotes the growth rate of Port Harcourt city.
- α_2 denotes the growth rate of Bori town.
- β_1 represents intra-competition coefficient due to internal migration between the city of Port Harcourt.
- β_2 represents intra-competition coefficient due to internal migration between the city of Bori.
- r_1 denotes the rate of internal migration of Bori town to enhance the growth of Port Harcourt city.
- r_2 represents the rate of internal migration of Port Harcourt city to enhance the growth of Bori town.
- For the purpose of this research we have considered the following model specific parameter values (Ayotamuno & Ekaka-a, 2017).
- $\alpha_1 = 0.4442$
- $\alpha_2 = 0.044$
- $\beta_1 = 0.000\ 000\ 6902$
- $\beta_2 = 0.000\ 000\ 18$

- $r_1 = 0.000\ 000\ 12$
- $r_2 = 0.000\ 000\ 8$

Initial condition P(0) = 635 000, B(0) = 150 000 with a duration growth of fifteen years.

2.3 Method of Analysis: Illustration

A non- linear ordinary differential equation has been proposed for analysing the research work. Since the proposed interaction models are non-linear, it does not have a closed formed solution. Hence, we have proposed to implement the numerical simulation method that is based on the ordinary differential equation of order 45 which otherwise is called O.D.E 45. The matlab ODE 45 numerical scheme will be used to run the calculation with the parameter values given above.

In determining the effect (percentage) of the internal migration on the populations of Port Harcourt and Bori, the following equations were used with the results as shown in the tables.

$$\text{The percentage Depletion} = \left[1 - \frac{new\ population}{old\ population}\right](100) \quad (3)$$

$$\text{The percentage increase} = \left[\frac{new\ population}{old\ population}\right](100) \quad (4)$$

3. Result

For a clearer understanding of the results, the notations used in the tables are defined as follows:

t stands for time in years

t = 1 represents 2011

t = 2 represents 2012

t = 3 represents 2013, … , t = 15 represents 2025

P(t) old represents the original population of Port Harcourt in a given year

P(t) new is the population preceding the original population of Port Harcourt in a given year

Effect 1(%) denotes the effect in percentage due to the change between P(t) old and P(t) new

B(t) old is the original population of Bori town in a giving year

B(t) new represents the population preceding the original population of Bori town in a given year

Effect 2 (%) is the effect in percentage due to the change between B(t) old and B(t) new

Table 1. Evaluating the Effect of r_1 = 0.000 066 on the Effective Working Population of Port Harcourt City and Bori Town: Variation of r_1 = 0.000012 by 550%

t(years)	P(t) old	P(t) new	Effect 1(%)	B(t) old	B(t) new	Effect 2(%)
1	635 000	635 000	0	150 000	150 000	0
2	647 233	9 178 488	1 318.0	145 004	79 799	45.0
3	645 876	5 646 814	762.0	140 189	46 681	66.7
4	659 488	4 160 131	530.8	135 583	32 948	75.7
5	662 144	3 347 830	405.6	131 197	25 438	80.6
6	663 559	2 836 078	327.4	127 030	20 700	83.7
7	664 197	2 484 280	274.1	123 076	17 439	85.8
8	664 355	2 227 674	235.3	119 325	15 057	87.4
9	664 221	2 032 287	205.9	115 763	13 239	88.6
10	663 916	1 878 588	183.0	112 381	11 808	89.5
11	663 512	1 754 902	164.5	109 165	10 654	90.2
12	663 057	1 652 658	149.3	106 104	9 698	90.9
13	662 579	1 566 985	136.5	103 189	8 895	91.4
14	662 095	1 494 172	125.7	100 409	8 212	91.8
15	661616	1431537	116.4	97 755	7623	92.2

Source: Author's (O.D.E 45 Simulated Data. Ordinary Differential Equation of Order 45).

Table 2. Evaluating the Effect of r_1 = 0.0000672 on the Effective Working Population of Port Harcourt City and Bori Town: Variation of r_1 = 0.000012 by 560%

t(years)	P(t) old	P(t) new	Effect 1(%)	B(t) old	B(t) new	Effect 2(%)
1	635 000	635000	0	150 000	150 000	0
2	647 233	9 241 500	1327.9	145 004	78 908	45.6
3	654 876	5 667 494	765.4	140 188	46 032	67.2
4	659 488	4 170 980	532.5	135 583	32 459	79.1
5	662 144	3 355 195	406.7	131 197	25 051	80.9
6	663 559	2 841 392	328.2	127 030	20 381	84.0
7	664 197	2 488 369	274.6	123 076	17 165	86.1
8	664 355	2 230 826	235.8	119 325	14 817	87.6
9	664 221	2 034 765	206.3	115.763	13 026	88.8
10	663 916	1 880 616	183.3	112 381	11 616	89.7
11	663 512	1 756251	164.7	109 165	10 476	90.4
12	663 057	1 653 809	149.4	106 104	9 355	91.0
13	662 579	1 567 985	136.6	103 189	8 746	91.5

14	662 095	1 495 054	125.8	100 409	8 074	92.0
15	661 616	1 432 318	116.5	97 756	7 495	92.3

Source: Author's (O.D.E 45 Simulated Data. Ordinary Differential Equation of Order 45).

Table 3. Evaluating the effect of r_1 = 0.000012 on the Effective Working Population of Port Harcourt City and Bori Town: Variation of r_1 0.000012 by 100%

t(year)	P(t) old	P(t) new	Effect 1(%)	B(t) old	B(t) new	Effect 2(%)
1	635 000	635 000	0	150 000	150 000	0
2	647 233	2 163 396	234.0	145 004	136 703	5.7
3	654 876	2 661 475	306.0	140 188	114 112	18.6
4	659 488	2 454529	272.0	135 583	95 255	28.7
5	662 144	2 206 283	233.0	131 197	81 333	38.0
6	663 559	2 004 696	202.0	127 030	70 865	44.2
7	664 197	1 845 508	178.0	123 076	62 741	49.0
8	664 355	1 718 206	159.0	119 325	56 259	52.8
9	664 221	1 614 317	143.0	115 763	50 966	55.9
10	663 916	1 528 017	130.0	112 381	46 563	58.5
11	663 512	1 455 230	119.0	109 165	42 847	60.7
12	663 057	1 393 027	110.0	106 104	39 655	62.6
13	662 579	1 339 270	102.0	103 189	36 896	64.2
14	662 095	1 292 354	95.2	100 409	34 483	65.6
15	661 616	1 251 060	89.0	97 756	32 354	66.9

Source: Author's (O.D.E 45 Simulated Data. Ordinary Differential Equation of Order 45).

Table 4. Results on Population Effect Prediction on Port Harcourt City and Bori Town for the Year 2018 as Internal Migration Rate Changes

Serial No	Internal migration rate (r_1)	Year	Effect 1(%)	Effect 2(%)
1	0.000066	2018	235.3	87.4
2	0.0000672	2018	235.8	87.6
3	0.0000684	2018	236.1	87.8
4	0.0000696	2018	236.5	88.0
5	0.0000708	2018	236.9	88.2
6	0.000072	2018	237.2	88.3
7	0.0000732	2018	237.6	88.5
8	0.0000744	2018	237.9	88.7
9	0.0000756	2018	238.2	88.9

10	0.0000768	2018	238.4	89.0
11	0.000048	2018	227.0	83.2
12	0.000042	2018	223.0	81.1
13	0.000036	2018	218.0	79.0
14	0.000024	2018	200.0	70.4
15	0.000012	2018	159.0	52.8

Source: Author's (O.D.E 45 Simulated Data. Ordinary Differential Equation of Order 45).

Table 5. Results on Population Effect Prediction on Port Harcourt City and Bori Town for the Year 2025 as Internal Migration Rate Changes

Serial No	Internal migration rate (r_1)	Year	Effect 1(%)	Effect 2(%)
1	0.000066	2025	116.4	92.2
2	0.0000672	2025	116.5	92.3
3	0.0000684	2025	116.6	92.5
4	0.0000696	2025	116.7	92.6
5	0.0000708	2025	116.8	92.7
6	0.000072	2025	116.9	92.8
7	0.0000732	2025	117.0	92.9
8	0.0000744	2025	117.1	93.0
9	0.0000756	2025	117.2	93.1
10	0.0000768	2025	117.3	93.2
11	0.000048	2025	114.0	90.0
12	0.000042	2025	112.3	88.1
13	0.000036	2025	111.0	86.3
14	0.000024	2025	104.5	80.7
15	0.000012	2025	89.0	66.9

Source: Author's (O.D.E 45 Simulated Data. Ordinary Differential Equation of Order 45).

4. Discussion

Tables 1 and 2 evaluate the effect of the rate of change on the population of Port Harcourt city and Bori town in the face of changing internal migration rate.

From Table 1 in the first row, column 1 and 2 the population of Port Harcourt denoted by P(t) old and P(t) new are the same (635 000) being the initial populations. Therefore, on the basis of either the theory of depletion or increase, the effect 1 in column 3 can be calculated using percentage depletion or increase formula to arrive at the value 0 for effect 1. The second row shows a slight increase in P (t) old column (647 233) and a sharp increase in P(t) new column (9 178 488). This has resulted in a

percentage increase of 1318.o% which is very high. The likely implication of this result is that it will impact on Port Harcourt city negatively since the demand for jobs will be too far more than the jobs available.

From row 3 down there is a steady increase on P(t) old while that of P(t) new which was extremely highly reduces steadily. This has resulted in steady decrease in the effect 1 column (1318.0% to 116.4%) which is still not good because that is higher than the old population of Port Harcourt. The migration of the effective working population of Bori to Port Harcourt has its impact on the population of Bori town. A close observation at row 1 column 4 and 5 of Bori population denoted by B(t) old and B(t) new, the population of the old and new are the same (150 000) that is initial populations. Hence, on the basis of either the theory of increase or depletion the value for effect 2 that is column 6 can be calculated using percentage increase or depletion formula to arrive at the value 0 as shown.

In row 2 B(t) old decreases from 150 000 to 145 004 while that of B(t) new decreased sharply from 150 000 to 79 799 which resulted in a depletion of 45.0%. From row 3 to row 15 the P(t) old increased monotonically while P(t) new after the sharp increase decreased monotonically. The column effect 1 of row 3 down to 15 which is percentage increase is also decreasing monotonically from 762.0% to 116.4%. For B(t) old and B(t) new there is a steady decrease which has made the depletion to increase (45.0% to 92.2%) in column 6 effect 2.

From Table 2 P(t) old is fixed while P(t) new varies with respect to the rate of internal migration. As the rate increases from 0.000066 in Table 1 to 0.0000672 in Table 2 so is P(t) new value in Table 2 higher than that of Table 1 even though they are decreasing monotonically down the row. Also effect 1 values in Table 2 are higher compared with that of Table 1. In the same manner B(t) old is fixed just like P(t) old while B(t) new varies due to the changing rate of internal migration. The values of B(t) new decreases as the rate increases which in turn affect the values of effect 2 which happens to be higher than the values of effect 2 in Table 1 and the depletion is also decreasing monotonically down to row 15. This implies that increase in rate of internal migration brings about a steady increase in the population of Port Harcourt while the populations of Bori decreases as people continue to migrate to Port Harcourt.

In Table 3 the scenario is different as P(t) new shows a dramatic decrease due to a lower internal migration rate (0.000012). The values of P(t) new has dropped from 9 241500 as at second year of Table 2 to 2 163 396 in the second year of Table 3. This reduction in the population has also resulted in reduction in the values effect 1. This in turn brought about continuous decrease in P(t) new along sides effect 1. The reduction in the rate of internal migration has also affected the new population of Bori. The B(t) new values has increased compared with the previous tables. The depletion in effect 2 column has reduced compare to previous tables. As B(t) new decreases down the year in the table, the effect 2 which is depletion increases along sides.

Tables 4 and 5 are the results on population effect prediction on Port Harcourt City and Bori town for the year 2018 and 2025. It shows the behaviour of the changing internal migration rate in the feature.

From Table 4 a closer observation reveals that as the rate of migration increases (0.000066 to 0.0000768) effect 1 increases monotonically while effect 2 depletes. A careful observation on effect 1 from serial number 11 to 15 shows that as the rate of migration drops down the line, the values of effect 1 decreases from 238.2% in the previous to 227.0% and finally to 159.0%. In the case of the depletion in effect 2, the depletion decreased from 89.0% in serial number 10 to 53.2% then finally 52.8%.

From Table 5, the case is the same as Table 4, the effect 1 dropped from 117.3% to 114.0% and finally decreased to 89.0%. While effect 2 dropped from 93.2% to 90.0% and later depleted to 66.9%. The results in the tables shows that an increase in the rate of migration increases the population of Port Harcourt city while population of Bori town decreases in each table. The result also reveals that as the rate is fixed in Tables 4 and 5 effect (1) values are decreasing down the year(t) while effect (2) are decreasing down the year(t). The percentage increase in 2018 is higher than that of 2025 so as the year goes by the effect (1) decreases. The situation is not different for effect (2) as the depletion is increasing down the year (t).

5. Conclusion

The findings from the results showed that if growth rate and intra-competition coefficient due to internal migration of Port Harcourt city are fixed and the rate of internal migration varies, it impacts on the population of Port Harcourt. From the results the population of Port Harcourt grew along sides the migration rate. As the rate increased the P(t) new values increased and as the rate dropped the population dropped too. This shows that the population is sensitive to the rate of internal migration. Also the population did not grow without bounds as the interaction between the other parameters tends to reduce the growth. But this reduction as a result of negative feedbacks did not give the required population growth that will enhance the population of Port Harcourt city.

Bori town is not left out in the share of the impact of internal migration, the population of Bori continued to deplete alongside with the increasing migration into Port Harcourt city. The decrease in the growth rate resulted in depletion which shows less sensitivity of the population. This is a better indicator for future prediction and it implies that if the trend is not checked it will cripple the economy of Bori town. The work clearly shows that internal migration drives population growth of a city and if not well managed the interaction within the city becomes unhealthy since too many persons will be competing for scarce resources. The infrastructures and the personnel will be over stretched since the population growth outweighs the facilities on ground. This brings to bear the issue of development of other cities and decentralizing industries and facilities in order to reduce the rate in which people in the urban and rural areas migrates to the cities.

This study has unveiled how the search for good jobs and a better life has led to migration into the city from the rural and urban areas which if not controlled may have a negative impact on the city and the rural areas. Therefore, the numerical ideals of this work can be extended to answer the following questions which we did not address in this work. Recommendations are; to model

the effects of infrastructural resources on the growth of Port Harcourt city and Bori town; and use this information to discuss the debate on the social economic gaps between Port Harcourt city and Bori town. To model the effect of appropriate government policies in terms of effective job creation and use it to discuss the social economic gaps between Port Harcourt and Bori town in the contest of the Greater Port Harcourt development agenda.

References

ACP Observatory on Migration 2011a Research Guide, ACP Observatory/IOM. http://www.acpmigration-obs.org/ node/168. 2011b. (2011). *Overview on South-South Migration and Development Trends and Research Needs in Nigeria*. Retrieved September 10, 2011, from http://www.acpmigration-obs.org/sites/default/files/NigeriaFin.pdf

Ayotamuno, A., & Ekaka-a, E. N. (2017). How has population growth and demand for housing affected land use in Port Harcourt, Nigeria. *Global Educational Research Journal*, *5*(3), 563-578.

Henry, S., Schoumaker, B., & Beauchemine, C. (2004). The Impact of Rainfall on the First Out-Migration: A Multi-Level Event—History Analysis in Burkina Faso. *Population and Environment*, *25*, 423-460. https://doi.org/10.1023/B:POEN.0000036928.17696.e8

Hunter, L. (2005). Migrant and Environmental Hazards. *Population and Environment*, *26*, 272-302. https://doi.org/10.1007/s11111-005-3343-x

Lopez-Carr, D. (2012). Agro-Ecological Drivers of Rural Out-Migration to the Maya Biosphere Reserve, Guatemala. *Environmental Research Letters*, *7*(art.045603). https://doi.org/10.1088/1748-9326/7/4/045603

Myers, N. (2002). Environmental Refugees. A growing Phenomenon of the 21st century. *Philosophical Transactions of the Royal Society B*, *357*, 609-613. https://doi.org/10.1098/rstb.2001.0953

Raleigh, C. (2011). The Search for Safety. The effects of Conflict. Poverty and Ecological Influences on Migration in the Developing World. *Global Environment Change*, *21*, 582-593. https://doi.org/10.1016/j.gloenvcha.2011.08.008

Temova, A. (2017). Internal Migration and its Impact on Regional Development in Macedonia. *Global Journal of Human—Social Science Economics*, *17*(4), 847.