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Global warming and rural-to-urban migration: A review of the urbanisation nexus

Lawrence Vorvornator *

Department of Development Studies, University of Zululand, KwaDlangezwa, KwaZulu-Natal, South Africa

Abstract

The study explores the effect of global warming on rural-to-urban migration. It is necessary because of the loss of agricultural productivity which escalates food prices and pushes millions into abject poverty globally. A meta-study of the relevant qualitative information reveals that global warming, migration, and urbanisation are topical issues. The adversities of global warming displace millions internally and internationally, and will continue to devastate underdeveloped areas and settlements dependant on agricultural productivity. The effects of global warming breed insecurity as increasing temperatures create conditions conducive to aggression, violence, and crime, facilitating internal conflict and economic dissatisfaction. Migration develops as a coping mechanism because of the concentration of public goods in urban areas. Increased temperatures cause heat strokes, related cardiovascular ailments, and spread infectious diseases, increasing demand on healthcare. I argue that population increase, scarce natural resources exploitation, and underdevelopment trigger urbanisation. It is asserted that the preferential treatment of urban areas in infrastructure development, access to markets, and institutions causes rural-to-urban migration, as opposed to a difference in salary and industry localisation, as existing literature portrays. I recommend the fair distribution of infrastructural development, and the establishment of markets and institutions to retain migrants in rural settlements. Global birth control policies and skills development are needed to avoid overdependence on agricultural productivity. A collaboration between governments and intergovernmental organisations is required for global research on environmental degradation. Academic debates need to be organised and developmental contributions made to the present understanding of the effect of global warming on rural-to-urban migration.

Keywords: Global Warming Effects; Urbanisation; Climatic Change; Rural-To-Urban Migration; Environmental Displaced Persons

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* Corresponding author. *E-mail address:* vorlaw@gmail.com

1. Introduction

The study explores the effect of global warming on urbanisation, which involves migration from rural settlements to urban areas. The study is necessary because of a loss in agricultural productivity which escalates food prices and pushes millions of people into abject poverty globally. In addition, the study aims to find recommendations to address pro-urban shifts because of public goods provisioning in cities at the expense of the hinterlands. The existing literature indicates that push factors, such as the loss of arable lands, the loss of agricultural products and wages, and unfavourable climatic conditions (drought, floods, and famine), exacerbate rural-urban migration, coupled with pull factors, namely infrastructure development, health facilities, and a good education system (Parkins, 2010). These adverse global warming effects in rural settlements trigger migration to urban areas (for example, rural-to-urban migration), and hence the global warming-urbanisation nexus. There is rural-to-rural migration, and urban-to-rural migration, but the objective of this study is focused on rural-to-urban migration and the nexus between global warming and urbanisation.

Arguably, the most topical issues globally during the twentieth and twenty-first century are the phenomena of global warming, migration, and urbanisation (De Haas, 2021). The devastating effects of global warming (such as drought, famine, floods and deforestation) trigger people to migrate to well-resourced and developed areas, which results in urbanisation. Therefore, there is a link or interlinking between global warming, migration, and urbanisation, hence the term global warming-urbanisation nexus (Helbling and Meierrieks, 2023). The effects of global warming on devastated rural dwellers who migrate to urban areas are called environmentally displaced or refugees. However, there are intergovernmental organisations, such as the United Nations Commission on Human Rights (UNCHR), that are mandated to protect environmental displaced refugees (UNCHR, 2018).

Global warming is defined as excessive heat temperatures on the earth's land and ocean surfaces since the mid-twentieth century (Naser, 2011). The effects of global warming are due to human activities, such as burning of fossil fuels and anthropogenic greenhouse gas emissions, namely, nitrogen oxide, carbon dioxide, and methane (Intergovernmental Panel on Climatic Change (IPCC), 2023). The research of Solomon et al. (2009) defines global warming as an *anthropogenic climate change*.

The effects of global warming, such as heat waves, 'uproot' or force rural dwellers to move the most since all their livelihood strategies depend on agricultural productivity. Due to the loss of agricultural productivity and lower wages of rural folks, migration to urban areas, where public goods are concentrated, is usually adopted as a coping mechanism. A coping mechanism is a livelihood strategy adopted to overcome adverse situations (Davies, 2016). Environmentally displaced movement from rural to urban areas is known as rural-urban migration, and hence what is called urbanisation. The phenomena associated with global warming which triggers rural-to-urban migration are: rising sea levels, increased extreme weather-events (such as heat-waves, drought, floods), shrinking glaciers, and changing precipitation patterns (IPCC, 2023).

Migration is defined as the movement of people from one place to another (Massey, 2015). International migration could take the form of South-to-South, South-to-North, North-to-South, and North-to-North movement to urban areas (Massey, 2015). Internally, as stated earlier, migration could take the form of rural-to-urban, rural-to-rural, and urban-to-rural. On this note, migration under this study is defined as the movement of people from less endowed resourced areas to more urban areas due to global warming effects known as rural-to-urban migration (Samson, 2017). These are vulnerable, devastated places affected by

environmental hazards such as drought, famine, and deforestation, which the people there do not have control over. They are vulnerable due to overdependence on agricultural productivity, and infrastructure underdevelopment in their settlements. Rural, environmentally displaced people consider migration as a coping mechanism, where they migrate from adverse conditions in their place of origin to new destinations (Lee, 1966). Such migration leads to urbanisation.

Urbanisation is the increase in a country's population, resources, and infrastructure development in urban areas at the expense of rural settlements (United Nations, 2024). According to the United Nations (2024), over 30% of the world population lived in urban centres in the year 1950. By 2010, urban dwellers had increased from 30% in 1950 to approximately 50%, and scholars project that by 2050 about 66 % of the world population will live in the urban areas (United Nations, 2024).

What are the effects of global warming on urbanisation? This paper aims to show that the effects of global warming have an excessive impact on rural settlements that depend heavily on agriculture productivity (such as livestock production and farming activities), as well as institutionally underdeveloped areas less adapted to the effects of global warming. The victims of global warming are more vulnerable and adopt migration as a coping mechanism, hence the use of urbanisation terminology.

The study is structured as follows: research methodology, summary of existing literature, summary of key patterns in climate-driven urbanisation, conclusion, and recommendations. The next section presents the research methodology of the study.

2. Research methodology

In exploring the effects of global warming on urbanisation, the study adopts a literature review (LR) as research methodology. Vartanian (2010, p. 21) states that LR is "the process of accessing published secondary data". The secondary information comprises articles, and organisational and non-organisational reports (Maxwell, 2021). The LR is employed 'in-house' not in the field (Vartanian, 2010, p. 11). Search engines, namely Google Scholars, Web of Science, and Journal for International Migration, were employed and search terms, such as 'global warning', and 'rural-to-urban migration' were used.

The study acquired 1,365 ideal publications; 1,354 of these were derived from electronic searches, and eleven were found through forward and back searching. An eligibility assessment was initially conducted and a total of 88 articles were selected through the following eligibility criteria: articles that: a) concentrated on either or both global warming and its effect on urbanisation; b) focused on global warming and urbanisation; c) were published in 2011 or later; and d) published in English (Creswell, 2013). Further, extraction and screening of 88 articles revealed 43 relevant articles, which were employed for the write-up as cited in the study and referenced below. The past fourteen years' articles were considered because of unprecedented phenomenon in global warming, and conflicting effects in history of rural-to-urban migration. After an eligibility check, I extracted dates which entailed coding relevant articles related to the study. I employed a 'framework analysis', using methodological processes and procedures to extract and analyse the literature. Indexing was done by sifting through the information according to particular themes and charting the information to sort it under the relevant headings and sub-headings during the thematic framework stage (Creswell, 2013).

A meta-analysis for the quantitative data was ignored because the research method was different. Textual information was mapped, coded, and presented appropriately by employing a framework analysis approach. The LR presented broader pictures, baseline information data, and an understanding of the existing literature on the effects of global warming on rural-to-urban migration (Maxwell, 2021). The LR helped to avoid duplication of previous works. However, the limitations could be that since not all academic search engines were employed, some existing literature may not have been used.

3. Population growth, resource pressure, and drivers of rural-to-urban migration

As of 2024 the United Nations data reveals that the world population is 8.2 billion people, and it is projected that by 2050, there will be 9.7 million people on the planet. The United Nations Environmental Programme (2024) states that ‘‘We have only one earth. Today, the 8 billion people on it are using more of its resources than it can provide. Every new person is a new consumer, adding to that demand. Some of us take far more than others and there are many steps those of us who do must take to make our consumption sustainable. Fewer new consumers everywhere are one of them”. The world organisation continued that “Increasing resource use is the main driver of the triple planetary crisis of climate change, biodiversity loss and pollution” (United Nations Environment Programme, 2024).

The United Nations statement above implies that the increasing world population is exerting pressure on the limited natural resources given by nature (Wang, 2022). Natural resources are limited in supply, whereas the world population continuous to increase. The effects of global warming, such as drought, famine, floods, and deforestation, affect the rural folks most because of the lack of infrastructure development and high dependence on agricultural products (Wang, 2022). The ever-increasing world population triggers a demand for consumption which leads to the exploitation of scarce natural resources. Hence, global warming affects rural settlement dwellers hardest (Wang, 2022). Devastation especially affects settlements that depend on agricultural productivity, outputs and wages, and underemployment triggers migration from rural to urban areas for betterment of lives (Samson, 2017; Helbling and Meierrieks, 2023).

3.1. Impact of global warming on agricultural livelihoods and migration

Increasing global temperatures have a negative impact on agricultural productivity, such as farming and livestock production. According to the research of Hertel and Lobell’s (2014), higher temperatures contribute to heat waves, drought, water shortages, depressed plant growth, and the exacerbated spread of plant pests and diseases, which affects agricultural productivity. That rising temperatures hinder agricultural productivity is supported by many researchers (Chen et al., 2018). As established by Harris and Todaro’s (1970) research, lower wages and agricultural output in rural areas spark migration to urban areas where there are huge wage disparities. The effect of heat waves on agricultural production in rural settlements triggers migration to urban settlements (Lee, 1966). Higher temperatures also create underemployment in agricultural sectors where rural folks migrate to urban areas to seek job opportunities (Feng et al., 2014). A case in point is research in Mexico, which found that the migration of Mexicans to the USA was because of prolonged drought conditions in rural Mexico. This implies the collapse of livelihood strategies of rural Mexicans. The urban USA cities provide pull factors for rural Mexicans to better their lives (Feng et al., 2014).

3.2. Inequitable public goods distribution and urban pull factors under climate stress

It is a known fact that increasing temperatures increase excessive demand for public goods such as in the healthcare system in rural settlements (Rocklöv et al., 2011). Excessive temperatures are linked to mortality (birth rates), and morbidity (death rates) (Rocklöv et al., 2011). Increasing temperatures cause heat strokes and other related cardiovascular ailments, mood disorders, difficulties during pregnancy, and the spread of infectious diseases. These adverse effects trigger rural folks to migrate to urban areas for medical care (Hajdu and Hajdu, 2021; Meierrieks, 2021). In other words, healthcare facilities in urban areas serve as pull factors for rural dwellers to migrate to cities.

Demand for order and security is likely to be on the rise, given that higher temperatures undermine social stability. For instance, the research of Burke et al. (2015) reveals that high temperatures are conducive to aggression and violent crime, which facilitate internal armed conflicts such as civil wars, over scarce natural resources (as arable land disappear), and economic dissatisfaction. A case in point is the Rwanda ethnic conflict, sparked by misunderstanding, environmental degradation, and scarce natural resources in overpopulated areas (Naser, 2011).

Urban areas are equipped with better public goods, namely: hospitals, schools, public health services, and electrification projects, as compared to rural areas (Galea et al., 2005). In addition, due to economies of scale, urban settlements are provided better access to infrastructure, external markets, and a greater availability of educated specialists compared to rural settlements (Galea et al., 2005). The concentration of public goods in urban areas creates demand from rural settlements prone to global warming effects and the need for good healthcare because of heat waves (Galea et al., 2005). This leads to the migration of people from rural to urban settlements because they need to access health facilities (Galea et al., 2005). Huma et al. (2021), reveal that the prioritisation of public goods provisioning and investment in urban areas over hinterlands (rural areas), and better access to institutions, markets, and public goods triggers rural-to-urban migration. Bias toward urban areas leads to rural-to-urban migration so people can access infrastructure in urban areas. (Huma et al., 2021).

Increasing temperatures further deepen the difference in the supply of public goods between rural and urban dwellers (Carleton and Hsiang, 2016). Increasing temperatures lead to economic contraction which affects government's revenue collection, reduces tax income, and results in cuts in public spending and investment (Carleton and Hsiang, 2016). A reduction in tax revenue enhances investment in urban areas at the expense of rural settlements (Carleton and Hsiang, 2016). In other words, the reduction in public spending and investment by governments affects rural settlements more than urban areas, leading to rural-to-urban migration (Burke et al., 2015). Therefore, the vulnerability of agricultural productivity in and underdevelopment of rural areas, combined with massive infrastructural development in urban areas, provides impetus for rural-to-urban migration, and hence the urbanisation.

There is, however, research that shows that it is possible for urban-to-rural migration to exist (Cattaneo and Peri, 2016). Where, for example, some urban areas are constructed near the coast, rivers might be vulnerable to rising sea levels, and there is an increase in floods due to global warming effects (Delazeri et al., 2022), there may be migration to non-urban settlements and less susceptible areas.

3.3. Environmental displacement and climate-induced migration

In 1995, Myers and Kent's (1995) research revealed that environmentally displaced people from rural to urban areas was 25 million. In contrast, as of 2023, the Internal Displaced Monitoring Centre (2023) statistics indicated that there were 76.9 million environmentally displaced people globally; 63.8 million displaced because of internal conflicts, violence and war, while 7.7 million were displaced because of natural disasters. Myers (2002), a British ecologist, predicted that by 2050, 200 million people will be victim to the effects of global warming. However, other scholars predicted figures far higher than that of Myers'. The variability in predictions demonstrates the uncertainty about the effects of global warming on urbanisation (Maja and Ayano, 2021).

Myers' (2002) research reveals that the effects of global warming range from pestilence, flooding, rising sea levels, drought, and deforestation. The adverse and devastating occurrences attributed to global warming, environmental degradation, and climate change affects vulnerable communities most, especially in the hinterlands, triggering rural-to-urban migration (Woube, 2012). These processes are inter-linked economically, politically, socially, and environmentally in nature (Woube, 2012). They lead to over prolonged changes and increase natural disasters, with a possible outcome being the displacement of victims from rural to urban settlements. In other words, prolonged environmental hazards, which are the effects of global warming, push rural dwellers to urban centres because rural dwellers consider them safe to improve their lives (Woube, 2012).

3.4. Migration as a coping strategy: internal and cross-border responses to climate stress

Generally, there are two effects of global warming on environmentally displaced people, namely: internal migration (migration within the country, which takes the form of rural-to-urban migration, rural-to-rural migration, and urban-to-rural migration, depending on where the global warming adversities occur), and international migration (migration across national borders) (Vorvornator, 2024).

One, the devastation of regions by unfavourable climate conditions triggers rural-to-urban migration (Korsi, 2022). For instance, the migration of people in Sudan Sahelian Africa to urban areas due to severe drought in the region (Wolde et al., 2023). The people in the rural regions of this area were hardest hit by drought because their livelihood strategies depend on agricultural productivity, combined with underdeveloped infrastructure. As a means of bettering their lives in such situations, people migrate out of rural areas and move to urban areas (Wolde et al., 2023). Two, there could also be concurrent migration from rural areas across borders to the urban cities of neighbouring countries. However, this depends on factors such as household income and age, the social networks of victims, and the availability of information. A case in point is the migration of some Zimbabweans to South African cities in 2008 during the economic meltdown (Crush and Ramachandran, 2010).

The coping mechanisms adopted to overcome the vulnerability of affected victims differ between individuals, groups of people, and households (Junaidi et al., 2022). In any given household or group of people, the coping mechanisms used depend on income, health, social class, family configuration, and other socio-economic situations in related to global warming (Czaika and Reinprench, 2022). However, migration becomes an obvious choice for households in addressing their vulnerability to climate stress (McLeman and Smit, 2006).

Devastated communities are pulled from their place of origin towards urban infrastructure development to improve their living standards (McLeman and Smit, 2006). This results in rural-to-urban migration; hence urbanisation and development.

What are the effects of global warming on urbanisation? The next section present summary of key patterns in climate-driven urbanisation.

4. Summary of key patterns in climate-driven urbanisation

The study's findings reveal that arguably the most topical issues globally during the twentieth and twenty-first century are global warming, migration, and urbanisation phenomena (De Haas, 2021). The ever increasing world population puts pressure on limited natural resources, leading to the exploitation of such scarce natural resources (United Nations Environment Programme, 2024). This results in the effects of global warming, such as drought, famine, floods and deforestation. These effects usually affect rural settlement dwellers most, whose livelihood strategies depend on agricultural productivity (Wang, 2022). The effects of global warming trigger the adoption of migration as a coping mechanism by rural folks to overcome adversities (Lee, 1966).

The effects of global warming affect underdeveloped areas, and this includes war-torn areas, which forces environmentally displaced persons to migrate to urban areas for security and safety (Burke et al., 2015). The demand for security and order increases where the temperatures are higher, as the higher temperatures undermine social stability. The increasing temperatures create conditions conducive to aggression and violent crimes which facilitate internal crimes, such as conflicts over scarce natural resources, and economic dissatisfaction (Burke et al., 2015). This situation sparks migration from devastated rural areas to urban areas, hence urbanisation (Burke et al., 2015).

The finding of this study reveals that excessive heat waves, which are the effect of global warming, are linked to mortality difficulties, and morbidity rates (Rocklöv et al., 2011). This implies that rural settlement dwellers are prone to the adversities of global warming and this increases the demand for healthcare facilities. Since infrastructure development is concentrated in urban centres, at the expense of the hinterlands, environmentally displaced persons migrate to urban areas to seek medical attention (Hajdu and Hajdu, 2021; Meierrieks, 2021).

The research findings further reveal that increasing temperatures deepen the inequality in public goods supply between rural and urban areas. This implies that rising temperatures reduce government revenue or income because of the loss in agricultural productivity (Carleton and Hsiang, 2016). This causes governments to further concentrate investment projects in urban centres at the expense of rural settlements, which triggers rural-to-urban migration. Moreover, government spending decreases due to the loss of revenue collections, causing economies to contract, hitting rural folks hardest and resulting in rural-to-urban migration (Carleton and Hsiang, 2016).

Research indicates that there is urban-to-rural migration but not always rural-to-urban migration. Urban settlements along the coast and on riversides are affected by global warming adversities (Delazeri et al., 2022). These adversities trigger migration from urban to rural settlements or non-urban, and less susceptible areas (Delazeri et al., 2022).

The findings reveal that the global warming-urbanisation nexus is devastating and has and will continue to displace millions of people (Myers, 2002). Historically, the effects of global warming displaced 30% of the world population in the 1950s and, as of 2010, the world population urbanisation increased by 20% to 50% due to the effects of global warming. It is projected that by 2050 environmentally displaced persons will cause 66% of the world population to live in urban areas (United Nations, 2024). Myers and Kent's (1995) research reveals that the number of environmentally displaced people worldwide, as of 1995, came to 25 million. As of 2023, the number of environmentally displaced people came to 76.9 million people; 63.8 million were displaced due to internal conflicts, violence and wars; while 7.7 million people were displaced to urban areas because of natural disasters. Myers' (2002) studies predict that as of 2050, 200 million people will be victims of the effects of global warming, and they will migrate to urban centres. However, other scholars predict that in 2050 displaced victims will be more than the 200 million predicted by Myers (Maja and Ayano, 2021). This shows the uncertain effects of global warming adversities on urbanisation (Maja and Ayano, 2021).

The effects of global warming trigger environmentally displaced persons to migrate internally or internationally to urban areas (Korsi, 2022). Migration is chosen as a coping mechanism because of the lack of infrastructure development, and over dependency on agricultural production (Wolde et al., 2023). However, the rural-to-urban migration of environmentally displaced persons depends on factors such as the availability of information, household income and age, and their social networks (Crush and Ramachandran, 2010). I therefore argue that the ever increasing population, which leads to the exploitation of limited natural resources, will exacerbate the effects of global warming and will continue to cause rural-to-urban migration because of the over dependence of rural settlement dwellers on agricultural productivity, and the underdevelopment of rural settlement infrastructure.

Overall, the study concludes that the global warming is devastating, both historically and presently, and will continue to displace millions of people. Settlements highly dependent on agricultural productivity, war torn areas, and settlements with underdeveloped infrastructure are hardest hit. Persons displaced by the effects of global warming could engage in internal and international migration, depending on factors such as income, social networks, and the availability of information.

5. Conclusion

The study explored the effects of global warming on urbanisation which triggers urbanisation nexus. The study revealed that arguably most topical issues globally during the twentieth and twenty-first century are global warming, migration, and urbanisation phenomena.

Global warming effects such as famine, drought, floods, and deforestation are historical, presently, and will continue to devastate underdeveloped areas, war torn areas, and settlements highly dependent on agricultural productivity (such as farming and rearing of livestock). Global warming triggers security as increasing temperatures create conditions conducive to aggression, violence, crimes which facilitate internal crimes such as conflicts over scarce natural resources and economic dissatisfaction. This situation triggers migration from devastated rural areas to urban areas, hence urbanisation.

Global warming affected victims overcome vulnerability through their choice of migration as a coping mechanism. Global warming victims migrate from rural settlement origins to urban area destinations. These people are then called 'environmentally displaced' or 'refugees'. The concentration of public goods in urban

centres at the expense of rural settlements also triggers urbanisation, because the increasing temperatures associated with global warming spark heat strokes and other cardiovascular related ailments, mood disorders, difficulties during pregnancy, the spread of infectious diseases, and increases the demand on the healthcare system. The inability of healthcare facilities in rural areas to cater to these issues sparks migration to cities, hence the urbanisation. Increasing temperatures also deepens governments' unequal spending and investment, as economies contract which in turn leads to tax revenue decreases.

The effects of global warming are the cause of internal and international migration, both historically and presently. Global warming displaced 30% of the world population in the 1950s and, as of 2010, world population urbanisation increased by 20% to 50% due to global warming adversities. It is projected that by 2050 global warming adversities will cause 66% of world population to move to urban areas. As of 1995, environmentally displaced people came to 25 million. As of 2023, there are 76.9 million environmentally displaced people; 63.8 million were displaced due to internal conflicts, violence and wars, while 7.7 million were displaced because of natural disasters. Studies predict that, as of 2050, 200 million people will be victims to the effects of global warming. However, other scholars predict that, by 2050, there will be more than 200 million displaced victims. This explains why the effects of global warming on urbanisation are so uncertain. I argue that the ever-increasing population causes the exploitation of limited natural resources, exacerbates the effects of global warming, and will continue to spark rural-to-urban migration. This is because of the lack of rural settlement infrastructure development, and the over dependence of rural dwellers on agricultural productivity.

The study established that the existing literature indicates that the causes of rural-to-urban migration are the differences in economic development, differences in salary scales, and the localization of industries in urban areas. This study posits that the preferential treatment of urban areas in terms of infrastructure development and access to markets and institutions is the cause of rural-to-urban migration. The study therefore recommends the fair distribution of infrastructural development, and the establishment of markets and institutions to keep migrants in their rural settlements. The study further recommends that there should be global birth control policies to curb the increasing population, skills development for settlement dwellers highly dependent on agricultural productivity, equal distribution of public goods and services between the hinterlands and urban areas to avoid underdevelopment, and checks and balances for developmental projects to avoid endemic corruption which leads to shoddy projects. Further, governments and intergovernmental organisations, such as UNHCR, need to collaborate to undertake integrated approaches to minimize, avert, and address displacement related problems that have adverse impacts on climate change. Such approaches might include field studies and global research on environmental degradation. The outcome of these studies may be of direct use to governments and agencies in curbing environmental degradation which sparks the effects of global warming on urbanisation. Field projects addressing the challenges of environmentally induced population displacement needs to be documented.

The paper asserts that the research outcomes will help to implement measures such as prevention and mitigation through means of global mass education and rehabilitation which is very expensive by nature. Academic debates and discourses should be organised through meetings, conferences, workshops which would contribute to the development of the present understanding of and responses to global warning on human migration and be compiled and globally disseminated.

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