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Commentary

From COVID-19 Pandemic Pivot to Progress: Blended Work as a Pathway to Greener African Cities

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Abstract: The COVID-19 pandemic, caused by SARS-CoV-2, disrupted work and life patterns worldwide, underscoring the urgency of addressing climate change. Despite contributing minimally to global greenhouse gas (GHG) emissions, Africa faces disproportionate vulnerability to the impacts of climate change. This commentary explores the benefits of blended work models (remote and in-office work) and the readiness of African cities to adopt them. Notably, the shift to working from home (WFH) during the pandemic improved individual well-being and reduced office energy consumption and commuting-related emissions. Robust digital infrastructure and organizational and sustainable policies are essential to fully leverage blended work for urban sustainability. The unexpected opportunities that arose during the pandemic could help African cities address climate change through careful planning and investment.

Keywords: blended work; COVID-19; greenhouse gases; climate change; sustainable urbanization; African cities

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1. Introduction

Africa is one of the continents most vulnerable to climate change, yet its contribution to global emissions is minimal (around 3.8%). Even before the emergence of COVID-19, climate change has loomed as one of humanity's gravest challenges, fueled by ever-increasing greenhouse gas (GHG) emissions [1,2]. These emissions have set a cascade of environmental consequences in motion, from catastrophic storms and rising sea levels to disrupted ecosystems and mass extinctions [3]. Despite international commitments to curb these emissions, like those pledged in the 2015 Paris Agreement, the current trajectory still puts us on course for a calamitous 2.7 °C temperature rise by 2100 [1].

Climate change is influenced by both natural processes and human activity. While natural cycles of climate variation have occurred over millions of years, driven by factors such as volcanic eruptions, solar radiation variations, and Earth's orbital changes, scientific consensus now overwhelmingly attributes the rapid warming observed over the past century to human activities, particularly the burning of fossil fuels, deforestation, and industrial emissions [4,5]. The overwhelming evidence for anthropogenic climate change comes from a broad body of research, which shows a clear correlation between rising greenhouse gas concentrations from human activity and the acceleration of global warming [4].

The emergence of COVID-19 in late 2019 forced a global shift in how people work, live, and connect [6–8]. While the immediate concern was public health, COVID-19 interestingly brought attention to possible climate solutions during a worldwide health crisis. Although critics emerged on the levels of policy and inequalities, the reduction in GHG emissions received relatively limited attention [9,10]. Blended working environments emerged as a promising approach, particularly for mitigating emissions related to transportation and office energy consumption.

African cities, which face unique challenges in urbanization, infrastructure, and climate change vulnerability, stand to benefit immensely from blended work frameworks. The reduction in transportation-related emissions, which are a significant source of air pollution and GHG in many African cities, can contribute directly to improving air quality. Moreover, blended work offers an opportunity for businesses to operate more cost-effectively, allowing for the reallocation of resources that would otherwise be spent on expensive office spaces. This is particularly beneficial for African cities where infrastructure constraints and high office space costs are often prohibitive [11].

In addition to mitigating climate change, blended work models can also contribute to the broader Sustainable Development Goals (SDGs) by enhancing social inclusion, promoting decent work, and fostering economic growth. Furthermore, a reduction in traffic congestion can lead to improved air quality, benefiting biodiversity and public health. Therefore, by addressing multiple SDGs, blended work serves as a multifaceted solution for sustainable urban development in African cities [11–13].

Given their greater susceptibility to climate change impacts, African cities stand to gain from well-crafted policies that use digital connectivity to cut emissions. This perspective article aims to explore the potential of blended work models in mitigating the environmental impacts of urbanization in African cities. Specifically, we focus on reducing GHG emissions through enhanced digital connectivity and reduced mobility. We also discuss the socio-economic implications of blended work for employees, businesses, and governments. In doing so, we proffer our perspectives on the complexities of implementing such models within the unique context of Africa, considering factors like infrastructure limitations, digital divides, and socio-political challenges. While the concept of blended work has been explored globally, this paper takes a novel approach by focusing on its application within lower–middle-income African countries. The pandemic presented an unexpected but invaluable opportunity to consider the role of digital work environments in Africa's urban sustainability efforts. Given Africa's distinct vulnerabilities to climate change and its underdeveloped infrastructure, blended work could help African cities leapfrog traditional development stages and accelerate the transition to a greener, more resilient urban future.

2. GHG Reduction During COVID-19

Amidst the challenges posed by COVID-19, the constraints on mobility have imparted valuable insights, unveiling three key facts. Firstly, Africa contributes the lowest share of

global greenhouse gas emissions (3.8%) compared to other major economies. However, it is disproportionately vulnerable to the consequences of climate change on the environment, economies, resources, and infrastructure. The continent disproportionately grapples with a multitude of climate-related threats, including unpredictable rainfall patterns, intense heat waves, rising sea levels, and depleting water resources, among others. These challenges underscore the urgency of finding sustainable solutions within the continent's unique context [14]. While high-income countries experienced more stringent lockdowns and mobility restrictions, African cities demonstrated varying levels of compliance due to different economic and social conditions [15]. Nonetheless, even in these cities, there was a noticeable reduction in transportation-related emissions, particularly in cities like Kigali, Nairobi, and Kampala [16–18]. These cities, despite less stringent lockdown measures, still benefited from reduced congestion and temporary decreases in air pollution. This illustrates the potential of blended work models to achieve environmental goals even in contexts where full mobility restrictions are less feasible [19].

Secondly, the COVID-19 pandemic, despite its devastating impact on public health, inadvertently triggered a global experiment in reduced mobility. Lockdown measures enforced worldwide, including restrictions on unnecessary travel and the widespread adoption of remote work, led to a significant decline in transportation activity [20]. While the temporary shift to remote work during the pandemic was not enough to fundamentally alter the course of climate change, it did contribute to a noticeable decline in greenhouse gas emissions, particularly in the transportation sector [21]. Reduced travel, both domestic and international, resulted in fewer emissions from cars, airplanes, and other forms of transport. Similarly, working from home led to lower office energy consumption and fewer commutes, resulting in reductions in carbon emissions [22–26]. However, these reductions were only partial and short-lived, underscoring the need for more systemic, long-term changes to achieve meaningful climate goals. Importantly, the pandemic highlighted opportunities for structural changes in work and mobility that could be leveraged in the future to continue lowering emissions, particularly in sectors where digital infrastructure and remote work can replace physical travel.

Thirdly, the case of Kigali City offers a compelling case study. During the full COVID-19 lockdown, travel activity within the city dwindled by a staggering 80%, resulting in a remarkable 33% reduction in air pollution levels. Even partial lockdowns yielded noticeable improvements, with a 41% decrease in travel activity and a 21% drop in air pollution. These findings provide concrete evidence of the significant impact the transportation sector has on air quality and greenhouse gas emissions. While temporary lockdowns may not be a viable long-term solution, they offer valuable insights for policymakers and urban planners seeking to develop sustainable strategies for curbing emissions and fostering green mobility solutions in African cities [27]. These results show a significant impact of transport on air pollution; thus, there is a need to adopt innovative measures from this sector to reduce air pollution [20].

The reduction in GHG emissions during the COVID-19 lockdowns not only helped mitigate climate change but also contributed to the preservation of biodiversity. With reduced air pollution and fewer vehicles on the road, African cities could see a revival of urban green spaces and improvements in ecosystem health, which in turn supports SDG 15 (Life on Land) [23]. This underscores the interconnectivity between climate action and other sustainability goals.

3. Work-from-Home Benefits

Telecommuting, or remote work, is not a new phenomenon. In fact, it has its origins as far back as the 1970s when it was initially adopted to alleviate traffic congestion and

reduce energy consumption, long before the widespread use of computers [28]. The advent of personal computing and the internet in the following decades further catalyzed the growth of telecommuting, making it feasible for an increasing number of jobs [29]. Today, in developed countries, a substantial proportion of jobs can be performed entirely at home, demonstrating the growing acceptance and practicality of remote work as a long-term solution to environmental and societal challenges [30]

The COVID-19 pandemic irrevocably altered the landscape of work [31]. To curb the spread of the virus, governments worldwide required people to work from home (WFH) unless they were essential workers [32,33]. This sudden shift transformed WFH from a perk for select professions to a necessity for many, becoming the only way to maintain job continuity [34]. While the pandemic's impact on mental health and social interactions remains complex, WFH offered potential benefits for some. Individuals with secure socio-economic backgrounds saw potential stress reduction by eliminating commutes, adjusting work schedules, and spending more time with family [35]. Studies in Italy, for instance, revealed participants working from home were less stressed and equally satisfied compared to office work [36]. Even in far-flung Indonesia, research suggests that WFH could sustain job satisfaction during the pandemic, creating new normalcy for workers [37]. However, the implications of WFH extend beyond individual well-being. This mass experiment in remote work presented a unique opportunity to assess its impact on greenhouse gas emissions. With fewer cars on the road and office energy consumption reduced, the potential for significant environmental gains became evident. For small businesses particularly, embracing WFH offered additional benefits. Studies suggest it potentially lowered operating costs, mitigated supply chain disruptions, and improved cash flow [38]. These findings suggest that, beyond mitigating the immediate pandemic shock, policies promoting teleworkable jobs and WFH could be crucial instruments in combating climate change while fostering greater business resilience.

4. Blended Work: A Sustainable Approach for African Cities

The idea of blended work has gained global traction, but its full potential remains untapped in the context of African cities. Unlike high-income nations where digital infrastructures are already well established, many African countries are still struggling with internet accessibility and energy inefficiencies. This makes the case for blended work models even more urgent in Africa. Through leveraging the pandemic-driven shift to remote work, African cities have an unprecedented opportunity to develop sustainable frameworks for urbanization that not only reduce GHG emissions but also contribute to broader socio-economic resilience [11]. Beyond enhancing work–life balance and employee satisfaction, a blended work environment, incorporating both remote and office work, presents a promising avenue for reducing GHG emissions in African cities. Reduced Commuting: Fewer daily commuters mean less traffic and lower emissions. Estimates suggest that remote work could lead to a 10–20% reduction in urban congestion, directly cutting CO_2 emissions [39].

Optimized Energy Use: Offices used less frequently consume less energy for lighting, heating, and ventilation, thus reducing their environmental footprint.

Green Mobility: With fewer private vehicles on the road, blended work opens the door for promoting sustainable transportation options in African cities. Increased investment in public transit, cycling infrastructure, and electric vehicle adoption becomes more feasible with reduced traffic congestion, creating a virtuous cycle of reduced emissions and improved livability.

Digital infrastructure growth: Hybrid model encourages investment in digital technologies, and thus a sustainable tech-driven economy. COVID-19 has fueled an inevitable surge in digitalization and can be leveraged for sustainable green economy in African cities.

Blended work models can help achieve several SDGs beyond climate action, including SDG 9 (Industry, Innovation, and Infrastructure), SDG 10 (Reduced Inequality), and SDG 11 (Sustainable Cities and Communities) [13]. Through fostering digital connectivity, blended work can empower marginalized communities, provide greater economic opportunities, and reduce urban sprawl, all while supporting sustainable urban infrastructure development.

However, while the environmental benefits of blended work are promising, it is important to acknowledge that challenges remain. Telecommuting, if not well-organized, can lead to issues such as isolation, decreased work–life balance, and a lack of engagement. These issues are not insurmountable, but they require thoughtful organizational strategies, such as fostering strong communication channels, promoting employee well-being initiatives, and ensuring that managers are equipped to oversee remote teams effectively [40]. While these challenges can be mitigated, they cannot be entirely eliminated, and ongoing adjustments to work policies and support systems are essential for sustaining a healthy, productive workforce.

5. Infrastructure for Blended Work Success

The successful implementation of a blended work environment hinges on the critical foundation of robust infrastructure. This goes beyond mere technology; it encompasses a range of technological, organizational, and support systems that enable effective remote work and seamless collaboration [39,41,42]. Here, we discuss some key infrastructures:

Digital Connectivity: High-speed and affordable internet is the cornerstone of remote work. In African cities, where digital infrastructure accessibility varies and can be limited, bridging the digital divide becomes crucial for inclusive blended work implementation. Studies have shown a direct link between improved internet access and increased remote work adoption, leading to reduced emissions [43]. To ensure an effective teleworking environment, the government in Africa needs to consider investing in widening the internet bandwidth more than other infrastructures; this has also been a noted effort being made in high-income countries like the United Kingdom [44].

Organizational Change: Shifting to a blended model requires a cultural shift within organizations. Building trust, fostering collaborative workflows, and equipping managers with tools to manage remote teams are key. Investing in training programs and communication platforms that break down geographical barriers will be essential for ensuring productivity and employee engagement.

Sustainable Support Systems: Blended work demands a rethinking of support systems. Ergonomic considerations for home workspaces, childcare options for working parents, and clear policies on work hours and communication etiquette are all crucial elements to address potential challenges like isolation and work–life balance.

Overall, the rationale for a blended working environment is rooted in the desire to create a flexible, adaptable, and inclusive workplace that meets the needs of both employees and the organization [45,46].

6. Challenges and Opportunities for Blended Work in Africa

While blended work offers numerous benefits, challenges such as inadequate infrastructure, digital divides, and organizational hesitancy should be addressed. Most African countries are operating with limited resources and some companies are struggling to maintain the costs of rental offices; a blended working environment can facilitate redirecting the

cost invested in the increasing demand of rental offices on the continent to a model for the effective implementation of co-working spaces with organizations merging. This can be beneficial for governmental operations, empowering the government to operate at a low cost and offering an opportunity to increase green spaces on the continent [47,48].

It would be beneficial for African countries to invest in the establishment of network infrastructures to ensure the seamless accessibility, affordability, and stability of the internet. Further required investments would include the automation of the processes. Considering that only 30% of the population of SSA had access to the internet in 2022, there is a need for the government to collaborate with partners to increase this access, thus further boosting the adoption of blended working [49]. Training related to the use of the internet should be prioritized to boost such an economic shift. COVID-19 has already served as a trial for cultural adaptation, although some organizations are yet to be prepared [50].

Moreover, it is essential for the continent to strengthen digital data privacy protection policies and foster homegrown digital solutions. Hybrid models require connectivity, shifting from locally to overseas-hosted non-homegrown internet-connected software systems, jeopardizing individual non-encrypted data. Since privacy has become ever more crucial in the digital era, there are still insufficient data protection policies in many African countries. Enforcing digital data governance in Africa can foster a good digital working environment and enable safe data sharing while also optimizing individual data privacy [51].

To unlock the full potential of blended work for greener African cities, we propose that policymakers in the region prioritize several strategies. Firstly, investing in digital infrastructure is critical for enabling blended work in African cities. Governments should collaborate with private companies to extend high-speed broadband networks, particularly in rural and underserved areas, to ensure equitable access. Secondly, supporting hybrid work frameworks through legislation is essential. Governments should develop legal frameworks that support flexible working models, including regulations that protect remote workers' rights, promote fair wages, and ensure health and safety standards for home workers. For example, policies that provide tax incentives for companies investing in remote work technologies could encourage the adoption of blended work at scale. Thirdly, promoting public–private partnerships is crucial for developing green infrastructure, such as sustainable public transport systems, that complements the benefits of remote work by reducing overall emissions. Fourthly, providing training and capacity building is essential to bridge the skills gap, particularly for workers in low-income communities. These programs will empower the workforce to take full advantage of blended work opportunities, ultimately driving economic resilience and reducing inequality. Fifthly, encouraging green mobility initiatives is vital to complement the environmental benefits of blended work. This could include funding for electric vehicle infrastructure, bike lanes, and improved public transportation systems. Finally, data privacy and cybersecurity legislation is crucial to protect the digital workforce and ensure that blended work models are secure. This could include national frameworks for data protection, with specific measures for remote work environments.

7. Conclusions

The COVID-19 pandemic, though a public health crisis, revealed new possibilities for addressing climate change through reduced mobility and remote work. While the implementation of blended work in African cities holds immense promise for reducing GHG emissions and promoting sustainable urban growth, the complexities of this transition should not be underestimated. The unique socio-economic and infrastructural challenges

faced by African countries demand tailored approaches to digital connectivity, policy formulation, and organizational transformation.

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