

DEVELOPING AFRICA: TOWARD SELF-SUFFICIENT, CUSTOMER ORIENTED URBAN TRANSPORT

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The role of urban mobility in (re)shaping cities
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Developing Africa: Toward Self-Sufficient, Customer Oriented Urban Transport

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Abstract

Poverty eradication has been identified as a prerequisite to sustainability. Developing Africa's poverty is intense and increasingly concentrated in the cities, which are capturing most population growth. Economic research indicates that improved urban access can contribute materially to higher levels of economic growth, and thus more rapid reductions in poverty.

The largest urban areas in developing Africa (herein defined as sub-Saharan Africa, excluding South Africa and Botswana) are described.

Much of the present research is unfavorable toward mass transit developing African urban areas. Yet, for all of the criticisms, people have often chosen informal transport over formal transport and that for all of the customer service difficulties, the systems are strongly patronized.

This paper would seek to synthesize the research on urban transport in these urban areas. The focus would be on the consumer preferences, needs, and indicators of consumer access. There would be emphasis on minimizing travel times, which economic research indicates is important to urban economic growth.

Urban access indicators are proposed that can be used to fashion output based policies to improve mobility. Subsidy intensive alternatives are not unlikely to be sustainable. Further, motorized urban mobility needs to be affordable so that people captive to walking can access economic and other opportunities throughout the urban area. Finally, if the ultimate focus is on improving urban access, economic growth is likely to be improved and the principal objective of poverty reduction is likely to be better served.

Keywords: Sub-Saharan Africa, cities, informal transport, urban access, 2-wheelers, poverty

1. Introduction

The recent Rio +20 Conference declared that (Rio +20 The Future We Want, 2012):

Eradicating poverty is the greatest global challenge facing the world today and an indispensable requirement for sustainable development. In this regard we are committed to free humanity from poverty and hunger as a matter of urgency.

This emphasis is particularly appropriate in developing Africa, which in this paper refers to all of sub-Saharan Africa¹ except for the middle income nations of South Africa and Botswana. In this area, the gross domestic product per capita is the lowest in the world. There is obviously an urgent need to increase incomes in developing Africa. Transport has an important role to play in eradicating poverty in urban areas.

2. Cities in context

Large cities are a relatively new development in human history (Figure 1). Before 1800, few cities ever exceeded 1,000,000 population and virtually none retained that population level (Chandler, 1987). Bagdad and Hangzhou may have briefly reached 1.5 million population (Modelske, 2000). The spatial expansion of cities was constrained by the prevailing urban transport, which was walking.

Since 1800, however, cities have increased substantially in size. Urban transport has been an important facilitator of that growth. By 1900, with the mass transit and greater urban access, the largest city in the world (London) reached more than 6 million. By 2000, with the automobile and even greater access, the largest city in the world (Tokyo) exceeded 35 million (Demographia, 2012).

2.1 Why Cities Grow

In 1800, less than five percent of the world population lived in urban areas. Recently, the urban population exceeded 50 percent, for the first time. People moved to take advantage of opportunities that are better than where they came from. Economic advance is the principal justification for the city. Indeed, the purpose of the city can be characterized as to facilitate better lives for its residents and reduce poverty. While many cities of the less developed world have grinding poverty, the reality is that for the urban poor, conditions are not sufficiently distressful to induce an exodus back to the even poorer rural areas from which they came. Given the less than optimal choice, the city is usually better than the countryside.

¹ As defined by the United Nations.

World's Largest Cities (Urban Areas) 650 BC TO PRESENT

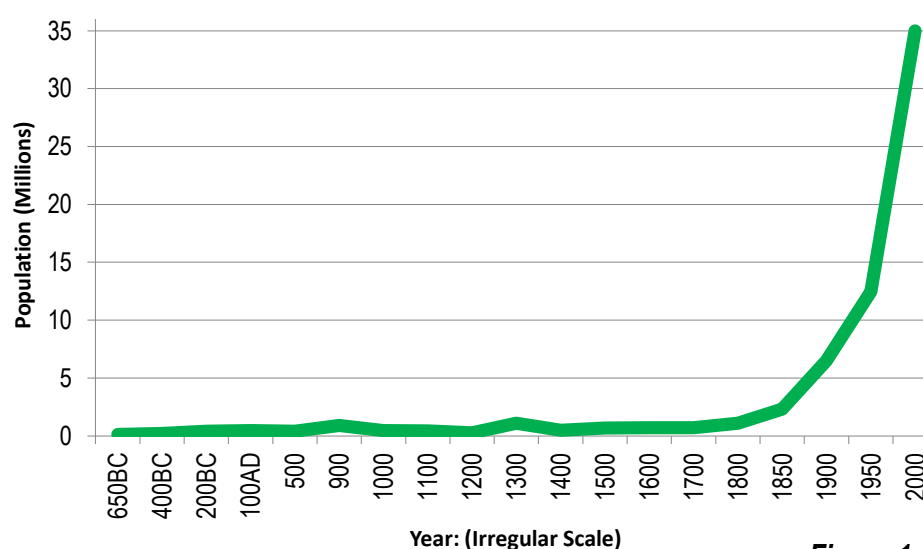


Figure 1

2.2 What is the City?

The city is the urban organism that has two manifestations: (1) The functional city, also called the metropolitan area or the labor market area. The functional city includes rural territory beyond the urban fringe from which people commute. (2) The physical city, which is the area of continuous development, or built environment (Hall, Gracey & Drewett, 1973). The physical city may also be called the urban area or the urban agglomeration.

2.3 Average Urban Densities

Average urban population density is measured at the urban area level. The urban area is not defined by administrative boundaries, such as city limits or provincial boundaries. It is defined by continuous urbanization and must be measured at the level of very small geographical units (such as the small communes of France or census tracts in the United States), so that the impact of adjacent rural areas is minimized (most nations do not designate urban areas).²

These differences are illustrated in Table 1, which compares the two largest French speaking cities in the world. The "ville de Paris" (municipality of Paris) and the ville de Kinshasa (municipality of Kinshasa) are each both municipalities and higher (regional) level jurisdictions. The ville de Paris is much smaller than its corresponding urban area and even smaller relative to its metropolitan area. On the other hand, the ville of Kinshasa is larger than its urban area and is would probably be larger than a reasonably defined metropolitan area (none is defined).³

² *Demographia World Urban Areas* provides urban land area, population and urban density estimates for all identified urban areas with more than 500,000 population in the world.

³ There are no international standards for designating metropolitan areas (most nations do not). In the United States, such large geographical building blocks (counties) are used that comparison of metropolitan densities can be misleading.

The differences are particularly obvious at the municipality level. The municipality Paris is nearly 20 times as dense than the city of Kinshasa. This is understandable, since the ville de Paris is confined to the dense core of the urban area, which spills out over more than 25 times as much land area into far less dense areas.. By contrast, the municipality of Kinshasa, on the other hand, is dominated by low density rural land. This illustrates the necessity of caution in making comparisons at the municipal level. Neither municipality (nor any) is an urban organism (the urban area or the metropolitan area), as noted above.

The appropriate level for comparing urban densities is the urban area, since the metropolitan area includes large rural areas, which by definition are not urban. The Kinshasa urban area is nearly 4.5 times as dense as the Paris urban area. In Paris, the urban area covers only 17 percent of the metropolitan area land.

Table 1 Comparison of Kinshasa & Paris Ville, Urban Area & Metropolitan Area		
	Kinshasa	Paris
VILLE (MUNICIPALITY)		
Communes (Municipalities)	1	1
Area (KM2)	9,965	105
Population	10,500,000	2,200,000
Density	1,100	21,000
URBAN AREA		
Communes (Municipalities)	1	412
Area (KM2)	583	2,845
Population	9,100,000	10,300,000
Density	15,600	3,600
METROPOLITAN AREA		
Communes (Municipalities)	NA	1,798
Area (KM2)	NA	17,145
Population	NA	12,100,000
Density	NA	700
Sources: Census Authorities & Demographia World Urban Areas (2012) & author's estimates		

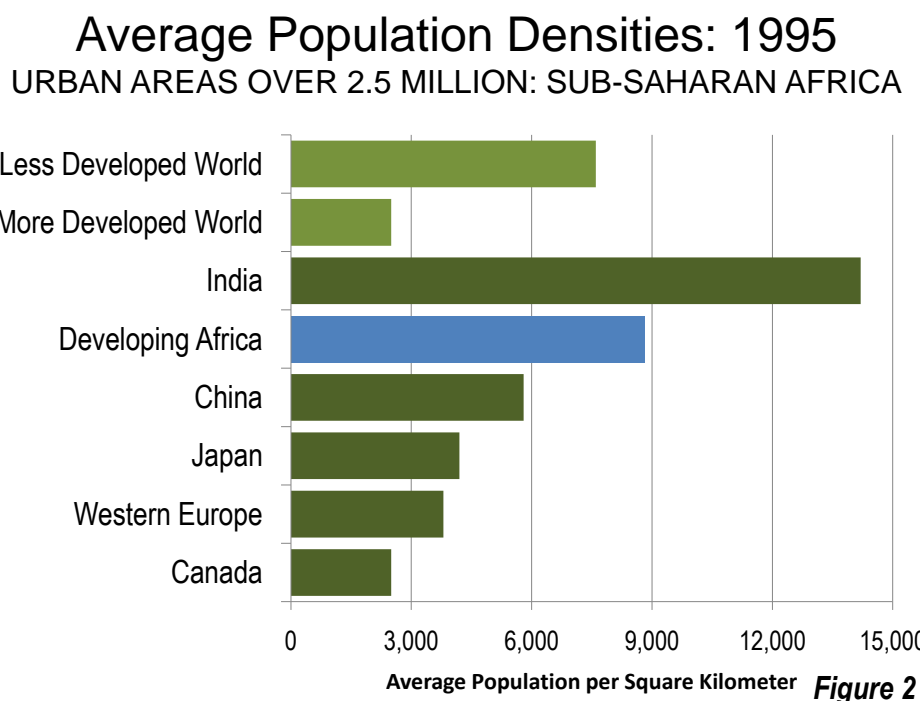
3. Cities in developing Africa

Sub-Saharan Africa is urbanizing rapidly. In 2011, 37 percent of sub-Saharan Africa lived in cities. Over the next 20 years, urban areas will comprise 60 percent of growth will drive the share of the population in cities to 45 percent By 2050, the cities will grow by 250 percent from their 2010 populations (United Nations, 2012).

3.1 Cities in Developing Africa

Developing Africa has 16 urban areas with more than 2.5 million population. The overall population is approximately 70 million and the only megacity⁴ is Lagos, with a population of 12.6 million. Overall, the urban population density is estimated at 8,800 per square kilometer, ranging from 4,000 in Accra to 16,200 in Dakar.

Developing Africa's cities are more dense, on average, than in the balance of the less developed world, more dense than the cities of China and twice as dense as the cities of Western Europe. They are, however, less dense than the cities of India (Figure 2).⁵



3.1 The Future

The challenge of urban population growth is daunting. By 2030, it is projected that these cities will more than double to a total population of nearly 150 million. Lagos is expected to reach 25.5 million, and would be joined by three new megacities, Kinshasa (14.9 million), Luanda (12.4 million) and Dar es Salaam (10.9 million). Accommodating the huge population growth may be the bad news. However, the good news is that as cities grow, they become more productive. Bentencourt, et al, (2007) have shown that as cities double in population, they tend to improve their economic productivity by 15 percent.⁶

⁴ A megacity is an urban area with more than 10,000,000 population.

⁵ These density data are higher than reported in some other sources (such as \$\$\$), where city boundaries are used, rather than the perimeters of built up areas (urban areas). City boundaries often include expanses of rural land, which are not included in urban density calculations.

⁶ This finding relates to metropolitan area population and though does not relate to urban density.

Urban Area	Population 2012	Urban Land Area (KM2)	Density	Population 2025	Change
Lagos	11.6	907	12,900	25.5	119%
Kinshasa	9.1	583	15,500	14.9	64%
Luanda	5.2	767	6,800	12.4	139%
Khartoum	4.8	930	5,100	9.0	88%
Abidjan	4.4	324	13,700	9.2	107%
Nairobi	4.3	557	7,700	8.6	102%
Accra	3.8	945	4,000	7.1	86%
Dar es Salaam	3.5	570	6,200	10.9	208%
Kano	3.5	251	14,000	7.7	119%
Dakar	3.2	194	16,200	6.8	116%
Addis Abeba	3.1	337	9,200	6.1	95%
Ibadan	3.1	389	7,900	6.8	121%
Kumasi	2.9	337	8,600	6.9	139%
Maputo	2.6	414	6,300	5.4	107%
Douala	2.5	205	12,300	5.3	110%
Yaounde	2.5	231	10,800	5.3	114%
Total	70.1	7,940	8,800	147.8	111%

Sources: Demographia World Urban Areas & UN Urban Growth Rates

It can be expected that the spatial expansion ("sprawl") of the cities will continue. Attempts to limit the expansion of urban areas is likely to encounter the same difficulties as in more affluent Latin America, where burgeoning populations simply built informal settlements on conveniently vacant land, regardless of ownership or regulation. Angel, et al (2010) project that the land area of sub-Saharan cities will expand by more than 250 percent in the next 20 years (in their middle scenario). Of course, any prediction is prone to error. However, urban expansion routinely accompanies economic growth.

4. Urban Transport and economic growth

The economic literature generally supports the proposition that the less time it takes to access employment, shopping and services, the stronger will be urban economic performance. For decades this assumption has been a principle of transport planning. Projects are routinely evaluated, at least in a part, based upon the amount of time that they will save users.

Prud'homme and Lee (1998) examine the productivity of cities and develop a "city productivity index," based upon the effective size of labor markets. Their data indicates that for every 1.0 percent increase in the size of the effective labor market, there is an associated increase in labor productivity of 0.18 percent. The effective labor market size is measured in the percentage of metropolitan area jobs that can be accessed by the average worker in a specified time, such as 30 minutes. Other research reaches similar conclusions, such as Cervero (2000), Hartgen and Fields (2009) and Cox (2004b). There also appears to be a strong historical relationship between improved access in the city (Figure 3).

Urban Access Definition: Urban access is defined by the percentage of metropolitan area employment that can be reached (door-to-door) the urban transport system in a specified period of time (such as 30 minutes).

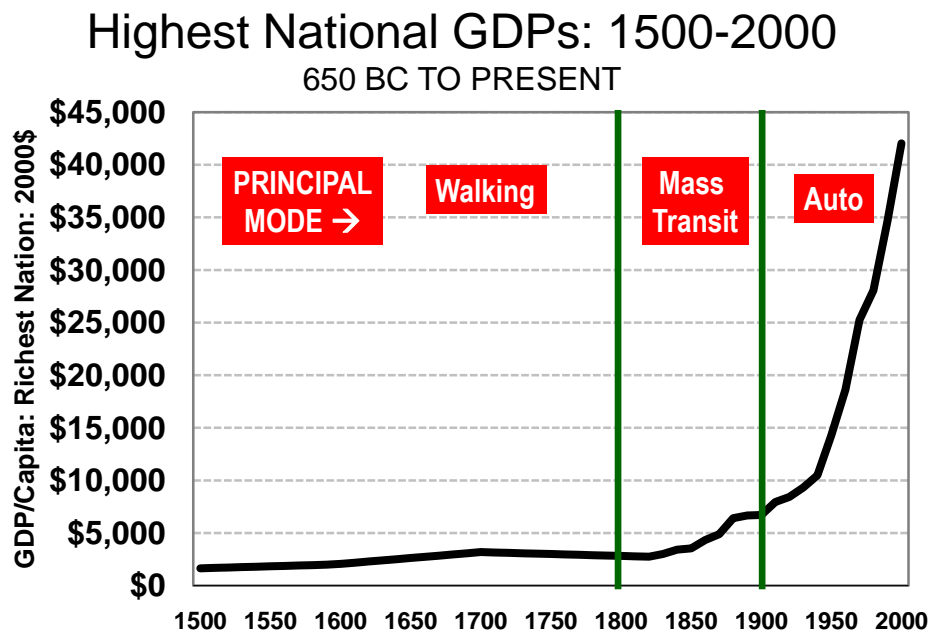


Figure 3

Because of its potential to lead to increased incomes and lower rates of poverty, maximizing urban access as a principle objective of urban transport policy could materially increase economic growth rates in the cities of developing Africa.

5. Urban Transport in developing Africa

A World Bank report (Kumar and Barrett, 2008) provides motorized transport data for seven of the above cities and is summarized (along with an 8th) in Table 3. Mobility in these cities differs from the more developed world. The conventional mass transit modes of large buses and urban rail are more rare in developing African cities than elsewhere in the world. Some large bus systems have run into such serious difficulties that they have ceased operation, principally because government subsidies have been unsustainable.

5.1 Motorized Urban Transport

The conventional large vehicle mass transit systems accounted for just 13 percent of motorized trips. Smaller vehicles, such as minibuses and shared-ride taxis account for the greatest share, at 64 percent of motorized trips. Personal motorized transportation, including automobiles and two-wheelers have already reached 21 percent, and as throughout all of the less developed world, this share is rapidly increasing.

Table 3		
Motorized Urban Transport in 8 Cities of Developing Africa		
Collective: Government (Large Bus)	13%	
Collective: Private	63%	
Minibus		50%
Taxi		13%
Private: Personal	23%	
Car		8%
2-Wheeler		15%
Abidjan, Accra, Addis Abeba, Dakar, Dar es Salaam, Douala, Lagos, Nairobi		
2-Wheeler shown as personal, though there is collective use of an unknown volume		
Calculated from Kumar & Barrett (2008) & Gonzales et al (2009)		

5.2 Walking

Walking also accounts for a large share of urban trips the cities of developing Africa. For example, in Kinshasa (where only walking data is available), 60 to 80 percent of trips are by walking, while 60 percent of travel is by walking in Douala and Addis Abeba. Among the six cities for which data is available (including Kinshasa), an average of 38 percent of travel is by walking.

Walking is the most sustainable form of urban travel. However, the cities of developing Africa are not walking cities. Their urban footprints area already much larger than those of the pre-19th century cities that were nearly fully walking dependent. The walking cities of ancient Europe generally covered no more than 20 square kilometers. Chang'an (modern Xi'an in China) reached perhaps the largest urban expanse of any pre-motorized city, at 78 square kilometers around 700 C.E. (Benn, 2003). As is noted above, the largest cities of developing Africa are much larger, ranging from 2.5 times (Dakar) to 12 times (Lagos and Khartoum) the largest expanses of historic walking cities (Table 3). Developing Africa's cities have long since become too large, in physical expanse, for walking play the important role of materially contributing to the economic growth the region so urgently requires.

The large physical expanses of developing African cities illustrate the fact that, however sustainable, walking imposes economic hardships on people who cannot afford motorized transport to reach destinations, especially employment opportunities, that are beyond the range of walking. In Nairobi, it is estimated that 65 percent of working slum-dwellers walk to work because they cannot afford even to pay the fares on the informal small vehicles transit system (Salon & Gulyani, 2008). The resulting lack of access to employment opportunities throughout most of the urban area restricts household incomes and is likely to retard the economic growth, while increasing unemployment and poverty.

5.3 International Reviews of Mass Transit in Developed Africa

As noted above, in most cities, large informal or smaller vehicle private modes dominate the mass transit market. There is no shortage of international and even local criticism of these mass transit systems. The large number of these small vehicles is blamed for much of the traffic congestion on city

roadways, which are themselves often sub-standard. Often mass transit service is not well coordinated and the transport literature includes criticisms about service reliability, comfort and a litany of other reasons for which customers would rightly avoid them. Yet, these services provide the only motorized transport that can enable many customers to reach destinations beyond the limited range of walking.

A strong defense of small vehicle systems (albeit in South Africa), however, is offered by Lomme (2010):

...it is arguable on the contrary that the quality of service provided by the minibuss taxi industry compares quite favorably with that of its formal competitors and that its operational flaws and negative externalities are blatantly overstated.

Finally, like virtually everywhere in the world that it has not become dominant, motorization is expanding rapidly in the cities of developing Africa, with both car and motorcycle ownership increasing.

6. Directions

As governments seek to improve urban transport in developing Africa, it will be important to review the strengths and weaknesses of the present system as well as those of potential models that might be partially or completely incorporated. Outside developing Africa, there are at least three models that might offer benefits.

6.1 Conventional Mass Transit

It is not unusual for consultants and planners to call for establishment of mass transit systems in developing Africa that emulate the bus and rail systems of rich western cities. This would involve systems relying principally on large buses and, to a lesser degree urban rail systems. Urban rail is already under construction in Lagos.

A mass transit system that could provide proximate (within 400 meters) access from each point to every other point in an urban area could effectively meet the need for comprehensive access throughout the urban areas of developing Africa. However, such a system is not feasible or affordable, whether in the more developed world or the less developed world. A mass transit system that met such a specification could cost, on an annual basis from 0. to 3.4 percent of the GDP of lower-income world megacities in which it might be built (Ziv and Cox, 2007). It was estimated that such a system in Lagos would require 2.3 to 3.4 times the annual GDP to pay for operations and debt service. Even in the more developed world, the cost was found to be prohibitive, at from 0.2 to 0.8 times annual GDP.

In the West, mass transit does not provide access throughout the urban area, nor does it need to. Most travel is by personal vehicle. Mass transit often provides the most effective mobility to the urban core or within the core area, but generally does not provide for the dispersed travel patterns that predominate outside these areas.⁷

The limited access provided by mass transit is illustrated in the United States. A Brookings Institution report (Berube and Puentes, 2011) indicates that the average major metropolitan area resident can access only six percent of jobs in 45 minutes. That is nearly twice the average commute time by car. More than 75 percent of US metropolitan area workers travel less than 45 minutes to work. Residents

⁷ Automobiles and two-wheelers account for more than 50 percent of motorized travel in all but three of the more than 60 more developed world urban areas covered by the Millennium Cities Database (UITP, 2001), Hong Kong, Tokyo and Osaka-Kobe-Kyoto.

of Paris new towns served by suburban metro stations can reach twice as many jobs in an hour by car as by mass transit (Fouchier & Michelin, 1999).

Western cities owe their superior mobility not only to the effective mass transit systems that serve the core, but even to much more significant degree, to their access to personal vehicles for other trips. Developing Africa does not share this advantage.

6.2 Manila

The Manila mass transit system may provide the greatest access of any system in the world. The Manila mass transit system is similar to those of developing Africa, in its dependence on private, small vehicles that provide service proximate to much of the area. The Manila "Jeepneys," and tri-cycles provide locally oriented service that can be supplemented for longer trips with transfers to the Metro.⁸ According to data in the *Millennium Cities Database* (UITP, 2001), no surveyed urban area had service levels as high as Manila. Manila's mass transit service density (service kilometers per urban square kilometer) was nearly double that of Hong Kong (the high-income world's most dense major urban area), nearly 15 times that of Tokyo (with the world's highest ridership mass transit system) and 30 times that of Paris (with perhaps the best mass transit system in the Western world). Dakar, with its strong minibus sector, ranked above Singapore and all surveyed cities in Western Europe, the United States and Canada (Figure 4) in mass transit service density.

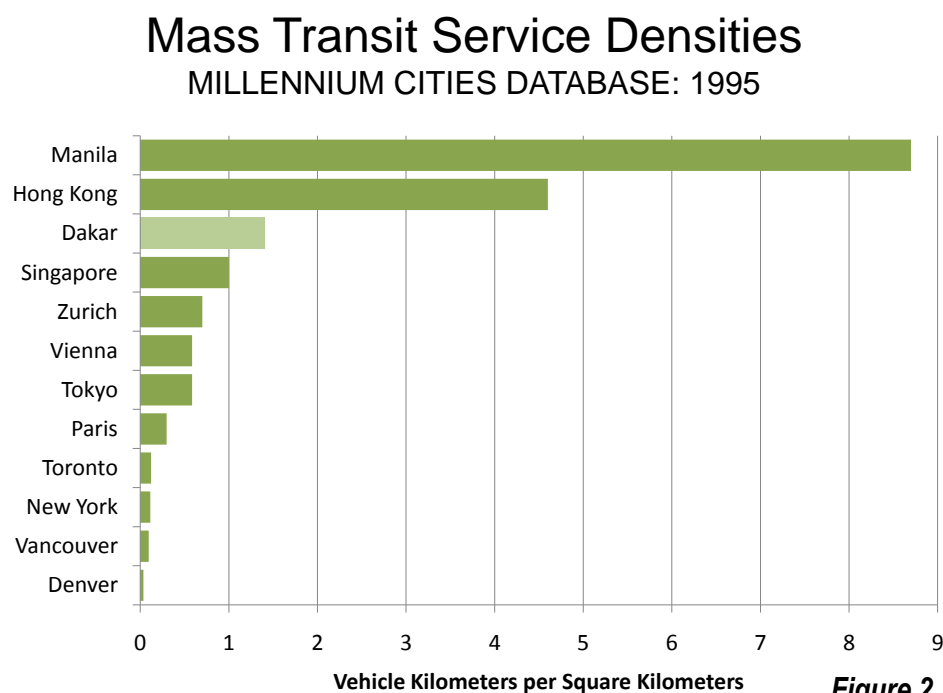


Figure 2

6.3 Viet Nam

Viet Nam has achieved a very high rate of motorized personal mobility, with the dominance of two-wheelers in cities like Hanoi and Ho Chi Minh City. This is despite Viet Nam's status as a lower income nation.

⁸ Referred to as such because of its full grade separation, though parts of the system are called "light rail."

Ho Chi Minh City represents a model of a less developed world urban area that has already transitioned nearly completely to personal motorized transport and has achieved a high degree of urban access. Ho Chi Minh City may have the highest personal transportation market share outside the Western Offshoots (Australia, Canada, New Zealand and the United States), as designated by Angus Maddison. The personal vehicle (motorcycle and car) share of travel is 92%, leaving just 8% for mass transit. Ho Chi Minh's motorcycles provide door-to-door access throughout the metropolitan area. Their mobility advantages are summarized by Dapice, Gomez-Ibanez, & Thanh (2010):

...the motorcycle offers many of the conveniences of a private automobile, such as on-demand, door-to-door service, and the ability to make intermediate stops and carry packages and extra passengers. Many Vietnamese have more than one job and children to drop off and pick up at school, and thus value the flexibility of a motorcycle.

Ho Chi Minh City's motorcycle use provides personal mobility throughout the metropolitan area. It seems likely that, as a result, urban access is greater in Ho Chi Minh City than in most other urban areas in the less developed world (and perhaps even in the more developed world).

Of course, as Viet Nam becomes more affluent, automobile ownership is likely to increase. While the high volume of motorcycles creates substantial traffic congestion, motorcycles themselves appear to consume approximately the same space on urban roadways as bicycles, measured in passenger car equivalents (Dapice, Gomez-Ibanez, & Thanh, 2010).

Ho Chi Minh City is building a Metro, which will provide mobility opportunities, principally in the urban core. Motorways are also being developed. At the same time, consistent with trends throughout the developing world, the Ho Chi Minh City area is rapidly decentralizing (Cox, 2012⁹). According to city produced projections cited in MVA Asia & Asian Development Bank (2010), the core area population will decline modestly by 2025, while nearly all population and employment growth will be in suburban and exurban areas. This decentralization is likely to ease the impacts of rising automobile ownership, moderating the growth of traffic congestion, which is likely to still be intense. Decentralization could also lead to greater economic growth (Gordon and Richardson, 2011).

7. Choices

There is need for caution in proceeding with mass transit reforms in the cities of developing Africa.

Many researchers are convinced of the imperative to establish western style large bus and rail systems to replace the informal systems in the cities of developing Africa. While objectives such as rationalization of service and reducing traffic congestion may sound attractive to professionals educated in the more developed world, the outcomes may not be satisfactory to the riders concerned.

For example, the rationalization of what was perceived to be a chaotic and insufficiently coordinated bus system in Santiago (Chile) failed to achieve its objectives. Riders were so displeased with the new, larger bus "Transantiago" service that they abandoned the system in large numbers. Many walked long distances to the Metro, lengthening their trip times and retarding their productivity. Finally, the system required considerably more in government operating subsidies than had been foreseen (Muñoz, Ortuzar & Gschwende, 2008). This is a particular concern in developing Africa, where the inability to sustain operating subsidies has resulted in bus service discontinuances.

⁹ This series documents similar trends all less developed world cities reviewed thus far, including Beijing, Cairo, Delhi, Dhaka, Guangzhou-Foshan, Jakarta, Kolkata, Manila, Mexico City, Moscow, Mumbai, Shanghai and Shenzhen.

Moreover, it is not certain that discontinuance of the small vehicle mass transit system would reduce traffic congestion. There is the potential that the regulatory authorities would not be able to ban the minibuses from the road. Even if they were successful, the conversion could well be perceived by many riders as a retardation of service (as in Santiago), which could accelerate motorization, since there is no other alternative available for longer trips.

Many people whose access might be retarded in the transfer from the small vehicle system to the conventional system might have a strong incentive to purchase motorcycles or cars. Thus, in the longer run, the choice may not be between minibuses with traffic congestion and buses and rail without traffic congestion. Removal of the small vehicles could provide only a temporary respite, with much more intense traffic congestion in the future as people purchase two-wheelers and automobiles to restore the mobility lost with the withdrawal of the small vehicle systems.

It may not be possible for alternatives to the small vehicle systems to provide sufficiently proximate access between origins and destinations that is provided by informal minibuses and shared taxis. As inconvenient as it may seem to sit in a minibus while the driver seeks to fill up the vehicle, the trip may be so long that walking is an even less viable option. Some people might not be able to reach employment sufficiently quickly and lose their jobs.

8. The need for information on urban access

Any reform of urban transport will be more successful if it is based upon complete information. Throughout the world, not just in developing Africa, there is a shortage of information on mass transit access in urban areas. Yet, there may be no more important issue to users of mass transit. If users are not able to reach their desired destinations by mass transit in an acceptable amount of time, the choices are limited.

- They may not be able to make the trip and may not, for example, be able to accept more lucrative employment that is too far for walking, as most jobs are likely to be in the expansive urban areas of developing Africa.
- They may purchase their own personal mobility, in the form of an automobile or a 2-wheeler.

Government officials need comprehensive urban access data, in at least two dimensions. Further, the Brookings Institution employment access report (Berube & Puentes, 2011) provides a useful model and can be applied to all trips. Indicators need to be developed between zones within urban areas for the various public and private modes of travel. Data should be available on a small zone basis, so that policies can be adopted to facilitate rapid access between virtually all origins and destinations (Prud'homme and Lee 1998).

- Employment (Enterprise) access: The employee access indicator would estimate the number of jobs in an urban area that can be reached by workers from specific zones and overall within a fixed period (such as 30 minutes).
- Employee (Worker) access: The work force access indicator would estimate the number of potential employees in an urban area that could reach employment locations in specific zones and overall within a fixed period (such as 30 minutes).

The best results are likely to be obtained if the urban transport system (including mass transit) maximizes access. This requires transport designs that mirror the needs of people that travel in urban areas. People are generally rational. They tend to travel by the mode that meets their needs to the greatest degree. There are important dimensions, such as door-to-door travel time, convenience and proximity to the origin and destination.

9. Conclusion

In proceeding with mass transit improvements, the situation in developing Africa suggests the following principles:

A focus on outputs is likely to produce more favorable urban mobility than focusing on inputs. The important issues are not so much how people travel, but rather how much of the city can they reach in a reasonable period of time. The following considerations may be useful.

1. Given the all too frequent failures of large bus systems in the past and the failure to sustain large subsidy levels, a priority on transport modes that do not require subsidies is likely to be more successful
2. A large share of urban residents simply cannot afford even the least expensive mass transit services. This makes them captive to walking, which means they must live close to work or may not even be able to take employment. It is important to seek ways to expand informal travel options that might be less expensive.
3. The most important consideration is to maximize access in the urban area. This will require adoption of alternatives that are both financially and economically sustainable.

Consistent with the emphasis on urban access, resources can be most efficiently used if major transport investment decisions are based upon the least out-of-pocket government cost per reduced hour of transport delay.

Mass transit and urban transport systems that maximize access in the cities of developing Africa would likely improve the potential for addressing the challenge of eradicating poverty and facilitating greater economic growth.

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