Urbanisation, transport and the environment: Some considerations for a more productive Kampala

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- Cities are Uganda's best at achieving the dual objectives of increasing living standards and cushioning against climate shocks.
- 'Going greener' requires a more targeted approach towards environmental sustainability objectives.
- Addressing congestion and other traffic-related issues can significantly improve air quality and reduce citizens' exposure to air pollution.
- Investments in mass public transit are critical for enhancing urban mobility and environmental sustainability in Kampala.
- Engaging the informal transport sector is a key step in ensuring the success of transport reforms.

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1. Connecting urban mobility and environmental sustainability

Cities are Uganda's best bet at achieving the dual objectives of increasing living standards and cushioning against climate shocks.

Uganda has one of the highest population growth rates in the world, currently at around 3% per year. **By 2060, the population is expected to reach 101.2 million people – more than doubling its size from the current 49.9 million**.[1] Rural-to-urban migration is expected to compound natural population growth as people continue to migrate to urban areas in search for better employment opportunities and amenities. **By 2060, for the first time in the country's history, more people are expected to be residing in urban areas than in rural areas, with Kampala dominating the economic and urban system**.[2] There are reasons to believe that climate change may also magnify internal migration to cities and towns as agriculture remains the economic activity most critically at risk from climate shocks, such as floods and droughts.

Transitioning from a predominantly rural to an urban society is the most critical structural transformation currently underway in Uganda – and sub-Saharan Africa more broadly – and a necessary step for countries in the region to achieve middle-income status. Well-managed urbanisation, among other things, improves the spatial connectivity between firms and households, maximising the benefits of agglomeration. With improved connectivity, cities can better realise their potential as engines of national economic growth, serving as hubs for diversified economic activity and trade, entrepreneurship and business dynamism, as well as human capital development, knowledge exchange, and innovation.

Cities may also represent the most viable solution to managing the impacts of climate change as they allow for greater efficiency in the provision of resilience-promoting infrastructure and services – such as water provision and solid waste management.[3] Consequently, they can more easily safeguard the population against climate shocks. Furthermore, by unlocking 'the miracle of productivity' and raising living standards, cities can allow millions of lower-income households to better adapt to climate disasters – for example, by having the financial means to build houses with better materials and infrastructure.[4]

[1] World Bank (2021).
[2] World Bank (2021).
[3] Delbridge et al (2022).
[4] Oliveira-Cunha (2022).

Urbanisation, however, does not automatically translate into prosperity. Ensuring that the benefits of agglomeration are reaped inevitably entails addressing its costs.[5] These include:

- **Contagion:** In the absence of clean water and surrounded by refuse, urbanisation leads to the spread of diseases with significant health consequences.

- **Crime**: Criminal activity yields direct welfare losses, but also negatively affects investment activity, tourism and urban street life.

- **Congestion:** As incomes rise, traffic problems can worsen because a larger share of the population can afford motor vehicles.

- **Air pollution:** Poor air quality not only leads to severe health consequences but also affects children's learning outcomes and workforce productivity.[6]

Given its fundamental role in improving spatial connectivity, transport – and the associated air pollution – was at the centre of IGC Uganda's II Climate Change Workshop, held in June 2024 in Kampala. Rapid urbanisation has caused large-scale proliferation of motor vehicle use, which contributes to making Ugandan cities, particularly the capital city, increasingly congested and polluted.

This policy note summarises key reflections from the conference, focusing on urban mobility, conceptual issues related to environmental sustainability, and potentially cost-effective policy options that can generate win-win solutions on both fronts.

'Going 'greener' requires a more targeted approach towards environmental sustainability objectives.

There is a government consensus on the urgent need to tackle urban mobility challenges, especially in Kampala, while also fostering economic growth and environmental sustainability. However, the goal of 'going greener' is often discussed in broad terms, lacking a clear definition in public policy and how it aligns with Uganda's development priorities. This lack of specificity risks creating a policy gap, potentially leading to inaction or delayed programme implementation.

[5] Glaeser and Sims (2015).
[6] Glaeser and Sims (2015), and Carozzi and Roth (2023).

Box 1: Environmental sustainability objectives

1. **Mitigating climate change:** Policy actions aimed at reducing the number and intensity of climate shocks.

2. **Enhancing climate resilience and adaptation:** Policy actions aimed at minimising the impact of a climate shock (improved resilience) as well as avoiding the shock altogether (improved adaptation).

3. **Improving air quality:** Policy actions aimed at reducing emissions of pollutants from industries, transportation, and other sources.

4. **Promoting resource efficiency:** Policy actions that encourage the sustainable use of natural resources.

5. **Conserving ecosystems:** Policy actions that protect, restore, and sustainably manage natural habitats and biodiversity.

Ambitions for greater environmental sustainability are reshaping urban mobility strategies. Policy options may differ depending on whether the primary goal is reducing greenhouse gas (GHG) emissions – a global challenge – or tackling localised concerns, such as reducing air pollution from particulate matter 2.5 (PM2.5) and enhancing climate resilience and adaptation. While these are fundamentally different issues, they may also share some key stressors and potential solutions. Identifying both the distinctions and overlaps can support more effective policymaking.

Climate change mitigation requires a reduction in GHG emissions (global challenge)

Greenhouse gases trap heat in the atmosphere, causing the Earth's temperature to rise. This warming leads to climate change, resulting in extreme weather, rising sea levels, and ecosystem disruptions. The main GHGs are carbon dioxide (CO_2) – primarily released through the burning of fossil fuels, deforestation, and various industrial processes – and methane (CH_4) – emitted during the production and transport of coal, oil, and natural gas, as well as from livestock and other agricultural practices, and by the decay of organic waste in landfills.

The transport sector is a major source of GHGs, primarily through the combustion of fossil fuels, such as gasoline and diesel. Vehicles, including cars, trucks, buses, ships and airplanes, emit carbon dioxide, methane, and nitrous oxide (N_2O) during fuel combustion.

Local improvement in air quality requires a reduction in PM2.5 concentrations (local challenge)

PM2.5 refers to fine inhalable particles with diameters that are 2.5 micrometres and smaller. It originates from sources such as vehicle emissions, industrial processes, residential heating using wood and coal stoves, and natural events like wildfires. PM2.5 is one of the most dangerous components of air pollution: particles can penetrate deep into the lungs and enter the bloodstream, posing significant health risks, including respiratory and cardiovascular diseases. **It is estimated that, in 2019, air pollution shortened life expectancy by an average of 1 year and 8 months worldwide.**[7]

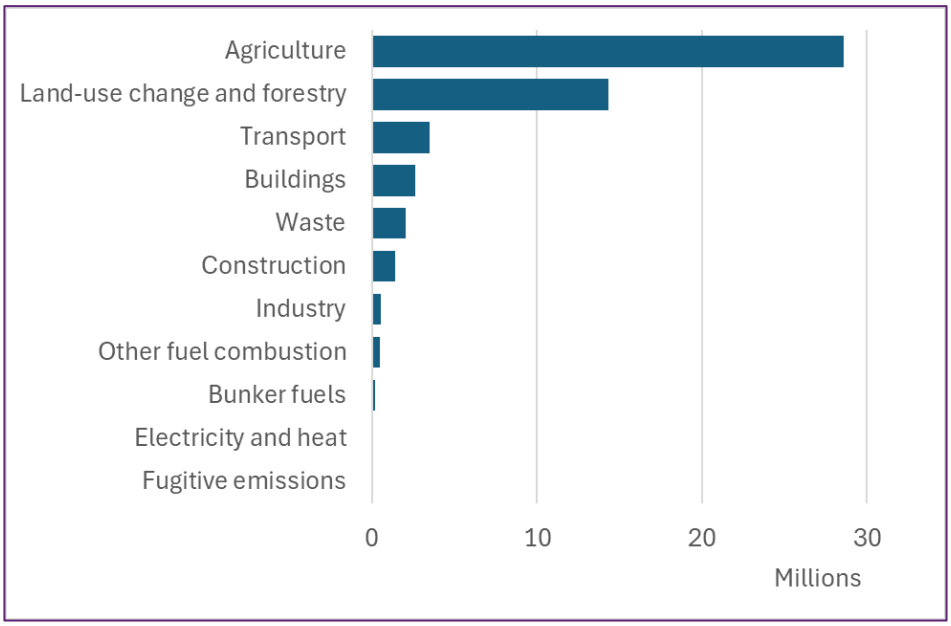
Diesel-powered vehicles, such as trucks, buses, and some cars, are significant sources of PM2.5 due to the combustion process, which produces soot. While less than diesel engines, gasoline-powered vehicles also emit PM2.5, especially older models without advanced emission control technologies. The friction from braking and tire wear generates particulate matter, and so does vehicle movement which can resuspend dust and other particles from road surfaces into the air.

Targeting of different environmental sustainability objectives

Countries around the world have pledged emission reductions as part of their nationally determined contributions (NDCs). **Uganda has an ambitious economy-wide mitigation target of 24.7% reduction in GHG emissions by 2030**, having become the first country to sign-off a NDC Partnership Plan for Climate Action in Africa. Figure 1 shows that the sectors which predominantly contribute to national GHG emissions are agriculture and land use change and forestry, followed by the transport sector. Due to fast urbanisation, the relative contribution of the latter is likely to increase.

[7] Health Effects Institute (2022).

Figure 1: Greenhouse gas emissions by sector, Uganda, 2020

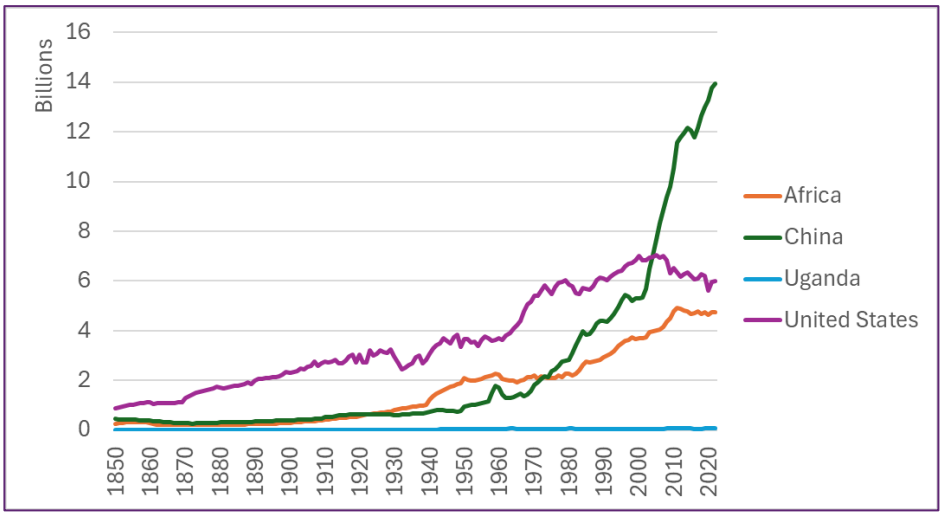


Source: Our World in Data. Note: Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide from all sources, including land use change. They are measured in tonnes of carbon dioxide-equivalents over a 100-year timescale.

While low-carbon urban development will be key to addressing climate change globally, it is important to situate Uganda's mitigation strategy in the context of its past, present and future GHG emissions. As Figure 2 shows, **Uganda has historically contributed less than 0.01% of total global emissions and presently contributes very marginally to the issue when compared to large emitters**, such as the US and China. **Estimates predict that Africa as a whole could account for between 10% and 20% of global emissions by mid-century**, depending on different scenarios.[8] This means that even if Uganda were to completely curb all its emissions by 2050, addressing the climate crisis would still largely rely on decarbonisation efforts from large emitters.

[8] Mostefaoui et al (2024).

Figure 2: Annual greenhouse gas emissions (1850-2022)



Source: Our World in Data. Note: Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide from all sources, including land-use change. They are measures in tonnes of carbon dioxide-equivalents over a 100-year timescale.

Therefore, the case for allocating scarce public resources to mitigation efforts is stronger when such initiatives can also deliver on economic growth, improved climate resilience and adaptation, or better public health outcomes. For example, the diffusion of low-carbon, more advanced technologies across the economy (including those transport-related, such as electric vehicles) also provide opportunities for productivity improvements and greater resource efficiency, as well as cleaner air.[9]

From a climate change perspective, a compelling case lies on directing public resources to the local challenge of climate resilience and adaptation. This involves designing, constructing, and maintaining transportation systems that can withstand and more quickly recover from the impacts of ever-more-frequent extreme weather events, rising temperatures, and varying precipitation patterns. This requires, among other things, broad improvements in road conditions and drainage systems.

From a public health perspective, an equally compelling case lies on addressing the local challenge of air pollution – which we delve deeper in this policy note. **The 2023 average of PM2.5 concentration in Uganda was 5.5 times the World Health Organisation's air quality guideline value, with urban areas being disproportionally affected.**[10] Not only are air pollution levels high, being comparable to those of Chinese cities, but they have also increased in recent years.[11]

[9] Oliveira-Cunha (2022).
[10] IQAir - https://www.iqair.com/uganda.
[11] Bassi et al (2024).

The dire public health consequences of air pollution also lead to negative economic impacts. Research from both developed and developing countries shows that worker productivity declines in environments with higher PM2.5 concentration.[12] A significant lack of awareness from managers about air quality often results in underinvestment in adaptive behaviours that could otherwise protect workers from unnecessary exposure, such as air filtration systems or flexible working arrangements.[13] The associated health problems – ranging from heart to respiratory diseases – also result in more sick leaves, and can ultimately be fatal. **Researchers from Makerere University have linked 7,257 deaths in Kampala over the past four years to air pollution**.[14]

Beyond the negative effects on workforce productivity, higher concentration of pollutants also negatively affects children's learning outcomes, with long-term consequences to human capital.[15]

Given the rapid pace of urbanisation, competing policy priorities, and constrained public budgets, identifying win-win solutions can help government strategically prioritise its response and allocate resources more effectively.

Addressing congestion and other traffic-related issues can significantly improve air quality and reduce citizens' exposure to air pollution.

Road transport is the most commonly used and accessible mode of transportation in Uganda, representing over 95% of total traffic. This includes a variety of private vehicles, motorcycles (boda-bodas), minibuses (taxis), and buses. **Between 2017 and 2021, Uganda registered over 900,000 vehicles, with the majority located in the Greater Kampala Metropolitan Area. Of these vehicles, 60% were motorcycles.** The fleet size has been steadily increasing, primarily consisting of pre-owned vehicles that are on average more than 15 years old and often poorly maintained. Gasoline and diesel continue to be the main fuels used for transport.[16]

Mass public transit options are inexistent, resulting in longer commuting times due to increased traffic flows.[17] **Research estimates that the cost of congestion (in terms of commuter time lost) in the Greater Kampala Metropolitan Area amounts to 1.5 million USD every day – or 4.2% of its daily GPD.**[18] This estimate most likely represents a lower bound of the true impact since the study does not account for other negative impacts of congestion, including air pollution and its health impacts.

[12] Bassi et al (2024).
[13] Bassi et al (2024).
[14] Daily monitor - https://www.monitor.co.ug/uganda/news/national/researchers-link-over-7-000-deaths-in-kampala-to-air-pollution-4662514
[15] Miller and Vela (2013).
[16] Ghaffarpasand et al (2024).
[17] Ghaffarpasand et al (2024).
[18] Baertsch (2020).

Under business-as-usual, the transport sector will increasingly contribute to worsening air quality, as road traffic constitutes a significant source of PM2.5 emissions. Air pollution is particularly concentrated along major roads, where small businesses tend to cluster due to better customer access and higher profitability – resulting in substantial exposure for workers. **Hypothetically, if a business was to choose a random location in Kampala, rather than along its major roads, workers could gain an average of two months of life expectancy due to reduced exposure to PM2.5**.[19]

Compared to cruise conditions, congestion further accentuates traffic-related emissions and exposure because:

- **Congestion lowers average speed,** which increases travel time and exposure on a per vehicle basis.

- **Congestion diminishes dispersion of vehicle-related pollutants** since vehicle-induced turbulence depends on vehicle speed.

- **Congestion can change driving patterns,** resulting in an more speedups, slowdowns, stops and starts, which increase emissions.[20]

Therefore, reducing traffic-related air pollution can lead to important improvements in worker health and productivity. However, the rapid increase in Kampala's motorised vehicle fleet, coupled with inadequate road infrastructure and inexistent mass public transit options, has exacerbated slow traffic, congestion, and accessibility issues.[21]

Recent research indicates that Kampala experiences not only higher levels of congestion, but also slower uncongested speeds (i.e. speeds without traffic) compared to other major capitals in Africa, such as Nairobi, Dakar, Accra, and Addis Ababa.[22] Figure 3 ranks African cities with populations between 3 and 7 million based on their average speeds, both with and without the impact of congestion. While Nairobi and Kampala are similarly slow in terms of congested traffic (left table), Nairobi's speed would significantly improve if congestion were resolved, whereas Kampala would remain relatively slow (right table). This suggests that the development of Kampala's road infrastructure has lagged behind rapid urbanisation.[23]

[19] Bassi et al (2024).
[20] Zhang and Batterman (2013).
[21] Akbar et al (2024).
[22] Akbar et al (2024).
[23] Akbar et al (2024).

Figure 3: Speed rankings for sub-Saharan African cities (population 3-7 million)

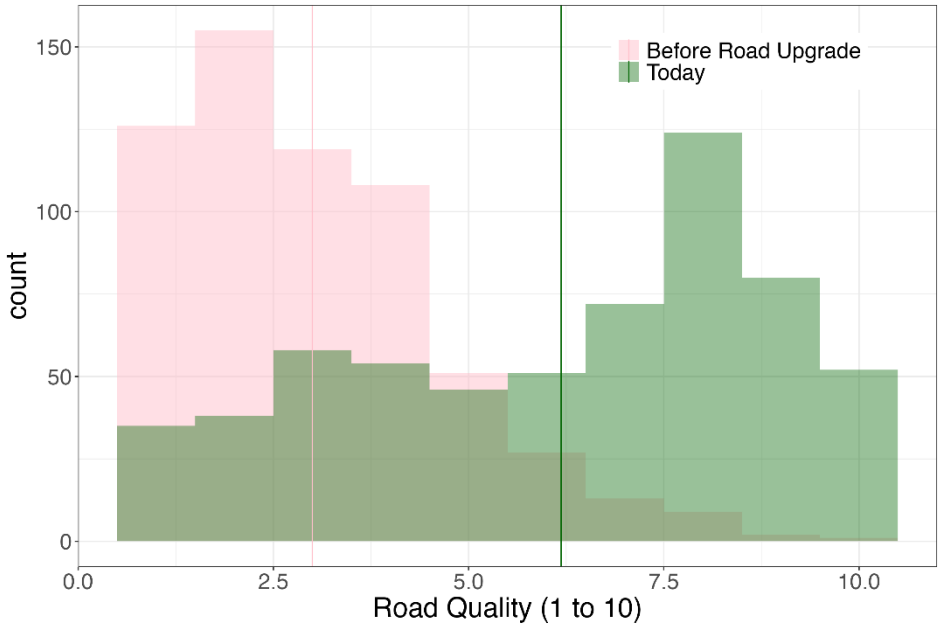
Speed				Uncongested speed			
Rank	City	Country	Index	Rank	City	Country	Index
1	Durban (Ethekwini)	South Africa	0.13	1	Cape Town	South Africa	0.15
2	Cape Town	South Africa	0.10	2	Durban (Ethekwini)	South Africa	0.14
3	Nnewi	Nigeria	0.05	3	Nnewi	Nigeria	-0.04
4	Kano	Nigeria	-0.20	4	Nairobi	Kenya	-0.14
5	Dakar	Senegal	-0.24	5	Abidjan	Côte d'Ivoire	-0.19
6	Abidjan	Côte d'Ivoire	-0.25	6	Dakar	Senegal	-0.20
7	Yaoundé	Cameroon	-0.27	7	Kano	Nigeria	-0.22
8	Nairobi	Kenya	-0.27	8	Accra	Ghana	-0.25
9	Ibadan	Nigeria	-0.27	9	Yaoundé	Cameroon	-0.26
10	Kampala	Uganda	-0.28	10	Addis Ababa	Ethiopia	-0.27
11	Addis Ababa	Ethiopia	-0.32	11	Kampala	Uganda	-0.28
12	Accra	Ghana	-0.34	12	Ibadan	Nigeria	-0.30
13	Kumasi	Ghana	-0.40	13	Kumasi	Ghana	-0.34
14	Dar es Salaam	Tanzania	-0.40	14	Dar es Salaam	Tanzania	-0.37

Source: Akbar et al (2024). Note: Preliminary results.

Road improvements could indeed generate large economic gains. Preliminary results from a second study reveal that **140 km of road improvements (shown in Figure 4) increased local speed by 2 to 4 km/h. In turn, average commuting times in Kampala decreased by up to 7%**.[24] These road improvements initiated in 2017 have also led to large reductions in dust and flooding, and moderate improvements in fumes and pedestrian safety. Local property values on the side of improved roads have gone up, with **residential and business sale prices estimated to have risen by 21% and 30%, respectively.** In addition, property values all over the city have increased, as workers adjusted to the new commuting conditions. **Overall, the study estimates that total property values increased by about 1.3%**.

[24] Sorin (2024). Preliminary results. The model focuses on time saved by Kampala residents commuting to and back from work only. The average commuting time is considered (rather than rush hour specifically). The 140 km considered include the ongoing improvements part of the KCRRP project, which are not yet finalised (the effect is predicted based on all improvements, including upcoming ones).

Figure 4: Reported change in road quality before and after road upgrades



Source: Sorin (2024). Survey question: On a scale of 1 to 10, with 1 corresponding to the worst roads in Kampala, and 10 corresponding to the best roads in Kampala, how would you rate your road in terms of overall road quality, before the road was upgraded versus today?

These studies underscore the significant benefits Kampala could realise through improvements in road infrastructure. Such investments not only deliver direct economic benefits through reduced commuting times and increased property values, but also generate substantial improvements in public health and increased resilience to weather events.

Investments in mass public transit are critical for enhancing urban mobility and environmental sustainability in Kampala.

While extremely important, improvements in road infrastructure alone cannot solve a key urbanisation challenge in Uganda's largest city: the absence of mass transportation options that can cope with population growth and the expansion of urban footprint. Especially in the central business district and main transport corridors, higher capacity modes will be necessary, with Bus Rapid Transit (BRT) plans already underway.[25]

Beyond the direct economic benefits of improved urban mobility, a mass transportation system would have the benefit of lowering emissions (both GHGs and PM2.5) by reducing the need for private motorised vehicle ownership and the associated congestion.

[25] Manwaring and Wani (2021).

Furthermore, for BRTs or other mass transit options to be operationally viable, land use strategies must promote densification, enabling each transport node to serve a greater number of people and achieve cost efficiency. Low-density urban expansion tends to lock cities into higher levels of energy consumption and per capita GHG emissions, discouraging public transport and non-motorised transport options like cycling. **In contrast, denser urban development can reduce emissions by nearly 25% compared to current trends of urban sprawl**.[26]

Engaging the informal transport sector is a key step in ensuring the success of transport reforms.

Informal, privately provided transport services currently form the backbone of Kampala's urban mobility system. They offer broader connectivity options than existing formal networks, particularly for lower-income areas, and can adapt more rapidly to market demand.[27]

Addressing congestion and other traffic-related issues through improvements in road infrastructure and mass public transit options will be crucial. However, tackling air pollution will likely require more stringent environmental regulations, such as the 2018 ban on vehicle imports older than 15 years.[28] Financial assistance might also be necessary to phase out highly polluting vehicles in favour of cleaner technologies, including catalytic converters, particulate filters, or electric vehicles (EVs).

The need for coordinated efforts across various fronts means that working around informal providers – rather than collaborating with them – is not only a counterproductive policy option, but also technically and politically unfeasible.[29] Cross-country experience highlights that, instead of ignoring informal systems, leveraging existing mobility options is more effective for improving the transport system from within.[30]

An impactful example is a recent study in which researchers partnered up with the Uganda Transport Operators Federation to assess whether there are gaps in the provision of transport services in Kampala. The pilot subsidised the initial investment required to start a new minibus route (that is, the cost of fuel and drivers' waiting time until passengers took it up). The intervention enabled the minibus associations to identify locations with a consistent passenger base by establishing relatively frequent operations, which individual drivers lacked the resources for.[31] Once the subsidy was withdrawn, a section of the route continued to operate as the demand was identified, creating a new connection for passengers in previously underserved communities. This demonstrated an

[26] Delbridge et al (2022).
[27] Manwaring and Wani (2021).
[28] Foster and Nakyambadde (2020).
[29] Manwaring and Wani (2021).
[30] Manwaring and Wani (2021).
[31] Kerzhner (2024).

effective way of working with associations and informal providers to improve urban mobility in the city.[32]

2. Policy recommendations

Urbanisation and urban mobility are integral components of Uganda's development landscape, with profound implications for economic growth and environmental sustainability. Rapid urbanisation is driving increased demand for transport services, leading to quick motorisation, congestion, and associated air pollution in urban centres.

In light of this:

a) Urbanisation and urban mobility would benefit from policy and public budgets to reflect their importance in enabling Uganda to transition to middle-income status.

Forty years from now, Uganda's population will be twice as big, and the majority of the population will reside in urban areas. If urbanisation is well-managed, rural living standards also stand to gain, as each person in rural areas will have more land on which to work, and rising urban demand for food will raise rural earning power.[33]

Decisions about the city's physical characteristics and infrastructure today will lock-in long-term consequences for the future.[34] Good connectivity is a key ingredient for cities to raise productivity and become engines of national economic growth – with transport and density representing two interconnected means of achieving this.[35] For instance, if population densities are not sufficiently high, BRT stations may struggle to remain financially viable due to insufficient customer base, which is further hindered by low-income levels.[36]

The cost of retrofitting infrastructure once settlement has occurred (both financially and politically) is considerably higher than if they had been planned and implemented in advance.[37] This means that Uganda could drastically reduce the costs of agglomeration in its growing cities and unlock significant economic growth by placing urbanisation as a top government priority.

[32] Kerzhner (2024).
[33] Collier (2017).
[34] Delbridge et al (2022).
[35] Collier (2017).
[36] Collier (2017).
[37] Collier (2017) and Sorin (2024).

b) Focusing on 'core' urban mobility challenges can significantly advance environmental sustainability goals.

The environmental sustainability agenda is often sidelined in light of competing policy priorities as it is perceived as an additional cost. However, increasing government's focus on core urban mobility challenges – such as reducing congestion and other slow-traffic stressors – may significantly contribute to objectives of climate change mitigation, resilience and adaptation, or improvements in public health. For example:

- **Improvements and expansion of road networks:** Well-maintained roads with fewer potholes and cracks reduce slow traffic, and produce less dust from the road surface and from vehicle wear and tear, improving air quality. It also prevents severe flooding after heavy rains, thereby improving resilience.

- **Investments in mass public transit options:** This can reduce both GHG emissions and air pollutants by decreasing the need for private motorised vehicles and the associated congestion.

- **Improvements in urban planning and zoning:** For example, mixed-used development reduces the need for travel by integrating residential, commercial and recreational spaces. Transit-oriented development also reduces the need for long commutes and encourage use of public transportation, impacting both GHG emissions and PM2.5 levels.

- **Improvements in infrastructure for non-motorised transport:** Dedicated bike lanes and bike-sharing programmes can encourage cycling as a viable and safe mode of transport. Pedestrian-friendly infrastructure (such as better sidewalks, pedestrian crossings, and green spaces) also make walking a safer and more attractive option.

By continuing to prioritise these core issues, Kampala could make significant strides in both urban mobility and environmental sustainability. Politically, focusing on these challenges may also foster broader long-term support.

c) The case for investing in GHG emission reductions in Uganda's transport sector is much stronger when these investments also help address local environmental concerns.

Given Uganda's relatively small contribution to global GHG emissions, prioritising scarce public resources for mitigation is more compelling if these strategies also target pressing local issues, such as high levels of PM2.5, which have serious implications for public health and the economy.

Beyond the 'core' urban mobility strategies discussed above, other policies that help reduce GHG emissions and improve air quality include the support for the adoption of electric or hybrid vehicles.

While some strategies align well with multiple objectives, certain policies may favour one goal over others, or even lead to conflicting impacts. For example, some alternative fuels, like biodiesel, may reduce GHG emissions relative to conventional diesel. However, they can still emit relatively high levels of PM2.5 and other pollutants, depending on the feedstock used and the engine technology. This can limit their effectiveness in improving air quality, even if they contribute to GHG reduction goals.

Policymakers can carefully assess these trade-offs to implement strategies that deliver the greatest overall benefit to urban residents.

d) Working with the informal sector, rather than around it, facilitates enacting policies that can improve both urban mobility and environmental sustainability.

Congestion, pollution and road safety are three challenges presented by Kampala's transport system. There is a clear role for policy to better regulate transport operations by disincentivising certain behaviour that negatively affect citizens at large, such as speeding, and overcrowding and polluting vehicles.[38]

Initiating any reform without anchoring key interest groups is unlikely to lead to change. Working with the informal sector is key to ensuring that regulations are complied with, as well as information and other forms of government assistance are taken up. This will require developing and maintaining honest dialogues with transport associations and providers with the objective of upgrading and integrating the informal sector into formal systems:

- **Upgrading the informal sector:** For example, this could include providing driver training and access to modern technologies and mapping tools that promote time- and energy-efficient driving.[39]

- **Integrating the informal sector into formal systems:** For example, by incorporating boda-boda drivers as 'feeder route' providers for higher-capacity transport systems and leveraging the smaller size of two-wheelers to navigate the narrow roads typical of informal settlements.[40]

A more detailed discussion on policy options for an informal transport reform in Kampala can be found at Manwaring and Wani (2021).

[38] Manwaring and Wani (2021).
[39] Manwaring and Wani (2021).
[40] Manwaring and Wani (2021).

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