



Urban Sustainability Transitions in the Global South: a Case Study of Curitiba and Accra

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Abstract

The existing literature is replete with examples of how sustainable urbanism unfolds in cities in the developed world. However, there is limited insight into how this concept is exemplified in the developing world. This paper poses the question, what strategies are appropriate for transitioning developing world cities towards greater sustainability. Drawing on insights from Curitiba and Accra, we argue that cities should not simply reproduce technical sustainability solutions successfully introduced elsewhere, but they should leverage indigenous potential to chart a sustainability path that is sensitive to conditions in the local context.

Keywords Sustainability · Global south · Transition · Governance · Cities

Introduction

The notion “*that you can’t fix the planet without fixing our cities is obvious, but less obvious is that cities can fix the planet*” (McLaren & Agyeman, 2015, p. vii). The impact of cities on the global ecosystem has mostly been viewed in a bad light. Nonetheless, cities remain the epicentre of current global development. They have emerged as our most significant platform for innovation in their experiential and performative dimensions (Ahern, 2011; Fitzgerald, 2010). Cities accommodate more than half of global population, and account for 80% of global gross domestic product; thus, making it critical that cities be re-envisioned as the solution, but not the problem.

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There are potentially many ways to make cities more sustainable. These strategies include investment in renewable energy sources, public transit and active modes of transport, circular economy, preservation of biodiversity and urban green spaces, adaptive reuse of buildings, mixed-use and compact development and environmental ethics among others (Bäing & Wong, 2018; Sharifi et al., 2020). Put together, these principles aim to shift the traditional view of cities as the driver and result of current global challenges, to one that reconceptualizes cities as the problem solvers of the future. A daunting question, however, is how cities can shift from entrenched practices and development pathways that are considered unsustainable to more sustainable trajectories.

This question receives considerable traction in current literature, but most of these studies are flavoured by the experiences of cities in the global north, with less attention to those in the global south (Hansen et al., 2018). Given that the rate of urbanization and its effect on carbon emissions are projected to be disproportionately strong in the global south, it is critical that issues of sustainability in this region be understood and addressed in more effective and meaningful ways (Drakakis-Smith, 2017).

As argued by Lehmann (2010, p. 17), cities in the global south cannot have the “*same strategies and debates*” on sustainability as those in the north because of the peculiarity of their inherent potential, endowments, and limitations. Besides, the socio-cultural, economic and political dynamics in both contexts are different; thus, the ways in which transitions towards urban sustainability unfold in the developed world may be different from those in the developing world (Hansen et al., 2018). Therefore, an understanding of what strategies work for the developing world is critical.

Emerging studies on sustainability transitions in the developing world identify several local factors that inhibit this endeavour. Typically, these factors include limited local funding mechanisms, bureaucratic bottlenecks in foreign aided projects, poverty, lack of education about sustainability, low levels of technological and infrastructural development, lack of transparency in the policy process and high levels of economic inequality among others (Ozo, 2009; Nguyen & Pojani, 2018). Besides, the daily life of many in this part of the world is a struggle to meet basic needs; therefore, issues of sustainability may seem to be of little importance (Larbi, 2019). Local governments in this region also tend to lack the capacity to act (i.e. espouse sustainability initiatives) due to budget constraints, corruption and dysfunctional institutions etc. (Chan et al., 2018; Newton, 2008). These observations beg the question of what strategies and pathways to sustainability are appropriate for cities in the developing world.

To explore this question in greater depth, we analyse the dynamics and processes of urban sustainability transitions in the global south using Curitiba as a reference point. Curitiba was selected for this analysis because of its widespread reputation as a success story in the global south in respect of urban sustainability innovation. It has a long history of experimenting with basic low-cost sustainability solutions which have helped to direct the city’s growth towards more desired trajectories. Drawing on this case study, this paper aims to address two main objectives. First, to analyse the historical unfolding of and sources of leverage for Curitiba’s

sustainability transitions. Second, to examine how Curitiba's approach may provide valuable insights into sustainability solutions appropriate for other cities in the global south. Specifically, we discuss how lessons from Curitiba's experiences might inform sustainability transitions in two key sectors in Accra (i.e. transport and waste). We acknowledge that these lessons cannot be applied dogmatically, but need to respond to the dynamics and location-specific requirements of the application domain (Hussaini et al., 2018; Larbi et al., 2021; Xu & Heikkila, 2020).

As discussed in Hansen et al. (2018), many of the transition theories that figure prominently in the existing (western-dominated) literature posit transition as a function of radical niche innovations displacing entrenched socio-technical systems. Theories such as Strategic Niche Management, Multi-level Perspective, Transition Management, and Multi-phase Concept all posit the emergence of radically new technological innovations as fundamental levers for change (Geels et al., 2016; Raven et al., 2010). We have explored how the Multi-Level Perspective theory might be used to explain transition in Curitiba and Freiburg in Larbi et al. (2021) where we suggest that the niche concept might be extended beyond a technological interpretation. The conventional western perspective on transitions might not fit the realities in low-income developing countries due to the significant differences in the local dynamics. Therefore, we seek to unpack a more nuanced interpretation of sustainability transitions in the global south through the experiences of Curitiba and Accra.

Research Method

The materials used in this paper include government policy documents, academic articles, maps, reports, site observations, and semi-structured interviews. The case of Curitiba is well-documented in the literature; therefore, much of the data was derived from secondary sources (i.e. academic articles, maps and reports). To fill the gaps in the existing literature, semi-structured interviews were conducted with policymakers and academics from Curitiba. The interviews were conducted via Skype and the interviewees were identified through snowball sampling.

Similarly, both secondary and primary data were used in the case of Accra. Secondary data was derived from national and local government policies, reports from government institutions, official websites of local government institutions and academic articles. In addition, 25 semi-structured interviews were held with policymakers in the transport and waste sectors, representatives of public transport unions, and private waste management companies to investigate the gaps in existing policies and practices. In addition, 240 questionnaires were administered to understand travel patterns and choices as well as waste management practices among residents in Accra. Thematic and qualitative content analyses were used to analyse both the primary and secondary data. Themes emerging from an analysis of the data are discussed in line with the core objectives of this paper.

We present a narrative describing the development history of both cities and attempt to draw out salient data in respect of economy, culture and governance in both cases. Then, we seek to address the question of how change occurred in Curitiba; what were the drivers of change and what were the technical solutions

employed? In respect of Accra, we then identify potential technical solutions, noting that whilst some of these may be similar to Curitiba, direct replication may not be possible or desirable. We seek to identify the reasons for this conclusion, exploring issues of opportunities and barriers which may be embedded in local conditions.

The paper is organized as follows. First, we provide a brief profile of Curitiba and an overview of the city's historical development. We identify factors that have shaped the city's spatial planning and growth. Next, we present a review of the various sustainability policies that have been applied in Curitiba. Particular attention is paid to Curitiba's land-use planning and public transport system, waste management, and ecological flood control initiatives which are identified as the linchpins of the city's urban revolution (Macedo, 2004; Moore, 2006). We analyse how situational context factors impacted the approach taken by Curitiba to implement these sustainability initiatives. Following this analysis, we examine the development history of Accra, noting how this contrasts with that of Curitiba. We note similarities in respect of the transport, waste and flood management challenges in both cities and discuss potential solutions to those in Accra. In particular, we seek to distinguish the similarities and differences between the two cases and emphasise what might be learned or avoided in Accra.

Profile and Historical Overview of Curitiba

With a population of about 1.8 million people, Curitiba is the seventh-largest city in Brazil. Since the early seventeenth century, the planning and development of Curitiba have been influenced by the prevalent political regimes in Brazil. During Portuguese colonial rule in the 1800s, for example, Curitiba had an organic urban form typical of most Portuguese settlements (Macedo, 2013). However, following independence from Portugal in 1822, international urban planning concepts such as Haussmans's Paris plan and Washington L'Enfant's plan for Washington began to influence its organic layout. Revision of Curitiba's spatial planning became necessary in the mid-1800s due to an administrative change that ensued from the city's rise to state capital.

Pierre Taulois, a French engineer began to undertake what would become the first amendment in Curitiba's urban form in 1857. This plan had limited impact because of its emphasis on rectifying existing roads with little attempt to clearly define strategic directions. By the early 1900s, a comprehensive plan was needed to respond to the urban challenges of rapid growth.

It was not until 1943, that French urbanist and architect Alfred Hubert Donat Agache was commissioned to develop the first comprehensive Master Plan aimed at improving Curitiba's infrastructure and sanitation systems and catering for its population growth and industrial development. Agache laid out Curitiba on a radial system of roads around the city center, with rings of perimeter avenues connecting the suburbs to the downtown. Implementation of the Agache Plan faltered because it turned out to be too expensive. Nonetheless, the plan helped to define the "*city's internal linkage based on a radial road system*" (Macedo, 2013, p. 338) and also introduced the concept of urban planning in Curitiba.

Between 1950 and 1960, Curitiba's population doubled due to industrial growth (Mikesh, n.d.; Rabinovitch, 1996). The Agache Plan was deficient in accommodating this rapid population growth and the upswing in economic activity. Therefore, in 1964, the mayor of Curitiba (Ivo Arzua Pereira) issued a call for a preliminary urban plan which was won by architect Jorge Wilhelm. His Plan adapted the Agache radial plan into linear axes that directed Curitiba's spatial growth along transit corridors (see Fig. 1). These corridors accommodated high residential densities, mixed-use development, provision of green open spaces, and the preservation of historical sites.

To ensure the efficient implementation of the Wilhelm Plan, the Arzua government established a working group of architects, planners, and engineers to adapt the plan to local needs and the future development of Curitiba. This working group

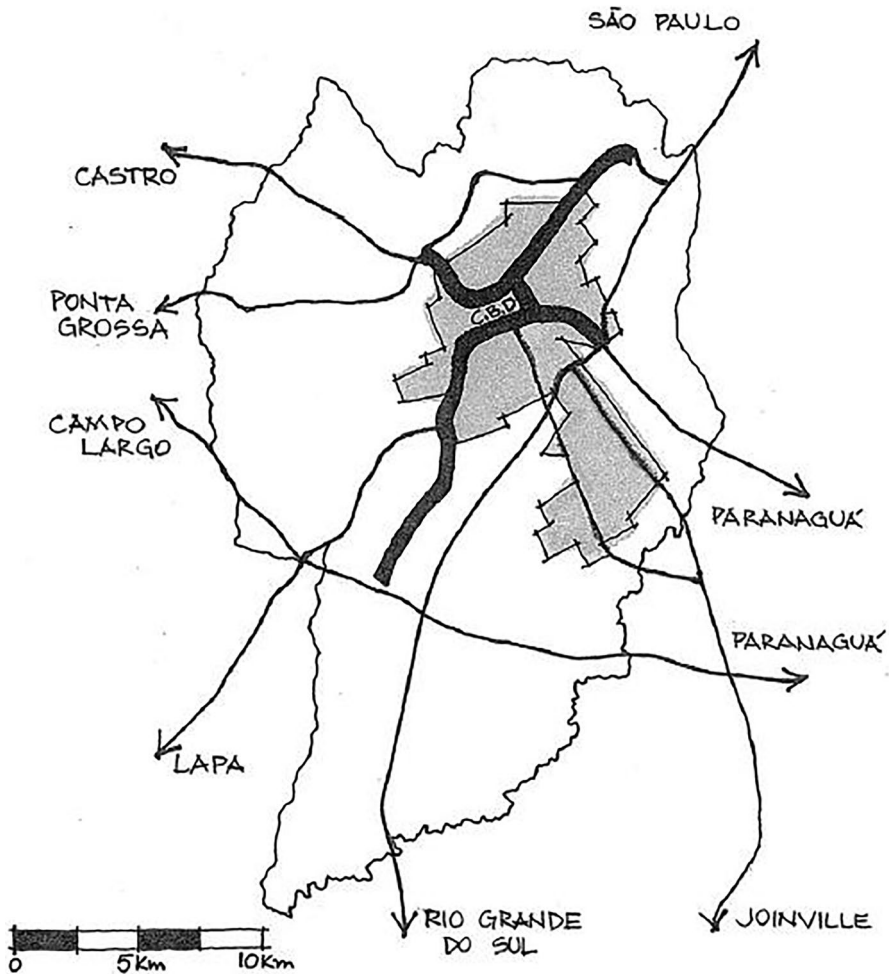


Fig. 1 Wilhelm Plan for Curitiba approved in 1966 (Source — Macedo, 2013)

eventually became the Institute of Research and Urban Planning of Curitiba (Instituto de Pesquisa e Planejamento Urbano de Curitiba- IPPUC) in 1965. However, less progress was made in terms of the actual implementation of the plan under Arzua's administration.

The tide turned when a former director of the IPPUC (Jaime Lerner) was appointed mayor of Curitiba by the military government that ruled Brazil from 1964 to 1985. Lerner (an architect and urban planner) led an urban revolution in Curitiba, with cutting-edge sustainability innovations in urban transit, waste management, preservation of biodiversity, and ecological flood management that transformed the city into a best practice urbanization model. These transformative ideas were informed by Lerner's belief in simple and low-cost solutions to urban problems rather than complex and technologically sophisticated solutions (Margolin, 2007). Below, we elaborate on Curitiba's low-cost sustainability initiatives in three key sectors (transport, waste, and ecology). They focus on the period between 1971 and 1992 when Lerner intermittently served as mayor of Curitiba.

Urban Sustainability Transitions in Curitiba (1971–1992)

Three-time mayor of Curitiba (1971–1975; 1979–1984; and 1989–1992), Jaime Lerner, believes that every city's trajectory can be transformed if development interventions are tailored to unravel its potential regardless of the scale of the city and resources available (Lerner, 2012). His leadership brought major improvements in Curitiba's land-use plan, urban transit, flood control mechanisms and waste management. Below, we discuss how Curitiba achieved these transformations through basic low-cost sustainability solutions.

Integrated Transport and Land-Use Planning

Curitiba owes much of its present urban form to the Wilhelm Plan. The implementation of the plan started in the early 1970s under the leadership of Lerner. An interview with a former Co-director of the IPPUC suggests that the political environment at this time enabled the implementation of such public policies with little bureaucratic inertia. The Wilhelm Plan was progressively developed to direct Curitiba's urban growth along four transit corridors (see Fig. 2). A fifth corridor was created in the late 1970s due to unanticipated population growth. This transit-oriented development (TOD) created the population density needed to fuel demand for Curitiba's public transit.

Demographic concentrations along the five transit corridors enabled the experimentation of a novel public transit system (i.e. bus rapid transit (BRT)) in Curitiba. Each structural axis had two dedicated lanes for the BRT at the center, with adjacent traffic lanes for other vehicles (Fig. 3). The separation of the BRT lanes from other traffic protected the BRT from traffic delays, enhanced the reliability of the BRT services and reduced the cost of time lost due to traffic congestion (Sherlick & Vassoler-Froelich, 2007). Besides, the BRT attracted public

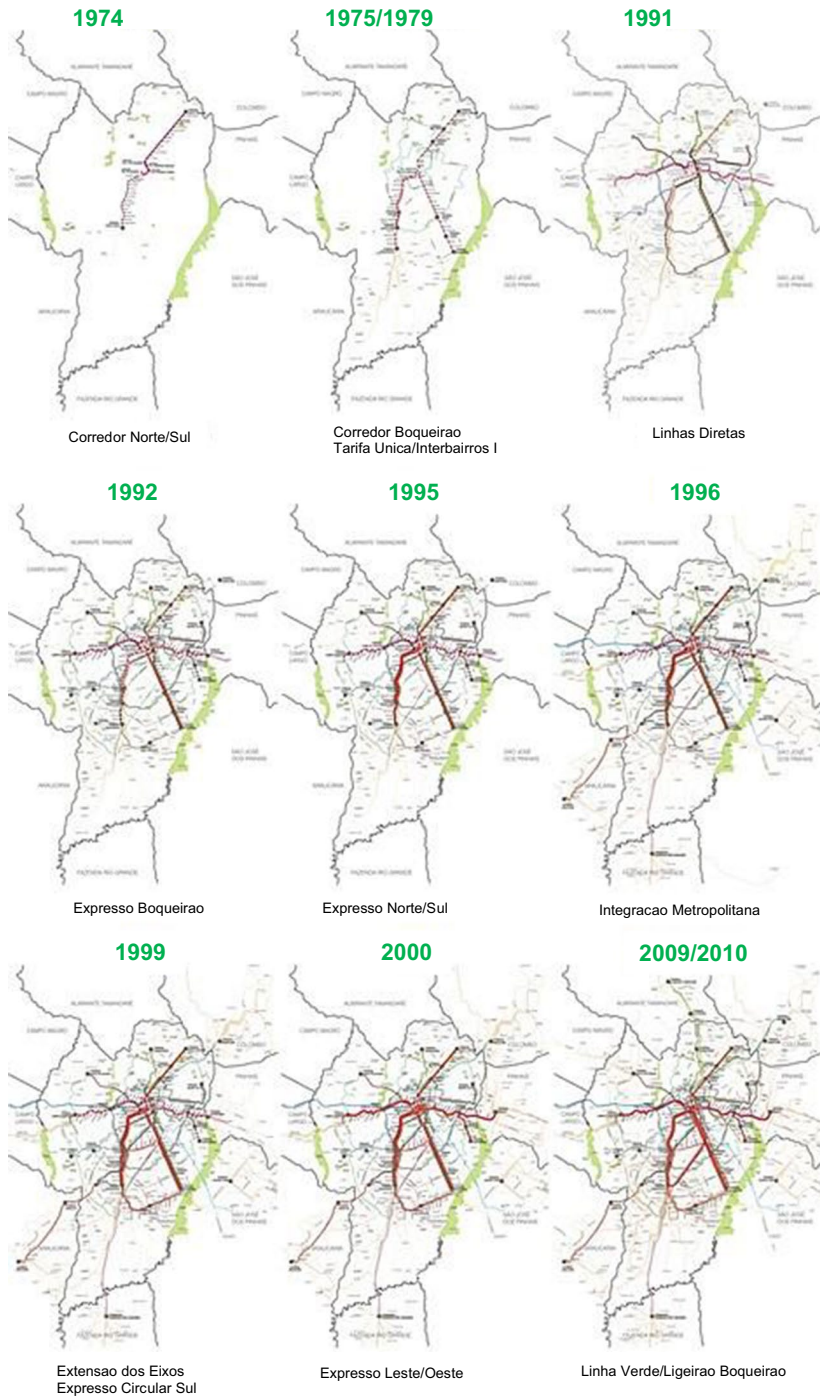


Fig. 2 Phases of Curitiba transport network (source: URBS)

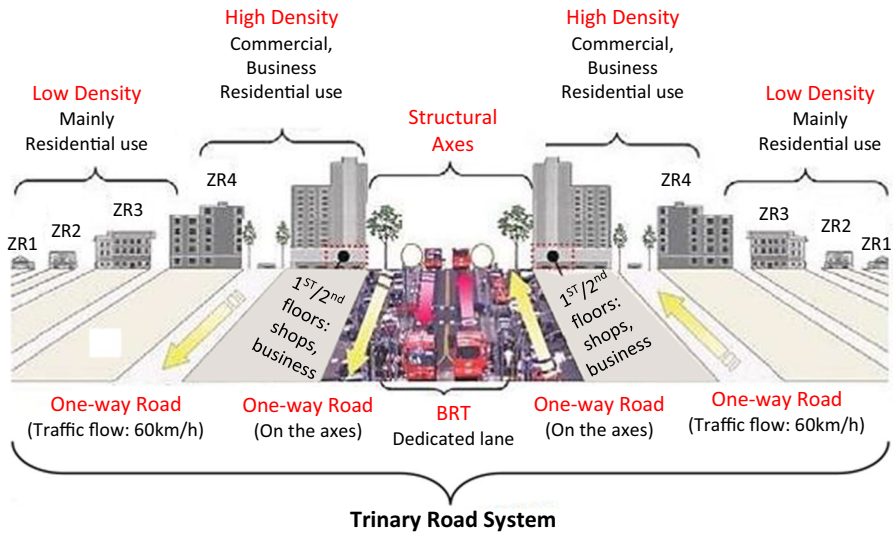


Fig. 3 Curitiba trinary road system (source: adapted from IPPUC)

patronage which resulted in less dependence on the automobile and an estimated 27 million litres savings in fuel per annum (Rabinovitch, 1995). Further improvements in the BRT enabled the introduction of 100% biofuel bi-articulated buses which emitted 70% less smoke than traditional buses (Lindau et al., 2010).

Curitiba's Low-Cost Approach to Public Transit

The TOD imposed by the Wilhelm Plan helped to reduce infrastructure and maintenance cost to the local government, as well as travelling cost to users (Goodman et al., 2005). Furthermore, against prevailing technological dogma that cities with more than 1 million people need a subway system to function efficiently, Curitiba transformed its bus-based transport system to deliver an efficient and economical public transit system. With insufficient resources to develop a subway line, Lerner and his team adapted the traditional bus system into the BRT which mimicked the performance efficiency of a subway line at a much lower cost.

It is estimated that the BRT costs \$200,000 per kilometre compared to \$60–70 million per kilometre for a subway (O'Meara, 1998). With the introduction of the BRT, Curitiba consumed 30% less fuel per capita than eight Brazilian cities of comparable size (Goodman et al., 2005, p. 76). Interviews with key informants revealed that a critical success factor in Curitiba's public transit system was the local government's commitment to exploiting local potential to address emergent urban problems rather than imposing sophisticated technological systems or ideas dogmatically. This approach enabled the optimization of local opportunities and resources to deliver cost-efficient and context-sensitive solutions. The success of the BRT has attracted interest from other cities around the world.

Waste Management in Curitiba

In addition to being recognized globally for its novel BRT, Curitiba has made great strides in promoting efficient waste management practices. As Newman (2010, p. 157) notes, Curitiba has avoided the traditional view of waste as “*negative outputs*”, and “*re-envisioned [it] as productive inputs to satisfy other urban needs*”. Curitiba recycles about 70% of its wastes which is one of the highest recycling rates in the world (Soltani & Sharifi, 2012). Two major initiatives underpin Curitiba’s waste management reforms. First, a “*Garbage that is not Garbage*” initiative was introduced in 1989 to encourage waste separation by residents. The public was engaged in this activity through intensive public campaigns by Lerner’s government. Consequently, it is claimed that nearly all households in Curitiba separate their organic and inorganic waste for recycling (Gratz, 2013).

Second, a “*Green Exchange*” program was introduced to clean up Curitiba’s shantytowns (favelas). Through this program, local residents were engaged to collect their wastes (especially in the favelas) in exchange for food and bus tickets. This exercise created an opportunity for active citizenship, reduced waste management cost, and opened up the possibility for more constructive interaction between the local government and the public. Lerner calls this initiative an “*equation of co-responsibility*”, a redistribution of social obligations between local governments and the people in a way that creates a strong sense of ownership and normative commitment to public policies. Being the first of its kind in the world, the United Nations Environmental Program (UNEP) presented its highest environmental award to Curitiba in 1990 (Lietaer & Belgin, 2010). Lerner also pioneered a “*fish for garbage*” concept that encouraged fishermen to collect rubbish from the bay (at a fee) to ensure pollution-free waterbodies and prevent flooding.

Curitiba’s Low-Cost Approach to Waste Management

The effectiveness of the garbage initiative depended greatly on grassroots support. This social support was galvanized through constant public campaigns and positive incentives which according to Scharpf (2009, p. 5), “*create a sense of normative obligation that helps ensure voluntary compliance with...rules or decisions of governing authority*”. Hence, the time and cost of government controls to enforce compliance are minimized (Martinsen, 2009). Moreover, the “*Green Exchange*” program offered an economical solution to managing waste, especially, in Curitiba’s favelas.

In an interview with an urbanist from Curitiba, it was pointed out that the cost of trading bus tickets and/or food for waste was three times lower than the cost of engaging private organizations to collect the waste from the favelas. In fact, some informants pointed out that the exchange of garbage for bus tickets came at no cost to the city government because the latter paid transport operators by the number of kilometres they covered rather than the number of passengers they conveyed. Put together, Curitiba’s waste management programs have had significant spin-off benefits such as environmental cleanliness, reduction in landfill cost, disease prevention,

job creation, food security, and improved nutrition in poor neighbourhoods. The city's paper recycling alone is estimated to save an equivalent of 1200 trees a day (Gustafsson & Kelly, 2016). These achievements were realized through low-cost solutions that leveraged local potentials.

Ecological Flood Management Strategy in Curitiba

Curitiba is widely acknowledged as the green capital of Brazil, with an abundance of ecological reserves (Soltani & Sharifi, 2012). However, in the early 1970s, Curitiba had only 0.5 square meter of green space per inhabitant, significantly lower than the World Health Organization's international standard of 16 square meters per capita. With comprehensive policies and political commitment, Curitiba has increased its green space per inhabitant to 51.5 square meters despite its population increasing significantly from 600,000 (in 1970s) to more than 1.8 million people today (Macedo & Haddad, 2016). Curitiba's "biophilic development" has been possible through an integrated urban development plan that promotes nature conservation and flood control mechanisms based on the use of green infrastructure.

Curitiba's Low-Cost Approach to Flood Management and Nature Conservation

Built on the first plateau of the state of Parana, Curitiba was faced with the problem of redirecting surface runoff to avoid flooding. In the early 1980s, severe flooding caused damage worth \$50.3 million (Tucci, 2004, p. 2). To reduce flooding and its attendant environmental, economic, and social impacts, Curitiba opted for a natural drainage system in lieu of constructing concrete culverts to direct water flow. The latter would have only decreased the frequency of flooding in the short to medium term, encouraged encroachment on the flood plains, and consequently increased the risk of more devastating long-term flooding. The cost was also a key concern (Suzuki et al., 2010).

The flood management strategy allowed nature to take its course by developing an ecological corridor along the main riverbanks (Iguaçu River) and flood plains to accommodate precipitation runoff. The city authority began with the expropriation of flood-prone lands, and the relocation of about 800 households (Slebzak, 2013). The integration of nature in Curitiba's flood management strategy was not only beneficial to the environment and people, but also proved to be more economical than hard engineering solutions. For example, the cost of resettling flood plain residents and constructing public parks was found to be five times lower than the cost of constructing concrete canals (Slebzak, 2013). Further development of green areas in Curitiba was espoused through fiscal incentives to property developers, and the transfer of development rights to ensure the preservation of greenfields.

The extensive development of public parks in Curitiba implied high maintenance cost to the city. Rather than employ lawn mowers to maintain the parks, Curitiba envisioned a cheaper and a more environmentally friendly approach to sustaining its parks using sheep and capybara as natural lawnmowers. This approach reduced maintenance cost by 80%, provided natural fertilizer from animal urine and dung to

enrich the soil, avoiding the use of conventional fuel-powered mowers which cause carbon emissions, and enhanced the attraction of the parks to locals and foreigners alike. The result has been a win-win situation for the shepherds, city government, general public and the environment.

Summary

To a great extent, Curitiba’s approach towards urban sustainability exemplifies what Lehmann (2010), calls basic low-cost sustainability solutions appropriate for cities in the developing world. As illustrated in Fig. 4 below, several factors can be identified which underpin Curitiba’s transition success: (1) building on local and/or existing potential; (2) efficient integration of policies; (3) political commitment to sustainability; and (4) an equation of co-responsibility. First, Curitiba prioritized optimizing what is already available (e.g. adapting existing bus-based transport to

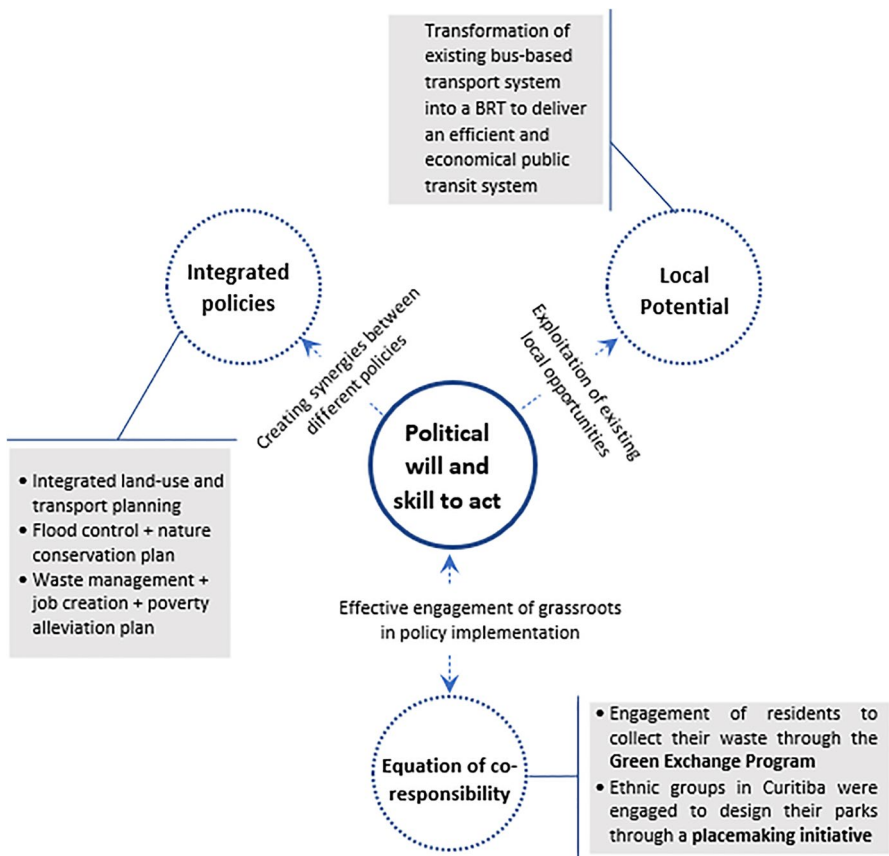


Fig. 4 Levers for Curitiba’s sustainability transitions (author’s construct)

BRT) to address its challenges within its fiscal capacity. Hence, many of the sustainability initiatives were undertaken without having to levy local taxes or depend on foreign aid or loans.

Second, effective policy integration was another critical success factor for Curitiba's transformation. Policymakers in Curitiba recognized that the challenges confronting the city (e.g. congestion, pollution, floods, and poverty etc.) were interrelated. Therefore, they ensured that the various policy initiatives were complementary. For example, Curitiba's nature conservation plan was also used as a flood mitigation strategy as well as a medium to promote more active modes of transport through the provision of bicycle routes in the city's ecological corridors. In addition, the Green Exchange Program was not only designed to reduce waste in the city, but also mitigate the risk of malnutrition in poor communities and provide a market for local farmers. These synergies helped to optimize limited resources and create a policy framework that is mutually reinforcing and self-perpetuating.

Third, political will and skill to act were central to Curitiba's sustainability transitions. As argued elsewhere, political will is a *sine qua non* of policy success as it generates commitment and support from key decision-makers for particular policy interventions (Huicho et al., 2016). The context within which Lerner was able to undertake this reform program must, however, be acknowledged. Brazil's twenty years of military dictatorship were characterised by a hard line on democratic rights, media censorship, and the torture and murder of political dissidents. Forced removals of favelas in the interests of economic development were widespread in many cities including Curitiba during this period.

That said, Curitiba's local government was committed to exploring several novel but low-cost sustainability ideas within a cycle of experimentation, optimization, and legitimization. Driven by the will to act, Lerner's government proactively engaged the public through intensive formal and informal campaigns. For example, an Infant and Adolescent Environmental Education Program was introduced to bring environmental ethics to the doorstep of children and young adults. This initiative was complemented by Curitiba's mobile classrooms that reuse the city's retired buses to provide education to people, especially, in low-income communities. According to one informant, through these campaigns, urban planning vocabularies became common parlance among ordinary people during Lerner's regime.

Fourthly, this case study suggests that despite being an authoritarian regime, grassroots support for Curitiba's sustainability initiatives proved to be a critical transition success factor. Residents were engaged through an "equation of co-responsibility" that helped to garner local support for policies such as the "Garbage that is not Garbage", Green Exchange Program, and the preservation of local biodiversity. Curitiba's parks, for example, were dedicated to various ethnic and immigrant groups who spearheaded the design of these parks according to their historical and cultural predilections. This helped to create a strong sense of ownership and place identity. It is, therefore, not surprising that a great majority of Curitiba residents were reported to be happy with Curitiba in a poll conducted to solicit public perception about the city. Put together, Curitiba has shown that a shift to more sustainable trajectories is achievable within a city's fiscal capacity if there is the political will and skill to act, and if cities look inward to leverage existing potential.

It is worth noting that Curitiba's approach is not without issues. Some urban rezonings in the interests of flood protection and economic development involved the forced relocation of neighbourhoods. Hence, it may not be reasonable to argue that Curitiba's sustainability transition burdened no one. In hindsight, Curitiba's approach had a strong focus on city-level development, with little recourse to the influence of globalization on city economies and governance systems (Klink & Denaldi, 2012). Besides, the city's incentive-based policies (e.g. the Green Exchange and social fares for the BRT) face longevity issues. Since these policies are mostly driven by external rewards rather than intrinsic motivation, there is a high tendency for people to renege on their commitment to these policies as their economic conditions improve. In fact, due to rising middle-class population in Curitiba, the BRT is said to have decreased by 14 million ridership, with a significant number of people reverting to private cars (Halais, 2012; Lopes et al., 2018). This shows that as time advances and development trends change, new solutions and/or regulations are required to sustain compliance with existing policies. For example, alternating between positive and negative incentives following changes in local conditions could be one way of modulating people's normative preferences and behavioural tendencies (Vlaev et al., 2019).

Lessons for Global South: What Can Accra Learn from Curitiba?

Despite all the shortcomings, Curitiba's experiences in urban sustainability experimentation offer some salient principles that can inform transitions in other contexts. However, there is a crucial caveat of how cities can sustain and adapt these principles to changing local conditions. As Curitiba has shown, context sensitivity is an important requirement for effective transfer of learning, given that cities differ in many basic characteristics (e.g. social, cultural, physical, political, and economic dimensions etc.). Therefore, what works for one city might not automatically deliver the same outcomes in another. Hence, lessons from one city should be tailored to meet the specific requirements of other application domains. In light of this understanding, we explore how Curitiba's five-decade experience in experimenting with several sustainability ideas offers a model for Accra, which has yet to make any significant headway.

Profile of Accra

Accra, the capital of Ghana, is located on the west coast of Africa on the Gulf of Guinea. It has a tropical savanna climate, with a population of about 2,500,000 people. During the pre-colonial period, Accra was a largely unplanned cluster of trading and fishing villages. Upon the declaration of Ghana as a British colony in 1874, a racially segregated plan was imposed on Accra to separate European neighbourhoods (which were laid out in a regular grid pattern) from native communities which were largely left unplanned (Grant & Yankson, 2003; Kaye-Essien, 2020).

The transfer of power from colonial rule to native Ghanaians in 1957 brought an end to racial segregation and provided the opportunity for a new plan for Accra which aimed to inspire national and African pride. However, the new development plan (which was spearheaded by the first Prime Minister of Ghana) gave no order to Accra (Grant & Yankson, 2003). Hence, much of the growth of the city in the mid-1900s unfolded with little planning (Fig. 5). Subsequently, like Curitiba in the early 1970s, Accra has experienced rapid urbanization in the last decades, with attendant problems such as loss of natural vegetation cover, uncontrolled sprawl, traffic grid-lock, and garbage pollution. In recent decades, several initiatives have been taken to address these problems. For lack of space, we focus on the transport and waste management sectors which have had a pronounced impact on the city’s development over the years.

Transport Regime in Accra

The transport sector in Accra has seen significant changes since independence. In the mid-1900s, public transport was provided by quasi-government transport agencies which were heavily subsidized by the government. However, in the early 1980s, the transport sector was deregulated which resulted in some creative destruction, with the de-alignment of the existing public bus services, and the emergence of new (private) actors (Dickson, 1961; Poku-Boansi, 2020). The latter introduced an informal public transit system (i.e. mini-buses locally known as “trotro” and taxis) which is more flexible in space and time, but less convenient. These private commercial

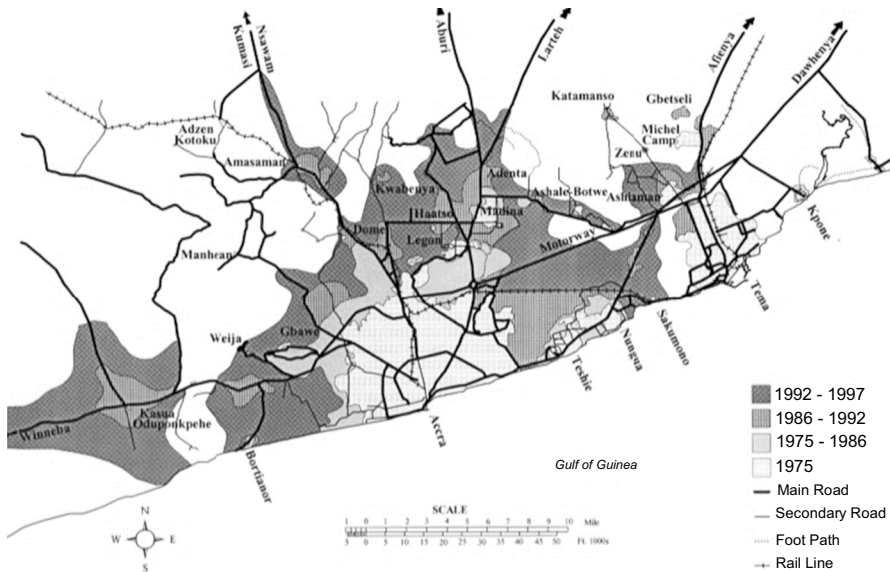


Fig. 5 Spatial growth of Accra from 1975 to 1997 (source: Yeboah, IE 2000)

vehicles operate under the umbrella of three main transport unions i.e.: Ghana Private Road Transport Union (GPRTU), Corporative Union (CU), and the Progressive Transport Owners' Association (PROTOA). Among others, the unions determine transport schedules, routes and fares in consultation with the government.

Due to the lack of proper regulation of these informal public transport services, Accra has seen a significant increase in traffic congestion and transport-related pollution in recent decades. Consequently, among the eight performance indicators (i.e. land-use, transport, waste, air quality, energy, water, sanitation, and environmental governance), the 2011 African Green City Index identified urban transport as the worst-performing sector in Accra. In light of these challenges, successive governments have attempted to reinstitute scheduled bus services in Accra and other metropolitan areas to reduce the number of *trotros* on the street.

For example, in the early 2000s, the New Patriotic Party (NPP) government introduced the Metro Mass Transit (MMT) system to provide intracity transport services in Accra and other regional capitals. However, due to poor management and the inability of the MMT to compete with the entrenched informal transport system (*trotro*), the National Democratic Congress (NDC) government (which assumed power from 2008 to 2016) suspended certain privileges to the MMT and established a new public transit system (i.e. *Ayalolo*). The *Ayalolo* was established in 2016 as a "Type B BRT" system i.e.: *a transit system that is far superior to trotro but does not reach the infrastructural superiority of a standard BRT system*. It is an outcome of a World Bank-funded transport improvement program in the Greater Accra Metropolitan Area (GAMA) which is currently managed by the Greater Accra Passenger Transport Executive (GAPTE).

Like the BRT of Curitiba, the *Ayalolo* transit system promises to alleviate the congestion and traffic chaos caused by the *trotro* and provide a more efficient, comfortable, and faster public transit system. However, interviews with officials from GAPTE, the ministry of transport, members of the transport unions, and passengers reveal several shortfalls that raise questions about the future of the *Ayalolo* BRT. First, *Ayalolo* lacks the basic infrastructure (e.g. dedicated lanes and independent bus stops) required to make it function efficiently. Second, there are lots of bureaucratic bottlenecks in the implementation of these initiatives due to reliance on foreign donors. Third, there is a lack of strong political support for the project because of change in political leadership and interest. Finally, there is poor integration of the *Ayalolo* plan with the land-use strategy of GAMA. In fact, there are no strategies to increase densities along the proposed *Ayalolo* corridors to encourage ridership in the medium and long term. These shortcomings bring into question the future prospects of the *Ayalolo* BRT, and whether the latter (like the MMT) will be out-competed by the *trotro*.

Waste Management in Accra

Waste is perhaps the biggest challenge confronting Accra in recent years. It is estimated that Accra generates about 3000 metric tonnes of solid waste daily which is largely composed of organic (60%) and plastic (18%) wastes (Knott, 2018).

According to the 2011 African Green City Index, per capita waste generation in Accra (440 kg/year) exceeds the average of the 15 African cities included in the index (i.e. 408 kg/year). The huge volumes of waste generated daily have created daunting challenges for waste collection and disposal in the city.

In the early 1990s, the waste collection problem in Accra was partly addressed through a public–private partnership agreement that enabled private companies to collect waste bins at designated communities. Notwithstanding, there is still the question of where the wastes go after collection. Presently, all the landfill sites in the Accra Metropolitan Area have been closed due to a lack of capacity. Collected wastes are transported to landfills (about 37 km) outside Accra. According to one informant, about 200 trips are made daily by garbage trucks to transport Accra's waste to these landfill sites. These trips contribute to fuel consumption rates and transport-related emissions.

Although Ghana's National Environmental and Sanitation Policy recommends waste recycling at the local level, there is no evidence of the implementation of this policy in Accra. In recent years, a few private companies have started small-scale recycling industries in Accra. However, this endeavour is marred by poor waste segregation at source and the lack of high-quality infrastructure to support waste recycling. In the view of one key informant, the solutions to Accra's waste problems lie in effective public education, incentive structures for waste segregation at source, and a simultaneous development of recycling infrastructure to ensure that segregated wastes do not end up in landfills.

Discussion

Cities in the developing world face an uphill struggle to espouse sustainability policies due to the limited adaptive capacity of local actors. As explained by Smith et al. (2005), adaptive capacity is the extent to which actors are able to mobilize resources and exercise power and informed judgement to engender change in desired trajectories. In the case of Accra, the adaptive capacity of the local government to deal with the transport and waste problems in the city was evaluated as very low by many informants. In the first place, Accra lacks the *Lerner-type leadership* that brought political will and skill to bear to reinvent Curitiba's image as a best practice urbanization model. It is important to stress that Lerner was highly unusual since he acted in the public interest despite taking his authority from a repressive dictatorship. We do not recommend this as a model for governance elsewhere, since it is fraught with risk. However, democratic government, as demonstrated in the cases of Porto Alegre (Klink & Denaldi, 2012), Lagos (Olawole, 2012) and Bogota (Bassett & Marpillero-Colomina, 2013) is capable of enlightened policy which, when consistently applied, represents a preferable alternative to authoritarian governance, whilst still, in many cases, driving change through enlightened leadership. In the transport sector, for example, interviews with GAPTE officials revealed that the *Ayalolo* BRT can only succeed if there is a "*political champion*" who can advocate for resources and facilitate the development of the basic infrastructure required to make the *Ayalolo* work at its optimum.

Presently, such proactive leadership is missing in Accra. Besides, the few government initiatives in transport (e.g. MMT and Ayalolo) and waste (waste segregation and recycling experiments in some communities) among other sectors are marred by partisan politics. As most informants interviewed in this study conveyed, almost everything in Ghana is politicized, resulting in the prioritization of partisan interest, mostly, at the expense of broader national interest. Consequently, what is started by one party (e.g. MMT) is mostly discontinued by another party (e.g. introduction of Ayalolo and the cut in government support for MMT); thus, creating a vicious cycle that undermines policy success.

To most informants, the pattern of politicisation in Ghana's democratic governance kills initiatives, threatens public sector governance, engenders policy inconsistency and implementation gaps, and undermines development in most sectors of the country. In contrast, Curitiba had the benefit of developing consistent policies across all local government sectors ensuring continuous political and institutional support to implement policies over time. This consistency and continuity of policy action seem far-fetched in Accra. Most informants in Accra agreed that the government should engage the private sector through an operational "*equation of co-responsibility*" that leverages the potential of non-state actors.

In the transport sector, for example, the informal public transit system (*trotro*) has proven to be more robust than the government bus services (both MMT and Ayalolo). Studies have shown that *trotro* services convey more than 80% of all passenger trips in Accra (Agyemang, 2017). The entrenchment of the *trotro* services in mainstream society begs the question of whether Accra needs a BRT or whether efforts should be directed at improving the existing *trotro* services. The BRT was first introduced in Accra in the early 2000s when Jaime Lerner visited the city. What city officials in Accra have failed to recognize in the adoption of this model is that its pioneers in Curitiba started the BRT with their existing bus-based transport system before progressively transitioning to more sophisticated articulated and bi-articulated BRT buses. This approach helped to save cost, allowed for incremental development, and avoided a dramatic shift in the existing transport regime which could have turned out to be counterproductive. A key insight from this observation is the need for city officials in Accra to leverage what is already available and thriving (e.g. *trotro*) to develop a model that is locally viable.

Several levers for change were identified in the field study. First, since the *trotro* services are driven by the informal sector, they are mostly chaotic and poorly regulated. Hence, there is a need for more proactive government oversight to regularize the sector. In the view of some informants, the government should focus on providing the needed infrastructure and regulatory framework that will enable the private sector to provide more efficient and reliable services. Also, the transport unions lack the capacity and skill to adapt the *trotro* services to emerging intelligent transport technologies. For example, GAPTE deploys a monitoring system that generates real-time data to assess the performance of the Ayalolo services for continuous improvement. This technology, among others, could be made available to the transport unions to help streamline their operations. Finally, the *trotro* services operate via a cash fare payment system which tends to cause delays and contentions between drivers and passengers. Although cashless electronic payment systems are widespread

across the globe, these systems have yet to gain traction in Accra. Therefore, new policies and public campaigns are needed to aid a transition from cash-based fares to electronic cards.

The critical argument here is that Accra's initial acceptance of Lerner's recommendation of a direct technological transfer from Curitiba using a BRT system has proved to be misplaced. For multiple reasons, this approach has not proved viable. By contrast, the above analysis which outlines the case for government support of the *trotro* system, suggests that the real lesson to be derived from Curitiba's experience is that attention needs to be paid to locally embedded behaviours and systems that already exist and which can be built upon using government resources and support. Lerner profited from understanding that Curitiba's physical layout and existing dense transport corridors carried intrinsic advantages for a BRT system funded and supported by the government. Accra by contrast lacks these attributes but benefits from very high *trotro* utilisation which, with suitable regulation and government support, could become an efficient public transport solution. Funding this would prove far less an issue than pursuing the BRT model. The missing elements in Accra are political clarity and will, which were abundant in Curitiba, albeit deriving from a flawed authoritarian regime.

Compared with the transport sector, the waste sector has seen more collaboration between the government and the private sector. However, there is less collaboration in the area of waste recycling. Several small-scale recycling innovations exist (e.g. conversion of plastic waste into fuel and pavement blocks etc.), but these industries mostly operate in the informal sector with no proper regulation and support. To ensure proper coordination of the activities of these informal actors, supportive government policies are required. Such policy measures may include fiscal subsidies, venture capital incentives, tax exemptions, skill and entrepreneurship development training, and government support for research and development etc. These interventions could help build indigenous capacity to manage the waste problem in Accra more effectively.

In addition, effective public education about waste segregation at the source is also needed to make waste recycling viable. Findings from the field study showed that a majority of respondents (69.2%) had no knowledge about waste segregation. As a result, the time and cost for processing these wastes by the few existing recycling industries are significantly high. As shown in Curitiba, constant public education about best practices in waste management (through both formal and informal media) can help induce a pervasive ecological worldview that has the potential to minimize domestic waste burden.

Such action in Accra will require effective collaboration between the local government and other stakeholders such as the media, civil society, religious groups, transport unions, and academic institutions etc. The emergence of the novel COVID-19 pandemic, for example, saw these stakeholders effectively collaborating to enable public access to relevant information. Accra will make significant headway if a similar effort is invested in environmental campaigns. In addition, incentives could be provided to solicit behaviour change. Most households in Accra have only one bin which makes waste segregation impossible. Therefore, the provision of subsidized bins might help to encourage waste separation at the source.

An inherent local advantage present in Ghana is the culture of communal labour. There is a strong long-standing culture of regular voluntary community-driven activities (e.g. clean-up exercises, tree planting, and placemaking etc.) which could be extended to manage communal waste. These activities are commonly known as *communal labour* in Ghana. Unlike Curitiba where residents had to be compensated to collect their own waste, *communal labour* is embedded in the Ghanaian culture; hence, no external rewards are required to encourage participation. The field study showed that 95% of the respondents evaluated *communal labour* favourably, and 76% acknowledged that they participate in *communal labour* at least once every month. This culture represents an inherent opportunity which could be leveraged to the advantage of sustainability objectives.

Finally, as illustrated in Fig. 4, effective integration of policies was also critical to Curitiba's transition success. Most informants interviewed in Accra acknowledged that government policies are well integrated on paper but fragmented in implementation. For example, the Ghana National Spatial Development Framework (2015–2035) advocates for integrated transport and land-use planning to strengthen the metropolitan city regions of Accra. However, little consideration was given to this policy in the implementation of the *Ayalolo* BRT. Although the *Ayalolo* is proposed to be implemented on four transit corridors, there are no strategies to increase densities along these corridors to make the BRT economically viable. In fact, the Town and Country Planning Department (TCPD) is not represented on the GAPTE Board. Hence, decisions by the board pay little consideration to land-use issues. This calls for an integration of the transit routes of the *Ayalolo* BRT with the land-use strategy of GAMA to encourage demographic concentration along these routes.

There are also opportunities for policy integration in the waste sector. Organic and plastic wastes account for almost 80% of the waste generated in Accra. The former presents an opportunity for the production of compost fertilizers for agricultural purposes. This can help to abate the importation of fertilizers which is estimated to cost the country about US\$250 million per annum. Plastic wastes are also identified as a major cause of storm drain clogs in Accra which cause flooding and increase the risk of vector-borne diseases. Already, there are several initiatives by local entrepreneurs to convert plastic waste into pavement blocks, designer handbags and diesel etc. Given the necessary policy backing, these small-scale initiatives can be expanded to help alleviate the current plastic waste challenges confronting Accra. In addition, waste recycling could be included in the initiatives supported by Ghana's Youth Employment Program. This could encourage more grassroots innovation in this sector, create employment opportunities for young people, and enhance the quality of the urban environment.

Conclusion

Drawing on the case of Curitiba, this paper has sought to provide insights into how transitions towards sustainable urbanism in the developing world can be achieved with more basic and less sophisticated solutions than in the developed world. Critical success factors in Curitiba's urban transition have been identified and discussed.

Central to these factors are political interest and commitment to sustainability. Curitiba's leadership has shown that cities can be transformed with simple and low-cost ideas if there is a political will, support and capacity to act. Action involved both high-level policy direction from city or state government, investment from the private sector and grassroots support and cooperation from the population at large. Grassroots engagement was critical to enabling the support of socially shared expectations that engender voluntary compliance of citizens with sustainability policies. The balance of effort and involvement between state actors and non-state actors will vary from city to city. Education on sustainability is essential to facilitate these processes. Critically, we point to the need for analysis of the opportunities and barriers to change and the development of policy solutions which build on these, rather than naïve attempts to simply translate technical solutions from one city to another.

Finally, cities must also be conscious of changing dynamics in the local context in order to develop adaptive control mechanisms that keep policies abreast of current developments. Besides, the use and misuse of political power is an ever-present concern in the global south. The case of Curitiba demonstrates how an authoritarian regime can achieve positive results but at some cost to civil liberties. Therefore, how cities in the global south-facing transitions might achieve their sustainability goals without disadvantaging any groups in society might prove an important area for consideration.

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Declarations

Conflict of Interest The authors declare no competing interests.

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