



GA4: Environmental Committee

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Issue: Reducing urban air and water pollution in African megacities

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I. Introduction

Megacities are often considered to be attractive places to settle due to them being centers of economic opportunity. Their numbers are on the rise as current trends have already led to sprawling urban centres around the continent, especially in Kinshasa in Congo, Lagos in Nigeria and Cairo in Egypt.(Appiah) While these three cities are currently the ones that meet the over 10 million people qualification for megacities, it is expected that other cities such as Cape Town and Johannesburg in South Africa, Dar Es Salaam in Tanzania and Nairobi in Kenya will soon earn this title as well.

With the increased number of megacities, the need and demand for food, healthcare and transportation services, education facilities and housing options increases, putting a toll on the availability of water resources. The impact will be most pronounced in the places with the densest populations (megacities), where the population has been predicted to grow by more than half a billion by 2050 (Taylor et al., 2009). Global water use has increased by a factor of six over the past 100 years and continues to grow steadily at a rate of about 1% per year (AQUASTAT, n.d.)¹ with increasing population, economic development and shifting consumption patterns and with the rainfall in Africa gradually decreasing, the importance of treating wastewater becomes more eminent. Climate change is expected to exacerbate water quality degradation as a result of higher water temperatures, reduced dissolved oxygen and thus a reduced self-purifying capacity of freshwater bodies. As floods and droughts are likely to increase due to climate change, there are further risks of water pollution and pathogenic contamination caused by flooding or by the higher pollutant concentrations during drought.

While it may be tempting to think of water and air pollution as separate problems, they are, in fact, ones that feed into each other. The pollutants in the air are introduced into the water cycle via precipitation, while the water pollutants are introduced to the atmosphere through evaporation. In fact, changes in precipitation and temperature will directly affect the terrestrial water budget (Schewe et al., 2014). Evaporation from the land surface is expected to increase as a result of the global trend of rising air temperatures in all but the driest regions, where the lack of water prevents such an increase. It may appear that precipitation increasing will have positive effects; however, the rate of greenhouse gas (GHG) emissions is at an all-time high (WMO, 2019) meaning that with the mentioned precipitation, the water resources may become even more polluted than previously measured. A similar effect may be observed as polluted water evaporating would also cause unwanted particles to hang in the air. Therefore, while mitigating both



problems at once will certainly be most beneficial, degrading the effects of one will also help decrease the impact of the other.



Image 1: A Photo of Lagos

By 2050, the percentage of people living in urban areas is predicted to rise from 47% in 2000 to around 60%. With an average annual urban growth rate of 3.5% in the last 20 years, Africa has seen the largest urbanization in the developing world, and this trend is anticipated to continue until the year 2050. (“Africa Urban Forum: ‘Sustainable Urbanization for Africa’s Transformation: Agenda 2063’ | African Union”) Keeping this in mind, it is extremely important to address water and air pollution in megacities in order to prevent the surge of people arriving to live in them.

II. Key Vocabulary

Megacities: “A major city whose total metropolitan area contains a population of more than 10 million inhabitants. They are characterized by their large geographic footprint and are found on all continents except Australia and Antarctica, extending across a broad range of environmental, cultural, political, and economic conditions (see also urban sprawl). (Eyre and Rafferty)

Pollution: “The addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form. The major kinds of pollution, usually classified by environment, are air pollution, water pollution, and land pollution.” (Nathanson)



Sustainability: “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (UN)

Urban Sprawl: “the rapid expansion of the geographic extent of cities and towns, often characterized by low-density residential housing, single-use zoning, and increased reliance on the private automobile for transportation.”(Rafferty)

Greenhouse Gases: are a category of gases that absorb heat energy emitted from the planet's surface and they remain in Earth's atmosphere for a long time (from decades to centuries). They're called "greenhouse gases" because they trap heat near the Earth's surface in a manner somewhat similar to how a greenhouse allows in the sun's rays and then holds in the resulting heat. (“What Are Greenhouse Gases and Why Do They Matter”)

III. Involved Countries and Organizations

Nigeria

“Nigeria is the country of Lagos, a megacity with an estimated population of 16–21 million people.¹ In the last ten years, the megacity has made tremendous progress in terms of: sustained rapid economic growth, improved infrastructure and services.” (Idris and Adesina Fagbenro) However, water pollution remains as one of the key problems.”Although Lagos is surrounded by water, the most common way of obtaining fresh water is from street vendors selling water in containers. Just 10 per cent of the population of Lago has a piped water supply that has been treated. The remaining 90 per cent rely on wells or sink boreholes to reach underground water supplies or rely on street vendors. (“Lagos Water Supply and Pollution”). Additionally, Lagos is under great threat due to sea levels rising, as it is a city just 2 meters above sea level and the rise would cause the potential pollution of freshwater by the sea. Air pollution caused by traffic and congestion, biomass fuel burning, and shipping is a major threat to sustainable growth.

Egypt

Egypt is the country in which one of the fastest-growing megacities in Africa resides, Cairo. “Despite accounting for 33% of Egypt’s current GDP, its sustainable growth prospects are hampered by pollution from traffic congestion, slash and burn land clearing, industrial power, and open waste burning.” (“Cairo and Air Pollution”) In addition to air pollution, Cairo is also responsible for the pollution in the Nile River. Cairo, being located in northern Egypt, right along the banks of the Nile River, enabled it to be one of the most significant contributors to the pollution in the Nile River. “Because the Nile provides water to the majority of Egypt, the fact that the river is constantly polluted with massive amounts of components such as sewage, poisonous chemicals, fertilizer residues, radioactive waste, and oil pollution is potentially disastrous.” (“Water



Quality in Egypt”) With almost half of Egypt’s current investments for educational, healthcare, and other social services, there doesn’t seem to be enough funds for wastewater treatment and preventative measures for air pollution.

DR Congo

“The Democratic Republic of the Congo (DRC) has the highest particulate pollution (PM2.5) in all of Africa, and the sixth highest in the world.” (“Democratic Republic of the Congo Gains Access to Air Pollution Data”) The majority of this pollution is caused by Kinshasa, the most famous megacity in Congo. Things don’t look promising for Congo in terms of sanitary water as well, since “High concentrations of fecal coliforms from poor sanitation systems and unprotected drinking water sources have contaminated drinking water, especially near large urban centers like Kinshasa. Deforestation has led to sedimentation of surface waters, especially along the eastern border and near Kinshasa.” (USAID)

African Union (AU)

The African Union has been closely monitoring the issue ever since it became one. It has amplified UN efforts such as the Bamako Convention, the Abuja Declaration and the African Clean Air Program. Their main job is to ensure that the decisions made by the other UN bodies in regards to this issue are carried to term and actualized.

World Health Organization (WHO)

Due to the impact of water and air pollution on the health of individuals, the World Health Organization has been closely monitoring CO₂, NO₂ and SO₂ emissions in various megacities so the emission rates do not exceed amounts that would cause health concerns. They aid member states in sharing successful approaches, creating detailed health risk assessments of various pollutants, producing evidence regarding the linkage of air pollution to specific diseases and measuring health gains from sustainable development. The collaboration of different countries is essential for the quality of assistance provided by the WHO, as their impact heavily depends on the data and information provided by the communities affected by the rapid growth of megacities.

IV. Focused Overview of the Issue

“In the developing world, the population growth rate in megacities ranges from 2.3 to 4.1 percent. A megacity whose population grows at a manageable rate (that is, approximately 1 percent per year or less) is typically able to provide adequate resources and infrastructure for its people.” (Eyre and Rafferty) As previously stated, the annual growth rate of megacities exceeds the capacity it would ideally be able to



provide for. Because of this, it becomes difficult to regulate the amount of pollution released into the air and water via different sources. Below are more detailed explanations of some of the main pollution sources.

1. Transportation

Transportation stands out among the most prominent. Due to the high numbers of old cars (with high sulfur content in imported diesel and gasoline fuel) the amount of pollution emitted into the air is extremely high. While a certain reduction in emissions would happen if people opted to use public transportation instead, the lack of them in most megacities makes the intent difficult to actualize. Additionally, the lack of fundamental infrastructure for underground transportation and overland railroads makes one of the easiest solutions to decrease harmful gas release into the atmosphere almost impossible. The released gases moderately make their way into the water cycle, increasing the impact of the released gases and showing that water and air pollution afflict one another greatly.

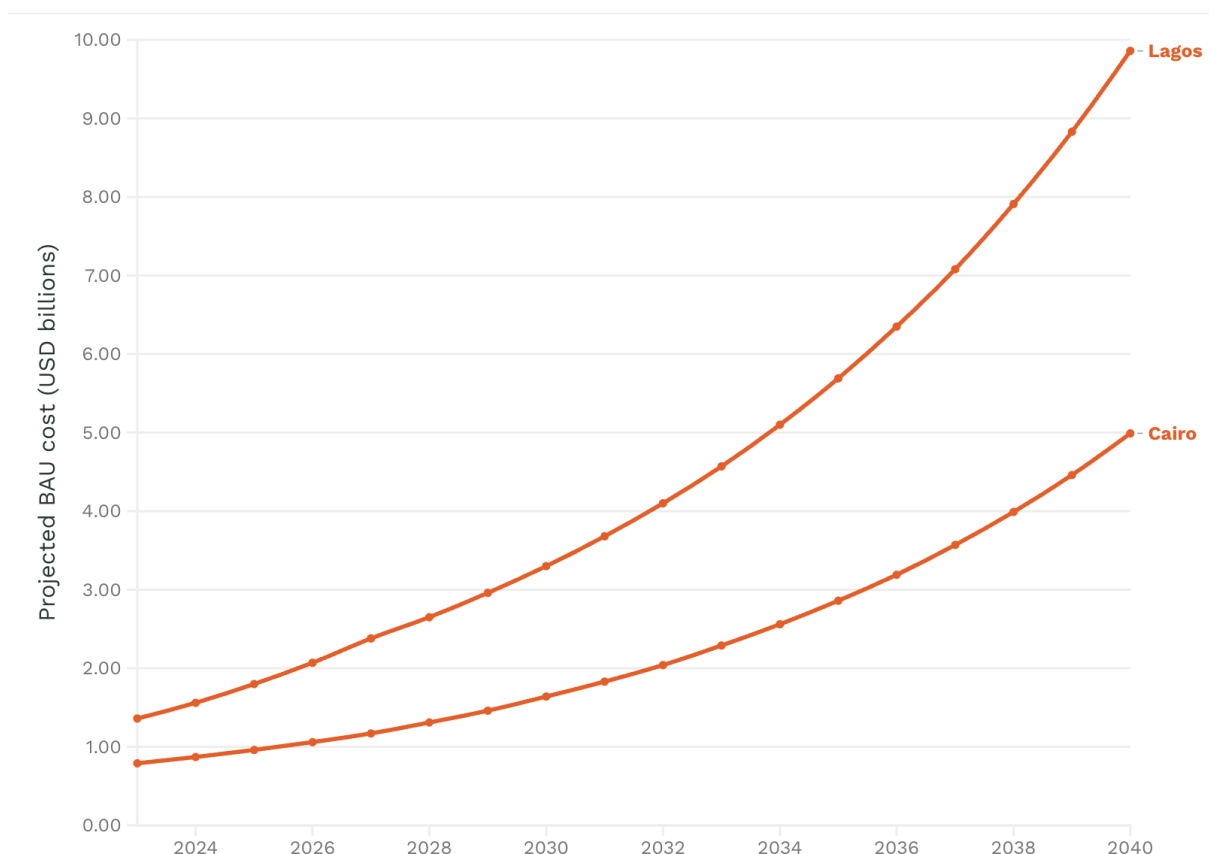


Image 2: Graph Showing the Projected Cost of Air Pollution for Lagos and Cairo



2. Biofuels

Emissions due to vehicles are closely followed by biomass fuel burning in terms of their impact into the atmosphere. Particularly in lower-income households, the majority of the heating is done through biofuels due to them being cheap and easily accessible alternatives to their more technological counterparts. While it is not correct to directly associate income and choice of fuel, as there may be other factors contributing to the decision, it is safe to say that the accessibility of biofuel is also among the reasons why it is a primary source for why “around 3 billion people cook and heat their homes using open fires and simple stoves biomass (wood, animal dung and crop waste) and coal.” (“Air Pollution”) This lean towards biomass usage, other than pollution, also decreases the number of trees present in the cities. As the trees' function decreases, the amount of carbon dioxide in the atmosphere and the harmful results caused by biofuel burning multiply.

3. Industrial Power and Electricity Generation

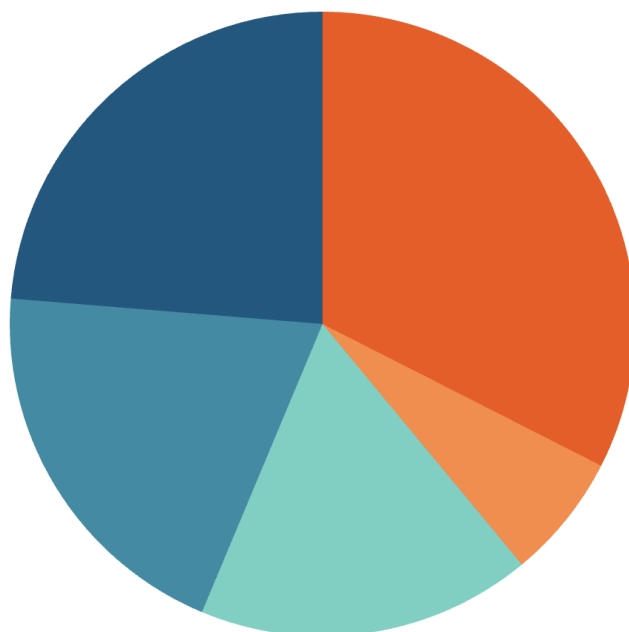
Water is used to cool down the systems used in industries, which leads to thermal pollution, affecting the ecosystem of the sites the water is released back into. Water that is used for cleaning purposes isn't properly treated before it's reintroduced into its source, which results in unwanted particles in the water. Regional interdependence through hydropower in shared basins is high. By 2030, 70% and 59% of hydropower capacity in eastern and southern Africa, respectively, will be located in one cluster of variability, increasing risks of concurrent disruption to power generation (Conway et al., 2017). Therefore, it is important to keep in mind that the pollution in various power-generating facilities all fall on the same water resources. The open areas where wastewater from factories can also be sites for diseases and places for the release of greenhouse gases. Because they lack the proper filtration systems, factories and electricity generation centers can also be centers of air pollution.

4. Untreated Sewage Waters

Due to rapid growth and urban sprawl, it is difficult to establish sufficient groundwork to support the sewage systems that are found in the cities. This results in difficulties in gathering wastewater for treatment. When the sewage waters are left untreated, they become the centers for the formation of CH₄ (methane) and N₂O (nitrous oxide). It is estimated that 13% of global non-CO₂ emissions in 2005 (US EPA, 2012) were caused by these waters, displaying the harm that untreated wastewater can cause both for human health and the environment.



■ Road transport ■ Mismanagement of waste ■ Industrial/power plants ■ Agricultural slash and burn practices ■ Other



Source: World Bank, Egypt cost of environmental degradation – Air and water pollution, 2019. • Notes: (i) The World Bank report aggregates 'Agricultural slash and burn practices' and 'Mismanagement of waste' into an 'Open Burning' category – the disaggregation was estimated based on data on 'Mismanagement of waste' from another source (McDuffie et al., PM2.5 Exposure Estimates, Sectoral Source Contributions, Total Attributable Mortality Estimates, and Fractional Disease Contributions, 2021), (ii) Secondary particulates in the primary source are assumed as PM2.5 emissions from 'Industry/power plants'

Image 3: Pie chart showing the cost of Environmental Degradation due to Air Pollution for Egypt

As the aforementioned problems accumulate, it becomes easier to see the impacts of water and air pollution on human health. According to the UN, 3.8 million premature deaths occur annually from noncommunicable diseases including stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer are attributed to exposure to household air pollution. With the growing population in megacities, it is essential for them to have a healthy workforce. However, if the pollution isn't taken under control with the lack of workforce, a large-scale economic backstep will take place causing megacities to be reduced to economic weights rather than hubs for growth. In contrast, "Reducing air pollution should have the opposite effect, increasing the competitiveness of the manufacturing sector and attracting investment that might otherwise go elsewhere." ("Lagos and Air Pollution")

Water-related impacts of climate change on human health are also expected, through vector- and waterborne diseases (including by further challenging access to safe drinking water, sanitation and hygiene) and via malnutrition, given expected impacts of wastewater on food security (IPCC, 2014a).

Seeing the larger scale impacts of air and water pollution in megacities on health and the economy, it is vital to tackle the problem from the core by creating ways to better waste management systems and implement solutions to decrease the amount of air pollution released.



V. Important Events & Chronology

Date (Day/Month/Year)	Event
1998	The Bamako Convention prohibited importing or dumping waste into African waters for any particular reason.
2008	While the Abuja Declaration mainly focused on decreasing the effects of malaria on African populations, this also led to strengthening wastewater treatment and management strategies, contributing to the efforts of managing water pollution.
2009	UNEP Governing Council Resolution 25/4 was adopted, which recognized the environmental problems associated with African cities.
2015	The 2030 Agenda for Sustainable Development was set for the nations of the UN.
2013	The Africa Integrated Water Resources Management (IWRM) Initiative was established.
2015	An international treaty on climate change, the Paris Agreement, aimed to mitigate the impacts of global warming through NDCs (nationally determined contributions). While it wasn't directly about African megacities, it aimed to mitigate the impact of greenhouse gases and, therefore, air pollution overall.
2019	UN-Habitat's World Urban Forum in Abu Dhabi
2022	The Africa Clean Air Programme (ACAP) was launched to improve air quality.
2023	Africa Climate Summit (Nairobi, Kenya)

VI. Past Resolutions and Treaties

[UN Environment Assembly \(UNEA-3\) Resolution 8 \(2017\)](#)



The linked resolution contains important steps towards proper identification and possible solution ideas for the air pollution aspect of the problem at hand. It stands out as it contains a political declaration on pollution, linked to the Sustainable Development Goals (SDGs). While the resolution called for collaboration within communities in order to reduce pollution, it was mainly voluntary. Therefore, it failed to raise recognition of the problem at an international level.

[UN Environment Assembly \(UNEA-4\) Resolution 7 \(2019\)](#)

This document was adapted as a way of building on the topics discussed in the third session of the assembly. It includes detailed descriptions of how to manage waste and prevent it from getting mixed into clean water. It calls for international collaboration for waste management in less economically developed countries. However, even if the resolution addresses potential solutions for waste management, it fails to provide sufficient resources for possible funding for the establishment of treatment facilities and fails to describe how these facilities would be maintained.

[UN Environment Assembly \(UNEA-5\) Resolution 7 \(2022\)](#)

Resolution 7 brings forward the extension of the Special Programme, drawing on existing frameworks aiming to reduce the chemicals released in the air, water and soil in order to minimize adverse impacts on human and environmental health. (Environment) It addresses the SDGs and suggests ways to improve air and water quality with the help of these goals.

VII. Failed Solution Attempts

Across African megacities such as Lagos, Cairo, Kinshasa, and Nairobi, governments have attempted various measures to combat air and water pollution, but many of these efforts have struggled to achieve long-term impact. Air monitoring networks, for instance, have been introduced in cities like Lagos and Nairobi to provide reliable data for policy decisions. However, insufficient funding, lack of technical expertise, and poor follow-up have caused many of these systems to fail, leaving governments without accurate data to guide interventions. Public transportation initiatives have also been launched to reduce car usage, yet the reliance on old, poorly maintained vehicles has meant that emissions remain dangerously high even as bus networks expand.

In terms of wastewater, treatment plants have been built in cities such as Cairo and Lagos, but inadequate investment in maintenance, weak institutional oversight, and limited public engagement have often led to these facilities falling into disrepair. These shortcomings illustrate a broader pattern: while solutions are identified and even piloted, structural barriers such as weak governance, insufficient financing, and rapid population growth prevent them from being scaled or sustained. As a result, pollution in African



megacities continues to pose serious risks to public health, ecosystems, and sustainable urban development.

VIII. Possible Solutions

To effectively address the problem of urban air and water pollution in African megacities, delegates should focus on improving urban planning and zoning to separate industrial areas from residential zones. Possible expansion of public transportation systems would be a crucial step to reducing carbon emissions, while constructing and maintaining wastewater treatment facilities would be essential to ensure safe water consumption. While it is essential for larger scale operations to take place such as the development of city-wide air and water quality monitoring networks, small acts such as encouraging the phase-out of older vehicles through subsidies or scrappage programs and providing incentives for households and industries to adopt solar, LPG, or electric alternatives to wood and diesel would be extremely beneficial for reducing pollution within African megacities. The delegates are encouraged to bear in mind the theme of “Navigating Uncertainty Through Mutual Trust” and incorporate international collaboration in their resolutions.

IX. Useful Links

[From pollution to solution in Africa's cities - Clean Air Fund](#)

[Africa: Megacities, Water and Climate Change | UNESCO](#)

[The rise of megacities in Africa](#)

[Satellite imagery shows air pollution rise in tropical ‘megacities’](#)

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