

Emerging outcomes, challenges and opportunities for inclusive Transit-Oriented Development (TOD) in African city: the case of inclusive TOD of Dar es Salaam, Tanzania

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Responding to the rapid urbanization of African cities over the past decades, Transit-oriented development (hereinafter, TOD) has been gradually introduced to some of the African cities as a sustainable urban development strategy. However, the achievement and challenges of African TOD within its distinctive context is little examined since TOD in Africa is still an early stage. This research captures the emerging outcomes of the case of Dar es Salaam, Tanzania from the perspective of inclusive TOD, which is a potential generalised model of TOD in Africa. Results indicate mixed outcomes and some challenges. The population density growth along the transit (BRT) corridor is the positive outcome as well as the improvement of destination accessibility and distance to transit. The progress of mixed-use property development around key terminal stations demonstrates mixed-outcomes; while two BRT terminal station area among three are still vacant, TOD-aligned property development is observed at another BRT terminal. On the other hand, a huge undersupply of affordable housing along the transit (BRT) is a challenge. Hence, developing more affordable housing along the transit (BRT) is a key for further inclusive TOD, which might contribute to contain the urban sprawl as one of the biggest challenges for the city.

Key Words : Transit-oriented development (TOD), Inclusive TOD, Africa, Dar es Salaam

1. Introduction

(1) Background

Transit-oriented development, commonly known as TOD, is one of planning strategy to create sustainable urban development associating mass public transit, walking and/or cycling, as primary transport mode. TOD is usually achieved by higher urban densities around the transit stations, communities and activities within walking distance from mass rapid transit stations, better access to a diverse mix of land uses. In the past few decades, TOD has been gaining popularity in both academia and practice, and currently regarded as one of the major urban development strategies¹. Indeed, a bulk of practice of TOD is implemented in the US, Europe, Asia, and Latin America. Furthermore, African continent is currently focused as a last frontier of TOD. So far, there are a few TOD practices in South Africa, however, the outcome is likely to be challengeable. In this regard, this research focuses on TOD in Dar es Salaam, Tanzania, which is most recent and expected to be a model of

TOD in Africa².

African cities are the fastest urbanised rather than any other part of the world³. The key feature of its urbanisation are: the urban sprawl by the significant scale of low-density urban peripheral with low-income residents⁴, massive informal settlements⁵, highly dependent on public transportation of low-income residents⁶, un-matured local property market and its dual dimensional characteristics (formal and informal market)^{7,8}. Those specific characteristics of African cities illustrate a different TOD context from the conventional US or Europe TOD context. Hence, emerging inclusive TOD, which considers an equitable benefit to different category of population including low-income population, is likely to be relevant to TOD in Africa. More specifically, inclusive TOD in Africa mainly would aim to shape sustainable and compact city through containing urban sprawl at corridor level, with locating affordable housing along the corridor for low-income residents.

The Dar es Salaam TOD was initiated with the operation of Bus-rapid-transit (BRT) as a mass public-transit in 2016⁹. This is the first case to introduce

BRT in East Africa, and has a potential of successful TOD in Africa²⁾. Therefore, this research aims to capture the emerging outcome of Dar es Salaam TOD in line with the inclusive TOD perspective to explore potentials and barriers for further inclusive TOD-oriented urban development. As it is expected for more African cities to adopt TOD in the future, this research may provide a useful insight to further inclusive TOD promotion in Africa cities.

(2) Research aims and research questions

TOD in African cities is still early phase of implementation, and the number of actual implementation cases are little with exception of a few cases in South Africa. Thus, there is relatively little discussion of potentials and barriers of TOD in African cities compared to that of other continents. The case of Dar es Salaam is most recent and might be applicable to other potential candidates of African cities adopting TOD.

This research is built on the concept of inclusive TOD. TOD comprises of Ds elements such as density, diversity, design, destination-accessibility, and distance to transit¹⁰⁾. Additionally, in the past decade, inclusive (equitable) TOD is emerging to mitigate negative effects caused by traditional TOD¹¹⁾¹²⁾. This inclusive TOD adds “affordability” to the TOD components as the key component. The key challenges to advance the inclusive TOD in African cities are providing dense, diverse (mixed-use), affordable property development despite of the dominance of informal property market (limited presence of sophisticated formal property market), and incorporating of low-income residents to TOD through the provision of affordable housing. However, existing researches argue that it is questioned if weak and un-matured formal property market in African cities could provide the dense, diverse (mixed-use), and affordable property development aligned with TOD concept¹³⁾. Thus, it is crucial to assess achieved outcomes with key TOD elements even if it is tentative, and analyze potentials and barriers for further inclusive TOD promotion in Africa. In turn, only little existing literature focused on the outcome of inclusive TOD in Africa. Furthermore, no literature examines the inclusive TOD outcome in Dar es Salaam, thus, this research aims to capture the emerging outcome of Dar es Salaam TOD in line with the inclusive TOD perspective to explore potentials and barriers for further inclusive-TOD-oriented urban development.

Building on the background as previously explained, this research aims to assess the extent to which the TOD in Dar es Salaam has achieved so far, aligning with inclusive TOD concept, and explore potentials and barriers to further inclusive-TOD-oriented urban development. The research questions

are as follows.

- To what extent the inclusive TOD in Dar es Salaam has achieved so far?
- What are the potentials and barriers to promoting inclusive TOD in Dar es Salaam?

This paper consists of seven sections. Following this introduction section, Section 2 describes the literature review to identify the research gap. In Section 3, it explains the methodology taken to answer the research questions. Next, Section 4 illustrates the summary of the case, Dar es Salaam TOD. Then, Section 5 shows the results, and Section 6 proposes some discussion, respectively. Finally, the paper is closed with the conclusion in the Section 7.

2. Literature review

(1) TOD components: D variables

As for the theoretical framework of TOD, the precise elements comprising of TOD seem to vary in the context of each research or practice. However, density, diversity, design, and destination-accessibility, and distance to transit are identified as factors of successful TOD¹⁰⁾¹⁴⁾. They are known as D variables of TOD to measure the built-environment in TOD. D variables are widely-used research framework meaning: density for increasing housing or employment near transit, diversity for increased land-use-mix including housing, retail, public services, and open spaces, design for pedestrian-friendly station design, destination accessibility for how easily one can access to the destinations, and distance to transit for access to transit station by walk, respectively¹⁵⁾. Moreover, D variables have been a central framework of TOD both in conceptual and operational perspective. **Table 1** indicates the key TOD components (D variables) and the examples of its indicators.

Table 1 Key TOD components and examples of indicators

TOD component	Examples of indicators
Density	Household/population density
	Job density
Diversity	Land use mix (entropy index)
	Jobs-housing balance
Design	Intersection/street density
	% 4-way intersections
Destination accessibility	Job accessibility by auto
	Job accessibility by transit
	Distance to downtown
Distance to transit	Distance to nearest transit stop

(2) Emerging inclusive (equitable) TOD: different context between Africa and North America/Europe

TOD would generate a series of positive impacts but

also possible negative impacts such as exclusive benefit concentration on high-income residents, or may induce gentrification in the transit-station area. In this regard, inclusive (equitable) TOD is recently advocated to address equal benefit to low-income residents, and promoting social equity in TOD¹⁶⁾. More precisely, the elements of equitable TOD is made up of mixed-use, affordable units (housing), compact design, proximity to transit-stations, accessibility to opportunity, and so on. While these elements are widely common with D variables, “affordability” is identified as a distinctive factor of inclusive TOD¹²⁾.

The context of affordability in the inclusive TOD concept may differ from the geographical settings. In the Global North, gentrification and potential displacement at station area are regarded as the main concern induced by TOD¹⁶⁾. On the other hand, in African continent context, adding to the gentrification concern in the station area level, shaping sustainable and compact city through containing urban sprawl is likely to be a focus of inclusive TOD at corridor level. In African cities, low-income residents settling the urban peripheral informally may often cause the rapid urban sprawl¹⁷⁾. The urban sprawl induces a series of negative impacts including waste of farmland, huge costs for infrastructure, poor transport connectivity, weaker agglomeration economies, increasing socioeconomic segregation between higher-income residents and low-income residents, energy-use waste, greenhouse gas emissions, and so on¹⁸⁾. Thus, spatial transformation toward compact and inclusive cities is one of the important perspectives for African TOD.

A typical example of inclusive TOD in Africa is Johannesburg, South Africa. The urban form of the city is quite distinctive due to historical racial segregation policy and apartheid; racially divided urban form, especially the concentrated low-income black residents in the urban peripheral¹⁹⁾. Johannesburg TOD was initiated in 2013, and called “Corridors of Freedom” which is a flagship programme by the Mayor in the time. This initiative aims to reshape the city into more accessible regardless of race or socioeconomic condition, and compact city. To shape the compact city, the key thing is locating a set of affordable housing along the corridor, which is well connected with public transport. To facilitate private developers into this affordable housing development, the public authority took rigorous interventions including social infrastructure development, public space development, and land purchase using its own budget, a fast-track planning approval, and permitting higher densification exceptionally. However, as the political commitment has declined in years, the capital expenditure of the city government was less than the originally planned¹⁹⁾. Hence, it is concluded

that Johannesburg inclusive TOD resulted in limited outcomes mainly due to the lack of viability for developers¹¹⁾.

The inclusive TOD in Africa casts a different context from the conventional inclusive TOD in the Global North; shaping sustainable and compact city through containing urban sprawl at corridor level rather than the gentrification concern in the station area level. Furthermore, the inclusive TOD in Africa is likely to be challengeable as seen in South African’s experiences. The key thing is locating affordable housing along the corridor for low-income residents, otherwise majority of them would tend to reside in the expanding urban peripheral.

(3) Rapidly expanding African cities: growing trend of TOD with BRT

African cities are the fastest urbanised rather than any other part of the world³⁾. Its annual growth rate of the urban population between 1995 and 2015 is 3.44%, the highest in the world²⁰⁾. In Tanzania that is focus of this research, the urban population is predicted to surpass the rural population by 2045, and to reach 55.4% of the total population by 2050²¹⁾²²⁾.

The key features of most cities in the Global South including African cities seem to have similarities to a certain extent. Firstly, the urban sprawl of African cities is characterised by the significant scale of low-density urban peripheral with low-income residents²³⁾, in other words, non-formal urbanisation²⁴⁾. Secondly, the majority of these settlements are informal settlements⁵⁾. Third, those urban low-incomes residents are usually highly dependent on public transportation (captive-riders) because of limited access to private cars⁶⁾. Fourth, the local property market is not yet completely formalised, and has dual dimensional characteristics⁷⁾⁸⁾. As the context of African urbanisation might differ from the context of Global North, these specific contexts of African cities are set to be the foundation of this research.

Focusing on Dar es Salaam, which is the case of this research, the rapid urban growth and spatial expansion are a central issue for sustainable urban development of the city. Indeed, Dar es Salaam experienced the higher growth of expansion of build-up area rather than that of population growth between 2002 and 2011²⁵⁾. The main reason for the rapid urban expansion of Dar es Salaam, and suggest that the affordable housing needs is the primary motivation for residents to settle in further urban peripheral. As the homeownership aspiration is so strong in Tanzania, the urban expansion is accelerated by newly coming residents to buy plots of lands and construct their own occupied house with affordable cost²⁶⁾. Thus, in the context of Dar es Salaam TOD, it is crucial to address mitigating this rapid urban expansion

focusing on the provision of affordable housing in line with TOD.

Responding to these rapid urbanisations and expansion, some African cities are introducing the TOD concept as their urban development approach. As a transit mode, the BRT system is widely used in African cities embracing its relative cost-effectiveness compared to rail or metro, and its operation is expanding across the continent with gradually replacing traditional paratransit transport systems⁶⁾²⁷⁾. BRT has also a significant potential to form sustainable urban growth which is aligned with TOD under the right conditions³⁾. The pioneer of TOD in Africa is South Africa. Cape-town is the first case in Africa to adopt the TOD strategic framework²⁸⁾. Johannesburg also adopts TOD to transform its socio-spatial structure by the legacy of Apartheid. The most recent case of African TOD is Dar es Salaam in Tanzania (see **Fig1** and **Fig2**). That has started the operation of BRT in 2016⁹⁾²⁹⁾³⁰⁾. The phase one line of Dar es Salaam BRT is currently under the operation, and the further construction of BRT will continue until the completion of phase 7 in 2040²⁹⁾. Though the pioneers of TOD in Africa are cities in South Africa, the legacy of Apartheid makes the urban form and the context of TOD in South Africa being exception among other African countries. Hence, TOD of Dar es Salaam is recently highlighted as a potential generalised model of TOD in Sub-Saharan Africa. Therefore, studying Dar es Salaam TOD may provide a useful insight for other African cities intending to introduce TOD in their urban development policy.



Fig1: BRT in Dar es Salaam



Fig2: Property development around BRT stations in Dar es Salaam

(4) Property market in Africa: challenge for affordable housing development

As previously explained, the inclusive TOD in Africa may significantly relate to affordable housing provision along the transit corridor. To examine the affordability in TOD, one of the key aspects is the

capacity of local property market since a significant volume of property development designed for TOD, including mixed-use or affordable housing, is usually provided through the property market. With regard to the housing market, the rapid urbanisation due to the growing urban population would lead to the severe housing crisis, especially shortage of affordable housing for low-income and middle-income groups³¹⁾. To tackle this, four main factors should be focused: political leadership to simplify the complex land tenure system, inclusive housing finance including affordable mortgage arrangement, housing micro-finance, and micro-insurance, increased access to affordable housing for the poor and middle-income families with boosting affordable housing supply, and industrializing the housing construction sector to fill the massive housing deficit³¹⁾. The housing market in African countries has generally two-dimensional structure (formal and informal), and latter accounts for a significant volume⁷⁾. For example, the housing market in Ghana comprises 80% of informal housebuilders and 20% of the formal sector⁸⁾³²⁾. This dominance of the informal sector is one of the significant obstacles in affordable housing supply.

As for property development in African TOD, new property development in the Johannesburg TOD (namely “Corridor of Freedom”) is executed in the collaborative manner between municipality and developers to addressing affordable housing needs and reshaping the socially divided city. While the majority of housing development is in peripheral, that is out of TOD area, some small scale of affordable rent housing is developed in line with TOD by emerging local small-scale developers as well as larger scale developers³³⁾. As for the case of Tanzania, affordable housing in Tanzania, currently provided by public sector, is not affordable for low-income residents due to the limited access to financial measures of residents including the mortgage system³⁴⁾. Hence, massive demand for affordable housing may result in constructing houses in urban edge in informal way, moreover, this leads to further urban peripheral expansion of Dar es Salaam²⁶⁾.

By contrast, little is known about commercial property market in Africa, including mixed-use property development. Africa’s commercial property market is the last-frontier, which is driven by growing middle-class due to Africa’s own economic growth, and international property industry searching for new markets³⁵⁾. Real estate investment market in Africa is emerging and still un-matured market with the exception of South Africa, and is driven by foreign capital flow rather than domestic demand. Some Sub-Saharan African real estate markets are entering the investment targets of global real estate investors, especially South Africa, Kenya, Ghana and Nigeria

which demonstrate a high performance on the market indicators³⁶). However, the African property market still lacks the transparency including available market data to track market performance and to make decision-making for investors. The emerge of commercial real estate sector is observed in Kigali (Rwanda) and Addis Ababa (Ethiopia) that are currently under the property development booms with many commercial high-scrappers and high-end residential property. It is revealed that while demand is limited, most of those property developments aims to be speculative investment as a safe asset, thus those properties are often underused³⁷). In addition, those property developments are rarely addressing to the actual property needs/demand including affordable housing.

Although the volume of existing research on the property market in Africa is limited, the existing research illustrates the challenges of still nascent real estate market in Africa: massive affordable housing needs to tackle housing crisis in Africa, and the risk of speculative commercial development.

(5) Empirical research on Dar es Salaam TOD and the research gap

Since the implementation of TOD in Dar es Salaam is recent, the number of existing literatures on Dar es Salaam TOD are relatively limited. The master plan on corridor development along BRT³⁸) indicates the various baseline data on the corridor. The report³⁸) helps author to grasp the conceptual picture of BRT corridor. However, this is not purposed for the assessment of TOD outcome. The urban form along the BRT is also investigated using the framework of urban morphology³⁹). The research³⁹) captures the current physical characteristics of the BRT station surrounding area, also reveals that some new private residential developments (medium and high-rise) and public affordable housing development are already on-going. The research³⁹) does not aim to assess the outcome of TOD, however, partially contribute to assessing design aspect of TOD through describing how each BRT station is located in the existing neighbourhood. Hence, the result of the research³⁹) is quite useful for this research. The analysis on preliminary impact of BRT in Dar es Salaam reveals that BRT brought a large reduction in the travel time and the general satisfaction on the transport, however, brought lower reduction in commute cost⁴⁰). This research⁴⁰) also reveals that people living closer to the BRT tends to use BRT. The research⁴⁰) aims to measure the impact of ‘BRT development’ (not TOD) through indicators like travel time or transport cost, but partially measures the impact of TOD through evaluating destination accessibility and distance to transit. BRT is also evaluated from the viewpoints of equality on the accessibility to job

across the different socio-economic groups residing in BRT stations area⁴¹). The result shows BRT network demonstrates well accessibility to BRT stations for a large part of residence including low-income group, and leads to better accessibility to formal jobs. However, BRT demonstrates unequitable distribution of job accessibility across different socio-economic groups. Furthermore, BRT is expected to promote more equitable job accessibility across different social-economic groups due to the expanding BRT network in near future. Again, the research⁴¹) also does not aim to evaluate Dar es Salaam TOD, however, some of the result are relevant with this research in terms of destination accessibility and distance to transit that are components of TOD. Hence, building on these existing research findings, this research aims to capture the outcome of inclusive TOD in Dar es Salaam. **Table 2** shows the relationship between inclusive TOD components and the research gap.

Table2: The relationship between inclusive TOD components and the research gap

Inclusive TOD component	Existing literature
Density	No existing literature
Diversity	No existing literature
Design	An existing literature ³⁹)
Destination accessibility	Some existing literature ⁴⁰⁾⁴¹)
Distance to transit	Some existing literature ⁴⁰⁾⁴¹)
Affordability	No existing literature

As a result of the literature review, no literatures study the overall preliminary outcome of inclusive TOD in Dar es Salaam that has a potential to be a model TOD in the African continent. Especially, the literature focusing on density, diversity, and affordability perspective does not exist. To fill the research gap, this research aims to capture the tentative outcomes of the inclusive TOD in Dar es Salaam with examining key components of inclusive TOD (density, diversity, and affordability). This research also aims to capture the degree of achievement in inclusive TOD in Dar es Salaam using a single case study method to explore the potentials and barriers of Dar es Salaam TOD.

3. Methodology

(1) Research method

This research employs the mixed method (quantitative and qualitative) with a single case study approach. With consideration to the first research question for the assessment of the Dar es Salaam inclusive TOD, density, diversity, and affordability achievements are focused since other factors of the inclusive TOD are already studied in the existing literature to some extent. To capture the emerging outcomes of density, diversity, and affordability, the mixed-method is employed with a variety of data including statistical data, satellite-image data, academic literature, market reports, and media articles. One of challenges in the research in Global South city is data-accessibility. In the context of this research, while the data regarding several TOD components are easily obtained, it is difficult to obtain some data on some other TOD components. In this case, it is necessary for researcher to set a proxy of the indicators, or process/combine the original data into new data to answer the research questions. Moreover, the acceptable research method highly depends on the available data. When the data availability is somehow limited, mixed-method could overcome this limitation to some extent. One of the mixed-method design is combining the qualitative method and quantitative method parallelly. In this case, the strength of the mixed method is to foster a triangulation or greater validity of findings by combining quantitative and qualitative data in a mutually corroborated manner⁴²⁾.

This research also employs a case study approach. The case study approach is suitable for analysing the complex phenomenon that has a particularity in that case⁴²⁾. Moreover, the case study is usually employed in-depth analysis within a single phenomenon, or within a clearly-bounded phenomenon. TOD is an urban development policy/strategy at each city-level, thus has a clear boundary among cities. TOD is also complex and local context-specific concept⁴³⁾, and is multi-factored phenomenon comprising of D variables. TOD in African cities are still a few practices and has a high particularity in each case. Thus, the research adopts the case study method, which has a familiarity with the detailed study of a single complex phenomenon. **Fig 3** indicates the research flow of this research. First, the emerging achievements on key inclusive TOD components (density, diversity, and affordability) are captured through indicators set in the latter section. Following the review of other TOD components outcome through existing literature, the overall outcome of Dar es Salaam inclusive TOD is evaluated. Finally, based on the evaluation, the potential and/or barriers for further promotion of inclusive TOD is explored.

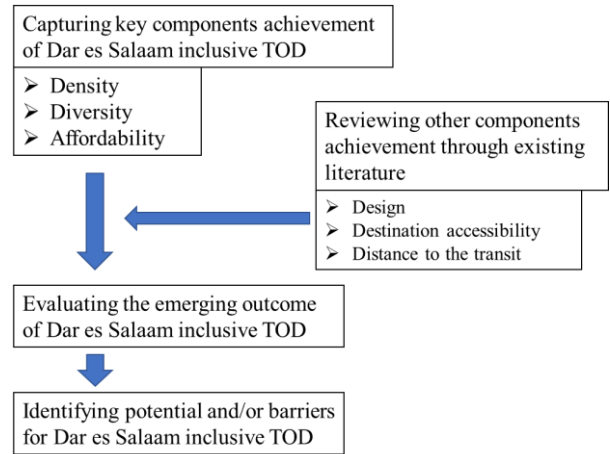


Fig3: Research flow

(2) Indicators and data for density, diversity, and affordability

Firstly, as for density, it is argued that population density is one of density indicators¹⁰⁾¹⁴⁾. Since the Tanzanian Government does not publish the official population density data at city or more detailed-area level, this research tries to use open data including GIS data and satellite-image data. The population density data is derived from WorldPop⁴⁴⁾ that is an open access spatial demographic datasets. WorldPop⁴⁴⁾ provides 100m resolution count data for each year, therefore, it is understood that the data equals the population density (population per 100m square). Since BRT in Dar es Salaam has started its operation in 2016, the data for 2016 and most recent data for 2019 are compared. The data is processed through an open geospatial data analytical platform, Google Earth Engine⁴⁵⁾ to confirm the change of population density along BRT.

Secondly, to measure diversity, the land-use diversity indicator is employed. The land-use diversity indicator is an entropy concept that is comparable among different TOD cases, and thus widely used in TOD literature⁴⁶⁾. The higher the land-use diversity indicator represents the higher degree of land-use diversity. The data is derived from urban morphology map along BRT³⁹⁾. The data has eight land uses, however, five among eight categories are some kinds of housings. Hence, the land-use is recalculated into four land-use aggregating four housing land-use into one category, and the area of each land-use is calculated using open GIS software. Based on the example method⁴⁷⁾⁴⁸⁾, the land-use diversity indicator is defined as follows.

$$\text{Land use indicator} = \frac{A}{\ln(N)} \quad (1a)$$

$$\text{where } A = \sum_{n=1}^4 \left(\frac{b_n}{a} \times \ln \frac{b_n}{a} \right)$$

a =total area of land for all land uses

b_1 =area in business uses

b_2 =area in institutional uses

b_3 =area in industrial uses

b_4 =area in housing uses (the aggregated area of area in formal high residential uses, area in informal high-density residential uses, area in formal low-density residential uses, and area in informal low-density residential uses)

N =number of land uses

The land-use diversity indicator represents the general degree of land-use diversity at corridor-level (or broader station area), however, the indicator cannot capture the land-use diversity at site-level. Thus, as supplementary, the achievement of land-use diversity at key station terminal are observed by satellite-image data. And, the recent property developments around key terminal stations are also confirmed via market reports and online media articles.

Thirdly, to evaluate affordability in Dar es Salaam TOD, several kinds of information and data are combined. It is identified that promoting affordable housing supply near transit is one of the principles to build inclusive TOD⁵⁰. It is also noted that most three important elements for housing affordability are housing price (house price/rental price), housing finance (interest rates/mortgage availability), and adequate housing supply (availability of affordable rented accommodation/home ownership)⁵¹. Therefore, following the review of property market structure, price, finance, and supply of affordable housing in Tanzania are explored through academic literature and market report. Then, the location of affordable housing along BRT is mapped using the information from the annual reports of public house builders⁵² including National Housing Corporation (NHC), which is main supplier of affordable housing in Tanzania. To summarise, **Table 3** indicates the assessment framework for key inclusive TOD components in Dar es Salaam.

Table 3: Assessment framework for key inclusive TOD components in Dar es Salaam

Inclusive TOD components	Indicators	Data
Density	Change of population density along BRT	100m resolution population data from WorldPop ⁴⁴ between 2016 (BRT operation start) and 2019 (current)
Diversity	· Land use diversity indicator	Morphology map ³⁹)
	· Key terminal area development progress	Satellite image ⁴⁹ , market reports, and media articles
Affordability	· Property market structure focused on affordable housing	Market reports, existing academic literature, and annual report of public housing developers ⁵²)
	· Property price, financial accessibility, and supply for affordable housing	
	· Location and numbers of affordable housing along BRT	

4. Case study project

Dar es Salaam is the largest commercial city of Tanzania with the approximately 5.8 million population, located along the eastern coast of the United Republic of Tanzania in East Africa. Dar es Salaam also plays a role of gateway for six landlocked countries in East Africa, making the city an important trade-hub in the region. The city is one of the fastest-growing cities in the world, indeed, the city has experienced 5% annual population growth rates over the past three decades²⁹). The population of Dar es Salaam recorded 5.7 million people in 2017, and expected to grow to 13 million people in 2032³⁸). This rapid population increase of Dar es Salaam is ranked among the top three of the fastest growing cities in whole Africa, and the city is expected to be one of mega-city globally in near future⁵³).

The unprecedented urbanisation in Dar es Salaam is associating with a large scale of urban sprawl in the form of informal settlement. The informal-style land development is the dominant form of urban land transactions in Dar es Salaam, and has led to this rapid expansion of city's built-up areas in recent decades⁵⁴). In fact, the urban area has rapidly increased; 255 km² in 1990, 382 km² in 2000, and 532 km² in

2014¹⁷). Also, the city's urbanisation is characterized by lower population density and informal settlement as the dominant form of residential construction in the fringe areas. Those informal settlements often outpace infrastructure development in the urban peripheral. The rapid growth has brought positive economic impacts, however more negative impacts, including a bulk of housing demand, shortage of public services, deterioration in living standards, land speculation, absence of waste management, and overcrowding⁵⁵).

Worsening traffic congestion is also a big challenge for the city. Indeed, the average people's commute speed in 2016 was 8.5 km per hour, and thus has a risk of threatening further economic growth of the city⁴⁰). Traditional public transport including daladala (minibuses), bajajs (rickshaws), bodabodas (motorcycles), and so on remains problematic; traffic delays, unpredicted waiting time, traffic congestion and frequency traffic accidents⁵⁶). In this regard, in 2002, the Dar es Salaam City Council decided to introduce a city-wide BRT system to tackle urban traffic congestion. The project is deeply collaborated with the World Bank in both financially and technically. Dar es Salaam Transit Agency (DART), the implementing body, was established in 2007, and in 2008 a credit arrangement of USD 290 million from the World Bank was prepared⁴⁰). The BRT system is comprised of 6 phases (see **Table 4**), and phase one already began full operations on 2016⁵⁶), which covers 20.9 km of trunk lanes, 57.9 km of feeder routes, 5 terminals, 27 stations, 7 feeder stations, 3 connector stations, and 2 bus depots⁴⁰). While phase one extends along Morogoro Road from the Central Business District (CBD) towards the west part of the city (Kimara), with two branches on Kawawa road from Morocco to Magomeni and along Msimbazi road up to Gerezani Kota, phase two extends towards the southern part of the city connecting with Phase one at the CBD area²⁹). Furthermore, phase three extends towards the south-west of the city connecting from CBD and airport. **Fig 4** indicates the route of BRT phases one, two, and three. The UDART (Usafiri Dar es Salaam Rapid Transit) is responsible of BRT operation under the surveillance of the SUMATRA (Surface and marine Transport regulatory authority). In 2015, following the sign of a contract with UDART, the Dar Rapid Transit Agency (DART), which is a special formed company, is providing transportation services of the BRT system⁵⁶).

Table 4: Description of all BRT phases

BRT Phases	BRT Road Corridor	Length (Km)
Phase 1 (already in operation and focus of this dissertation)	Morogoro -Kawawa North- Msimbazi- Kivukoni	20.9
Phase 2 (under construction)	Kilwa-Kawawa South	19.3
Phase 3 (under construction)	Uhuru Street-Nyerere- Bibititi-Azikiwe Street	23.6
Phase 4 (planned)	Bagamoyo-Sam Nujoma	16.1
Phase 5 (planned)	Mandela Road	22.8
Phase 6 (planned)	Bagamoyo Road	27.6

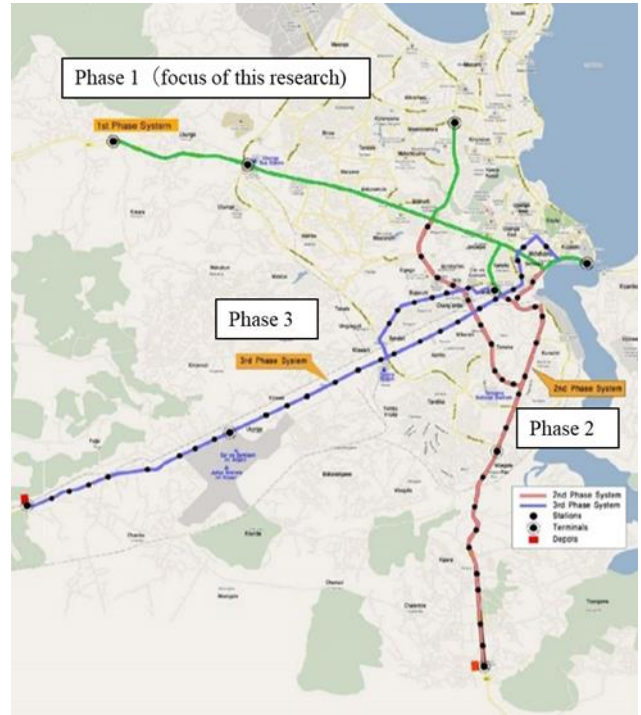


Fig4: Route of BRT phase one, two, and three

BRT helps to solve the transportation issues like traffic congestion, but also can be a catalyst in transforming a city. BRT does not only increase the mobility of people as well as boosting employment opportunities, essential services, and leisure opportunities, thus contributes to living conditions up-grade. Areas alongside BRT phase one are categorised into five areas from city centre to sub-urban³⁹) (see **Fig 5**), and its land-use is likely to be still monocentric rather than fully mixed-used. Hence, property development along BRT may unlock housing opportunities, increase productivity, attract business and investment. Also, urban sprawl can be effectively contained through a number of policies aligning with TOD⁵⁷).

In this connection, in 2018, Corridor Development Strategy (CDS)³⁸) was set to help the planning authority to implement a proper development along the BRT Phase one corridor in line with Transit-Orientated-Development (TOD) principles. In CDS, it is analysed that ridership levels for stations along the BRT Phase one vary; some terminal stations are overcrowding while other stations remain low passenger

flows. Most of BRT stations area remains unchanged that is dominantly informal development, thus, cannot maximize the economic-potential due to the proximity of BRT³⁸⁾. Hence, CDS aims to maximise the benefits of the BRT Phase one corridor development. More precisely, proposed strategy of CDG are; formalisation of informal areas trough providing ownership and tenancy initiatives, a second city initiative in Ubungo, promoting compact city by minimum-density-targets encouraging developers to adapt higher density, Kimara as commercial and distribution hub, Magomeni as a mixed-use centre with new Msimbazi Park, the gateway function of Morocco and Gerezani to attract new commercial development, boosting more commercial and tourism activity in the city centre and its waterfront³⁸⁾. CDS also sets priority projects areas to encourage TOD-based-development around the selected station; Ubungo, Kivukoni and the waterfront, Morogoro Road in the Downtown, Gerezani/Keriakoo, Fire/Jangwani, Magomeni, Morocco/Kinondoni, and Kimara³⁸⁾. Among them, the most important three projects are Ubungo as a second city-centre offering a range of facilities and land-uses, and both Gerezani and Morocco as commercial hubs owing to promoting high-density and quality mixed-use hub (see **Fig 6**). Finally, CDS sets affordable housing strategy responding the needs of 76,000 affordable homes in the BRT Phase one corridor; while private developers are responsible for the provision of new affordable housing with the benefits of land value capture, a development corporation/non-profit housing companies are engaging the replacement/renewal of existing poorest homes to own or rent³⁸⁾.

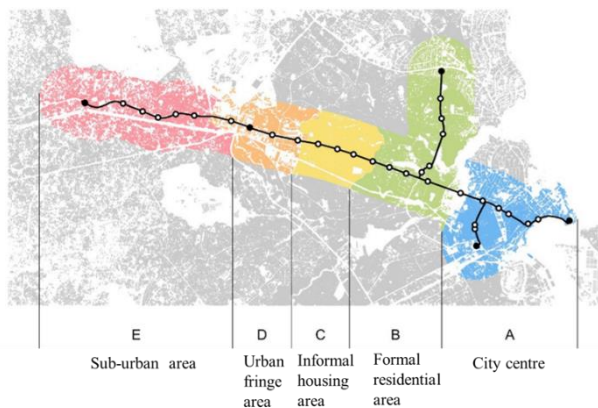


Fig 5: Categorisation of land-use alongside BRT phase one

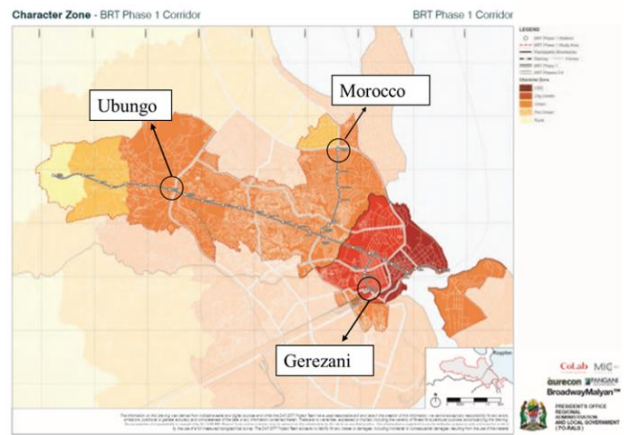


Fig 6: Locations of key TOD-based development

5. Results

(1) Density

As the previous studies define BRT-affected area as both sides' area within 500m of BRT⁵⁸⁾⁵⁹⁾, the population density in both sides' area within 500m of BRT from 2016 to 2019 is examined. Additionally, the population density in both sides' area within 1,000m of BRT and 1,500m of BRT is also measured to confirm the difference between the affected area (500m) and further widen-area (see Appendix).

Fig 7 and **Fig 8** indicate population density within 500m area along BRT in 2016, and in 2019, respectively. It is observed that compared to 2016 (when BRT initiated its operation), the population density of central area including the city-centre and formal housing area has been increased in 2019. However, the population density of urban-fringe and the sub-urban area is unlikely to be impacted by BRT development. It is also observed that the population density within 500m of BRT is higher than those of 1,000m and 1,500m of BRT, and the degree of population density increase is likely to be indifferent according to 500m, 1,000m, or 1,500m area (see **Fig 9**).

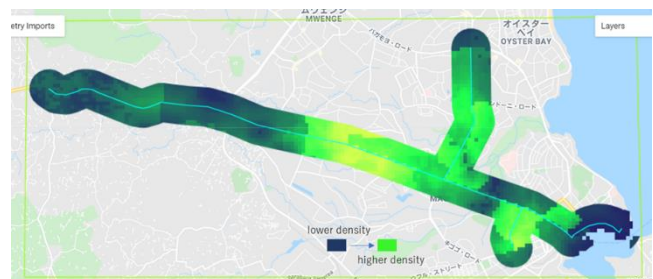


Fig 7: Population density along BRT in 2016

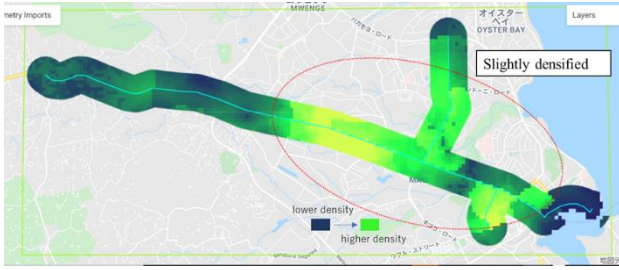


Fig 8: Population density along BRT in 2019

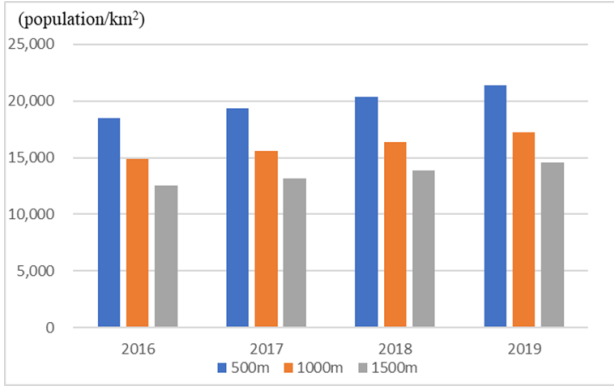


Fig 9: Population density along BRT (within 500m, 1,000m, and 1,500m of BRT)

(2) Diversity

a) Land-use diversity indicator along BRT corridor

While Fig 10 represents the land-use diversity indicator for the whole corridor (all zone), Fig 11 indicates the land-use diversity indicator for each zone. The indicator for the whole corridor is 0.68, thus medium-level of diversity. However, the land-use diversity indicator for each zone shows a variety of numbers according to the zone; 0.68 for zone A, 0.22 for zone B, 0 for zone C, 0.96 for zone D, and 0 for zone E. The area including city-centre (zone A) and key terminal areas (zone D) indicates a higher number of indicators, on the other hand, other three areas that are dominantly residential area demonstrate a much lower number of indicators (zone B, C, and E).

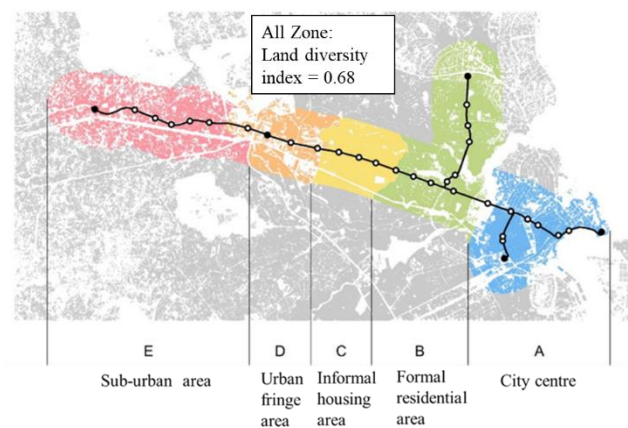


Fig 10: Land-use diversity for all zone

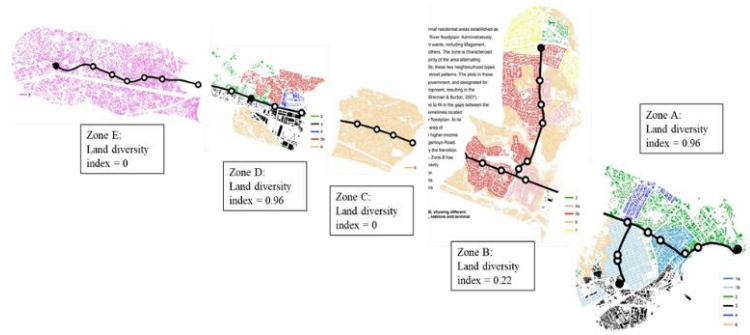


Fig 11: Land-use diversity for each zone

b) Key terminal station area's development progress

In this section, the property development status of the selected terminal station areas, which are Gerezani, Ubungu, and Morocco, is described. In Gerezani, the mixed-use high-density development alongside the BRT station is planned (see Fig 12), however, at the time of writing this research, it is observed that while the BRT terminal construction work is likely to be commenced, none of property development has yet occurred (see Fig 13). Furthermore, in Ubungu, with the relocation of original bus-terminal to feeder route, mixed-use development is planned (see Fig 14). Nonetheless, it is observed that none of property development has yet occurred at this moment (see Fig 15). As a matter of fact, a Chinese developer has a plan of 4-storey commercial development called “East Africa Commercial & Logistics Centre”, which is regarded as a key project of Chinese enterprises to invest in Africa under the One-Belt One-Road initiative⁶⁰⁾. Table 5 indicates the details of property development plan of East Africa Commercial & Logistics Centre. Regardless of the expected completion date of the first half of 2019, no construction work has been started in the site at this moment. Finally, in Morocco, the mixed-use development has been completed (see Fig 16, 17, and 18). This development is implemented by National housing corporation⁶¹⁾, which is a public entity and also one of the dominant developers in Tanzania. This development is the mixed-use of office, residential, commercial, and hotel, which is highly aligned with TOD concept. To summarise, the property development status of the selected terminal station areas demonstrates the contradicting results; while no development outcome is observed in Gerezani and Ubungo at this moment, TOD aligning mixed-use development has been completed in Morocco.

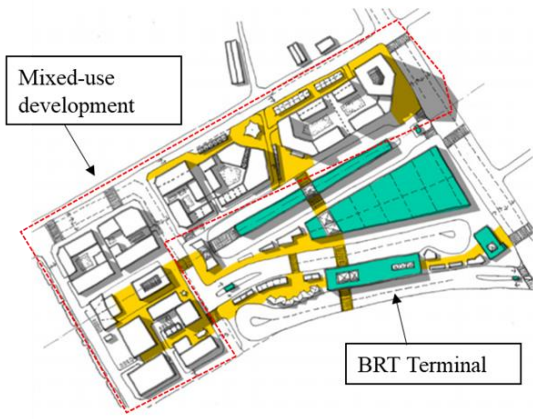


Fig 12: Hypothetical development layout for Gerezani station area

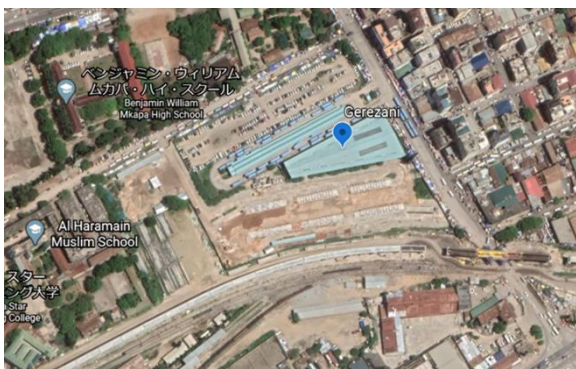


Fig 13: Development status for Gerezani station area

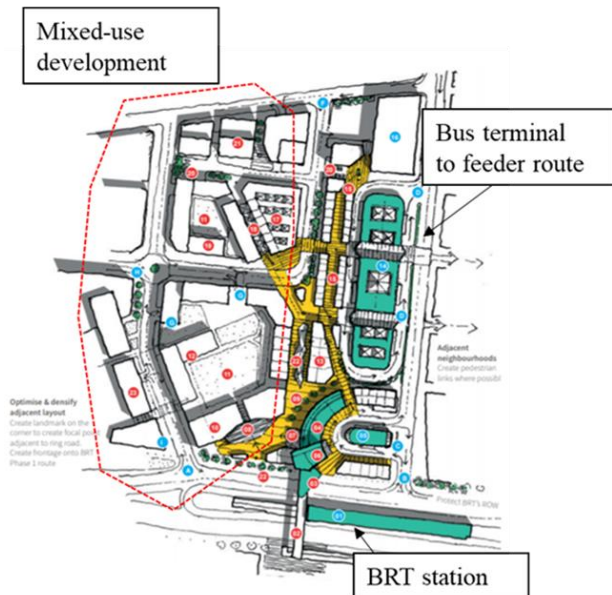


Fig 14: Hypothetical development layout for Ubungo station area



Fig 15: Development status for Ubungo station area

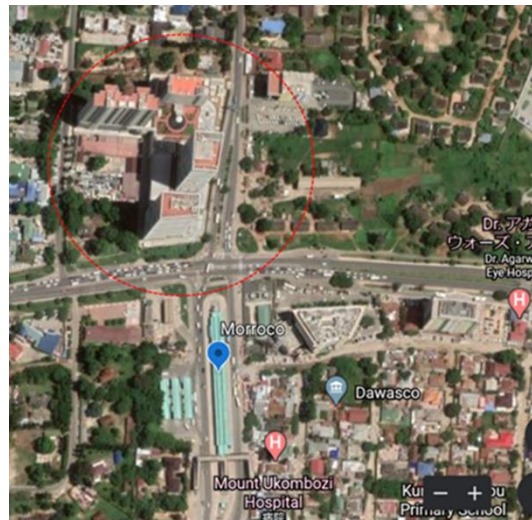


Fig 16: Development status for Morocco station area



Fig 17: Office development in Morocco station area



Fig 18: Residential development in Morocco station area

Table 5: The mixed-used property in Morocco station area

Property name	Morocco Square
Total area	110,000 m ² (Gross Floor Area).
Areas of each use	1. Office Space – 47,793 m ² 2. Residential – 24,924 m ² 3. Commercial space – 28,827 m ² 4. Hotel – 8,456 m ²
Floor usage	1. Office Space: Tower 1 - 20 storey, Tower 2 - 17 storey 2. Residential: 100 apartments, 3 & 4 bedrooms, 22 storey 3. Commercial Space: Supermarket & retails, Cinema, Conference, Coffee shops, Food Courts, Kids Zone 4. Hotel: 13 storey, 81 rooms

(3) Affordability

a) Property market structure focused on affordable housing

A majority of housing in Dar es Salaam is informal with only 11% connection to water supply and public amenities, however, the housing ownership rate in Dar es Salaam is relatively high since informal housing is self-funded and built by owner-occupiers over five or ten years⁵⁷). On the other hand, rented housing in Dar es Salaam is rather formal housing than informal housing, located in more middle-income or high-income neighbourhoods. Social housing is small; only 4% of total housing stock, and thus a shortage of affordable housing is estimated to be more than 3 million units over the country³⁴). Geographically speaking, whilst poorer residents tend to reside in far from city-centre, richer residents are concentrated in the centre of the city and its-north with the highest property value. The housing deficit is the biggest problem for the property market in the country. The dominant housing developer is National Housing Corporation (NHC) that is a public entity under the Ministry of Lands, Housing and Settlements Development. NHC was established in 1962 with the aim to deliver affordable housing as a primary objective, and currently aims to address the housing deficits in urban areas³⁴). NHC is mandated to do property development for both rental and sale for mainly residential, but also business, industrial or other purposes. As there is no private developer engaging in housing development for the low or middle-class, NHC is also encouraged to create more housing for those economic classes. Another emerging developer is the Watumishi Housing Company (WHC), which is a Real Estate Investment Trust (REIT) under PPP joint venture scheme between NHC and six pension funds. Their housing development is also formal affordable housing targeting government employees with different types of housing from single-family homes, to apartment blocks. WHC engaged in apartment-type housing development at Magomeni (see **Fig 19**) at the Morogoro road alongside a BRT station. To summarise, the affordable housing market structure is highly oligopoly with two housing providers that are

some kinds of public entities.

**Fig 19:** Residential development by WHC alongside the BRT

b) Property price, financial accessibility, and supply for affordable housing

A limited supply of affordable housing, and high-interest rates of the mortgage is a big challenge for affordable housing sector⁶²). As explained, in Dar es Salaam, a large proportion of housing is informal and unplanned, hence the formal housing sector is still marginal. As for formal rental housing sector, while the lowest market rent for new housing is around US\$300 per month, the majority (72%) can pay at least US\$66 per month³⁸). Thus, this implies that the majority of low-income residents cannot afford to pay the market rent. In turn, as for housing purchase sector, accessibility to the mortgage is a key for housing affordability. However, the limited access to mortgages allows only high-income residents to purchase formal housing³⁴). In fact, most loans for home purchase remain expensive, indeed, high-interest rates (19 percent in 2019), thus this could negatively affect affordability⁶²). The financial accessibility to the housing mortgage for urban poor is quite limited due to the short loan periods, high-interest rates, financial collateral conditions, and so on³⁴). Thus, affordable housing in the formal market is not reachable for the vast-majority of the low-income residents.

Undersupply of affordable housing is another challenge. It is estimated that, over 15 years, 39,000 new affordable homes and 37,000 replacement of existing homes to affordable housing are needed to be built in Dar es Salaam³⁸). However, the supply of affordable housing constructed by two state-owned developers in the past five years are up to 689 units; 208 units by NHC⁵²) and 481 units by WHC⁶³). Hence, the huge gap between demand and supply of affordable housing is likely to exist due to the low-viability of affordable housing development. In this regard, it is proposed that land value capture mechanism could be a potential financial source that is estimated to be around \$4.4 billion and provide 76,000 affordable homes in the BRT Phase one corridor³⁸). To summarise, the more affordable housing development as well as improving housing financial accessibility are key to promote the inclusive TOD of the city, which may lead to containing further informal housing development in the urban peripheral.

c) Location and number of affordable housing along BRT

Fig 20 indicates the location and number of units of affordable housing in Dar es Salaam, and **Table 6** indicates the details of affordable housing in Dar es Salaam. Firstly, the total number of affordable housing is 689 units (208 units constructed by NHS, and 481 units by WHC) at this moment, and this number is far below the estimated affordable housing demand (39,000 new affordable homes and 37,000 replacement of existing homes to affordable housing in 15 years). Secondly, it is observed that affordable housing located in BRT influenced area is only 88 units at Magomeni. The rest of affordable housing is not synthesised with BRT development in terms of TOD aligned location.

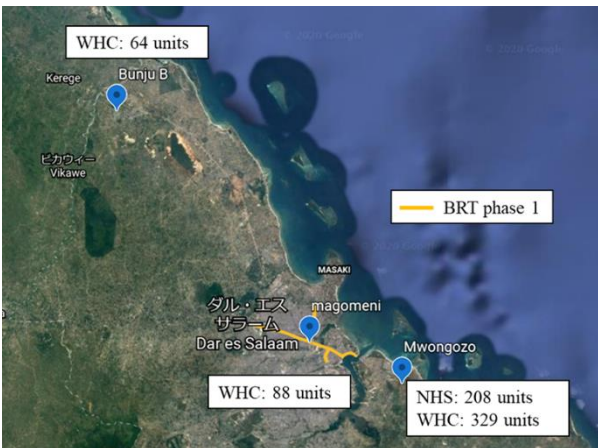


Fig 20: Location and number of units of affordable housing

Table 6: Details of affordable housing in Dar es Salaam

Housing provider	Property name	Number of units	Location	Located within BRT affected area
National Housing Corporation (NHC)	Mwongozo affordable housing project	208 units	Gezaulole in Kigamboni	×
Watumishi Housing Company (WHC)	Bunju-Mabwepande Housing Project	64 landed houses constructed	Bunju B off Bagamoyo road along Mabwepande road about 3 km from the main road	×
	Kigamboni-Gezaulole Housing Project	329 landed and apartment houses	Mwongozo area in Kigamboni District	×
	Watumishi Magomeni Flats	88 apartments	Usalama in Magomeni off Morogoro Road	○

(4) Other TOD aspects

a) Design

Design in TOD signifies how street networks' physical characteristics is pedestrian-friendly environments, which are different from auto-oriented environments¹⁰⁾. All BRT station types are categorised

into 8 types of stations and two types of terminal according to surrounding neighbourhood types, station design, and station functions³⁹⁾. The existing research³⁹⁾ reveals that while some stations area is designed for pedestrian friendly with proximity between station and sidewalk, a large building setback that is regulatory decisive by Tanzanian law undermines the pedestrian-friendly station proximity environment. It is also pointed out that since BRT was introduced into well-established major roads, the pedestrian may feel unsafe when to cross the BRT station area. Hence, the elevated-crossing, which is introduced in some terminal stations including Morocco, Ubungo, and Kimara, might be a solution regardless of time-consuming for pedestrians.

b) Destination accessibility

While destination accessibility means how easy one can access to destination such as working place¹⁰⁾. Destination accessibility is usually measured by the distance to central building district, or the number of jobs or other attractions accessible within a certain travel time¹⁰⁾. The accessibility to job location of the full phase of BRT system (not only BRT phase one) is investigated in the existing literature³⁴⁾. Within a travel time of 30 minutes, only some part of CBD has high accessibility to job locations. However, within a travel time of 45 and 60 minutes by BRT, it is observed that accessibility to jobs improves dramatically with widely spread from CBD area. In terms of historical change of destination accessibility, the change of the average commute cost and time to working place between 2016 (BRT start) and 2019 (current) for residents living within 2 km from BRT Phase one, is measured⁴⁰⁾. It is revealed that while the cost to main jobs has reduced from 1,578 (Tanzanian Shelling) in 2016 to 1,148 (Tanzanian Shelling) in 2019, the time to main jobs has also reduced from 44.98 (min) in 2016 to 30.70 (min) in 2019, respectively (see **Fig 21**).

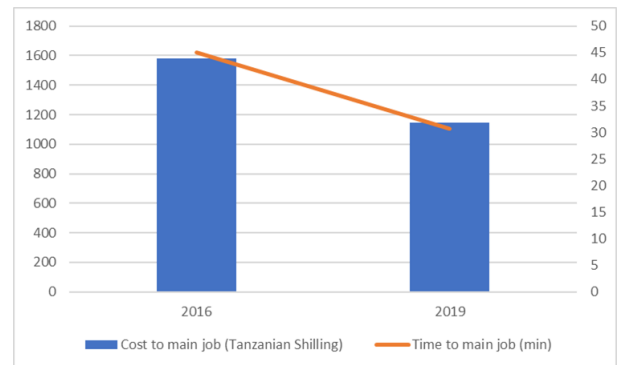


Fig 21: Average commute cost and time to work for people living within 2km from BRT phase one

c) Distance to transit

Distance to transit means the shortest-route from residence or workplace to the nearest transit stations¹⁰⁾. The walking-time to the nearest BRT stations for the full phase of BRT system (not only BRT phase one) is also investigated in the existing literature⁴¹⁾. A large part of the area is covered by 20 minutes' walk to the BRT stations especially in close area to CBD. More specifically, while 31% of the city area is located within 20 minutes' walk to the BRT stations, 60% of population is located within 20 minutes' walk to the BRT stations⁴¹⁾.

6. Discussion

In this section, the inclusive TOD achievement so far is discussed and evaluated as high, moderate, or low according to each component, with a comparison of other TOD cases using the evidence shown in the existing literature where appropriate. Firstly, the population density along BRT corridor as the indicator of “density” indicates the growing trend since the BRT operation, and this result is identical with the case of BRT in Bogota, Colombia⁵⁸⁾, which is an example of BRT-based TOD in the Global South. The population density of BRT influenced area is much higher than the city-wide average density, and also demonstrates approximately 15.82% increase from 18,459 habitant/km² to 21,380 habitant/km². This growth-rate is higher than the successful BRT case of Bogota that is approximately 9.6% (see **Fig 22**). In turn, as shown in **Fig 7**, the population density growth is not spatially unequitable but seems to concentrate on the city-centre (zone A), formal residential area (zone B), and informal housing area (zone C). TOD does not seem to fully impact on the whole-corridor, especially on the urban-fringe (zone D) and sub-urban area (zone E). Therefore, further housing development including affordable housing within zone D and E would bring TOD impacts across the BRT corridor more equitably. To summarise, the results show relatively positive density growth, however, the growth pattern is spatially uneven. Hence, the density aspect is likely to be evaluated as moderate.

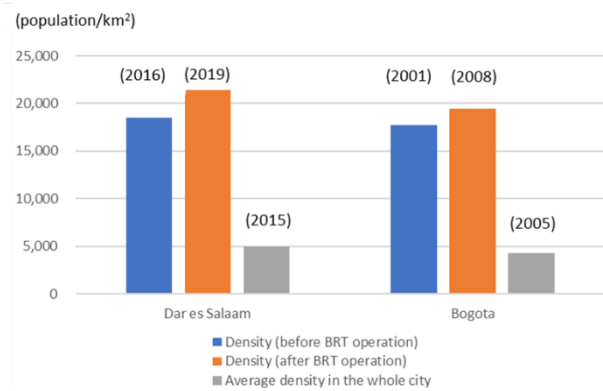


Fig 22: Population density within 500m of BRT in Dar es Salaam, Tanzania and Bogota, Colombia

Secondly, the land-use diversity index as the indicator of “diversity” demonstrates the moderate-level of diversity (0.68) over the corridor, and also a variety of diversity from 0 to 0.96 according to the land-use pattern of each area. **Fig 23** indicates the comparison of average land-use index of other TOD cases, which describes that the corridor level land-use diversity is the almost as same level as others such as 0.67 of Seoul, Korea⁶⁴⁾, 0.77 of Jakarta, Indonesia⁶⁵⁾, and 0.63 of Arnhem and Nijmegen City Region in the Netherlands⁶⁶⁾. However, the degree of diversity is highly varied according to area (from 0 in zone C and E to 0.96 of zone A and D), thus it is desirable that the measures to encourage land-use diversity be implemented especially in zone C and E. The example is the project to make Kimara in zone E as distribution-hub servicing agricultural wholesale market trade³⁸⁾. Furthermore, the diversity of key terminal stations demonstrates the contradicting result: no development in Gerezani and Ubungo at this moment, and TOD aligned mixed-use development in Morocco. In Morocco, the mixed-use development was led by a state-owned developer. In turn, the commercial development in Ubungo is planned by a Chinese developer, however, the development is behind the schedule, and no information about the update of development schedule is found. In Gerezani, it is likely that no developer commits the mixed-use development since no information about the property development in Gerezani is publicly opened. These results suggest that mixed-use development is a challenge for both local and international private developers due to the risk and complexity of mixed-use development. Hence, some involvement of public developers is likely to be a key for mixed-use development as the example of Morocco shows. To sum-up, the land-use diversity level is medium at corridor-level, and demonstrates the mixed result in both area/station-level and site-level. Therefore, the diversity is evaluated as medium-low.

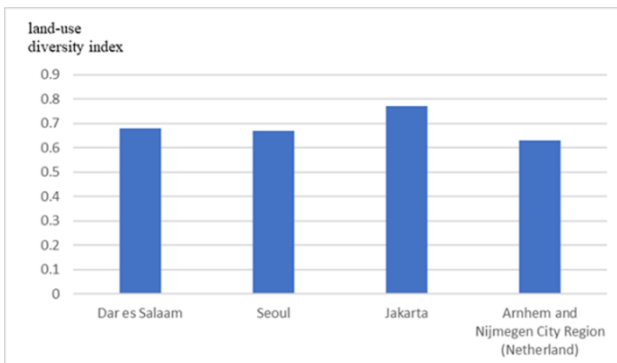


Fig 23: Comparison of average land-use index across four cities

Thirdly, affordability is likely to be low considering the evidence found in this research; only a few public developers engaging in affordable housing development, unaffordability of formal housing for low-income residents, very limited access to mortgage, huge undersupply of affordable housing, and un-synthesized location of affordable housing with BRT. These challenges have a commonality with the case of inclusive TOD in Johannesburg to a large extent¹¹⁾. Un-viability is one of the key features of affordable housing development, thus, some kinds of public interventions seem indispensable. To fill this financial gap for developers, it is suggested that land-value capture approach could generate a potential financial source of 4.4 billion US dollars equalling for providing 76,000 affordable homes in the BRT Phase one corridor³⁸⁾. The effective use of land-value capture would also encourage more private developers to participate in the affordable housing market, and to boost the number of affordable housing supply. However, it is pointed out that the current laws and planning practices do not make the application of land-value capture possible and enforceable⁶⁷⁾. Hence, the systematic review and improvement of laws and planning practices are likely to be required. Additionally, it is also important to facilitate more developers to enter the affordable housing market. In this regard, the case of Johannesburg, South Africa provides a useful insight. In Johannesburg, the municipality facilitates the collaboration with emerging local small developers to supply more affordable rental housing along the corridor with instruments such as Special Development Zones that enable fast-track development, while large developers tend to focus on the well-established housing market outside the corridor⁷⁵⁾. Thus, effective collaboration with small local developers might be considered in Dar es Salaam. Furthermore, the easier access to mortgage should be further encouraged though the mortgage market in Tanzania has improved recently. Tanzania's mortgage market demonstrates the growing-trend; 18.76 percent increase in a number of mortgages between

2017 and 2018⁶²⁾. However, the total volume of mortgage market is still marginal as 0.34 percent in GDP, and 15 to 19 percent interest rate is also a burden for low-income population⁶²⁾. Finally, the location of affordable housing should be strategically selected and be harmonised with BRT development.

Fourth, the existing research investigates design, destination accessibility, and distance to transit aspects of Dar es Salaam TOD. In design, some stations are designed in a pedestrian-friendly manner while a large building setback could hamper the proximity between stations and pedestrians³⁹⁾. Therefore, design is likely to be evaluated as moderate. Additionally, destination accessibility improves thanks to the BRT. Full development of BRT network contributes to better access to the job for a wide-spread area of the city⁴¹⁾. Also, both average commute cost and time to work has decreased due to the BRT phase one development⁴⁰⁾. Hence, destination accessibility could be evaluated as high. Lastly, it is estimated that a large-part of the area is covered by 20 minutes' walk to the full-phased BRT stations⁴¹⁾. Thus, distance to transit is also judged as high. It should be also noted that improvement of destination accessibility and distance to transit is estimated in the condition of full phase development of BRT. Therefore, further BRT development in a planned schedule is important.

The overall evaluation of Dar es Salaam inclusive TOD is summarised in **Table 7**. It is concluded that while most components demonstrate high or moderate, diversity and affordability are key challenges for Dar es Salaam inclusive TOD. In light of the first research questions (the degree of TOD achievement), while some remarkable achievements are observed such as destination accessibility or distance to transit, the journey for ideal inclusive TOD seems to be the still "middle point" since four criteria for inclusive TOD among six are evaluated as low or medium. However, considering that only four years have passed since the BRT initiation, there is likely to be much room for further improvement. Speaking about the second research question (potential and barriers for successful inclusive TOD), both boosting affordable housing supply located in BRT influential area and facilitating the private-led mixed-use development around BRT terminal stations are identified as the key barriers to unlock the full potential of Dar es Salaam TOD. To overcome these barriers, good practices in other countries might be useful. For example, to supply more affordable housing along BRT, land value capture mechanism or facilitating the engagement of small local developers into affordable housing market may be taken into consideration. To do so, the Tanzanian authority needs to consider how to mobilise land-value capture mechanism in the Tanzanian context. Furthermore, the Tanzania authority

may consider how to incentivise such small local developers to enter the affordable housing market. In conclusion, Dar es Salaam TOD has some barriers for its success, however, it has a potential to overcome these barriers with referring good practices in other countries.

Table 7: Overall evaluation of Dar es Salaam inclusive TOD

Inclusive TOD component	Evaluation	Rooms to be improved
Density	Moderate	<ul style="list-style-type: none"> More spatially equal density growth might be encouraged
Diversity	Moderate-low	<ul style="list-style-type: none"> At sub-corridor (zone) level, mono land-use zone in zone C and E should be more diversified land-use At key station area level, the mixed-use development is a challenge. Hence, some involvement of public developers is desirable.
Affordability	Low	<ul style="list-style-type: none"> A systematic review and improvement of laws and planning practices is required to make land-value capture workable, which significantly contributes to fill the gap of affordable housing supply. An effective collaboration with small local developers might be considered. Easier access to mortgage should be examined Affordable housing should be strategically located and harmonised with BRT development
Design	Moderate	<ul style="list-style-type: none"> Setback adjacent to BRT station might be minimised to boost the proximity between BRT stations and pedestrians Elevated crossing structure to BRT terminal station might make pedestrian feel safer when crossing
Destination accessibility	High	<ul style="list-style-type: none"> Full-phased BRT development in planned schedule is prerequisite.
Distance to transit	High	<ul style="list-style-type: none"> Full-phased BRT development in planned schedule is prerequisite.

7. Conclusion

Transit-oriented development (TOD), which is one of the planning strategies to create sustainable urban development associating mass public transit and walking/cycling, is now globally regarded as one of the major urban development strategies. Since the African cities are the fastest urbanised in the world, it is expected that more African cities are adopting their sustainable urban development strategies as the last frontier of TOD. As TOD in Africa is still an early stage with little existing literature, it is necessary to explore the achievement and challenges of African TOD within its distinctive context. Hence, this research focuses on TOD in Dar es Salaam, Tanzania that is a potential generalised model of TOD in Africa, and this is the first attempt to capture the

emerging outcome of Dar es Salaam TOD. The uniqueness of this research is to bring the concept of inclusive TOD into the analysis with tailoring the concept with African cities' context; shaping sustainable and compact city through containing urban sprawl led by expanding informal settlements by low-income residents. The literature review reveals that some of TOD components are already investigated in other research contexts, however, density, diversity, and affordability aspects are not yet studied. Thus, to fill this gap, this research aims to capture the tentative outcomes of inclusive TOD in Dar es Salaam to explore the potentials and barriers of Dar es Salaam TOD. In this regard, the research questions are formed as follows; (1) To what extent the inclusive TOD in Dar es Salaam has achieved so far?, and (2) What are the potentials and barriers to achieving inclusive TOD in Dar es Salaam?. This research employs the single case study approach with the mixed-method, making the most use of the available secondary data including the satellite-images.

The results indicate the mixed outcomes according to inclusive TOD components. Destination accessibility and distance to transit are expected to be much improved with the completion of full development of BRT. Density and design aspects are also regarded as the medium level of outcomes. On the other hand, the biggest challenge is affordability. More specifically, it is revealed that there is a huge undersupply of affordable housing, and their location is not synthesized with BRT. In these current circumstances, Dar es Salaam TOD rarely contributes to slowing down the rapid urban sprawl through accommodating low-income residents in BRT influenced areas. The second biggest challenge is diversity. Among the three mixed-use development in key stations precinct areas, two sites are still vacant, and only one site has been completed by the public developers. Hence, it is identified that the private-led mixed-use development is still challengeable.

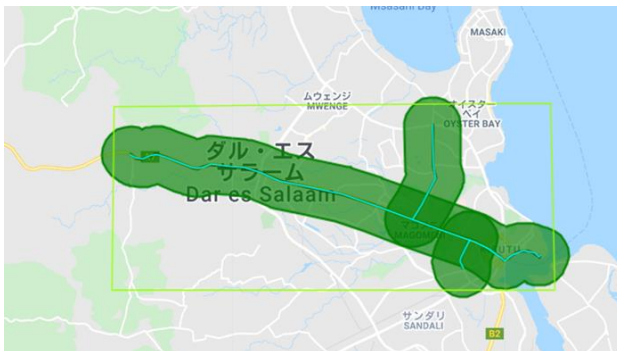
The journey for ideal inclusive TOD seems to be the still middle point. Moreover, the major barriers for the Dar es Salaam TOD are both boosting affordable housing supply and facilitating the private-led mixed-use development around BRT terminal stations. However, since Dar es Salaam TOD is still early phase, there is likely to be potentials for further improvement. To overcome these barriers, the policy makers could consider countermeasures with referring the good practices in other countries. Lastly, the major limitation of this research is relying on secondary data. Although several important progresses of TOD are revealed through the public open data, the research cannot analyse the underlying facts (what are behind reasons for bottlenecks). Furthermore, an-

other limitation is a temporality of the research findings. Thus, it is also important to update the TOD outcomes with consideration to the rapid urbanisation of the city. Further research on updating the outcomes and analysing the background of the key challenges identified in this research is expected in the future.

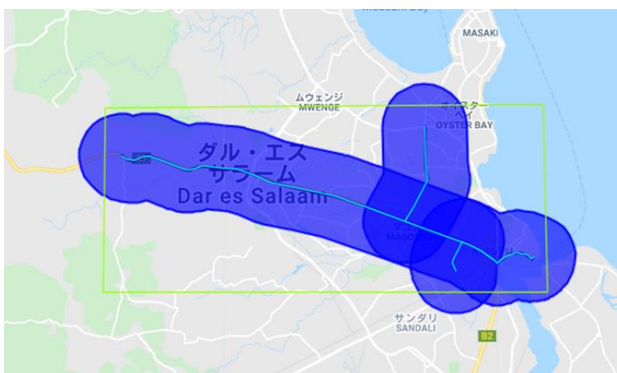
APPENDIX: Both sides' area within 500m, 1,000m, and 1,500m of BRT



Both sides' area within 500m of BRT



Both sides' area within 1,000m of BRT



Both sides' area within 1,500m of BRT

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