DOI: https://doi.org/10.68064/jshe.2020.gstcfhgh

Perceived Climate Change Impact on the Livelihoods of Rural Families in Numan, Adamawa State- Nigeria

UMORU, Mohammed Lawal

Abstract

This study examined the perceived climate change impact on the livelihoods of rural families in Numan Local Government Area, Adamawa State-Nigeria. Four objectives and three null hypotheses were stated for this study. The study used a descriptive survey research design and the population consists of one thousand and twenty respondents (1020) from the three villages in Numan district, Numan LGA- Adamawa State, namely Pullum (351), Shafforon (424), and Zambun (245). The sample for the study was two hundred and fifty-five (255) respondents. This was systematically obtained using systematic sampling techniques of an interval of four families in each of the villages' population, with Pullum (88) Shafforon (106), and Zambun (61). The instrument for data collection was a structured questionnaire developed by the researcher titled Climate Change Impact Questionnaire (CCIQ) with a reliability coefficient of 0.79. The instrument consisted of four sections. Frequency and percentages were used to answer research question 1, while mean scores was used for 2,3 and 4. T-test statistics was used to analyze the three null hypotheses. Results indicated that out of 255 (100) respondents, 221(87.00) agreed to have had information about climate change while 34(13.00) did not. Radio was seen to be the main source of information 93(42.10), followed by religious leaders 56(25.40). Respondents had good knowledge of the signs of climate change (4.72) but poor knowledge of causes of climate change (2.75). Respondents had good perceptions of climate change impact (4.29) and adaptation strategies (4.27). No significant difference in the responses of males and females on signs of climate change ($p=0.94$; $p>0.05$), causes of climate change ($p=0.86$; $p>0.05$), climate change impact on the livelihoods of rural families ($p=0.91$; $p>0.05$) and that of adaptation strategies ($p=0.97$; $p>0.05$). In conclusion, this study shows that the climate change issue has no gender bias and that rural families are more vulnerable to the adverse impact of climate change. Poor knowledge of respondents on the causes of climate change is an indication that more work needed to be done in ensuring that rural families are to be educated by Home Economists professionals and other environmental experts on the signs, causes, and climate change impact.

Keywords: Climate change, Livelihoods, Rural families, Adaptation strategy, Risk perceptions

Introduction

The world is faced with difficulties associated with climate change in all aspect of human endeavors (Sullivan and White, 2019). The need to understand how rural families perceive climate change variation on the livelihoods become necessary and critical in ensuring successful adaptation efforts in coping with the crises. According to Howe, Marlon, Wang & Leiserowitz (2019), climate change is expected to globally harm individuals and families in cities and rural areas. Weber (2011) stated that lack or poor perceptions of the signs, causes and risk associated with climate change have been discovered as the major barriers in engaging people and families in various efforts of

climate change mitigation and adaptation, (Asekun- Olarinmoye, Bamidele, Odu, Olugbenga-Bello, Abodurin, Adebimpe, Oladele, Adeomi, Adeoye, & Ojofeitimi, 2014).

Risk perceptions of climate change according to Niles, Lubell & Haden (2013), suggests that families frequently formed these perceptions through experiences with devastation like drought, flooding, irregular rainfall as signs of climate change that are causing growing crisis and threats to the livelihood of families all over the world today. According to World Health Organization (2018), climate change is a global crisis that has several potentials that undermine family development and survival. This is because there is no exception in climate change impact since the impact is increasingly witnessing the frequency of severe droughts, floods and precipitation changes as well as long term heat, with water shortage stress among families. This condition according to the State of Food Insecurity and Nutrition (2020), make families bear the high burden associated with hunger, malnutrition and food insecurity.

Rural families are said to have been confronted with life-threatening disasters associated with climate-related crisis that affects family resources such as food, economic activities, health and other infrastructure that supports family livelihoods, (Madu, 2016). When families are exposed to climate risks that had manifested in the rise in temperatures, changing patterns of rainfall, water supplies dwindling and scarcity of resources, it exacerbates vulnerable families to migratory pressures, food insecurity and rural poverty. Rural families in many developing countries depend highly on natural resources particularly in sub-Saharan Africa where families use these resources to service all activities that support their survival and livelihoods. Climate change is said to have severe and negative impact on the sub-Saharan Africa countries, most especially those whose economy is sensitive to climate change like Nigeria (Anabaraonye, Okafor and Ikuelogbon, 2019).

The livelihoods of rural families in Nigeria are vulnerable to the pronounced effects of change and this is expected to increase as a result of their heavy reliance on agriculture that is rain-induced (Anabaraonye, Okafor and Ikuelogbon, 2019). This is said to be more prominent in Northern Nigeria and Adamawa state in particular where there is an increased high temperature coupled with dry weather conditions and low precipitation that provides greater opportunity for high frequency conditions for drought (Abdulkadir, Lawal and Muhammad, 2017). Furthermore, demographic variables are not left out in the consideration of climate change impact, as Amobi & Onyishi (2015) mentioned that income groups, occupation, class, gender and age are all affected by Climate change. This, for example, is the climate change condition which Onwutuebe (2019) stated that large percentage of women and men of poor small-scale family farmers who depend largely on rain for agricultural production will continue to face these challenges.

According to the United States Environmental Protection Agency (2017), climate change vulnerability is located in rural areas with certain characteristics of poverty, aged, young, or the sick. Numan community in Adamawa state is one of the communities that fall within the characteristic of rurality. This is because most families in Numan are located in the rural areas with majority along the confluence of Rivers Benue and Gongola whose major occupation for their livelihood are climate influenced activities such as farming and fishing.

This situation makes Numan communities more vulnerable to climate change impacts. Also, the state is in the disadvantaged position of poverty along with few resources available to cater for climate change risks and most rural areas of this state are already facing challenges of development and crisis due to insurgency, loss of income and food production. The study on perceived signs, causes and climate change impact on livelihoods becomes imperative to the adaptation strategy.

Objectives of the Study

The study is guided by the following objectives:

1. Identify the source of knowledge from which rural families get information on climate change in Numan LGA.
2. Identify the gender differences in the knowledge of signs and causes of climate change in Numan LGA.
3. Examine the Perception of Climate Change Impact on the Livelihood of gender based rural Families in Numan LGA.
4. Identify rural families' strategies to reduce the impact of climate change on livelihoods in Numan LGA.

Research Hypothesis

Three null hypotheses are stated and tested for this study at a 0.05 level of significance.

1. HO_1: There is no significant difference in the perception of male and female respondents on the signs and causes of climate change
2. HO_2: There is no significant difference in the perception of male and female respondents on climate change impact on the livelihood of rural families
3. HO_3: There is no significant difference in the perception of male and female respondents on the adaptation strategies of rural families

Methodology

Research Design

The study used a descriptive survey research design which takes into cognizance the perceptions, opinions and practices of respondents on a field of research interest. A small representative sample is used to derive this data upon which the findings is generalizable to a larger group. It is common in the social sciences.

Population of the Study

The population consists of one thousand and twenty respondents (1,020) from three villages in Numan district, Numan LGA-Adamawa State, namely Pullum (351), Shafforon (424) & Zambun (245). The study was conducted in Numan district, Numan Local Government Area, Adamawa state-Nigeria. Most of the villages lie on the confluence of Rivers Gongola and Benue. The most predominant occupations for the livelihoods of the families in these communities are farming, fishing and pastoral activities. These activities are climate depended which makes them more vulnerable to climate change risks.

Sample and Sampling Techniques

The sample for the study was two hundred and fifty-five (255) respondents with 151 males and 104 females. This was systematically obtained using systematic sampling techniques of an interval of four families in each of the villages' population to form the sample with Pullum (88) Shafforon (106), & Zambun (61) making o total of 255 respondents.

Method of Data Collection

The instrument for data collection was a structured questionnaire developed by the researcher titled "Climate Change Impact Questionnaire" (CCIQ) with a reliability coefficient of 0.79. The instrument consists of four sections. Section A deals with sources of information, B signs and causes, C climate change impact, and D adaptation strategies.

Method of Data Analysis

Frequency and percentages were used to answer research question 1 while mean score was used for 2,3, and 4. A 5-point Likert rating scales of Strongly Agree 'SA'; Agree 'A'; Undecided 'U'; Disagree 'D'; Strongly Disagree 'SD' with values 5,4,3,2. The decision rule is that any point from 3 and above are said to be agreed while any point less than 3 points are said to disagree. T-test statistic was used to test the three null hypotheses. The decision to test the null hypotheses is that when the p-value is greater than the 0.05 level of significance, the null hypothesis is rejected, otherwise, it is retained.

Results

The results of the study are presented on tables 1-

Table 1 shows the mean response of the respondent's on source of information of climate change. Out of 255 respondents, the majority 221(87.00) agreed to have had information about climate change. On the source of information majority of them 93 (42.10) identify the radio, religious leaders (Imams/Pastors/traditions) 56 (25.40), teachers 15(6.75), television 13(6.10), family and relatives 12(5.47), neighbors and health personals 11(4.82) each and finally, the newspaper and magazine 10(4.50).

Table 1: Source of knowledge from which rural families get information on climate change in Numan LGA

S/N	Variables	Frequency (%)
	Information source on climate change is through the Radio.	93(42.10)
	Information source on climate change is from health personnel	11(4.82)
	Information source on climate change is from Imams/Pastors during prayer in the mosques and churches.	56(25.40)
	Information source on climate change is from members of the family and relatives	12(5.47)
	Information source on climate change is through neighbors	10(4.82)
	Information source on climate change is from teachers	15(6.75)
	My information source on climate change is from newspaper and magazine.	10(4.50)

Table 2 shows the mean responses on the perception of signs and causes of climate change. Prolong drought, prolong period of the dry season, variation in the pattern of rainfall, high temperature on the sea surface, desertification, abnormal cold, and frequent flooding, all had grand mean scores of above 3.00, is an indication that the respondents had good perception on signs of climate change. On the causes of climate change, both the male and female respondents had disagreed on the 7 items, except one. The total grand mean scores of 2.75 for both the male and female respondents on the perceptions of causes of climate change, indicates that the respondents had poor perceptions of the causes of climate change.

Table 2: Gender differences in the knowledge of signs and causes of climate change in Numan LGA

S/N	Variables	Male Mean N=151	Female Mean 104	Grand Mean 255	Remark
	Signs of climate change				
	Prolong drought	4.10	4.12	4.11	Agreed
	Prolong period of dry season	3.92	3.90	3.91	Agreed
	Variation in pattern of rainfall	3.82	3.84	3.83	Agreed
	High Temperature on sea surface	4.74	4.72	4.73	Agreed
	Desertification	4.82	4.80	4.81	Agreed
	Abnormal cold	3.53	3.55	3.54	Agreed
	Frequent Flooding	4.11	4.13	4.12	Agreed
	Total	**4.15**	**4.15**	**4.15**	Agreed
	Perceptions of Causes of Climate Change				
	Industrial development	2.33	2.31	2.32	Disagreed
	Growth in population	2.23	2.24	2.24	Disagreed
	Excessive carbon emission	2.49	2.46	2.48	Disagreed
	lifestyle changes and urbanization	2.80	2.82	2.81	Disagreed
	It occurs naturally by God	4.70	4.73	4.72	Agreed
	Food wastage	2.31	2.29	2.30	Disagreed
	Logging and cooking using firewood	2.40	2.38	2.39	Disagreed
	Total	**2.75**	**2.74**	**2.75**	Disagreed

Table 3 indicates the mean responses of both the males and the female's respondents on the impact of climate change on livelihoods. All the 11 items relate to the impact of climate change on the livelihoods of their families.

Mean Perception of Climate Change Impact on the Livelihood of gender based Rural Families

S/N	Variables	Male Mean N=151	Female Mean 104	Grand Mean 255	Remarks
1	Shortage of food and insecurity resulting from droughts and flooding.	4.18	4.20	4.19	Agreed
2	Higher drought associated with risks of crop damage Resulting to food crisis.	3.99	4.05	4.02	Agreed
3	Frequency in conflict due to farmer and herder clashes	3.98	4.02	4.00	Agreed
4	Poor satisfaction of basic needs due to Climatic shocks affect food production and prices.	4.45	4.32	4.39	Agreed
5	Frequent occurrence of diseases and death of livestock	4.54	4.42	4.44	Agreed
6	Decreased in fish production and fish species extinction affects fish access and consumption among families.	4.65	4.51	4.58	Agreed
7	Water scarcity experienced in dry wells and numbers of times wells are drilled	3.97	4.00	3.99	Agreed
8	Crop damage due to pest pressures may lead to hunger	4.21	4.17	4.19	Agreed
9	Decline and poor soil fertility lead to poor food production, and malnutrition	4.16	4.10	4.13	Agreed
10	Decline and poor crop yield has serious implication on food varieties for families	4.52	4.50	4.51	Agreed
11	Death of livestock due to shortage of fodder and water, increase hunger and undernutrition among families	4.68	4.64	4.66	Agreed
	Total	**4.30**	**4.27**	**4.29**	Agreed

The result on table 4, indicates the adaptation strategies to reduce the impact of climate change on the livelihood of rural families. The results show responses of 4.30 for males and 4.27 females, with both having a grand mean of 4.29. It is an indication that the respondents have a good perception of all the eight items stated as adaptation strategies

Table 4: Mean Responses on the Strategies to Reduce the Impact of Climate change on Livelihoods of Rural Families

S/N	Variables	Male Mean N=151	Female Mean 104	Grand Mean 255	Remarks
1	Agreed	4.05	4.10	4.08	
2	Cultivating Foods that can satisfy nutritional needs of families.	4.34	4.37	4.36	Agreed
3	Uses of local materials in packaging food products to protect the adverse effect of climate change.	4.21	4.15	4.18	Agreed
4	Sustainable farming by planting resistant crops that can withstand the resiliency to the climate	3.98	4.01	3.99	Agreed
5	Planting of improved variety crops by rural families.	4.81	4.84	4.83	Agreed
6	Educating rural families on food preservation methods and provision of storage facilities by the government.	4.32	4.39	4.36	Agreed
7	Educating rural families to plan ahead according to weather forecast.	3.99	4.09	4.04	Agreed
8	Carrying out campaign in the rural areas and creating awareness on climate change.	4.33	4.31	4.32	Agreed
	Total	4.25	4.28	4.27	Agreed

Test of Hypotheses

The results on table 5, show no significant difference in mean scores of (4.14) male and (4.15) female. The t- cal. value of 1.02 and p-value of 0.94 > 0.05 alpha level. Regarding the causes, it shows no significant difference in mean scores of (2.46) male and (2.47) female as the t- cal. value of 1.03 and p-value of 0.86 > 0.05 alpha levels. Since both p-values of 0.94 for signs and p-value of 0.86 for causes are greater than the 0.05 level of significance, then the null hypothesis which states there is no significant difference between the perception of male and female respondents on signs and causes of climate change is therefore, retained.

Table 5: T-test Statistics of Male and Female's Perception on Signs and Causes of Climate Change

Variables	N	Mean	SD	Df	t-value	p-value	Remarks
Male	151	4.14	0.12				
				253	1.02	0.94	Not sig
Female	104	4.15	0.11				
Male	151	2.46	0.15				
				253	1.03	0.86	Not sig.
Female	104	2.47	0.14				

Table 6 shows the t- cal. value of 1.32 and p-value of 0.91 > 0.05 alpha level. Since the p-value of 0.91 is greater than the 0.05 level of significance, it then means that the null hypothesis which states there is no significant difference between the male and female perceptions of the climate change impact on livelihoods of rural families is, therefore, retained.

Table 6: T-test Statistics of Mean Response Scores between the Male and Female respondents on the Perceptions of Climate Change Impacts on the Livelihoods of Rural Families.

Variables	N	Mean	SD	Df	t-value	p-value	Remarks
Male	151	4.30	1.36				
				253	1.32	0.91	Not sig
Female	104	4.27	1.45				

Table 7 shows no significant difference in mean response scores of (4.25) male and (4.28) female respondents on the adaptation strategies of climate change among rural families. It is so because; the t-cal. value of 1.33 and p-value of 0.97 > 0.05 alpha level. Since the p-value of 0.97 is greater than 0.05 alpha levels, it means that the null hypothesis is retained.

Table 7: T-test Statistics of Mean Scores of Male and Female Respondents on the Adaptation Strategies of Climate Change among Rural Families.

Variables	N	Mean	SD	Df	t-value	p-value	Remarks
Male	151	4.25	1.38				
				253	1.33	0.97	Not sig
Female	104	4.28	1.34				

Discussion

The majority of the respondents 86.63% had information on climate change from various sources. Similar studies showed good knowledge of respondent about climate change (Asekun-Olarinmoye et al., 2014); Banstola, Schneider & Stebbing, 2014). The main source of information identified by the respondents was the radio. This finding is at variance to the study of Banstola et al. (2014), where religious leaders were the major source of information about climate change in Nepal.

The findings on the perceived signs and causes of climate change revealed good knowledge on the signs of climate change. This is because the respondents have observed several changes inform of prolonged drought, desertification, frequent flooding, and high temperature. More so, is the prolonged dry season, variations in the patterns of rainfall and abnormal cold that have affected farms and the environment in the past ten years. This result is similar to the studies that show an increase in temperature and less rainfall (Poudel, Funakawa and Shinjo, 2017; Jellason, Baines, Conawa and Ogbaga, 2019). The respondents had poor perception on the causes of climate change. This is because majority of the respondents agreed that climate change is attributed to have occurred naturally by God. The findings of this study are not in agreement with that of National Climate Assessment (2017), where human activities are seen as the major causes of climate change. The implication of poor knowledge on the causes of climate change among rural families portends dangers and can lead to wrong behavior that could contribute negatively to the environment.

On the gender responses, the null hypothesis which states there is no significant difference between the perception of male and female respondents on the signs and causes of climate change is therefore, retained. This finding is in disagreement with that of Onwutuebe (2019); Amobi & Onyishi (2015) whose studies showed significant gender

difference, as women were seen to be more affected by climate change than men. These findings call for a holistic approach in enlightening both the male and female members in the family on climate change issues.

The findings on the impact of climate change revealed that families suffer shortage of food, insecurity, drought, crop damage, food crisis, frequency in conflict among farmers and herders, climatic shocks, high food prices, diseases, death of livestock, poor nutrition, decreased fish production and fish species extinction. Other identified impact include increase in the frequency of drying wells and number of times wells are drilled; increase in water scarcity, decline soil fertility, shortage of fodder, increased hunger, and undernutrition among families. Similar to these findings is the study of Poudel et al. (2017) where it was perceived to have contributed in the decrease in food production, dairy production, increased prices of food and increase in the burden of living of families. Other studies showed that it threatened family nutrition due to decreased food production (Ghimire, 2014; Hussain, Rasul, Mahapatra and Tuladhar, 2016). Similarly, climate change is seen to contribute to the decrease in food production, dairy production, and increase prices of food (Poudel et al., 2017).

Findings on the strategies revealed that families are to promote and patronize locally grown foods and its products, make use of local materials in packaging food products engage in sustainable farming, plant resistant crops; and plant an improved variety of crops. Further findings are to educate families on food preservation, engage in the campaign according to the weather forecast precautions and government provision of storage facilities. Similar to these findings are soil-management and planting of trees (Asekun-Olarinmoye et al. 2014). Irrigation, insurance for livestock and crops, using crops resistant varieties, improved crop rotation and the use of extension services (Jellason, Baines, Conawa, and Ogbaga, 2019; Onoja, Abraha, Girma and Achike, 2019; Oluwole Akintonde and Shuaib, 2016). The study showed that families had good acceptability on the adaptation's strategies irrespective of gender and are ready to take personal responsibility in promoting adaptation efforts.

Conclusion and Recommendations

This study demonstrated the perceived signs, causes and impact of climate change on the livelihood of rural families. The result shows that there is an indication that research is needed to ensure families receive education on the various climate change causes. Based on the findings of this study, the following recommendations are made:

1. Home Economists and environmental experts should collaborate to provide climate change education to families. Climate change and its impact has come to be part of living; therefore, awareness should be created by all the stakeholders concerned with family welfare.
2. Governments at all levels should ensure practical implementation of adaptation strategies to reduce the negative impact of climate change on the livelihoods of families.

References

Abdulkadir, A. Lawal, M. A. & Muhammad, T. I. (2017). Climate change and its implications on human existence in Nigeria. *Bayero Journal of Pure and Applied Sciences*, *10*(2), 152 – 158

Amobi, D. & Onyishi, T. (2015). Governance and climate change in Nigeria: A public policy perspective. *Journal of Policy and Development Studies, 9*(2), 199-210.

Anabaraonye, B, Okafor, J.C. & Ikuelogbon, J. O. (2019). Educating Farmers and Fishermen in Rural Areas in Nigeria on Climate Change Mitigation and Adaptation for Global Sustainability. *International Journal of Scientific & Engineering Research, 10*(4)

Asekun- Olarinmoye, E.; Bamidele, J. O; Odu, O. O.; Olugbenga-Bello, A. I.; Abodurin,O; Adebimpe, W. O; Oladele, E; Adeomi, A. A.; Adeoye, O. & Ojofeitimi, O. E. (2014). Public perception of climate change and its impact on health and environment in rural southwestern Nigeria. *Research and Reports in Tropical Medicine, 5*,

Banstola, A.; Chettri, R. M.; Schneider, R. & Stebbing, M. (2014). *Knowledge related to*

climate change and willingness to act for adaptation and mitigation practices in rural Nepal. Retrieved 13 may, 2020 from https://www.researchgate.net/publication/259990345_

Ghimire, D. R. (2014). Household food security and coping strategies: Vulnerabilities and capacities in rural communities. *International Journal of Scientific and Research Publications, 4* (9), 1-8. Retrieved 21 August, 2020. https://www.academia.edu/42167256/

Howe, P. D.; Marlon, R. J.; Wang, X. & Leiserowitz, A. (2019). Public perceptions of the health risks of extreme heat across US states, counties, and neighborhoods. *Journals of Forestry and Environmental Studies, 116*(14), 6743-6748

Hussain, A.; Rasul, G.; Mahapatra, B. & Tuladhar, S. (2016). Household food security in the face of climate change in the Hindu-Kush Himalayan region," Food Security: The Science, Sociology and Economics of Food Production and Access to Food, Springer; *The International Society for Plant Pathology*, *8*(5), 921-937.

Jellason, P. N.; Baines, N. R.; Conawa, S. J. & Ogbaga, C. C.(2019). Climate Change Perceptions and Attitudes to Smallholder Adaptation in Northwestern Nigerian Drylands. Journals of *Social Science. 8*(2), 31

Madu, I. A. (2016). Rurality and Climate Change Vulnerability in Nigeria: Assessment Towards Evidence Based Even Rural Development Policy. Berlin Conference on Global Environmental Change.

National Climate Assessment (2017). *Human activities are impacting the climate system*. Globally Changing Climate: Retrieved 21 August, 2020 from https://science2017.globalchange.gov/chapter/1/

Niles, M. T.; Lubell, M.; & Haden, V. R. (2013)."Perceptions and Responses to Climate Policy risks among California farmers".College of Agriculture and Life Sciences Faculty Publications. *Global Environmental Change Journals 23*, 1752-1760.

Oluwole, A. J. & Shuaib, L. (2016). Assessment of Level of Use of Climate Change Adaptation Strategies among Arable Crop Farmers Oyo and Ekiti States, Nigeria. *Journal of Earth Science Climate Change 7*, 369.

Onoja A.O., Abraha A.Z., Girma A., Achike A.I. (2019). Climate-Smart Agricultural Practices (CSA) Adoption by Crop Farmers in Semi-arid Regions of West and East Africa: Evidence from Nigeria and Ethiopia. In: Castro P., Azul A., Leal Filho W., Azeiteiro U. (eds) Climate Change-Resilient Agriculture and Agroforestry. *Climate Change Management. Springer,* 89-113

Onwutuebe, J. O. (2019). Patriarchy and Women Vulnerability to Adverse Climate Change in Nigeria. *Journals of sage publication 17,* 1-7

Poudel, S., Funakawa, S. & Shinjo, H. (2017). Household Perceptions about the Impacts of Climate Change on Food Security in the Mountainous Region of Nepal. *Journal of Sustainability 9,* 641;

State of Food Insecurity & Nutrition (2020). FAO World 2020 online summary. Retrieved 21 August, 2020 from http://www.fao.org/state-of-food-security-nutrition/en/

Sullivan, A. & White D. D. (2019). An Assessment of Public Perceptions of Climate Change Risk in Three Western U.S. Cities. *Journal of American Meteorological society,11*(2), 449-463.

United States Environmental Protection Agency (2017). Climate Impacts on Human Health. National Service. *Center for Environmental Publications (NSCEP)*, Accessed 23 June, 2020 from https://archive.epa.gov/epa/climate-impacts/climate-impacts-human-health.html

Weber, E. U. (2011). Psychology Climate change hits home. *Nature Climate Change, 1*, 25 – 26.

World Health Organization (2018). Climate change and health. Retrieved 21 July, 2020 from https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.