TMP UNIVERSAL JOURNAL OF RESEARCH AND REVIEW ARCHIVES

VOLUME 3 | ISSUE 3 | YEAR 2024 | JUL-SEP 2024

RECEIVED DATE	REVISED DATE	ACCEPTED DATE
05/06/2024	30/06/2024	19/07/2024

Article Type: Review Article

Available online: www.tmp.twistingmemoirs.com

ISSN 2583-7214

FOOTPRINTS OF CITIES IN CLIMATE CHANGE - A MINI REVIEW

*** YEMISI AJOKE OLAWORE**

**Biology unit of Applied Mathematics department, Mathematics Programme, National Mathematical Centre, Sheda-Kwali, Abuja, Nigeria*

ABSTRACT

Climate change is a long-lasting change in weather conditions over a certain period, from tropics to poles. Anthropogenic activities are inextricably linked to climate change. It is important for governments to understand this relationship in order to discuss economic, health and other associated risks with the public and to inform public policy. The aim of this review is to harmonize the current understanding on this topic, focus on current breakthroughs in our knowledge and examine research priorities. The article begins with the backdrop on sources and emission trends of global warming gases in Cities, especially carbon dioxide (CO_2); and their footprints in climate change. Further section delves into the impacts of climate change and changing environmental conditions on residents of Cities especially urban citizens of low- and average-income nations who are most susceptible. Furthermore, discussion continues on how cities can help to control climate change and its impacts. The article concludes with the discussions on the topic areas covered and how residents of cities can contribute in combating climate action through individual actions.

Keywords: Cities, Emissions, Climate-change, Greenhouse gas, Governments

CORRESPONDING AUTHOR

Name: Yemisi Ajoke Olawore

Affiliation: Biology unit of Applied Mathematics department, Mathematics Programme, National Mathematical Centre, Sheda-Kwali, Abuja, Nigeria

Email: olaworeyemisi1@yahoo.com

INTRODUCTION

Cities perform a crucial part in the discourse of climate change, this is because of their lion share of GHG emissions and their control over managing the highest emission-intensive sectors like energy, transportation, buildings and land use (1, 2). Presently, cities occupy almost 2 % of the land surface on Earth, but its global Carbon dioxide (CO_2) emissions is at 70% (3). Pledges to reduce emissions have been made by many cities, climate policies have also been introduced to direct the planning and implementation of local climate action (4). Over the past several years, more than 980 cities world-wide have undertaken to either become carbon neutral or convert to 100% clean energy, to at least take one climate action (5). Climate change is a global issue that has been identified as a pressing concern over the past 30 years. Continuous emissions of GHGs (e.g., CO_2, N_2O and CH_4) have been implicated in several environmental problems, which includes global temperature rise, alterations in precipitation patterns, changes in groundwater levels and soil conditions, and extreme weather events (6). Therefore, Researchers have been developing strategies to mitigate GHG emissions as a result of their work in identifying its different sources. Many researchers like (7) and (8) have shown that anthropogenic activities have slowly, but surely affected natural environmental factors over the last 50 years. The lack of moderation in energy consumption is a major cause of GHG emissions which eventually leads to global warming and then climate change (9). According to 4, metropolitan areas are becoming warmer as a result of urban development and global warming. Urban communities determine scale of effects of hazard by the decisions they make for their lives and surroundings while its intensity is determined by the impact the disaster has on communities (10). Some particular topics which are related to climate change have been reviewed in many works, such topics are, energy consumption, infrastructure, cultural heritage, health, tourism and renewable energy (11). Most sectors of cities that are implicated in climate change are also affected in return by climate change, examples are buildings (12), Transportation sector (13), Waste management (14), work (15) and ICT.

SOURCES OF EMMISIONS IN CITIES

Work

Economic activities and urbanization have been powering the extraordinary progress of Coastal cities around the world (16).

Cities are employment creators and centres of creativity, innovation and communication (11). They play a paramount role in industrialization as over 80% of the gross world product (GWP) emerged from cities (14). Cities further play a prominent role cultural and social matters (17; 18). The revamp of a place like China due to the city's growth and industrialization is happening 10 times faster than that of UK 100yrs ago (19). This is accompanied with inevitable repercussions (15).

Many researches have been executed to forecast building energy consumption in the future, buildings increase usage of air conditioning and natural ventilation to improve thermal comfort (20). In reality, climate change is foreseen to have strong effects on a building's energy needs as their cooling and heating requirements are closely tied to temperature state and weather change. (20).

Transportation

A growing share of the world's greenhouse gas emissions is being contributed by the transport sector (13). It is on exact same level with other industrial combustion for manufacturing and fuel production, transport was the second wide-ranging origin of CO_2 emissions following the power sector in 2019 (13). In 2020 there was swift emission depletion during the first months of the pandemic, aviation industry worldwide emissions were down by 56%, 25% depletion by the international shipping, and road transport down by nearly 15% in 2020 when compared to the

year before, which was 2019 (13). From the energy sector, transport was responsible for 23% world overall CO_2 emissions in 2019 and its global final energy demand was 30% (13). The fastest growing fossil fuel –burning sector worldwide between 2010-2019 was Transportation. The global impacts of the COVID-19 pandemic depleted international energy demand by an estimated 4% and total global CO_2 emissions reduced a predicted 5.4% In 2020 (13).

Waste management:
Cities are intense centers of manufacturing, usage and waste (21). When cities are studied ecologically, it is observed that their environmental footprints are exceeded by a factor 10-150 (22). Large amounts of solid waste are generated by cities. Non-existing collection system and ineffective disposal are some of poor waste management systems that can cause environmental deterioration (14). From large villages to the small towns and megacities, controlling solid waste is an additional threat to urban areas of all capacities (23). Plastics enter rivers and in the long run oceans, easily (14). The urban residents in Asia and Africa will be twice the number by 2030 (24). Slightly over half of the inhabitants of Dar es Salaam are connected to some form of hygiene. However, the wastewater given rise to by 15% of the population who have access to the sewer system is released into the sea untreated (25). Stemming from studies of cities in Africa, the difficulties of Dar es Salaam are not different (26).

IMPACTS OF CLIMATE CHANGE ON RESIDENTS OF CITIES

Studies show that fast population growth and urban development steer the impact of natural disasters extensively (27; 28). The probability of casualties and economic losses resulting from climate or geodynamic events will increase more as the number of people dwelling in vulnerable areas rises (29). There is an urgent need to reduce the risks posed by natural disasters in urban areas (30; 27). The major players in the attempts to minimize the risks created by natural hazards and to build strong urban societies are local governments and city planners (31). Past studies have shown that natural disasters are a source of major risks to megacities, also that megacities are susceptible to a broad range of natural disasters, which encompasses climatic, meteorological and geological events and also wildfires (30; 32). China for instance has suffered from serious and persistent air pollution which has resulted in elevated associated morbidity and mortality due to rapid urbanization and climate change (33).

Health impacts
A literature reviewed by a group of researchers on the potential health impacts of climate change causing changes in the frequency and intensity of severe weather afforded elaborate explanations of the health risks associated with storm and flood surges, fires, droughts, hurricane, fires and tornadoes (34). Their conclusion was that rise in the frequency and extremity of harsh precipitation would straightforwardly affect flooding and elevate the incidence of associated adverse health outcomes (34). In Guangdong, China, the accelerating consequence of excess heat was greatly connected with Hand, foot, and mouth disease HFMD epidemic, this was observed by (35).

Health impacts related to air pollution
Climate variability and change are likely to increase health risks from particulate-transported fungal spores and multiplied fungal growth (36). **(**37; 38) noted that elevated CO_2 and increased temperatures generally cause a rise in the growth rate of plants which produce allergen and the production of pollen. (39) arrived at the conclusion that air pollution might improve the entry and degree of entry of allergens into the lungs, thereby multiplying the risk of these allergens.

Water and food-borne diseases
The risk of contamination events would increase as a result of increase in the frequency and severity of extreme precipitation events attributed to climate change (40). According to the

conclusion by (40), with climate change, the risk of water and food-borne diseases will likely increase. (41), established that the loading of contaminants to waterways gets increased as a result of extreme precipitation events. Also the risk of illness associated with *Cryptosporidium parvum* will increase due to climate change (42).

Vector- and rodent-borne diseases

According to (43) a multiplication in the recurrence and sternness of water-related extreme events could modify existing conditions guiding human-mosquito interplay in large parts of the united States, potentially multiplying mosquito-human contact.

It is worthy of note that (44) and (45) stated that with natural reservoirs in animal populations, the emergence or reemergence of diseases involves complex interactions, they therefore cautioned that care has to be taken in attributing an increase in incidence of vector and rodent-borne illnesses to climate variability and change.

HOW CITIES CAN HELP TO CONTROL CLIMATE CHANGE AND ITS IMPACTS

Good planning and effective urban management

Major cities located in coastal areas are placed in vulnerable and unstable conditions due to extreme weather events associated with climate change (46). The approaches to the management of natural disasters associated with climate change in cities has to become multifaceted because the disasters have increased globally in same way (46). Susceptibilities to climate change therefore requires deliberate and calculated urban management and planning practices with greater amounts of investments in infrastructure (46). The critical link between urban forms and emissions can be addressed with the help of planning and management tools like development guidelines, official plans, development permits, transit planning etc.; as climate change mitigation strategies, other planning tools can help to address greenhouse gas emissions in cities (46). One thing that would be valuable for effective planning is spatial data that connect greenhouse gas emissions with city expansion and urban form, as such report will reinforce locally relevant policy decisions and uphold understanding and support by the public (47).

Inclusive citizen participation

According to (46), the degree and form to which citizens participate can be encompassed by different models of city governance.; they also said in order to get stronger involvement of urban citizens on climate change agenda, inclusive local government planning, transparency in climate change data on cities and community-based adaptation strategies has to be practiced.

Effective leadership

Resilient leadership can overcome competition and individualism across political turf" When working on concurrence in the climate change agenda in cities, effective leadership is crucial for prevailing over divisions over all departments and investment sectors (46),

Efficient financing

For governance to be empowered in cities efficient financing must be a core requirement. In the efforts to confront climate change challenges in cities, success has been hampered by deficient financing tools at local levels of government. If even at individual municipalities, the problem of raising finance to tackle climate challenges are common; then at the broader metropolitan areas, the problems are compounded. In many metropolitan areas, efficient financing for area-wide climate mitigation and adaptation strategies has become an ongoing challenge due to highly fragmented governance arrangements (46).

Addressing deeper and enduring risks and long-term vulnerabilities in cities

Unprecedented risks are confronting cities in the 21st century. According to (48). a third of people living in cities will live in poverty-stricken, jam-packed and insecure living conditions because

the world's urban population is likely to reach 4.2 billion by 2020 while the urban slum population is expected to multiply to 1.4billion by 2020. The ability that individuals and groups have to adapt to climate changes and impacts is reflected in climate resilience from a social point of view. The availability of financial assets, political power, social status and personal and professional networks is related to the ability to cope (49). The objective of aiding urban climate resilience is to secure the viability of settlements into the future. In other words, climate change mitigation and adaptation are fundamental to a larger program of social, economic and environmental sustainability (46).

CONCLUSION

Even though major contributors, cities are one of the vital areas majorly affected by climate change. Cities should therefore get significantly involved in mitigation and building resilience against climate change. The magnitude and effect of climate change will be determined by climate smart planning in cities, also the ability to reduce emission and the capacity to adjust to changing circumstances. Communities can combat climate and build resilience to climate impacts by thinking and acting at a local level; this entails local production of food and goods which will reduce cost of transportation, lower waste and help the economy. In cutting CO_2 emissions, we can encourage one another to cycle and walk more often and to use low carbon public transport. More parks and gardens should be built to green cities in order to reduce CO_2, reduce flooding and cool urban areas. Through reports like this article, urban researchers can provide updated information to city decision-makers.

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